

Age Management during the Life Course

CLAS-HÅKAN NYGÅRD, MINNA SAVINAINEN,
TAPIO KIRSI & KIRSI LUMME-SANDT (eds.)

Age Management during the Life Course

Proceedings of the 4th Symposium on Work Ability



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PREFACE

The 4th International Symposium on Work Ability was held in Tampere 6–9 June 2010. The theme of the symposium was “Age Management during the Life Course”. Some 135 participants from altogether 23 different countries participated in the three-day symposium. The book of proceedings contains 45 selected papers from the conference including the following main chapters: Work Ability Index, Work Ability in Different Jobs, Extending Working Life, Age Management, Occupational Health and Well-being, Occupational Gerontology and Unemployment and Employability.

This was the fourth Symposium on Work Ability. The first Work Ability conference was also held in Tampere in 2001 and after that we met in Verona, Italy (2004) and Hanoi, Vietnam (2007). The theme of the first conference was “Past, Present and Future of Work Ability”. Now, after almost ten years, we recognize that the topic of work ability is even more important than before due to increasing demands in the work life and due to the attempts to extend the work life both at the beginning and the end. Age management was the main theme of the symposium, the focus being on how to take better account of the needs and abilities not only of older employees but also of people of all other ages in work life. Work ability is primarily a question of balance between work demands and personal resources. In practice, people search for an optimal balance throughout their entire work life. This optimal balance may be very different in different phases of work life.

The concept of age management includes a holistic appreciation of the importance and needs of every age group in the working life, also better planning for an ageing work force and labour market and workplace policies which take account of the changing needs of workers as they age.

Quality of life after retirement may depend on the quality of the work life and therefore functional ability in old age may be related to work ability. In the work ability model, the work demands are compared with the person's functioning, with the aim to achieve a good and optimal balance between the work demands and the person's functioning. Functioning (or functional ability) refers to the functions of cells and organs, the functioning of individuals, their psychological and social participation. This is an interdisciplinary term but used especially in studying people in old age. The general concern is how well the ability of people matches the demands of their surroundings. The hypothesis is that good work ability during work life means good functioning after retirement, but there is relatively little research on this. The symposium gave rise to many fruitful multidisciplinary discussions bridge the gap between researchers in working life and in gerontology. The new field of study called Occupational Gerontology aims at describing the effect of occupational exposures on age-associated changes in work ability and employees' health.

Aging and work and especially the work ability of aging workers is currently a hot topic worldwide. It has been of special interest in Finland for more than 30 decades, partly because the Finnish population is ageing very fast compared to the populations of many other countries. In the last few years the discussion on how to prolong the work life has been a subject of considerable media attention.

The main organizer of the symposium was the Tampere School of Public Health (since the beginning of 2011 School of Health Sciences) at the University of Tampere in collaboration with the Finnish Ergonomics Society, the Finnish Society for Growth and Development, the International Committee on Occupational Health, the International Ergonomics Association and the Federation of European Ergonomics

Societies. The main sponsors were the Finnish Work Environment Found, the Finnish Ministry of Social and Health Affairs (Forum for Wellbeing at Work) and the Finnish Society for Learned Societies.

Professor Clas-Håkan Nygård, PhD

Chair of the Symposium
School of Health Sciences,
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INVITED KEYNOTES

30 years' work ability and 20 years' age management

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Abstract

Work ability and age management have a long history in Finland. Work ability research started in the early 1980s aiming to study how long people are able to work. Because the managers appeared to have the major role for changes in work ability the concept of Age Management was introduced in the early 1990s. In late 1990s the Work Ability House was constructed indicating more comprehensive dimensions of work ability. The recent activities in Finland are focusing on national surveys with the Work Ability Index (WAI), developing survey instruments covering the dimensions of the work ability house concept, and developing practical training, coaching and consulting tools for work organizations. Thirty years of work ability and 20 years of age management worldwide gives an evidence based background for better and longer work life. Promotion of work ability and good age management practices in workplaces are the key concepts and tools for modern work life.

Key terms: Work Ability Index, Work Ability House, Age Management

Finnish history of work ability research and age management

The history of work ability research can be described by the following three phases: (i) 1980–1989 Evolution, with longitudinal research, (ii) 1990–1999 Conceptualization and Implementation, and (iii) 2000–2009 Internationalization (1, 2, 3). In the same way, Age Management followed from the work ability research findings: (i) 1990–1999 Responses to Research, Conceptualization, Training, and (ii) 2000–2009 Case studies, Good practices, Typologies.

The starting point of the work ability research was the demographic challenge of Finland as early as in early 1980s; due to the baby boom generations born in 1945–1950 in Finland, the predictions of the high rates of older workers in the 1990s and thereafter were easy to make. In the 1980s the high rates of work disability were seen and new exit ways for early retirement emerged. A question was raised by the Municipal Pension Institution “How long can people work and what is the right retirement age?” In those days there were 8 different, job-related retirement ages in Finnish municipal sector. The request to clarify the situation was made to the Finnish Institute of Occupational Health (FIOH) in 1980. From the research point of view, the question was “how to measure human abilities to work during aging?” The study approach was a positive one – to measure work ability instead of work disability, the latter had dominated the research and discussion so far. Therefore, a multidisciplinary team of scientists constructed a new, epidemiological method which was called the Work Ability Index (WAI). The method was applied and tested in a longitudinal study of 6500 municipal employees (1981 – 1985 – 1992 – 1997 and 2009).

The results after 4-year and 11-year follow-up were very interesting: about 60 % of employees kept their WAI at a good or excellent level, about 10 % even showed an improvement, but about 30 % indicated a dramatic decline of WAI during aging. Working alone did not prevent work ability from declining among a third of the study population, independent of occupation and gender (4, 5). As a consequence, the

Finnish social partners agreed in 1989 that “Maintaining work ability during aging is our common goal”. Today this statement appears in the Occupational Health Act of 2002 and the Occupational Safety Act of 2003.

The next step was to develop the concept to maintain and promote work ability. Therefore, the Finnish Institute of Occupational Health (FIOH) established a research program called “Respect for aging – promotion of work ability and well-being of aging workers”. The program tested and implemented the promotion concepts in 20 projects in the private, state and municipal sectors 1990–1996 (6, 7, 8). At the same time the training of occupational health doctors and nurses for WAI was organized by FIOH.

The results of the 11-year follow-up study in 1992 indicated that managers and supervisors were the key players influencing the work ability: age awareness and readiness to find age-related solutions improved the work ability of aging employees and workers; a lack of knowledge and preparedness impaired work ability more than other factors. This finding was the base for developing the concept of age management. The training in age management started by NIVA in 1993 and the 6th International Course on Age Management was carried out in 2010.

The next phase can be described as political awareness raising: A government committee on ageing workers was established first (1996) aiming to find solutions to support the growing aging work force. The committee created almost 50 recommendations. To realize and implement those recommendations, the Finnish National Programme for Ageing Workers (FINPAW, 1998-2002) was established. One part of the national program was the request to develop an Age Management Training Programme together with management training institutions of Finland. About 1,000 managers and supervisors were trained in age management during the national program. Also, the Work Ability Barometer was developed aiming to evaluate nationwide the activities of work ability in enterprises and work organizations in every third year. Special attention was paid to small and midsize enterprises (SME);

the so called Carrot Project with about 20 SMEs tested the means to promote work ability (9).

After the FINPAW new national programs of the Ministries of Social Affairs and Health, the Ministry of Labor and the Ministry of Education were carried out (2003–2007). In 2006 Finland was rewarded by the Carl Bertelsmann Prize for Active Ageing Policy. During the Finnish EU Presidency of 1999 and of 2006 the Finnish success factors dealing with work force aging were introduced to other Member States of the European Union.

The success of Finland’s approach to active aging policy in work life matters relies on integrating:

- Public Policy – delivers mandate and resources
- Research – including the longitudinal study supports action research and effective implementation
- Tripartite ownership – supports take-up, and enables companies to respond
- Promotion, facilitation and tools – engage and provide practical guidance and support and link the components of the model
- Win-Win approach – both employers and employees are winners. Each country needs to translate this experience to their own environment

Internationalization

In the early 1990s the first translations of WAI were done into Swedish, English, German (Dr. Rudolf Karazman, Austria) and Dutch (Prof. Willem J.A. Goedhard, The Netherlands). By the end of 2008, the WAI was translated and used in 26 languages.

The key role in WAI internationalization was played by the International Committee of Occupational Health (ICOH) and its Scientific Committee for Ageing and Work (Chair: Prof. Goedhard 1989–2006)

and by the International Ergonomics Association (IEA) and its Technical Committee for Ageing (Chair: Prof. Ilmarinen 1997–2006). The ICOH and IEA committees organized numerous scientific workshops, symposia, conferences worldwide, with WAI and aging as the main topics. Altogether 11 books of proceedings were published: a valuable and unique source of scientific information on work ability and aging, likewise for corporate practice in age management (10).

In the 2000s important and large-scale research and development activities in age management were carried out under the umbrella of the European Union. The European Foundation for the Improvement of Living and Working Conditions (Ireland) collected and analyzed the best practices in age management in EU Member States. These company case studies and related reports can be found at their website (www.eurofound.europa.eu). These European activities of case studies ran parallel with Finnish active aging policy and international R&D activities with WAI and age management by ICOH and IEA.

From the Work Ability Index – research to the Work Ability House Model

Numerous studies introduced results of factors related to WAI and explained the changes in WAI both by work-related and employee-related interventions at workplaces. The research information served to comprehend the work ability in a broader way. A comprehensive work ability – model as a scientific paradigm was developed by FIOH in early 2000 (11). The factors influencing work ability were constructed like a house with four floors: health, competence, values and attitudes, and work. The environment outside the Work Ability House was also illustrated: family, close community, operating environment and policy level. The new model emphasizes that four factors influence human work ability daily at the workplace, and other four factors outside the workplace have an influence on work ability, although less directly.

The new model was tested on the Finnish population based project Health 2000 (12).

The Work Ability House Model serves as a new generation concept of work ability. It can be applied both in planning research and developmental projects, in constructing training and education programs, in planning actions to promote work ability and well-being, in developing corporate well-being policy, and in planning legislation aiming to support the work ability and longer work careers.

New Model – Work ability and environment

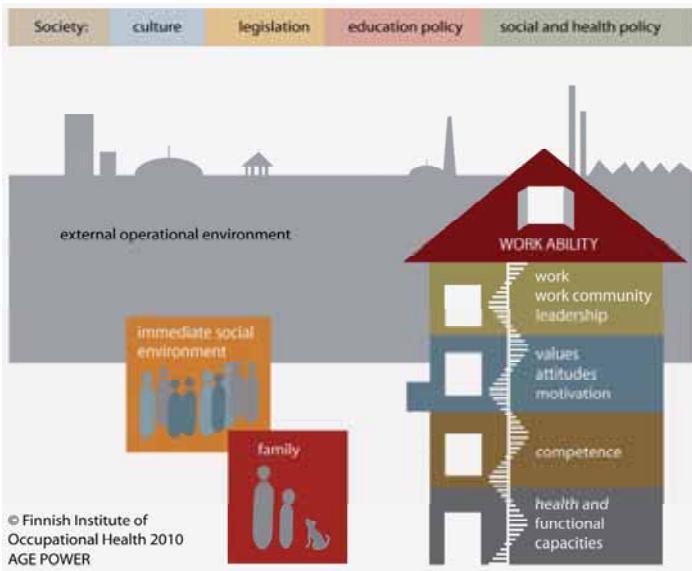


Figure 1. Work Ability House model

Some recent research activities have been oriented to create a valid survey instrument to cover the different dimensions of work ability. In Finland, two survey methods have been used (FIOH's 28-year follow-

up study, the Health 2000 study). A feasible, corporate level survey instrument is under development for the Finnish technology industry. In Austria, a house model survey instrument has been used and tested among 20 companies in Fit for the Future Program (Kloimueller in this volume). In Australia, a Work Ability Survey instrument was developed and tested in four case companies in the Business, Work and Ageing Research Centre, Melbourne (Taylor et al. unpublished). In the Netherlands a survey instrument is also under development in the Rotterdam Medical Center. For the research community, a serious wish has been expressed that a more standardized survey method for work ability, following the house model, should be developed. FIOH expressed its interest in the Tampere Symposium to coordinate these developing activities.

The work ability concept and WAI as a resource for the work organizations

For the work organizations two overarching and strategic benefits of the work ability approach are:

- Brand reputation in the employment market (and in the community)
- Cost-benefit analysis of improved productivity

More detailed benefits of the concept are that it:

- indicates the status of work ability and need for promotion
- is an early indicator of risks of work disability and early exit
- initiates preventive actions
- evaluates the effects of actions
- is a validated method for Occupational Health Services and for health promotion

- initiates the discussion about ageing and work
- improves the awareness of human work ability
- improves the collaboration between employers and employees due to win-win possibilities
- can be used as base for cost-benefit analysis

The work ability concept should be taken as a resource for the enterprises and work organizations.

It brings together the needs of employers and employees, likewise the needs to prolong the work careers of older workers. Promotion of work ability is a cornerstone of age management, or generation management. A life course approach emphasizes the needs and possibilities of different generations. A good exercise for the companies is to discover the generation-related issues in the work ability house-model.

Future of Work Ability

It has been a long way from the WAI research to the Work Ability House Model. The future of work ability will cover the following measures and targets:

- WA concept: The new house model can be utilized aligned across research, training, strategy and policy.
- WA concept: The new survey instruments of work ability can be used for the identification of problems and targets for improvements, evaluation of effects of interventions across all components of the model.
- WA concept: Work ability networks are needed in national, regional and global levels.
- WAI: Long-term effects on the Third Age should be studied
- WAI: National surveys as a sound foundation for databanks

- WAI: Establishment of national data banks and international co-operation
- WAI in OHS: Use as an instrument for dialogue for the health and well-being of individual employees
- WAI in business: Tool for promoting, training, coaching and consulting
- WA and WAI: Establishment of pre- and post doc programs in universities
- WA and WAI: Developing curricula for occupational gerontology in universities

Towards a better and longer work life – role of work ability?

The work ability concept provides a comprehensive and evidence based concept for better and longer work life. Based on sustainable balance between work and human resources, the concept gives dimensions for actions, which should be then identified through separate survey over the floors of the work ability house together with the dimensions outside the workplace. There are, however, overarching reforms needed in the modern work life:

- Attitudes towards ageing must be changed (attitudinal reform)
- The awareness level of managers and supervisors in age-related issues needs to be improved (management reform)
- Better age and life course adjusted, more flexible working life is needed (work life reform)
- Health services should better meet the increasing needs of older workers (reform of occupational health services)
- Improvement of horizontal and vertical co-operation and networking between the key actors is needed (co-operational reform)

Better and longer work life can be realized only through better age-awareness among workplace actors, which gives room for changing the attitudes to age. Managers and supervisors are the key persons to improve the age-friendly work life. The workplace is the most important platform for better and longer work life. Promotion of work ability and occupational well-being is the validated process for win-win results – both the employer and employees will be winners and our welfare state model will be secured (13).

References

1. Ilmarinen J, Tuomi K: Past, present and future of work ability. In: Past, present and future of work ability. Edited by J Ilmarinen, S Lehtinen. People and Work, Research Reports 65. Finnish Institute of Occupational Health, Helsinki 2004, 1–25.
2. Ilmarinen J. Towards a Longer Worklife: Milestones of Finland and Finnish Institute of Occupational Health from 1981–2008. In: William K Zinke (ed.) Utilizing Older Workers for Competitive Advantage. The New Human Resources Frontier. Center for Productive Longevity, Boulder, Colorado 2008, 59–71.
3. Ilmarinen J. Work Ability – a comprehensive concept for occupational health research and prevention. Editorial. Scand J Work Environ Health 2009;35(1):1–5.
4. Ilmarinen J (ed.): The aging worker. Scandinavian Journal of Work, Environment and Health, Volume 17, supplement 1, 1991, 141 p.
5. Ilmarinen J, Tuomi K, Klockars M: Changes in the work ability of active employees over an 11-year period. Scand J Work Environ Health 1997; 23 suppl 1: 49–57
6. Ilmarinen J.: Ageing workers in the European Union. Status and promotion of work ability, employability and employment. Finnish Institute of Occupational Health, Ministry of Social Affairs and Health, Helsinki 1999, 274 p.

7. Ilmarinen J, Louhevaara V (editors.): FinnAge-respect for the aging: action programme to promote health, work ability and well-being of ageing workers in 1990–96. People and Work, Research reports 26. Finnish Institute of Occupational Health, Helsinki 1999
8. Tuomi K, Huuhtanen P, Nykyri E, Ilmarinen J: Promotion of work ability, the quality of work and retirement. *Occupational Medicine* 51 (2001):5, 318–324
9. Ministry of Social Affairs and Health: The many faces of the Finnish National Programme for Ageing Workers. Ministry of Social Affairs and Health, Helsinki 2002.
10. Goedhard, WJ.: Achievements in Aging and Work “period 1989–2007”; challenges after 2007. In: M. Kumashiro (ed). *Promotion of Work Ability towards Productive Aging*. Taylor & Francis Group, London, UK, 2009, 3–14.
11. Ilmarinen J.: Towards a longer worklife. Ageing and the quality of worklife in the European Union. Finnish Institute of Occupational Health, Ministry of Social Affairs and Health, Helsinki, 2006, 467 p.
12. Gould R, Ilmarinen J, Järvisalo J, Koskinen S. Dimensions of work ability. Results of the Health 2000 Survey. Finnish Centre of Pensions (ETK), The Social Insurance Institution (KELA), National Public Health Institute (KTL), Finnish Institute of Occupational Health (FIOH), Helsinki, 2008, 185 p.
13. Ilmarinen J. Aging and Work: An International Perspective. In: Sara J. Czaja and Joseph Sharit (eds.) *Aging and Work. Issues and Implications in a Changing Landscape*. The Johns Hopkins University Press 2009, 51–73.

Planning for an Ageing Workforce

Taylor P

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Abstract

Population ageing has caused policymakers to rethink working lives. Out has gone the supposedly anachronistic notion of early retirement, to be replaced by ‘active’ or ‘productive’ ageing, economic activity being one obvious corollary here. But how is this new policy objective being realized and does this conflict with the wider objective of tackling issues of ageism in the labour market. Are the tools being adopted by policymakers under the auspicious of promoting a longer work life potentially at odds with wider efforts to reduce age barriers?

This chapter has three aims. First, to examine changes in work and retirement against a background of population ageing. Second, to review the status of policymaking concerned with age and employment and how this needs to be adapted to align with the needs of different individuals and societies. Third, to consider trends in the employment of older workers, how policymakers are envisioning a flexible end to working life and the prospects of success.

A brief recent history of older workers

It is important to place the present situation of older workers in some context. A policy development since the late 1990s has been the idea of prolonging working lives, presented as a means of reducing pressures on social welfare systems. This contrasts with previous approaches which focused on the supposed need to remove older workers from the labour market, a response to high unemployment, particularly among young people. In the 1980s and 1990s the restructuring of industrialised economies was accompanied by a dramatic fall in labour force participation rates among older workers.

Early retirement has cast a long shadow over the employment of older workers, being both the cause and consequence of age discrimination in the labour market. Research has consistently demonstrated that older workers are severely disadvantaged in the labour markets of the industrialised economies. Their position is summarised in a review of OECD countries:

- Labour market mobility in terms of new hires is lower for older workers.
- Although rates of job loss are similar for younger and older workers, the latter are more prone long-term unemployment.
- A shift to economic inactivity is generally permanent across older age groups (2).

On the other hand, important changes appear to be underway. As Table 1 shows, among older men, after decades of increasingly early labour market withdrawal, employment rates have been on the increase. The changing situation for women is clouded by a cohort effect of increasing participation generally, but there is evidence that older women, as with their male counterparts, were affected by early exit. What these figures tell us is that older workers' prospects may be improving. However, it is important to note that employment rates for older people are far below those for other age groups and are only just returning to levels last seen in the late 1970s. Thus, substantial labour market age barriers may be persistent.

Table 1. Employment/population ratios, men and women aged 55-64, 1979–2008.

| | Men | | | | | | Women | | | | | |
|-------------|------|------|------|------|------|------|-------|------|------|------|------|------|
| | 1979 | 1983 | 1990 | 1995 | 2000 | 2008 | 1979 | 1983 | 1990 | 1995 | 2000 | 2008 |
| Australia | 67.4 | 59.6 | 59.2 | 55.3 | 58.3 | 65.7 | 19.8 | 19.9 | 24.2 | 27.4 | 35.3 | 49.1 |
| Finland | 54.3 | 51.4 | 46.3 | 34.9 | 43.7 | 57 | 39.0 | 44.1 | 39.7 | 33.1 | 40.9 | 55.8 |
| Germany | 63.2 | 57.4 | 52.0 | 47.2 | 46.4 | 61.7 | 26.8 | 24.0 | 22.4 | 24.4 | 29.0 | 46 |
| Netherlands | 63.2 | 46.1 | 44.5 | 39.9 | 49.9 | 60.2 | 14.0 | 13.2 | 15.8 | 18.0 | 25.8 | 41.1 |
| Japan | 81.5 | 80.5 | 80.4 | 80.8 | 78.4 | 81.4 | 44.8 | 45.1 | 46.5 | 47.5 | 47.9 | 51.7 |
| UK | - | 64.3 | 62.4 | 56.1 | 59.8 | 67.7 | - | - | 36.7 | 39.3 | 41.4 | 49 |
| USA | 70.8 | 65.2 | 65.2 | 63.6 | 65.7 | 67.7 | 40.4 | 39.4 | 44.0 | 47.5 | 50.6 | 57 |
| EU-15 | - | - | 52.3 | 47.2 | 48.9 | 56 | - | - | 24.3 | 25.6 | 28.4 | 38.9 |

Source: OECD Employment Outlook (various)

Towards 'active ageing'

There is an emerging consensus around the notion of 'active ageing', defined by the WHO (6) as 'the process of optimizing opportunities for health, participation and security in order to enhance quality of life as people age'. According to the OECD (1), such an approach requires:

- an emphasis on prevention, making policy interventions at an earlier life stage, reducing the need for later remedial action
- actions that are less fragmented and that are concentrated at critical transition points in life
- and enabling less constrained choices and greater responsibility at the level of individuals.

Alongside the promotional efforts of the OECD and WHO, national governments have been busy attempting to reverse the trend towards early retirement, instituting various policy reforms and measures. Out have gone measures aimed at facilitating the withdrawal of older workers. Many industrialised nations, worried about the cost of rapidly ageing populations, now support the labour market reintegration of older workers. Concerns about labour supply have also featured in the policy discourse, although the recent global recession has dampened these for now. These new policies often recognise that older workers face a range of barriers, such as a lack of job readiness (e.g. skills currency and low self-esteem), particularly the many who have been out of work for extended periods, and negative attitudes among employers. Measures taken have included the following:

- Closure of or limits on use of early retirement pathways
- Increasing retirement ages
- 'Active' labour market measures
- Age awareness raising among employers
- Incentive schemes for employers to hire older workers
- Rewards for pension deferral or taking a job

- Ending mandatory retirement
- A more flexible approach to retirement in the form of measures to promote gradual retirement.

However, evidence on the success of the various measures suggests that efforts to date have not been entirely successful (2). For instance:

- Ending mandatory retirement appears not to have been effective.
- Gradual retirement schemes appear to have had limited influence, although it is early days in terms of evaluation.
- Gradual retirement schemes may have encouraged early retirement, albeit on a part-time basis.
- It has proved difficult to change the behaviour of employers.
- There is evidence of creaming, deadweight effects and of occupational downshifting in 'active' labour market programs.

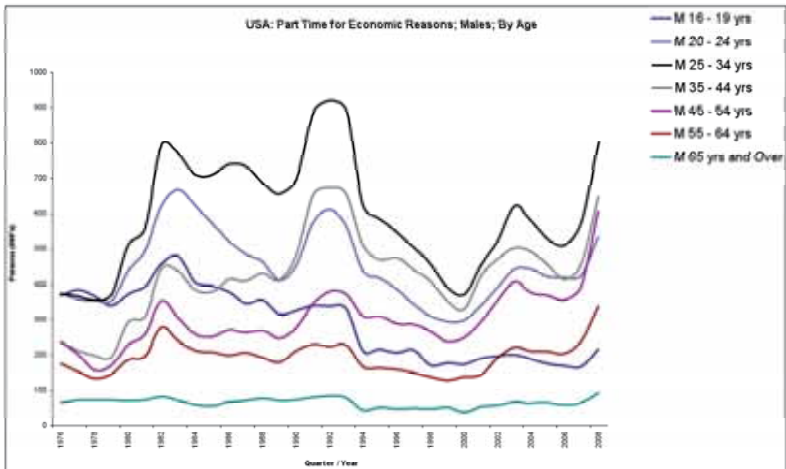
This nascent culture of policymaking in favour of older workers' employment is seeking to undo decades of measures with the opposite intent. It is by no means clear that they did have this effect, but it can be assumed that such policies did not engender a positive attitude among industry, perhaps confirming pre-existing attitudes concerning the capabilities and competences of older workers. The consequence may have been a legacy of disinterest or even hostility to notions of hiring and retaining older labour. Meanwhile, this fresh start is being handicapped by a lack of clear understanding and articulation of the barriers facing older people. What has emerged in policy terms is a fragmented, gradualist, approach, often contradictory in the messages it sends and frequently at odds with the day-to-day realities of older people's lives (5). Critically, by emphasising the disadvantaged status of 'older people', policy may have simultaneously undermined their prospects, a paradox that seems to have gone largely unnoticed. The next section aims to illustrate these points.

Flexi-insecurity and the paradox of ageist older worker policymaking

Recently, campaigners, commentators and policymakers have been united in promoting a new, similar, vision of the end of working life. A remarkable consensus has emerged around the notion of working later and its supposed benefits for older people. Early retirement has been roundly criticised for its high social and economic costs.

As part of the new rhetoric surrounding the inclusion of older people in the labour force ‘gradual retirement’ has been strongly promoted, offering it is argued, benefits to governments, employers and older people themselves as workers gradually withdraw from the workforce via part-time work rather than exit permanently and all at once. This approach has received scant criticism, but unfortunately the rhetoric belies the reality. There is certainly evidence that older workers are willing to work on if they can reduce or work flexible hours. But frequently it seems, the flexible jobs older workers take up are unwanted. Data are suggestive of significant constraints on older workers’ choices, with many trapped in involuntary part-time working. This is exemplified by figures 1 and 2, which report data from the USA concerning involuntary part-time working by age. It can be seen that this affects a significant proportion of the workforce. Levels rose sharply during the recessions of the 1980s and 1990s and then rose again as the economy deteriorated in 2008. As can be seen, older workers were not excluded from this trend. From this perspective, ‘gradual retirement’ takes on quite a different meaning from that of a voluntary, gradual withdrawal from the labour market.

Flexibility may indeed benefit some, but for others a gradual switch from work to non-work is not an option, for instance, those with near-empty pension funds. A singular public policy position of one-way transitions from full-time to part-time work and on to retirement is simplistic, perhaps partly drawing on ageist assumptions about older people’s needs and desires. It may play directly into stereotypes of ageing as inevitably being about decline and disengagement. It clearly



Source: Bureau of Labour Statistics

Figure 1. Involuntary part-time working by age for males

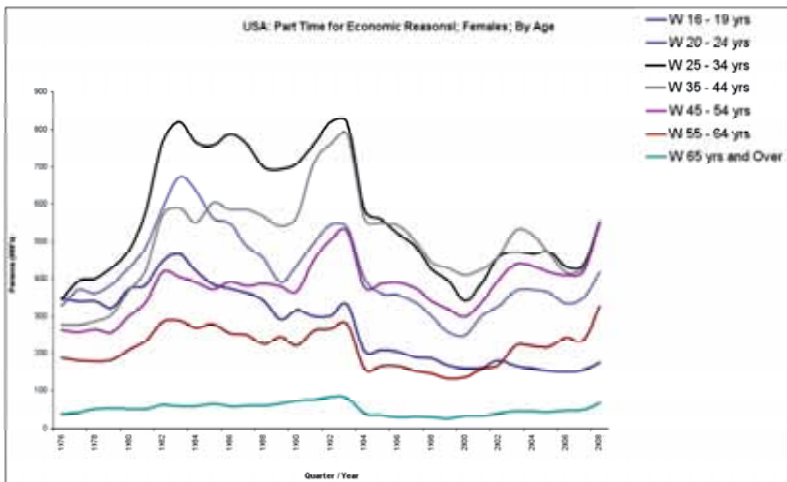


Figure 2. Involuntary part-time working by age for females

ignores the needs of those older people who are forced into jobs that do not meet their requirements and which may undermine their future prospects, raising serious questions about the prospects of 'active ageing' for this group. 'Active', in what sense?

Other well-meaning efforts to re-integrate older workers may only serve to entrench ageism in the labour market. For instance, recently in Australia, during the General Election campaign, the Coalition (opposition parties) announced that if elected to government it would offer a financial incentive to employers who recruit and retain older workers for a minimum of six months. Under the scheme, an employer taking on a worker aged over 50 who was on a pension or other government benefit would receive a lump-sum payment of \$3250 at the end of six months' employment. On the surface, this seems like a good deal for mature age workers having difficulty finding jobs. Unfortunately, the evidence tells us otherwise.

It does not seem that we necessarily help older workers by devising specific schemes for them. The evidence tells us that chronological age is of limited value in determining the employment-related needs of an individual as what characterizes older people are their differences, not their similarities. As we age, we diverge on a whole range of psychological, physiological, economic and social factors. Definitions such as 'older worker' are, therefore, an arbitrary shorthand, a poor basis for devising public policy. Campaign groups have frequently argued for special schemes for unemployed older workers, but it is usually difficult to see much in these that would not be equally applicable to people of all ages. This also raises questions about whether 'older' workers would, anyway, benefit from being separated from 'younger' ones and presumably, vice-versa. This issue seems to have been largely ignored in the literature.

Further, public programs that use age as a selection criterion may send the wrong message to both employers and older workers. Offering a financial incentive to employers who recruit older workers is not a new idea. Similar programs have been tried, with limited success in a number of countries. Employers have not taken up the incentives

offered to any substantial degree. Unfortunately the signal sent is that mature age workers have such work-limiting issues that the only way they can be employed is if the government steps in and pays someone to do it. This may lead to a loss of self-esteem and internalised ageism on the part of older people. For employers, such a message may only serve to confirm existing prejudices rather than encourage them to take a fresh look at older labour. The evidence is that finding willing employers is often difficult, except in the case of 'younger' older workers and those who are most qualified, who would be more likely to have found a job anyway. Often, jobs do not last after an incentive scheme ends. On the other hand, there is some evidence that incentives paid directly to the worker may encourage job take-up. However, such jobs are often at the lower pay and skill ends of the spectrum and seem not to help jobless older workers back on to the career ladder in the long-term (3, 4, 5).

On top of such concerns, narrow economic imperatives also seem to be over-riding wider social ones in the minds of policymakers as they have formulated policies on age and work. How, for instance, older women will balance work and care for older relatives has barely featured yet in the public discourse. But this will be a critical issue in years ahead.

In summary, a new set of policies are emerging which seek to reverse the trend towards early exit which has characterised the experiences of older workers in many of the industrialised nations for more than a quarter of a century. However, this new approach is equally deficient in a number of ways. The instruments being adopted or proposed often seem to fall short in terms of their functionality and the new language of inclusivity is strongly at odds with the actual experiences of many older workers. While this does not point to the futility of such policymaking, it does suggest that there is a need for a fundamental re-think of approach.

Concluding comments

New policies to integrate older workers have placed them at the forefront of efforts to engender flexibility in the labour market. However, recent policymaking has had a singular focus on prolonging careers, ignoring the context of older workers' lives. Thus, some versions of this flexibility may not be in the best interests of an older person. Narrow economic imperatives are also overriding wider social ones such as the work/care nexus. Neglect of such scenarios risks exposing older people to the now familiar problem of diminishing opportunities and increasing constraints and with them, reduced prospects for 'active ageing'.

A new approach is required that is cognisant of the heterogeneity of older workers and that policy failure is a likely scenario if remedial approaches are favoured over more substantial ones that seek to attend in a timely fashion to deficiencies that emerge over the course of a working life. Thus, effective public policies for older workers will be based on the following related principles:

A realistic stance on older workers' employment – An extension to working life depends on a range of individual, organisational, economic and societal factors and while this may be achievable for some, prospects for others might be remote. Barely conceivable until recently, suddenly society is demanding that older people and business unlearn decades of entrenched attitudes and behaviour. The construction of old age is undergoing refurbishment. This is a long-term project. It is not a surprise therefore, that institutional change does not always match societal expectations. While each catches up with the other, older workers should not be disadvantaged.

Integrated and strategic policymaking – There is a need for a matrix of public policies which respond adequately to the heterogeneity of older people's lives. Schemes specifically for 'older workers' risk deepening age prejudice and institutionalising age discrimination. The particular problems confronting them should be acknowledged in terms of service provision, but attention should be paid to the delivery of such services in order to avoid problems of stigmatisation. Targets

might be set for the recruitment of older workers on to particular labour market programs, but there is no requirement for the establishment of specific schemes to support them. These are, by their very nature, ageist, and can further erode self-confidence by categorising people as 'difficult to employ'.

Preventative – A shift to a life course approach, emphasising long-term measures, preparing for tomorrow's older workers is required. Today's older workers should not be neglected but a long-term approach is required which prepares people to remain competitive in the labour market over a career. Remedial actions, by contrast, will always be deficient.

Above all, there is a need for much greater reflection on how public policies which purport to assist older workers are devised and implemented. Efforts to prolong work lives, while obviously promoted as having the opposite intent, may be ageist in practice and may even entrench yet further age barriers in the labour market. This is as much a failure of the current discourse surrounding older workers as it is the process of policymaking itself. It is incumbent on scholars and those lobbying on behalf of older workers to improve the quality of the dialogue with policymakers if a more robust approach is to emerge.

References

1. OECD (1998), *Maintaining Prosperity in an Ageing Society*, Paris.
2. OECD (2006) *Live Longer, Work Longer: A Synthesis Report*, Paris.
3. Taylor, P. (2002) *New Policies for Older Workers*, The Policy Press, Bristol.
4. Taylor, P. (2006) *Employment Initiatives for an Ageing Workforce in the EU-15*, Office for Official Publications of the European Communities, Luxembourg.
5. Taylor, P. (2008) *Ageing Labour Forces: Promises and Prospects*, Edward Elgar.
6. World Health Organization (2002) *Active Aging: A Policy Framework*, Geneva.

Occupational Gerontology

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Introduction

The International Committee of Occupational Health (ICOH) scientific committee “Aging and Work” that was raised in 1989 articulated as one of its main objectives to bridge the gap between occupational health and gerontology (1). Knowledge about changes in the organisms of active workers in relation to the aging process is instrumental in good occupational health practice. During the 1990s the committee organized several workshops and conferences but contributions from gerontology studies were few.

It is well known that several physiological functions decrease with advancing age (2). This decrease may affect the functional capability of a worker and retirement from professional activities is generally accepted beyond a certain age, e.g. the age of 65 years. An optimal retirement age, however, has not been settled for most professions. Since the 1990s in most industrial countries aging of the population has been observed as a general phenomenon due to decreased birth rates and increased life expectancy. Policies are developed in many countries to encour-

age workers to continue working until the age of 65 and even beyond that age. At a conference on aging and work organized in Kitakyushu (Japan) in September 2001, the concept of occupational gerontology was launched (3). The main question is: “do work exposures affect the rate of aging of employees?” To answer this question knowledge about the rate of aging is necessary. Unfortunately a true biomarker of the rate of aging is lacking. However, since the implementation of the Work Ability Index (WAI) by the Finnish Institute of Occupational Health in the 1980s a useful instrument to monitor aging employees is available.

Results of studies with the WAI.

Tables 1 and 2 present the average results of two studies with the WAI in the Netherlands.

Table 1. Decline in work ability in 504 municipal workers.

| Age group | Mean WAI score | Standard dev. |
|-----------|----------------|---------------|
| 30-40 yrs | 44.0 | 4.1 |
| 50-60 yrs | 40.9 | 5.7 |

Table 2. Decline in work ability in 384 industrial workers.

| Age group (mean age) | Mean WAI score | Standard dev. |
|----------------------|----------------|---------------|
| (1) (26.3 ± 2.0) | 44.4 | 3.5 |
| (2) (54.0 ± 3.0) | 40.3 | 5.8 |

From the data in Table 1 a decline in mean WAI of 3.1 points in about 20 years can be concluded. From the data presented in Table 2 a decrease of 4.1 points in 28 years is observed. The general conclusion therefore can be drawn that the average decline in WAI is about 1.5 WAI points

per decade. This is considerably less than the decline in physiological functions, which is usually about 1% per year (2).

Toward an optimal age of retirement

In most countries the retirement age is based on political and economic decisions made in the past. With the present need to encourage older employees to stay in the workforce beyond the traditional retirement age of 65 there will be a growing need to determine the optimal age of retirement for individual workers in different professions. The WAI may be a useful instrument in the process of monitoring the possible decline in work ability of an older employee.

Work life expectancy

The WAI score, if measured periodically, can be used to determine the time a worker can continue his (or her) professional activities. This time could be indicated as “work life expectancy” (WLE). To determine WLE knowledge about the average decline of WAI over time is necessary. From studies with the WAI in the Netherlands the following regression model was obtained (4):

$$\text{Equation 1) } \text{WAI} = 48.4 - 0.16 \times \text{age}.$$

This equation will be used in this publication as a benchmark of the WAI score.

Estimate of work life expectancy

Suppose we want to estimate WLE of a 50-year-old employee. Based on equation 1 a WAI score of 40.4 is expected. Suppose the observed WAI score is 42 it can be reasoned that this employee is functionally younger than his calendar age.

Another important variable is healthy life expectancy (HLE). HLE is a statistically variable that shows an increasing tendency over the last few decades (4). Using equation 1, WLE can then be assessed as follows:

$$\text{Equation 2) } WLE = HLE + [WAI (\text{obs}) - WAI (\text{exp.})]/0.16$$

Using earlier observations of HLE (5) HLE of a 50-year-old employee is 20 years.

Using equation 2 the following calculation can be made:

$WLE = 20 + [42.0 - 40.4]/0.16 = 20 + 10 = 30$ years; this would indicate that the 50-year-old employee might be able to continue working until the age of 80 years. WAI should, of course, have to be closely monitored periodically during the remainder of his active work life.

Toward a higher pension age

In many countries especially in the EU there are on-going discussions to raise the mandatory retirement age from 65 to 66 or even to 67 years. To examine whether this will be feasible in the future, the WAI could play an important role. Again, if a 50-year-old employee is used as an example, his remaining work life will then have to be 1 –17 years. The question then is: What should his WAI score at 50 years be?

Using Equations. 1 and 2:

$$\begin{aligned} [\text{WAI (obs.)} - \text{WAI (exp)}] / 0.16 &= \text{WLE} - \text{HLE} = 17 - 20 = -3.0 \\ [\text{WAI (obs.)} - 40.8] / 0.16 &= -3.0 \end{aligned}$$

Thus, WAI (obs.) should be: 39.9. This is considerably more than the limit of 38 points that is usually estimated as moderate and used as an incentive to improve work ability.

Work stress and aging

Exposure to a work environment usually involves exposure to work stresses. Such stresses may, of course, differ considerably in different professions. A major aspect of work stress is the question whether work stress may affect the rate of aging of an individual. An important finding about work stress in relation to aging was published in 2004 (5). The study involved healthy women (average age 38 years), who were caregivers to children with chronic illnesses, which was considered a considerable stress and perceived as stress in comparison with age-matched women with healthy children. The authors examined the possible effects of the perceived stress on the telomere length of peripheral mononuclear blood cells. Evidence was provided showing that chronic stress is associated with shorter telomere length. Telomere length can be considered an indicator of a cell's biological age. Telomere length declines during aging. The authors made calculations and concluded that the examined leukocytes of mothers under stress had aged 9–17 additional years compared with the low stress group. In the study it was found that telomerase activity was also lower in the women with high stress. This study thus shows that environmental exposures may affect certain cellular biomarkers of aging, although the exact nature of the relationship is as yet unknown. The authors expressed as one of the conclusions of their study “the findings have implications for

understanding how, at the cellular level, stress may promote earlier onset of age-related diseases”. It is obvious that this conclusion is important in matters dealing with the maintenance of work ability of older workers.

Discussion

The concept of occupational gerontology may hopefully lead to a better understanding of age-associated biological changes of older employees. This will be useful in an era in which employees are asked to continue their professional activities to higher age limits than customary during the 20th century. This implies new challenges for occupational health physicians. Research on aging workers has to be intensified. Important research topics will be:

1. Do adverse work exposures affect the rate of aging?
2. Does work stress affect the rate of aging and possibly decrease life expectancy?
3. Are workers exposed to heavy job demands (physically or mentally) entitled to early retirement?

In the above-mentioned items the WAI may play an important role. It seems obvious that the key importance of the WAI is found in the periodic assessment of the WAI score. From successive observations over time a clear picture can be obtained about the decline of work ability. The challenge will be to assemble databases of WAI scores of workers in different professions. The Finnish study with WAI that started in 1981 has already produced valuable longitudinal WAI data on many workers. The observations cover a period of more than 25 years. This database can therefore serve as an important database to study the longitudinal changes in work ability. From a publication (6) based on these data it can be concluded that blue-collar workers tend

to have lower WAI scores than white-collar workers of comparable age groups (see Figure 1).

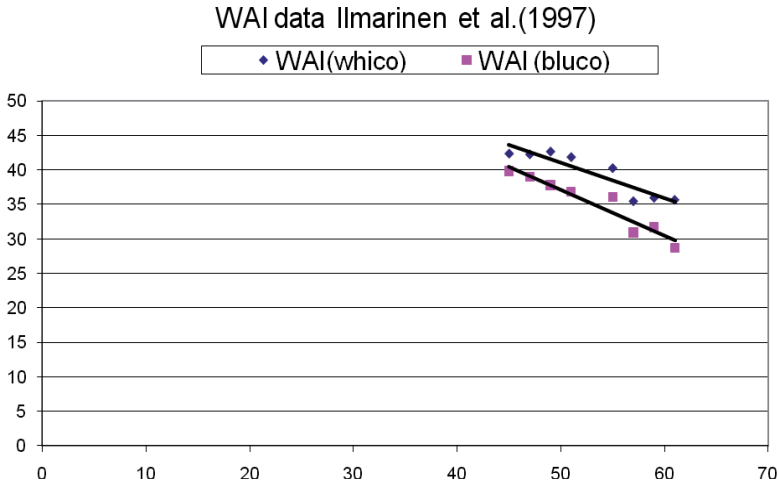


Figure 1. Average decline of work ability of different groups of worker. Analysis based on data presented in a publication by Ilmarinen, J. et al.(8). Horizontal axis: calendar age. Vertical axis mean WAI score. Two groups of workers are distinguished: 1. those with physically demanding jobs (blue-collar workers); 2. those with mentally demanding jobs (white-collar workers). The calculated regression lines differ significantly suggesting that the decline in the work ability of blue-collar workers is greater than the decline in the work ability of white-collar workers.

Work stress and aging

As mentioned earlier, there are indications that work stress may have adverse effects on the aging process and subsequently on the development of chronic age-associated diseases. The exact nature of the process (through which mechanism can perceived stress affect a fundamental aspect of the aging process, i.e. affecting telomere length) is still unknown (9).

With so many interesting research questions to be answered occupational health in general and the study of the relationship between aging and work will be of great interest for several years to come. I am convinced that occupational gerontology may serve as a useful field of research that can bridge the gaps between occupational health and the aging process of active workers.

References

1. Goedhard W.J.A. (ed.) *Aging and Work*; ICOH Scientific Committee, 1992, Pasmans Printing Office, The Hague; 1992, preface.
2. Shock N.W., Greulich R.C. et al (eds) *Normal human aging. The Baltimore longitudinal study*. NIH Publication No. 84-2450, 1984, Washington DC.
3. Goedhard, W.J.A. *Occupational Gerontology: the science aimed at older employees*. In: Kumashiro, M. (ed.) *Aging and Work*, Taylor & Francis, London, 2003, pg. -19.
4. CBS (National Office of statistics) , The Hague, 2010.
5. Goedhard, W.J.A. *WAI scores and its different items in relation to age: a study in two different companies in the Netherlands*. In: Ilmarinen, J. (ed.) *Past, Present and Future of Work Ability*, Res. Report 65, FIOH, Helsinki, 2004, pg. 26-32.
6. Van de Water, H.P.A., Boshuizen, H.C., Perenboom, R.J.M. *Gezonde en ongezonde levensverwachting*. In: Ruwaard and D. Kramers, P.G.N.(eds) *Volksgezondheid toekomstverkenning*, RIVM, SDU, The Hague, 1993, pg. 203-211.
7. Epel, E.S., Blackburn, E.H. et al. *Accelerated telomere shortening in response to life stress*. *Proc. Nat. Acad. Sciences*, 2004: 17312-17315.
8. Ilmarinen, J., Tuomi, J., Klockars, M. *Changes in the work ability of active employees over an 11-year period*. *Scand. J. Work Environm. Health*, 1997; 23 suppl. 1: 49 -57
9. Sapolsky R.M. *Organismal stress and telomeric aging: an unexpected connection*. *Proc. At. Acad. Sciences*, 2004,17323-17324.

I WORK ABILITY INDEX

Australian Work Ability Index (WAI) Databank

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Abstract

Australian studies have used the WAI over the last ten years as the issues of sustainability of health and welfare systems, contracting labour supply and early exit have become issues of interest for researchers. A commonality amongst these applications is an extremely high mean work ability score in conjunction with negative skew in the distribution of WAI scores. This study assesses of the psychometric properties of the WAI. Overall, the results of this study interpreted as providing a level of support for the proposition that there is a consistent pattern of responding when the WAI is administered to Australian respondents.

Key words: Psychometric properties, Distributional characteristic, Australia, WAI.

Introduction

Several studies have used the WAI in Australia over the last ten years as the issues of sustainability of health and welfare systems, contracting labour supply and early exit have become issues of substantial interest for researchers. These studies have used the WAI as a component of their studies for varying purposes, for example, to compare the predictive power of different indicators of retirement intentions, to assess the influence of organisational values on work ability and to investigate the age related factors that affect injury proneness and work ability. An interesting commonality among some of the applications of the WAI in Australia is an extremely high mean work ability score (1); (2); (3); (4). This has been observed in conjunction with negative skew in the distribution of WAI scores. The study populations across the various research programs have been diverse, from both the public and private sector, locations across the country, from industries as distinct as open-cut mining to international freight companies (1); (2); (3); (4). In these studies samples have ranged in size from 109 participants to over 1800. This WAI finding for Australians, though currently somewhere short of being a certainty, provides an interesting initial indication of something different about Australian respondents. This consistent finding across a number of studies is unlike findings across the vast history of validation and assessment of the WAI in Europe. The presence of persistent and strong skew in WAI total scores in Finnish studies developing and administering the WAI has not been reported. Equally, the application of various statistical analyses to WAI total scores, particularly in the assessment of the longest running longitudinal study using the WAI (5), would suggest that the assumptions of these techniques, for example distribution normality, were surely met.

The search for explanations for this finding would be premature at this stage. The cited research programs that have uncovered the potential of inflated WAI scores across its distribution do provide the basis for an argument for a general expectation in the application of the WAI. In order to establish a dialogue regarding this issue, researchers

who had administered the WAI were invited to pool their data. The result was a databank of six independent studies using the WAI. Due to privacy limitations and other factors, not all Australian studies using the WAI were included in the databank though the number of studies not included is fewer than of those that were included.

This paper investigates the characteristics of the WAI when applied to Australian respondents and takes an exploratory approach to the assessment of any pattern in responding that is consistent across the six independent studies. This study represents an initial step in the assessment of the psychometric properties of the WAI when administered to Australian respondents. At this early stage of the development of a national databank of WAI scores, questions exist regarding the extent that the six studies that are included represent the wider Australian population. As such, analyses have been limited to an assessment of the comparability of results across the six studies.

Methodology

The databank of pencil and paper responses to the WAI was established from six independent studies undertaken between 2006 and 2009. Participants of these studies were located predominantly across the eastern states of Australia and were drawn from various industry sectors, including; manufacturing, freight and logistics, tertiary education, local government and the automotive industry. The total sample included 2,900 participants. Total WAI scores from all six studies were not calculable as four of the studies omitted elements of the WAI from their selected measures. In one case, space constraints dictated the omission of the lengthy item 3, which lists fourteen illness categories from the International Classification of Diseases, Revision 10, Australian Modification (6). The remaining studies used only certain items from the WAI because of both space limitations and concerns regarding the validity of the psychological wellbeing items in the WAI in comparison

to the widely validated alternatives such as the Kessler 10 (7). Given in Table 1 below is the breakdown of elements of the WAI used in each of the six studies and the sample size of each.

Table 1. Elements of the WAI included across the six studies.

| | n | Item 1 | Item 2 | Item 3 | Item 4 | Item 5 | Item 6 | Item 7 | Total WAI Score |
|-----------------|------|--------|--------|--------|--------|--------|--------|--------|-----------------|
| Study 1 | 332 | x | x | | x | x | x | x | |
| Study 2 | 128 | x | x | | x | x | x | | |
| Study 3 | 109 | x | | | | x | x | | |
| Study 4 | 306 | x | | | | | x | | |
| Study 5 | 338 | x | x | x | x | x | x | x | x |
| Study 6 | 1687 | x | x | x | x | x | x | x | x |
| Total responses | | 2900 | 2485 | 1913 | 2485 | 2594 | 2900 | 2245 | 1913 |

The analysis outlined in this paper can be considered overall as two related analyses. First, the two studies that have the total WAI score are compared then, each item is individually assessed in terms of the comparability of results from each of the studies. The WAI total scores were assessed through visual inspection of the distribution, descriptive statistics including measures of central tendency and skew and kurtosis. Also, a significance test for mean differences in WAI total scores was applied. Moving to the individual assessment of the items of the WAI, the analysis approach was determined by the nature of the response options used. Item 6 of the WAI is scored on a three-point response scale and its assessment was limited to a description of the distribution. Items 3 and 7 are scored on a four-point response scale and were treated as continuous variables. Although the practice of considering response scales, for example Likert type response scales, as continuous variables is commonplace, it is generally accepted that doing so with fewer than five response options can be problematic. This is commonly highlighted using Pearson's r as it has been shown that correlations are underestimated as response options reduce particularly below five (8).

As such, the analysis applied in this case can be considered to be indicative rather than definitive. Considering these variables as continuous allowed the application of various analysis techniques including; visual inspection of the distribution, descriptive statistics including measures of central tendency, skew and kurtosis. The remaining items were assessed in a similar fashion.

The limited scope of this series of analyses was applied primarily to begin the process of a full assessment of the psychometric properties of the WAI when administered to Australian respondents. Further analysis will undoubtedly be required to draw firm conclusions regarding this issue. An important preceding step in this process is exploratory study that builds a sound argument for the focus of research attention in this area. In light of the unexpected and anecdotally comparable findings from independent researchers in Australia using the WAI and the potential value of the work ability concept the present analysis appears justified. In the following discussion, each item of the WAI is discussed in turn, taking those items with the largest negative skew first.

Results

Presented in Table 1 are the proportions of respondents from studies 5 and 6 that fall into the four categorisations of WAI total scores. Notable here is how these proportions force a departure from the intended purpose of the WAI. The scoring categories were initially conceptualised to reflect the rate of work disability throughout the Finnish population. Hence it is expected that approximately 15% of respondents would fall into the 'poor work ability' category when applied to a Finnish sample. This could be expected to be marginally lower in Australia with approximately 10% of the population operating in the labour force while having some restriction in their core activities (including employment)(9). It is evident from Table 2 that the WAI total score does not reflect this population characteristic when administered to Australian respondents.

Table 2. Proportion of participants in studies 5 & 6 in WAI total score categories.

| WAI category | n | % |
|--------------|------|------|
| Excellent | 854 | 44.6 |
| Good | 719 | 37.6 |
| Moderate | 262 | 13.7 |
| Poor | 78 | 4.1 |
| Total | 1913 | 100 |

Distribution of WAI scores from studies 5 & 6

As presented in Figure 1 and Figure 2 there is an obvious similarity between the distribution, mean and standard deviation of total WAI scores for studies 5 and 6. WAI scores from study 5 were highly skewed (*Skewness* = -1.2) and truncated (*Kurtosis* = 1.9). Study 6 demonstrated a similar though more extreme pattern of skewness and kurtosis (*Skewness* = -1.3, *Kurtosis* = 2.4). Notably, the mean score for each of these studies was high, falling into the ‘good work ability’ category, though distinct by approximately 1.5 points. An independent samples t-test elucidated that study 6 had a statistically significant higher mean WAI score than study 5 ($t(430.8) = 4.3, p < 0.001$). The median, a useful measure of central tendency when describing skewed data, of study 6 (*Median* = 43.5) was less than one point higher than study 5 (*Median* = 42.8). For both of these studies, more than 40% of respondents fell into the ‘excellent work ability’ category while less than 4% fell into the ‘poor work ability’ category. The WAI demonstrate adequate reliability according to Chronbach’s alpha (.65). It is suggested that these results provide mixed support for the proposition that Australian respondents ubiquitously convey positive assessments of work ability. To suggest unequivocal support for this idea, no differences should have been detected. However, minor differences in variance and measures of central tendency were evidenced between study 5 and 6, while the distribution of total WAI score, in terms of both the graphical representation and the statistical assessment of its shape described the same stacking of scores at the top of the range.

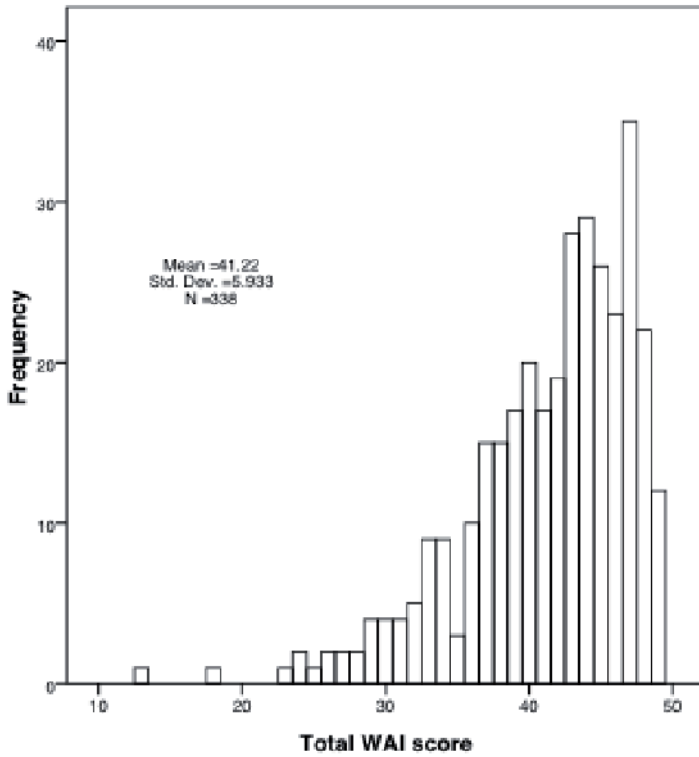


Figure 1. Distribution of WAI total score for study 5.

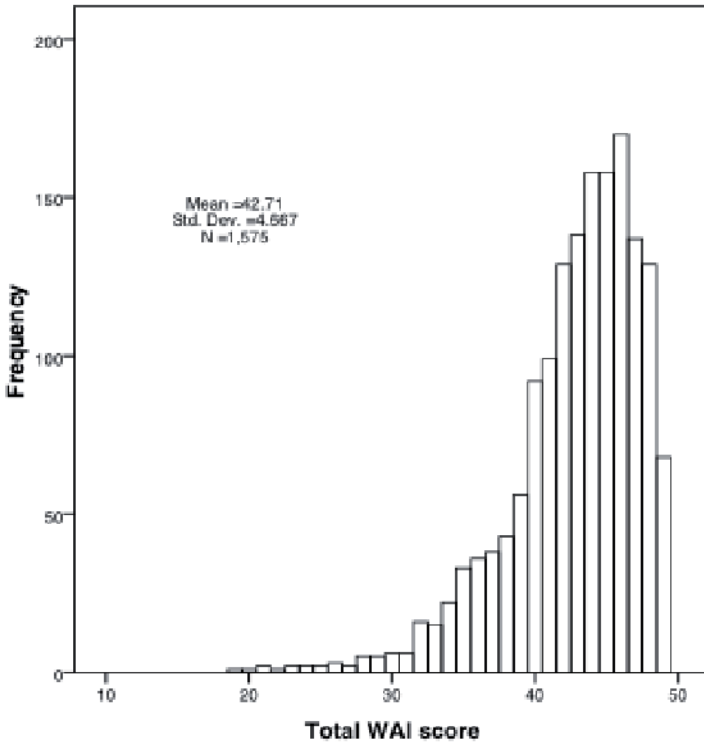


Figure 2. Distribution of total WAI scores for study 6.

Comparison of WAI items

To investigate the existence of communalities among responses to the WAI with Australian respondents, each of the items were reviewed in turn. Item 3, which captures the number of illnesses that respondents have been diagnosed with or treated for is discussed first as it was only administered in two of the six studies. The remaining items are discussed in order of complexity of comparison, i.e. the number of studies that administered the item.

Taking item 3 first, which is scored on a four-point scale has been treated as a continuous variable. Looking at measures of central

tendency, minor differences between study 5 and 6 were elucidated. An independent samples t-test indicated that the item 3 mean score for study 6 (*Mean* = 5.4, *Standard Deviation* = 1.8) was significantly higher than that of study 5 (*Mean* = 4.4, *Standard Deviation* = 2.1; $t(443.7) = -8.1, p < 0.001$). For both studies a ceiling effect was evident with this item though it was more extreme in study 6 in which more than half the sample scored the maximum for this item. One third of respondents in study 5 also scored the maximum. It appears plausible that these proportions of respondents may in fact have no diagnosed illness, thus warranting the ceiling effect in these data. It is suggested that the results of this item are clearly distinct for these two studies and provides an argument for considering the samples as being drawn from unique populations.

Moving to item 7, it is again noted that this item with a four-point response scale was treated as a continuous variable. In the WAI, this item captures the psychological wellbeing aspect of work ability. Presented in Table 3 are the distributions of item 7 scores across the three studies that administered this element of the WAI. Importantly, there are clear similarities in the distribution of responses to this item across the three studies. For example, in all three studies, more than 90% of respondents were in the top two response options. Although the greatest mean difference in item 7 scores between studies was .01, a univariate analysis of variance indicated that a statistically significant difference in the mean score for item 7 was present between the three studies ($F(2, 2269) = 3.3, p < 0.05$). Study 5 (*Mean* = 3.5, *Standard Deviation* = 0.5), in this case, had a significantly larger mean score than study 6 (*Mean* = 3.4, *Standard Deviation* = 0.6) but not study 1 (*Mean* = 3.4, *Standard Deviation* = 0.5) according to post hoc comparison (*Dunnnett's T3*, $p = 0.03$). This finding is questionable as it is likely an artefact of unequal sample sizes, the result is not statistically significant when the Bonferroni correction is applied (10) and is of such a magnitude to be of little practical importance. It is concluded that the responses to item 7 of the WAI demonstrate a degree of consistency across the three studies in which this item was administered.

Table 3. Distribution of scores on item 7 for studies 1, 5 & 6.

| Item 7 score | Study 1 | | Study 5 | | Study 6 | |
|--------------|---------|------|---------|------|---------|------|
| | n | % | n | % | n | % |
| 1 | 0 | 0 | 0 | 0 | 14 | 0.9 |
| 2 | 13 | 3.9 | 10 | 3 | 128 | 8 |
| 3 | 143 | 43.1 | 118 | 34.9 | 512 | 32 |
| 4 | 176 | 53 | 210 | 62.1 | 945 | 59.1 |

Item 2 reflects respondents' perceived ability to meet the mental and physical demands of their work. Four of the studies in the WAI data-bank administered this item. Across the four studies, the mean score for item 2 of the WAI ranged from 8.4 to 9.0 as presented in Table 4. A univariate analysis of variance detected a significant difference amongst the means for this item across four studies ($F(3, 2394) = 31.4, p < 0.001$). Post hoc comparisons suggested that study 1 had a significant lower mean score than studies 5 and 6 when the Bonferroni correction is applied (*Dunnett's T3*, $p < 0.001$). This result is likely to be an artefact of unequal sample sizes or differences in the extent of skew in responses and the practical implications of this difference is difficult to ascertain, hence it may be more useful to consider the median for these studies. This measure of central tendency does not demonstrate vast differences (1.1 being the largest difference) but may indicate more skewed distributions for these studies. This proposition is supported by skewness statistics for studies 5 and 6 which both had severe negative skew compared to study 1. It is important to note that while all four studies indicated the presence of negative skew in responses to item 2, the extent of this skew was not identical. These results are interpreted as providing mixed support for the proposition that the sample of the studies in the WAI data bank were drawn from the same population. It is suggested that if the same extent of skewness and identical results for measures of central tendency would have indicated unequivocal support for considering responses in the data bank to be representative of all Australian respondents.

Table 4. Means, Medians and Standard Deviations for item 2 across studies 1, 2, 5 and 6.

| | | Study 1 | Study 2 | Study 5 | Study 6 |
|---------|--------------------|---------|---------|---------|---------|
| Study 1 | Mean | 8.4 | 8.6 | 9.0 | 8.9 |
| | Standard Deviation | 0.1 | 1.5 | 1.2 | 1.3 |
| | Median | 8.3 | 8.5 | 9.0 | 9.5 |

The next item of the WAI to be considered is item 4. This item reflects the extent to which illness or injury affects the respondent's ability to do their work. Table 5 presents the distribution of responses to item 4 across the four relevant studies. It is evident from this table that the vast majority of respondents reported that injury and illness did not hinder their ability to do their work. This result is expected when the highly negatively skewed responses to item 3 are considered. A univariate analysis of variance indicated that a significant difference in the mean scores for item 4 existed between these studies though the difference range was 0.1 to 0.3 ($F(3, 2377) = 9.19, p < 0.001$). Post hoc comparisons indicated that study 1 (*Mean* = 5.6, *Standard Deviation* = 0.8) had a significantly larger mean than studies 5 (*Mean* = 5.2, *Standard Deviation* = 1.13) and 6 (*Mean* = 5.5, *Standard Deviation* = 0.8) (*Dunnett's T3* < 0.001). This result is statistically spurious as it is likely to be related to unequal sample sizes and discrepancies in the extent of skew in these datasets. As, again, it is suspected that the skew present in these datasets affected the assessment of the mean, the median of these data sets is compared. Interestingly, the median of the responses to this item is equal across all four datasets (*Median* = 6). It is concluded then that there exist strong similarities in the responses to this item across the dataset in this WAI databank. Of the measures applied, it was only the measures of skew and kurtosis that indicated a variation in the extent of the skew and truncation of the data, though all four studies scored beyond the critical values on these measures.

Table 5. Distribution of responses to item 4 across studies 1, 2, 5 and 6.

| Item 4 score | Study 1 | | Study 2 | | Study 5 | | Study 6 | |
|---|---------|-----|---------|------|---------|------|---------|-----|
| | n | % | n | % | n | % | n | % |
| I am totally unable to work | 3 | 0.9 | 1 | 1 | 3 | 0.9 | 3 | 0.2 |
| I have had to reduce my hours of work | 4 | 1.2 | 3 | 2.9 | 10 | 3 | 26 | 1.6 |
| I often have to slow down my work pace or change the way I work | 5 | 1.5 | 0 | 0 | 11 | 3.3 | 26 | 1.6 |
| I sometimes have to slow down my work pace or change the way I work | 21 | 6.3 | 16 | 15.4 | 57 | 16.9 | 160 | 10 |
| I am able to do my job but my conditions cause some difficulties | 40 | 12 | 14 | 13.5 | 37 | 10.9 | 154 | 9.6 |
| I have no disease or those I have do not hinder work | 259 | 78 | 70 | 67.3 | 220 | 65.1 | 1238 | 77 |

Item 5 assesses the amount of sick leave that respondents took in the previous year. This item was administered in five of the studies present in the data bank. Shown in Table 6 are the distributions of responses to item 5 across the five relevant studies. All studies excluding study 5 had the highest proportion of respondents taking less than two weeks of total sick leave. Notably, respondents in study 5 were most likely to have taken no sick leave. When presented graphically, as in Figure 3 it is evident that there is variation amongst the proportion of respondents that endorsed the ‘none’ and ‘less than two weeks’ response options, however rates of endorsement are relatively homogenous for the other categories. Equally, in all studies, approximately 90% of respondents endorsed either the ‘none’ or ‘less than two weeks’ response options. This loading of scores at this end of the response range is reflected in the equality of the medians of all five of these studies. A univariate analysis of variance indicated that a significant mean difference was present in the item 5 scores across the five studies ($F(4, 2492) = 5.4, p < 0.001$). Post hoc comparisons suggested that both studies 5 ($Mean = 4.3, Standard Deviation = 0.9$) and 6 ($Mean = 4.3, Standard Devia-$

tion = 0.7) had significantly larger means than studies 1 (*Mean* = 4.1, *Standard Deviation* = 0.8) and 2 (*Mean* = 4.0, *Standard Deviation* = 0.6) (*Dunnett's T3* < 0.01). It is unclear whether this represents a substantive population difference or whether this result is due to unequal sample sizes in some cases and differences in the extent of skewness and kurtosis present in the datasets. It is suggested that these results provide partial support for the proposition that a pattern of responses to WAI items can be reasonably predictable with Australian respondents.

Table 6. Distribution of responses to item 4 across studies 1, 2, 3, 5 and 6.

| Item 4 score | Study 1 | | Study 2 | | Study 3 | | Study 5 | | Study 6 | |
|------------------------|---------|------|---------|------|---------|------|---------|------|---------|------|
| | n | % | n | % | n | % | n | % | n | % |
| More than 3 months | 4 | 1.2 | 1 | 0.8 | 0 | 0 | 9 | 2.7 | 14 | 0.9 |
| Between 1 and 3 months | 20 | 6 | 4 | 3.3 | 5 | 5.1 | 9 | 2.7 | 39 | 2.4 |
| Between 2 and 4 weeks | 22 | 6.6 | 8 | 6.5 | 7 | 7.1 | 22 | 6.5 | 90 | 5.6 |
| Less than 2 weeks | 182 | 54.8 | 93 | 75.6 | 66 | 66.7 | 130 | 38.5 | 818 | 51 |
| None | 104 | 31.3 | 17 | 13.8 | 21 | 21.2 | 168 | 49.7 | 644 | 40.1 |

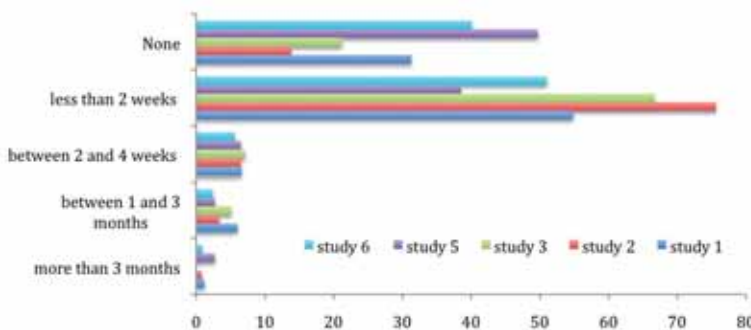


Figure 3. Distribution of responses (%) to item 5 across studies 1, 2, 3, 5 and 6.

Item 6 of the WAI asks respondents to assess the likelihood that they will be able to undertake their current work in two years' time. This item was administered in all of the studies present in the data bank (Table 7). Compared with the analysis of items discussed in this paper, a more descriptive approach was adopted with item 6 as it affords only three response options. Overall, it is evident that the responses were heavily loaded toward the 'very likely' response option. Study 5 was the only study where this loading was not approximately 90 %. Despite some variation in the distribution of responses to this item, it is suggested that the pattern of responses across these studies bear strong resemblance to each other. When it is considered that study 5 adopted a specific focus on workers approaching retirement age, the differences in the distribution of responses to this item appear conceptually valid. With this conceptual link in mind, it is suggested that these results support the proposition that these studies capture the tendency for Australian respondents to consistently report positive estimations of their work ability.

Table 7. Distribution of item 6 (estimate of current work ability after 2 years) in 6 studies.

| Item 6 scores | Study 1 | | Study 2 | | Study 3 | | Study 4 | | Study 5 | | Study 6 | |
|---------------|---------|------|---------|------|---------|------|---------|------|---------|------|---------|------|
| | n | % | n | % | n | % | n | % | n | % | n | % |
| Unlikely | 7 | 2.1 | 4 | 3.2 | 0 | 0 | 13 | 4.5 | 24 | 7.1 | 22 | 1.4 |
| Not sure | 36 | 10.8 | 6 | 4.8 | 13 | 12.6 | 13 | 4.5 | 48 | 14.2 | 127 | 7.9 |
| Very likely | 289 | 87.0 | 116 | 92.1 | 90 | 87.4 | 266 | 91.1 | 266 | 78.7 | 1462 | 90.8 |

Finally, item 1 asks respondents to rate their current work ability compared to their lifetime best. This item was administered in all of the studies in the databank. Presented graphically in Figure 4 is the distribution of responses to item 1 across the six studies present in the databank. Visual inspection of these distributions suggests that variations in the proportions in each of the ten response options across these studies exist. It is also evident that the majority of respondents

in each study scored seven or above for this item. Across the six studies, between 85 % and 94 % of respondents scored in this range. A univariate analysis of variance indicated that a significant difference in the mean response to item 1 across the six studies ($F(5, 2800) = 20.8, p < 0.001$). Post hoc comparisons indicated that study 1 ($Mean = 7.8, Standard Deviation = 1.5$) had a significantly lower mean than studies 3 ($Mean = 8.6, Standard Deviation = 1.5$), 4 ($Mean = 8.3, Standard Deviation = 1.3$), 5 ($Mean = 8.5, Standard Deviation = 1.3$) and 6 ($Mean = 8.5, Standard Deviation = 1.3$) ($Dunnett's T3 < 0.001$). Notably, the varying extent of skew and kurtosis and the presence of unequal sample sizes in the item 1 scores across these studies may be a more reasonable explanation for the significant result here than a substantive difference. The medians of these responses are somewhat divergent, ranging between 8 for study 1 and 9 for all other studies. It is suggested that these results provide some support for considering the studies included the databank as representing a homogenous single population that tends to report highly positive estimations of their work ability. Study 1, which was somewhat unique in terms of responses to item 1 may reflect a subset of this population whose specific characteristics have not been considered thus far. The difference in these scores is not considered to be a critical delineating factor at this stage of analysis but warrants further attention.

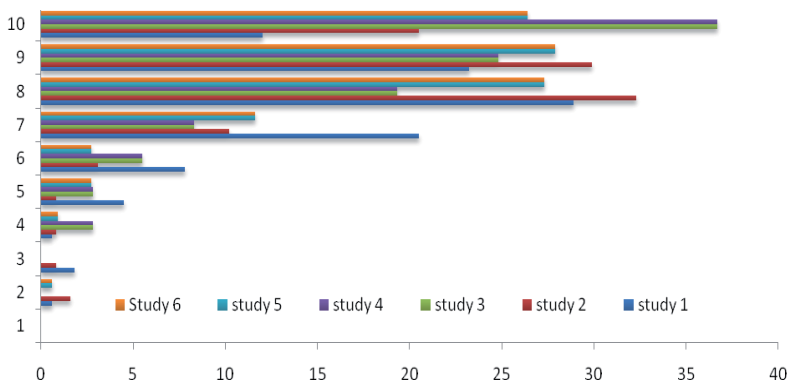


Figure 4. Distribution of responses (%) to item across all six studies.

Discussion

Overall, the results of the exploratory analysis described above are interpreted as providing a level of support for the proposition that there is a consistent pattern of responding when the WAI is administered to Australian respondents. Despite the presence of variation in the distributions and central tendencies in responses to the items of the WAI and the resultant WAI total score, it is suggested that the series of analyses discussed here did not uncover a critical delineating factor. Concurrently, incidental differences observed between the 6 studies discussed in this paper may represent extant population differences, which would add weight to the propositions that Australian respondents report highly positive WAI scores. In subsequent analyses further consideration should be directed to the specific objectives of the studies in the databank. The initial analyses presented here uncovered some differences that may reflect the characteristics of a specifically sampled population. For example, study five focused on employees approaching retirement age. This difference in sampling frame notably influenced the pattern of responses to questions about participants' short-term career trajectories. The addition of further studies may normalise the influence of the presence of such specifically selected samples

Further analysis of this databank will be useful for the discussion of future use of the WAI in Australian studies. This may include the assessment of group differences for age groups and genders. Also, the application of more rigorous tests of the psychometric properties of this measure. For example, verification of the factor structure and application of the Rasch model. As suggested, the present analysis exists as an important preceding step to these more specialised analysis techniques.

The addition of new studies administering the complete WAI would vastly improve the generalisability of results drawn from this dataset but to administer the WAI to a nationally representative sample would be the ideal condition in which to make assertions regarding its psychometric properties when administered to Australian participants.

Until such a study is undertaken it is difficult to dismiss the possibility of sample specific factors, such as cohort effects, as the explanation for the findings discussed here. If a similarly skewed distribution was demonstrated with a nationally representative sample, possible explanations such as employee insecurity in reporting problems with their work life or their ability to do their work or a more general issue relating to measurement effects could then be tabled. Equally, in this case, a number of responses would then be available including; standardised transformations, new item weightings or even the development of a new measure if required.

References

1. Oakman, J. & Wells, Y. (2009). Can organizations influence employees' intentions to retire? In Kumashiro, M. Promotion of Work Ability Towards Productive Aging: Selected Papers of the 3rd International Symposium on Work Ability, Hanoi, Vietnam, 22-24 October 2007, Taylor and Francis.
2. Parker, T., Worringham, C. J., Greig, K., & Woods, S. D. (2006). Age-related changes in work ability and injury risk in underground and open-cut coal miners. Available at: <http://eprints.qut.edu.au>
3. Palermo, J., Webber, L., Smith, K., & Khor, A. (2009). Factors that predict work ability: Incorporating a measure of organizational values towards ageing. In Kumashiro, M. Eds. Promotion of Work Ability towards Productive Ageing. Taylor & Francis, London.
4. Healy, P., Taylor, P., Brooke, L., Bohle, P., & Ilmarinen, J. (2007). Adapting the Work Ability Index (WAI) for use in Australia. Third International Symposium on Work Ability. Unpublished conference paper.
5. Gould, R., Ilmarinen, J., Järvisalo, J. & Koskinen, S. (2008). Dimensions of Work Ability: Results of the Health 2000 Survey. National Public Health Institute. www.etk.fi
6. International Classification of Diseases. (2006) Revision 10, Australian Modification.
7. Australian Mental Health Outcomes and Classification Network A. (2005) Kessler -10: Training Manual. National Mental health Strategy: Commonwealth of Australia.
8. Cunningham, E. (2008). A Practical Guide to Structural Equation Modelling Using Amos. Statsline, Melbourne.
9. Australian Bureau of Statistics. (2003) Survey of Disability, Ageing and Carers. Catalogue Number 4430.0.55.001. Retrieved from <http://www.abs.gov.au/ausstats/abs@.nsf/mf/4430.0> on September 6th, 2010.
10. Tabachnick, B. G. & Fidell, L. S. (2005). Using multivariate statistics. Boston, MA: Allyn and Unwin.

Work Ability During Life Course: Brazilian workers data bank analysis

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Abstract

The objective was to evaluate the Work and Health Research Group databank, at the University of Campinas, Brazil, sorted by sector: hospital/health center; metal, poultry, information technology and pharmaceutical industry, SMEs, lorry/taxi drivers, teachers, and small-farm workers in Brazil. The sample included 5,830 workers with data collection through cross-sectional studies between the years 2000 and 2009. Teachers/day care (31.2%), hospital (26.8%), poultry industry (18.8%), and flower workers (11.8%) were in poor/moderate work ability categories. The distribution in the Work Ability Index categories (poor, moderate, good and excellent) were 1.3%, 13.1%, 42.4% and 43.2% respectively. It was concluded that public policies in relation to workers' health need to be improved in Brazil.

Key terms: work ability, Brazil, industry, sector service, worker's health

Introduction

The Work Ability Index – WAI (1) has been used in the Work and Health Research Group from University of Campinas – Brazil since the year 2000.

Brazil is a large country, with 5,564 cities and approximately 190 million inhabitants. The majority of the population is under 30 years of age (99.1 million) and there are 19 million inhabitants aged 60 years or more (2). The majority of the population received support from the public health sector by the Unified Health System (SUS), during the last two decades. In general, during the last decades, work life has begun early, before 16 years and this has an impact in relation to the health of these workers.

The country has huge differences between regions, and sometimes in the same city and this has an impact on work life, work conditions and private life.

According to Ilmarinen “aging is also a global phenomenon for which both developed and less developed countries are searching strategies for survival” (3).

“In occupational health, the work ability concept is built on the balance between a person’s resources and work demands. A person’s resources consist of health and functional abilities, education and competence, and values and attitudes. Work, on the other hand, covers the work environment and community, as well as the actual contents, demands, and organization of work (4).

Measures need to be taken around the age of 30–35 years, in developing countries, in relation to the maintenance of the work ability, as proposed by Ilmarinen (5). Brazilian regions have different grade of development, sometimes with characteristics of developed countries, such as in the south and southeast regions. On the other hand, some of the northeast and north regions do not have the same development.

Objectives

The objective of this study was to study the work ability in different sectors through the Work and Health Research Group databank in the following branches: hospital and health centers; metal, poultry, information technology and pharmaceuticals industry; SMEs, lorry/taxi drivers, teachers, greenhouses and small farms.

Methods

The sample included 5,830 workers with data collection between the years 2000–2009, in eleven cities of three different states in Brazil.

This research was submitted and approved by the Ethics Committee of the Faculty of Medical Sciences – University of Campinas.

The WAI is a questionnaire with seven items: “current work ability compared with the lifetime best; workability in relation to the demands of the job; number of current diseases diagnosed by a physician; estimated work impairment due to diseases; sick leave during the past year (12 months); own prognosis of work ability two years from now and mental resources”. The index could range from 7 to 49 points (1).

Gould et al (2008) proposed a new denomination for the first item of the WAI work ability score, which corresponds to current work ability and ranges from 0 to 10 points. From 0 to 5 points corresponding to poor; 6–7, moderate; good; 8-9 and excellent; 10 points (6).

A cross-sectional study was developed and a questionnaire with socio-demographic data, life-style, work conditions and the WAI was answered. The questionnaire was distributed in the workplace in industries, hospitals, health centers, to IT company workers and teachers, as well as SME’s workers, lorry and taxi drivers and flower and green house small-farms. Percentage, mean value and Chi-square test and Spearman’s correlation coefficient $p < 0.0001$ were used for statistical description.

Results

The majority of the sample in the data bank were men (57.8%), with an average age of 34.1 years (SD11.0, range 14-79 years), from private companies (48.4%), working under legal contract (78.3%); 47.2% had at least completed high school; 58.3% were married and only 58.4% were physically active.

Table 1. Work Ability Index according to gender and age (mean).

| Gender | WAI mean/ age (years) | | | | | |
|--------|--------------------------|--------|--------|--------|-------|-------|
| | n=337 | n=2024 | n=1673 | n=1210 | n=478 | n=93 |
| | <20 | 20-29 | 30-39 | 40-49 | 50-59 | 60-79 |
| Women | 41.5 | 41.6 | 40.3 | 39.7 | 38.8 | 37.8 |
| Men | 43.4 | 42.9 | 42.5 | 42.6 | 41.8 | 41.6 |

The WAI mean for the whole sample was 41.7 (SD5.1) and range 11-49. Women had in general lower mean WAI than men (Table 1). This is the first publication of a large research about Brazilian workers' work ability and there are no other national data to compare, only individual results.

Similar WAI mean was found in a study with hospital nursing personnel in a Brazilian city of the southern region (7), and in Sao Paulo city, where 22.8% of hospital nursing personnel had poor or moderate work ability (8).

Table 2. WAI according to the demands of the job and age (mean).

| Demands | WAI mean/age (years) | | | | | |
|---------------------------|----------------------|--------|--------|--------|-------|-------|
| | n=337 | n=2024 | n=1673 | n=1210 | n=478 | n=93 |
| | <20 | 20-29 | 30-39 | 40-49 | 50-59 | 60-79 |
| Physically demanding work | 42.6 | 41.7 | 41.0 | 41.1 | 40.2 | 39.4 |
| Mixed | 43.1 | 43.0 | 41.9 | 40.8 | 40.5 | 42.3 |
| Mentally demanding work | 43.1 | 43.2 | 42.0 | 41.8 | 41.3 | 41.1 |

The majority of the workers had predominantly physical demands at work (42.3%), followed by mixed (31.9%) and mental (25.8%) work demands.

The mean WAI was statistically different between the work demands groups ($p < 0.001$) in all age groups (Table 2). Employees with physically demanding work had the poorest WAI.

The distribution in WAI categories were: poor (1.3%), moderate (13.1%), good (42.4%) and excellent (43.2%) (Table 3)

Table 3. Distribution of the sample (%) according to WAI classes and age (mean).

| WAI classes | Age bracket (years) (%) | | | | | Total (%) |
|-------------|-------------------------|--------|--------|--------|-------|-----------|
| | n=337 | n=2024 | n=1673 | n=1210 | n=571 | |
| | <20 | 20-29 | 30-39 | 40-49 | 50-79 | |
| Poor | 1.2 | 0.4 | 1.3 | 1.5 | 3.9 | 1.3 |
| Moderate | 6.8 | 10.2 | 13.6 | 17.2 | 16.8 | 13.1 |
| Good | 41.0 | 42.3 | 43.7 | 41.5 | 42.0 | 42.4 |
| Excellent | 51.0 | 47.0 | 41.4 | 39.8 | 37.3 | 43.2 |

The group with the largest percentage of excellent work ability was the workers less than 20 years old, and the poorest, the group aged 50–79 years. The group with the largest percentage of poor and moderate categories were the oldest workers (Table 3).

It is important to highlight that teachers and day care workers (31.2%), hospital (26.8%), poultry industry (18.8%), greenhouse, and flower workers (11.8%) were in the poor and moderate work ability categories.

Table 4. WAI according to branch and age (mean).

| Branch (or sector) | WAI mean/age (years) | | | | | |
|--|----------------------|--------|--------|--------|-------|-------|
| | n=337 | n=2024 | n=1673 | n=1210 | n=478 | n=93 |
| | <20 | 20-29 | 30-39 | 40-49 | 50-59 | 60-79 |
| SMEs (n=1211) | 42.6 | 43.0 | 42.7 | 42.5 | 41.5 | 40.2 |
| Hospital and Health Center (n=847) | - | 41.1 | 40.5 | 39.0 | 37.9 | 37.6 |
| IT company (n=688) | 44.2 | 43.7 | 42.2 | 42.8 | 43.2 | 40.5 |
| Lorry and taxi drivers (n=297) | - | 44.1 | 44.2 | 44.4 | 42.4 | 43.4 |
| Poultry industry (n=1567) | 42.3 | 41.1 | 40.4 | 41.0 | 41.6 | 36.0 |
| Metal industry (n=142) | 45.0 | 44.7 | 44.4 | 43.9 | 44.3 | 45.0 |
| Pharmaceuticals industry (n=357) | 44.5 | 43.8 | 44.3 | 43.8 | 43.6 | 47.0 |
| Flowers and greenhouse small farms (n=407) | 42.6 | 42.8 | 41.9 | 42.2 | 41.1 | 43.5 |
| Teachers (n=314) | - | 39.9 | 39.1 | 38.7 | 37.7 | 37.8 |

If workers in the same age bracket are compared, it is possible to observe a difference among branches, ranging from 2.7 (<20-year group) to 9.4 points (60–79 year group) in relation to the WAI mean.

The workers from the public sector: hospital, health centers and teachers had the lowest WAI mean in different age brackets.

Table 5. Mean of the work ability according to branch.

| Branch | Work ability score mean |
|--|-------------------------|
| SMEs (n=1211) | 8.55 |
| Hospital and Health Center (n=847) | 8.26 |
| IT company (n=688) | 8.46 |
| Lorry and taxi drivers (n=297) | 8.51 |
| Poultry industry (n=1567) | 8.30 |
| Metal industry (n=142) | 8.94 |
| Pharmaceuticals industry (n=357) | 8.94 |
| Flowers and greenhouse small farms (n=407) | 8.62 |
| Teachers (n=314) | 7.95 |

The mean value of current work ability was 8.4 (SD1.5) and 20.2% had poor/moderate work ability scores (6).

A negative correlation was found between age and work ability (Spearman's correlation coefficient $p < 0.0001$).

Conclusion

The results yielded an overview of work ability in different sectors and cities in Brazil. The workers from the public sector – teachers, nursing personnel at hospital and health centers and day care workers - presented the poorest results and need immediate attention.

Day care workers, nursing personnel (hospital and health center), poultry industry and greenhouse, and flower workers (11.8%) were in the poor and moderate work ability categories. Measures related to workplace health promotion need to be implemented to restore and improve their work ability.

References

1. Tuomi K, Ilmarinen J, Jahkola A, Katajarinne L, Tulkki A. Work Ability Index. Helsinki: Finnish Institute of Occupational Health; 1998.
2. Instituto Brasileiro de Geografia e Estatística – IBGE. Síntese de indicadores sociais. Uma análise das condições de vida da população brasileira, 2007. [Social indicators synthesis. Brazilian population life condition analyses]. Brasília: IBGE; 2007.
3. Ilmarinen J. Towards a longer worklife! Ageing and the quality of worklife in the European Union. Helsinki: Finnish Institute of Occupational Health; 2006.
4. Ilmarinen J. Work ability: a comprehensive concept for occupational health research and prevention. *Scand J Work Environment Health*. 2009; 35(1):1–5.
5. Ilmarinen J. Aging and work – coping with strengths and weaknesses. *Scand J Work Environ Health*, Helsinki. 1997; 23(suppl. 1):3–5.
6. Gould R, Koskinen S, Seitsamo J, Tuomi K, Polvinen A, Sainio P. Data and methods. In: Gould R, Ilmarinen J, Järvisalo J, Koskinen S (ed). *Dimensions of work ability. Results of the Health 2000 Survey*. Helsinki: FIOH, KELA, ETK, KTL; 2008. p.25–32.
7. Raffone AM, Hennington EA. Functional capacity evaluation of nursing professionals (portuguese). *Rev Saude Publica*. 2005; 39(4):669–76.
8. Fischer FM, Borges FN, Rotemberg L, Latorre MRDO, Soares NS, Rosa PFLS et al. Work ability of health care shift workers. *Chronobiology International*. 2006; 23(6):1165–79.

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The Relationship between Work Ability Index, Exercise Habits, and Occupational Stress – Employees with Good Exercise Habits Have Greater Work Ability

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Abstract

Factors affecting the work ability of Japanese workers from the perspective of work demands and physical and mental capacity were studied. The results suggested that those subjects with self-confidence in their physical strength demonstrated regular exercise habits and had fewer subjective fatigue symptoms. Further, those subjects with exercise habits had less symptoms of depression like acute stress reaction and less job dissatisfaction. At the same time, those subjects who have regular exercise habits with the stronger exercise activities had higher scores in WAI. Quantitative workload was identified as the primary factor for the decline in job satisfaction and it also functioned as the main stressor.

Key Term: Work Ability Index (WAI), exercise habits, job stress, fatigue

Introduction

The Work Ability Index (WAI) was created by FIOH (Finnish Institute of Occupational Health) in 1981 as a method of assessing the capacity for adaptation to work of moderately aging workers (1). WAI studies have begun in many countries since the English version of the Work Ability Index was published by FIOH in 1994. In Japan, the first version was translated into Japanese and registered with FIOH in 1998 by Kumashiro. This was later revised and reached its present form based on the WAI English language 2nd revised edition (FIOH, 1997) and the corrections to the Japanese language expressions identified through trial use. Full-fledged WAI research in Japan was started by the author and his group in 2000 at the factory of a major air-conditioner manufacturer. The results were presented at several conferences organized by the ICOH SC (International Commission of Occupational Health Scientific Committee) for Aging and Work.

The theme taken for the first WAI study conducted in Japan was the “Influence of Worker Stress Moods on the WAI Score. It was also shown that workers with low WAI scores have a variety of strongly negative feelings about their work (2). Then, of the various stressors in the workplace to which workers were routinely exposed, the research group identified the stressors with the greatest affect on work ability. They then studied the relationship between the WAI score and those people with Type A behavior pattern, who are said to be enthusiastic about work. The results indicated that the factors that positively affect work ability improvement were human relations, satisfaction with work, mental health, and degree of discretion at work while that with a negative affect was a heavy workload. However, no meaningful relationship was found between people that demonstrate a Type A behavior pattern and work ability (3).

The third report was a comparative study of the follow-up results for the WAI (Work Ability Index) and mental stress conducted five times from 2000 to 2004. The results showed that over the relatively short span of five years, stable work ability can be maintained even for

elderly workers unless there is an extraordinary episode relating to quantitative workload, intra-group conflict, or social support. Conversely, it was shown that WAI response differs during the busy work season and slow season even when the observation period is within a year. In other words, it was observed that the WAI score tends to increase during the slow season (4).

As for long-term observation, the research monitoring the changes in work ability of the same individuals working at the same factory was conducted over the eight-year period of 2000 to 2007. During this eight-year period, the research group was successful during the study in tracking 571 of the original 1,004 individuals. Of these, 221 people filled out each and every WAI and the Japanese version of the NIOSH Generic Job Stress Questionnaire. The results from studying the data of these people showed a strong relationship between an increase in depression and poor social support and excessive quantitative workloads and that this was a major factor leading to lowered WAI scores (5).

As mentioned above, the research group was interested in WAI and mental health conditions. A review of WAI related reference works to date, however, shows that most of the studies were on the relationship between WAI and physiological function. For example, they showed a correlation between WAI and muscle strength (6) or the correlation with aerobic exercise, which is thought to show endurance strength (6,7). Regarding the relationship between physical exercise, which is thought to affect physical capability, and WAI, it has been reported that increased physical exercise supports increased WAI (8) and that deficient sports or leisure time (9) or deficient physical activity will lower the WAI score.

The daily workload at work affects the worker's WAI. Occasional research results show that an excessive workload lowers the work ability of the worker (For example, 10, 11). This type of workload is thought to have the opposite effect of physical activity during leisure.

Much research has also been done on the relationship between WAI and musculoskeletal disorders, cardiac disease, etc. (For example, 12, 13). Many papers have reported that disorders lower the WAI

score. Further, Pohjonen (14) reported, using an odds ratio adjusted for age, that musculoskeletal disorders and psychological symptoms had a great effect on work ability, and similarly, Kiss and Walgraeve (15) reported that they found a correlation between musculoskeletal disorders, cardiac disease, and respiratory disorders and people with a low WAI score, with musculoskeletal disorders being the factor that had the greatest impact.

As stated above, the various WAI research that has been conducted by the authors mainly focused on mental capacity. This research therefore aimed to clarify the relationship between physical capacity and WAI in addition to the relationship with mental capacity, which study has been continuously conducted at the same factory since 2000.

We sought to ascertain physical capacity from the state of regular exercise habits. In particular, we used a combination of exercise intensity and frequency as an exercise habits index. This exercise habits index was used to study the relationship between exercise habits and fatigue induced by work as well as to study the relationship between exercise habits and WAI score.

Method

The WAI, NIOSH job stress questionnaire, awareness survey regarding exercise habits and physical strength, and a questionnaire focusing on subjective fatigue symptoms were given to 1,200 employees working at a residential air-conditioner factory of a major Japanese manufacturer. The intensity of daily exercise habits was surveyed by asking respondents to choose 1 of 5 levels. These were, “Almost none, just some light exercise such as calisthenics or stretching,” “Light to medium exercise, for example, slow walking for 30 minutes,” “Medium exercise, for example, walking quickly for over 30 minutes,” or “Heavy exercise, for example, jogging for over 30 minutes. For the subjective symptoms

of fatigue, the degree of fatigue felt was divided into 4 levels, “Very tired”, “A little tired”, “Not so tired” and “Not tired at all”.

The study was conducted in the summer of 2009. WAI studies have been conducted at the factory studied since 2000, so WAI data has been accumulated for the past 9 years. The same company organization as in the past was used to distribute the mark sheet type questionnaire. The questionnaire can be completed at work or at home and the respondents place the questionnaire in an envelope and seal it. From past experience the respondents know that no one will know whose data it is.

The management, labor union, and employees of the subject factory have been working on mental health measures since 2000 and this project was conducted as part of this initiative. Therefore, everyone except those that were away on business trips when the questionnaire was distributed completed and returned the questionnaire.

Results

1. Comparison of WAI scores from 2000 to 2009

A comparative observation of the WAI average score from 2000 to this project (2009) is shown in Fig. 1. The WAI average score range for the studied factory over 10 years is 35.8 to 38.5, and 2009 produced the highest score (38.5). Looking at the breakdown we see the share for Moderate has declined while that for Excellent has increased. This trend is the same for both men and women and for aging workers over 45 as well as for younger workers.

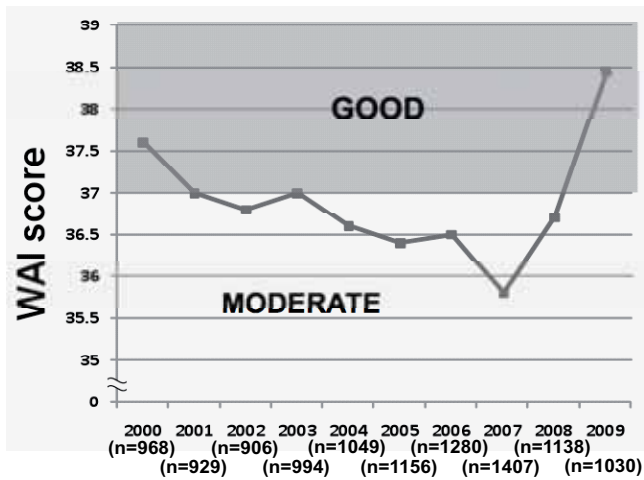


Figure 1. Change in WAI score at the studied factory from 2000 to 2009

2. Change in Occupational Stress Related Factors from 2007 to 2009

For the Japanese version of the NIOSH Generic Job Stress Questionnaire, looking at the stress trend over the last 3 years gives the results shown in Table 1. Compared to the past 2 years, the greatest change seen during this year's study was in Quantitative workloads and Depression. There was a large burden in Quantitative workloads for workers in their 30's and 40's. A major trend was also seen in Depression for workers in their 20's to 40's compared to aging workers.

Table1. Change in stress survey results from 2007 to 2009

| | 2007 | 2008 | 2009 | Reference |
|------------------------------------|------|------|------|-----------|
| Quantitative Workloads | 32.6 | 33.0 | 37.5 | 36.34 |
| Job Satisfaction | 9.0 | 9.1 | 8.9 | 8.96 |
| Depression | 14.5 | 13.9 | 15.7 | 12.79 |
| Job Control | 44.1 | 44.5 | 43.9 | 45.52 |
| Social Support from Supervisor | 14.9 | 15.1 | 14.9 | 14.57 |
| Social Support from Coworkers | 15.2 | 15.2 | 15.0 | 15.15 |
| Social Support from Family/Friends | 15.1 | 15.1 | 15.1 | 15.24 |

Source: Research Report by the Ministry of Labor in Japan, 1997

The Japanese version of the NIOSH Generic Job Stress Questionnaire was used. The number of subjects for the stress questionnaire in 2007 was 1,403 (1,227 men, 176 women), 1,133 in 2008 (1,009 men, 124 women), and 1,195 in 2009 (1,060 men, 135 women). The workplace consisted mostly of men because it is a manufacturing plant that handles medium to heavyweight objects.

3. Relationship between Daily Exercise Habits, Physical Strength, Fatigue, and WAI

In-depth study of the work ability index including physical capacity in relation to exercise habits, etc., was first conducted in 2009. The results shown below differ from the data in Figure 1 and Table 1 above and are cross-sectional results for one time only.

The relationship between WAI scores and the intensity of exercise habits which is divided into 5 levels is shown in Figure 2. Workers with no exercise habits had a lower WAI score compared to workers with exercise habits. Workers with a heavy exercise habit had a very high WAI score. At the same time, Figure 3 shows the relationship between depression and exercise habit intensity. It is apparent that the habit of daily exercise and its intensity greatly influence the occurrence and severity of depression in workers. As regards the exercise intensity in particular, the results indicated that an effect is obtained by light and moderate exercise, such as walking slowly for 30 minutes.

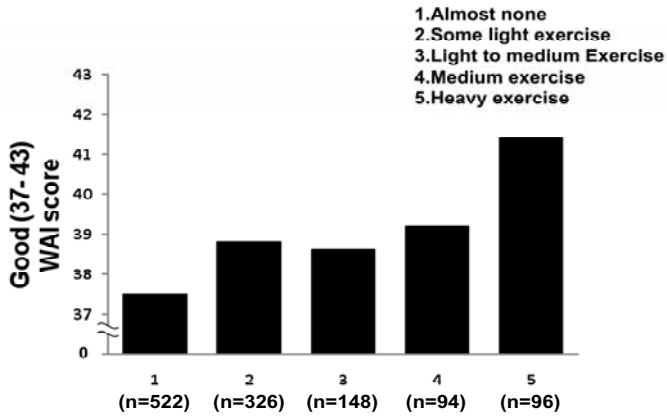


Figure 2. Relationship between exercise intensity divided into 5 levels, WAI and stress

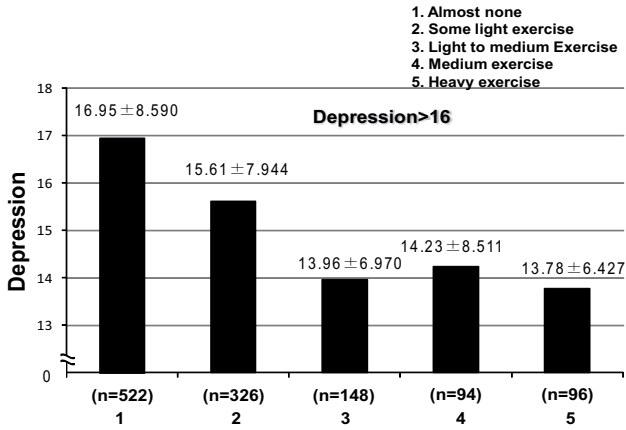


Figure 3. Relationship between depression and the exercise habit intensity

Further, a study of the relationship between exercise intensity and the item relating to “Mental resources” in the WAI questions showed that people with exercise habits demonstrated better mental health and that the higher the exercise intensity, the better the level of mental health (Figure 4).

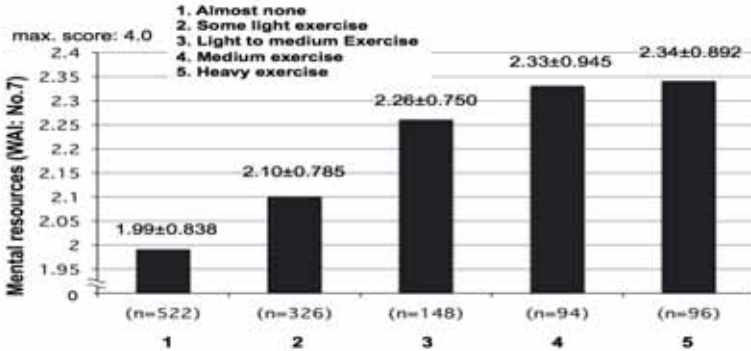


Figure 4. Relationship between the State of Mental Health and Exercise Intensity.

Next, the relationship between exercise habits and the subjective feelings of fatigue induced by work was studied. The relationship between this and the daily fitness habit intensity yielded the results shown in Figure 5. Looking at the percentage of people answering “Very tired” for each exercise intensity level showed that people with an exercise habit felt less fatigue from work than people without an exercise habit.

It was also shown that an exercise habit of light to medium or higher intensity reduced the degree of fatigue.

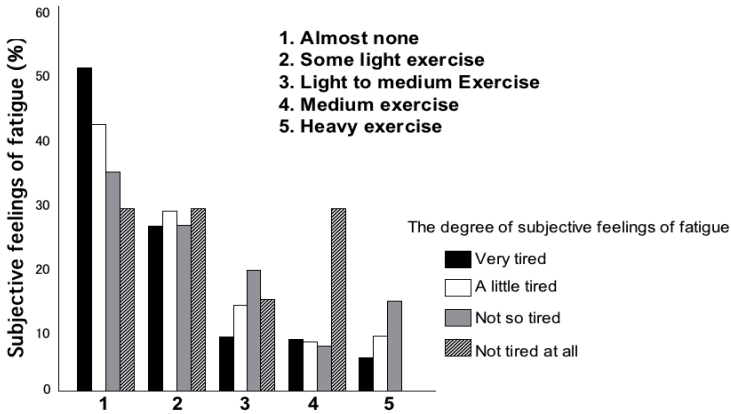


Figure 5. Relationship between Exercise Intensity and Degree of Fatigue Subjective Symptoms

The above mentioned results showed that the benefit of daily exercise not only increase physical strength and reduced fatigue subjective symptoms during work but also increase work ability as expressed by WAI.

Discussion and conclusion

The result of the WAI-related studies conducted at the subject factory for 10 years showed that negative feelings toward work and stress moods were strongly related to a decline in WAI score, and that there is a strong relationship between WAI score and mental stress (2). Here, looking at the relationship between stress and the high-score WAI group and the low-score WAI group showed that the poor group had marked receptivity to stressors while the excellent group had endurance against the stressors. The way in which depressive symptoms, which are a stress response, were expressed showed that for the poor group

there was a decrease in WAI prior to the appearance of the depressive symptoms. For the excellent group, however, applying the same load as was applied to the poor group was not immediately linked to a decline in WAI but that the depressive symptoms are expected to appear when the individuals can no longer endure the stress. In addition, it was demonstrated that causes for a decreased WAI score were an increase in quantitative workload as a stressor and increased depression as a stress response (5). Further, the current study demonstrated that the benefits of daily exercise had a markedly positive effect on the WAI score. This shows that the benefits of individual exercise habits and support for those habits from the company occupational health team will be an important key to increasing work ability. Therefore, since the intensity of exercise has a major affect on work ability, there is an urgent need to develop programs containing a suitable amount of exercise to increase work ability.

References

1. J. Ilmarinen and K. Tuomi. Past, present and future of work ability. Proceedings of the 1st International Symposium on Work Ability. 1–25. FIOH, Helsinki; 2004.
2. M. Kumashiro, S. Shazuki, A. Fujii, T. Hasegawa, W. Goedhard, J. Ilmarinen. The improvement of stress moods and the increase in negative emotions toward work have a major impact on declines in WAI scores ~ The first WAI research in Japan ~. The 4th Conference on Aging and Work. Krakow; 2002.
3. M. Kumashiro, H. Suzuki, K. Yamamoto and S. Shazuki. Occupational Stress, Behavior Pattern and Work Ability. 2nd International Symposium on Work Ability. Verona; 2004.
4. M. Kumashiro, K. Yamamoto & K. Shirane. WAI and Job Stress, Five Years of Follow-up Research. IEA 2006, Maastricht; 2006.
5. M. Kumashiro, M. Kadoya, Y. Otsuki, M. Kubota, T. Yamasita and H. Izumi. WAI and Mental Health Conditions ~ What was learned from following the changes in the same worker's workability for 8 years? ~. International Workshop on postponing ageing "Contemporary Problems of Prolonging Work Ability. Age Management: Extending the Work Life. Tallinn; 2008.
6. Pohjonen T. Age-related physical fitness and the predictive values of fitness tests for work ability in home care work. *J Occup Environ Med.* 43(8): 723–30; 2001a.
7. Bugajska J, Makowiec-Dabrowska T, Jegier A, Marszalek A. Physical work capacity (VO_{2max}) and work ability (WAI) of active employees (men and women) in Poland. *International Congress Series.* 1280: 156–160; 2005.
8. Tuomi K, Vanhala S, Nykyri E, Janhonen M. Organizational practices, work demands and the well-being of employees: a follow-up study in the metal industry and retail trade. *Occupational Medicine.* 54(2): 115–21; 2004.
9. Estryn-Behar M, Kreutz G, Le Nezet O, Mouchot L, Camerino D, Salles RK, et al. for the NEXT Study Group. Promotion of work ability among French health care workers: value of the Work Ability Index. *International Congress Series.* 1280: 73–78; 2005.
10. Parker T, Worringham CJ, Greig K, Woods SD Age-related changes in work ability and injury risk in underground and open-cut coal miners; 2006. Available; online: <http://eprints.qut.edu.au/3854/1/3854.pdf>

11. Ilmarinen J, Tuomi K, Klockars M. Changes in the work ability of active employees over an 11-year period. *Scand J Work Environ Health*. 23 (s1): 49–57; 1997.
12. Walsh IAP, Corral S, Franco RN, Canetti EEF, Alen MER, Coury HJCG. Work ability of Subjects with chronic musculoskeletal disorders. *Rev Saude Publica*. 38(2):149–156; 2004.
13. Walsh IA, Oishi J, Coury HJ. Clinical and functional aspect of work-related musculoskeletal disorders among active workers. *Rev Saude Publica*. 42(1):108–116; 2008.
14. Pohjonen T. Perceived work ability of home care workers in relation to individual and work related factors in different age groups. *Occup med*. 51(3): 209–217; 2001c.
15. Kiss P, Walgraeve M, Vanhoorne M. Assessment of work ability in aging fire fighters by means of the Work Ability Index Preliminary result. *Arch Public Health*. 60: 233–243; 2002.

Associations between Work Ability Index and demographic characteristics in Portuguese workers

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Abstract

In this study we intended to measure the Work Ability Index (WAI) in Portuguese workers from different professional areas and analyze how the WAI was associated with demographic factors. A cross-sectional study with 1955 workers from the chemicals and metal-mechanic industry, nurses, teachers and public administration was made. Subjects responded to self-administered questionnaires evaluating demographic characteristics and the WAI. The causal relationship between the sociodemographic characteristics and the WAI was quantified by calculating odds ratios (OR) and confidence intervals of 95%. The majority of subjects showed a good or excellent ability to work. The WAI was significantly associated with age and sex. Young and male workers had the highest work ability index.

Keywords: Work Ability Index, Portuguese workers, Demographic factors.

Introduction

The ability to work is a multi-faceted and multi-determined concept not only associated with health but also with competence, values, organizational environment and social relations (1). The concept of work capacity changes as society develops. Work capacity is associated with all aspects of life, whether these are related to the individual, the workplace, the immediate social environment or society itself or not. The ability to work refers to the balance between the personal resources of the worker and the demands of their work. According to Ilmarinen and Tuomi (2) the concept must be understood as “how good is this employee in the near future and how able to carry out work taking into account the demands of work, health and mental resources.” In 1991, Ilmarinen developed the Work Ability Index (WAI) as a tool for the evaluation of the work ability concept (3).

According to the results obtained by Ilmarinen and colleagues at the Finnish Institute of Occupational Health through a longitudinal study of 11 years, WAI is presented as a good predictor of early retirement due to disability and validated support for preventive interventions or rehabilitation (4, 5, 6, 7). One of the social issues emerging in industrialized societies is related to population aging and its impacts on the sustainability of the economy, social security and active labor force (8, 9, 10). The proportion of individuals aged between 50 and 64 years in the European Union has steadily increased and is expected to reach a figure of 35% of the total workforce in 2025 (3). According to the World Health Organization (11), the aging population will be about twice the size of the younger age group (15-24 years) by that time.

Maintaining and promoting the ability to work is a very important social objective. The changes in structure and size of the population create challenges regarding the availability of manpower and funding for social security, meaning that the importance of working capacity will increase further in the future. When promoting the ability to work in the labor force it is even more important to allow individu-

als to maintain their health and functional capacity in the retirement period (12, 13, 14, 15).

Considering these aspects, this study aimed to evaluate the ability to work among Portuguese workers in different professional groups and to analyze how work ability relates to age and gender.

Methods

The sample consisted of 1,955 individuals from the general population, belonging to five core professional areas (nurses, teachers, municipal workers, chemicals and metal industry workers). This sample was collected from various enterprises and institutions in northern, central and southern Portugal. Exclusion criteria were (a) younger than 18 years (b) incomplete information on the scales and (c) clear evidence of breach of response to instructions.

In this cross-sectional study workers responded to two questionnaires. The first enabled the collection of socio-demographic and occupational characteristics (gender, age, marital status and occupational group), as shown in Table 1. Of the 1,955 workers who participated in this study, females predominate. The sample subjects were aged between 19 and 67 years, mostly young adults, 80% of the population was less than 45 years of age.

Table 1. Socio-demographic and occupational characteristics of the sample

| Characteristics | Parameter Value |
|---|-----------------|
| Number of participants | 1,955 |
| Male (%) | 40.3 |
| Age in years: mean (standard deviation) | 37 (9) |
| Married (%) | 60.2 |
| Nurses (%) | 23.3 |
| Chemical Industry Workers (%) | 1.4 |
| Municipal Workers (%) | 29.2 |
| Metal Industry Workers (%) | 10.2 |
| Teachers (%) | 36.0 |

The second assessment instrument used was the Work Ability Index (WAI) developed by the Finnish Institute of Occupational Health and adapted for Portugal by Silva and colleagues (16, 17). WAI consists of seven subscales: current work capacity, ability to work according to the physical and intellectual requirements, current diseases (various injuries and illnesses); estimate of discomfort caused by disease at work, absence from work due to illness, future capacity at work and mental resources. The sum of these items gives the index score of work ability, ranging between 7 and 49. Scores between 7 and 27 indicated ‘poor’ ability, between 28 and 36 indicated a ‘moderate’ one; these were in present study considered as unsatisfactory results. Scores between 37 and 43 indicated ‘good’ work ability and between 44 and 49 ‘excellent’, these two categories were considered as satisfactory.

Results

In all, 49% of workers surveyed showed good capacity, 27.3% excellent and 21% showed moderate work ability. Only 2.8% of workers had a low capacity for work, as shown in Table 2.

The causal relationship between the sociodemographic characteristics and WAI was quantified by calculating the odds ratio (OR) and confidence intervals of 95%. The OR found (most likely to have better work ability) was 2.40 (CI: 1.93-2.98) for younger workers (<36 years), 1.63 (CI: 1.31-2.04) for male workers and 1.70 (CI: 1.35 -2.14) for married workers.

The regression analysis suggested that the best predictor of the variance of work ability was age, explaining 5.7% of the variance ($t = -10.800, p = .000$).

Table 2. Associations between work ability and sociodemographic and occupational characteristics

| | Ability to work | | | | |
|---------------------------|-----------------|-------|----------------|-----|---------|
| | Satisfactory | | Unsatisfactory | | N total |
| | N | % | N | % | |
| Sex | | | | | |
| Male | 776 | 98.5 | 12 | 1.5 | 788 |
| Female | 1125 | 96.4 | 42 | 3.6 | 1167 |
| Age (years) | | | | | |
| ≥ 36 | 930 | 95.3 | 46 | 4.7 | 976 |
| < 36 | 958 | 99.2 | 8 | 0.8 | 966 |
| Marital Status | | | | | |
| Married | 1135 | 96.5 | 41 | 3.5 | 1176 |
| Not married | 766 | 98.3 | 13 | 1.7 | 779 |
| Professional Group | | | | | |
| Nurses | 452 | 99.3 | 3 | 0.7 | 455 |
| Chemical industry workers | 27 | 100.0 | 0 | 0.0 | 27 |
| Municipal workers | 552 | 96.8 | 18 | 3.2 | 570 |
| Metal industry workers | 190 | 95.0 | 10 | 5.0 | 200 |
| Teachers | 680 | 96.7 | 23 | 3.3 | 703 |

Discussion and Conclusions

Through the Work Ability Index it was found that the vast majority of employed respondents had good or excellent work ability. This finding may be due to the age characteristics of the sample, since this is a population composed, mostly, of young adults. It is known that the decrease in work ability is associated with chronological aging. In fact, the assumption that the working ability decreases with age concurs with the results of this study.

Moreover, there may be a possibility for a “healthy worker effect”. That is, since the sample was collected at the offices of professionals in companies/institutions it is selection of more or less healthy people, excluding those for dismissal, sick leave, e worst health conditions and hence worse work capacity, and remaining most probably those who are best able to perform their working activities.

Regarding external validity, the generalization of the results must be viewed with caution given the heterogeneity of the sample characteristics. Considering the cross-sectional design of this study, the reduced external validity and timing of initial studies on the work ability in Portugal, further studies are recommended in order to assess the ability to work in different professional areas, evaluate factors influencing this capacity or to evaluate the results of measures to promote work capacity, both individually and collectively.

In conclusion, it was found that the vast majority of the workers analyzed present a satisfactory ability to work. Consistent with the literature, it appears that the younger ones had a better individual work capacity. Similarly, this study shows that male workers and married workers had a better capacity for work than female workers and unmarried ones.

Understanding these associations is of great importance in the comprehension of Portuguese labor reality, consistent with results from other countries, stressing the importance of implementing preventive and interventive measures against the ability to work losses throughout the life cycle.

In September 2008 our research team started a new project - Measuring the Human Work Index in Portuguese Workers. This project aims to adapt the instrument to the Portuguese language in order to enable the evaluation of work capacity and well-being at work, featuring our workforce and to compare it with other European studies in this field and this sequence, the suggestion of preventive measures of early retirement and poor quality of life in work.

The key idea is that while the work capacity seems to decrease with age in a society tending to aging, several interventions must emerge in order to increase the maintenance of work capacity.

References

1. Gamperiene M, Nygard JF, Sandanger I, Lau B, Bruusgaard D. Self-reported work ability of Norwegian women in relation to physical and mental health, and to the work environment. *Journal of Occupational Medicine and Toxicology* 3. 2008; 8: 1–9.
2. Ilmarinen J, Tuomi K. Work ability of aging workers. *Scand J Work Environ Health* 1992; 18 (2): 8–10.
3. Ilmarinen J. The aging worker. *Scand J Work Environ Health*. 1991; 17(1).
4. Tuomi K, Ilmarinen J, Klockars M, Nygård CH, Seitsamo J, Huuhtanen P, et al. Finnish research project on aging workers in 1981–1992. *Scand J Work Environ Health*. 1997; 23(1):7–11.
5. Tuomi K, Ilmarinen J, Martikainen R. Aging, work, life-style and work ability among Finnish municipal workers in 1981–1992. *Scand J Work Environ Health*. 1997; 23(1):58–65
6. Tuomi K, Eskelinen L, Toikkanen J, Jarvinen E, Ilmarinen J, Klockars M. Work load and individual factors affecting work ability among aging municipal employees. *Scand J Work Environ Health*. 1991;17(1):128–34.
7. Ilmarinen J, Rantanen J. Promotion of work ability during ageing. *American Journal of Industrial Medicine Supplement*.1999; 1:21–23.
8. Nygård C, Pohjonen T, Ilmarinen J. Muscular strength of ageing employees over an 11-year period. In Ilmarinen J, Louhevaara V. *FinnAge – Respect for the ageing. People and work, Research reports 26*. Helsinki: Finnish Institute of Occupational Health; 1999. p.240–249.

9. Ilmarinen J. Aging workers. *Occupational & Environment Medicine*. 2001; 58(8): 546–552.
10. Ilmarinen J, Tuomi K. Past, Present and Future of Work Ability. In Ilmarinen J, Lehtinen S. *People and Work – Research Reports 65*. Helsinki: Finnish Institute of Occupational Health; 2004.
11. World Health Organization (WHO). Aging and working capacity: report of a WHO study group. Geneva: WHO Technical Report Series nr 835. 1993
12. Tuomi K, Huuhtanen P, Nykyri E, Ilmarinen J. Promotion of work ability, the quality of work and retirement. *Occupational Medicine*. 2001; 51(5): 318–324.
13. Ilmarinen J. Physical requirements associated with the work of aging workers in the European Union. *Experimental Ageing Research*. 2002; 28:7–23.
14. Cotrim T, Simões A, Ramalho F, Paes Duarte A. Why healthcare workers ask for early retirement at a central Portuguese hospital: Work ability preliminary results. *International Congress Series*. 2005; 1280: 258–263.
15. Ilmarinen J. Towards a Longer Worklife! Ageing and the quality of worklife in the European Union. Helsinki: National Institute for Occupational Health. 2006
16. Silva C, Silvério J, Nossa P, Rodrigues V, Pereira A, Queirós A. Envelhecimento, ritmos biológicos e capacidade laboral – versão portuguesa do Work Ability Index (WAI). *Psicologia: Teoria, Investigação e Prática*. 2000; 2(5): 329–339.
17. Pereira AS, Silva CF, Castelo-Branco MC, Latino, ML. Saúde e a capacidade para o trabalho na docência. *Proceedings of the IV Congresso de Saúde Ocupacional, Departamento de Clínica Geral da Faculdade de Medicina da Universidade do Porto*. 2002; 159–167

The Work Ability Index as screening instrument for university staff

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Abstract

The Work Ability Index (WAI) is a well-accepted questionnaire designed to assess an individual's work ability. However, most research with WAI has focused on occupational populations with physical demands at work. The purpose of this study is to explore the value of WAI as screening instrument among professionals in a Dutch university.

Based on database data about absenteeism, questionnaire data and interview data, our results show that the predictive, added and practical value of WAI are quite good, but the combination with measuring burnout yields even more and better information as a screening instrument.

Key terms: WAI, burnout, university staff, mixed methods.

Introduction

Based on extensive research by members of the Finnish Institute of Occupational Health (1; 2; 3), work ability has been promoted as an affirmative means with which to decrease work disability and premature retirement. This is important, as many Western countries face the challenge of an aging workforce.

The concept of work ability is defined as the ability of a worker, at present and in the near future, to perform his/her job with regard to work demands, health and mental resources (4). As a result, it has been identified as an important tool to identify workers at risk for imbalance between health, capabilities and demands at work (5). A systematic review of 20 empirical studies on the determinants of work ability by Van den Berg et al. (6) revealed that individual characteristics (lack of leisure-time, vigorous physical activity, older age), lifestyle (obesity), demands at work (high physical and psychosocial work demands) and physical condition (poor musculoskeletal capacity) are associated with decreased work ability. A limitation of this review is that the studies included are predominantly Finnish with an emphasis on research among municipal workers.

The Work Ability Index (WAI) is a well-accepted questionnaire designed to assess an individual's work ability. Since its development in the 1980s it has been widely applied in scientific studies on occupational health in order to identify occupational and personal risk factors or as a method to evaluate intervention programs on work ability (7). In an assessment of the test-retest reliability De Zwart et al. (7) provide evidence that the WAI questionnaire is very suitable for the purposes of occupational health research and occupational health care.

However, with a few exceptions (8, 9, 6), most research in which the WAI is used focused on occupational populations with mainly physical demands at work. In a study among professional workers in commercial services, Van den Berg et al. (6) found that the determinants of mental health are similar to those of work ability. The work ability of these workers was mainly associated with psychosocial factors at work,

such as teamwork, stress handling and self development. Physical health was influenced primarily by life style factors.

With regard to psychosocial factors at work, psychological job demands are probably the most important single factor (10). Many (industrial and organizational) psychological theories focus on the quality of work in terms of a balance – or lack of balance – between job demands and something else, for instance between job demands and decision latitude (11), job demands and job resources (such as social support; 12), or job demands (effort) and rewards (13). An imbalance between job demands and job resources results in stress and burnout, which are associated with production loss, sickness absence (14, 15, 16) and health problems (17).

However, regarding job demands differences, they were also found between blue and white-collar workers. Kristensen et al. (10) show that quantitative job demands for blue-collar workers are mainly associated with work pace, whereas job demands for white-collar workers are more associated with long working hours and overtime.

These studies indicate that the relative importance of personal and work-related aspects may differ for different kinds of jobs. Additionally, work-related aspects may also differ for various types of jobs, and they may have different effects regarding work disability and early retirement. Moreover, whereas the WAI questionnaire is suitable for identifying workers at risk and taking individual measures aimed at occupational health care, questionnaires on burnout, job demands and job resources are suitable for identifying risky work situations and taking measures at a group level. However, measures of work ability and burnout are hardly ever combined. An exception is a study by De Boer et al. (18) in an attempt to evaluate the effectiveness of an intervention programme preventing early retirement. This study yields no information on the quality of either measure as a screening instrument.

Since studies on the work ability of well-educated professionals are scarce, the purpose of this study is to explore the associations between job demands, burnout (as an indicator of quality of work) and work ability among well-educated professionals in a Dutch university. An

additional purpose is to determine whether screening work ability or burnout generates better points of departure for managers to prevent work disability and early retirement.

Method

If WAI is to be a proper screening instrument for university staff, it has to have predictive, additive and practical value. Predictive value is high when work ability correlates with burnout and/or work characteristics. Additive value is high when respondents with low work ability are not otherwise known as persons at risk, for instance based on their absenteeism pattern (frequency and/or duration) or previous visits to the Occupational Health Service (OHS). Practical value is high when the work ability scores suggest directions for improvement measures.

In 2008, a total number of 575 employees (scientific and support staff) working in three departments of a Dutch university were invited to participate in a cross-sectional study on the usability of WAI. The study used data from three sources. First, we constructed a questionnaire containing the official Dutch translation of WAI, a scale on burnout and seven scales on work characteristics. Burnout, as a dependent variable of job demands and job resources, is measured with the 16 items from UBOS (Utrechtse Burnout Schaal; 19) and consists of three parts: emotional exhaustion, depersonalization (emotional distance or cynicism), and feelings of personal accomplishment. The work characteristics are measured with scales from the Questionnaire on Experience and Evaluation of Work (QEEW; 20) and can be divided into job demands (work load, role ambiguity, and task changes) and job resources (autonomy, voice, relationship with superior, and career opportunities). An imbalance between job demands and job resources results in work pressure and eventually work stress (11).

Secondly, we used data on absenteeism from the university's Occupational Health Service (OHS) database to determine the absenteeism

(frequency and duration) of the employees in the three departments in the year prior to the study. Besides, we used data on OHS visits by the employees in the year prior to the study. These visits indicate that employees have problems regarding occupational health. We use these data to determine whether WAI indicates people at risk that are not already known based on their absenteeism or prior visits to the OHS.

Finally, we gathered data in counseling interviews by an OHS professional with invited employees. Based on the questionnaire results individual respondents with low scores on work ability and/or high scores on burnout were invited for a counseling interview to determine the background of these scores. These data are aimed at drawing individual measures to improve work ability and/or help decreasing burnout.

The questionnaire was completed by 242 employees (response rate: 42.1%). All respondents received an individual overview of their scores on the scales in the questionnaire (work ability, burnout and work pressure). Based on the individual scores, 59 respondents were invited to discuss their scores with an OHS professional, because of their low WAI and/or high burnout scores¹¹. Eventually, 37 respondents attended for a counseling visit (response rate: 62.7%).

Results

Predictive value. Table 1 presents the correlation matrix for work ability, burnout and work characteristics. This table shows that work ability and burnout are strongly correlated; a high score on work ability correlates with low scores on burnout ($r=-0.487$), emotional exhaustion ($r=-0.520$), depersonalization (emotional distance; $r=-0.319$), and feelings of personal accomplishment²² ($r=-0.324$). Table 1 also shows

1. 20 respondents scored low on work ability, 28 scored high on burnout, and 11 scored low on work ability *and* high on burnout.
2. Feelings of personal accomplishment is reversed coded; a high score indicates that an individual has a feeling not to be able to perform the work.

Table 1. Correlation between work ability, burnout and work characteristics (p<.05; two sided)

| | 1 WAI score | 2 Burnout | 3 Exhaustion | 4 Distance | 5 Personal accomplishment | 6 Workload | 7 Role ambiguity | 8 Task changes | 9 Autonomy | 10 Voice | 11 Relation with superior |
|----|----------------|--------------|-----------------|---------------|------------------------------|---------------|---------------------|-------------------|---------------|-------------|------------------------------|
| 1 | - | | | | | | | | | | |
| 2 | -.487** | - | | | | | | | | | |
| 3 | -.520** | .815** | - | | | | | | | | |
| 4 | -.319** | .834** | .566** | - | | | | | | | |
| 5 | -.324** | .775** | .385** | .548** | - | | | | | | |
| 6 | ns | .202** | .314** | .237** | ns | - | | | | | |
| 7 | ns | .411** | .240** | .384** | .436** | .258** | - | | | | |
| 8 | -.266** | .370** | .319** | .364** | .225** | .365** | .268** | - | | | |
| 9 | .198** | -.325** | -.188** | -.290** | -.334** | -.169* | -.338** | -.333** | - | | |
| 10 | .233** | -.419** | -.166* | -.440** | -.438** | ns | -.548** | .608** | .298** | - | |
| 11 | .196** | -.338** | -.188** | -.411** | -.249** | -.284** | -.470** | -.357** | .633** | -.210** | - |
| 12 | .249** | -.284** | -.156* | -.295** | -.221** | ns | ns | -.147* | .210** | .343** | .210** |

* p<.05, ** p<.01, ns=not significant

12= Career opportunities

that work ability correlates significantly with the work characteristics in the expected direction, except work load and role ambiguity. Burnout and its dimensions are correlated with all work characteristics. This is a first indication that work ability and burnout are not related to the same determinants.

We also conducted regression analyses to determine to what extent work ability and work characteristics may predict burnout. Table 2 presents the results. In the first model we entered the work characteristics (following the job demands-resources model), in the second model we added work ability. Table 2 shows that adding work ability as independent variable to explain burnout adds significantly to the explanatory power of the work characteristics (significant R^2 Change). This effect is strongest for emotional exhaustion, but much weaker for emotional distance and feelings of personal accomplishment. Furthermore, this table shows that in every model, except for feelings of personal accomplishment, work ability has the highest value of β , meaning that work ability has the strongest effect on burnout. From the work characteristics work load and role ambiguity are the strongest predictors of burnout. This is in accordance with the hypotheses in the job demands-resources model (12).

Table 2. Regression analysis with Burnout as dependent variable (standardized coefficient β).

| | Burnout | | Exhaustion | | Distance | | Personal accomplishment | |
|-----------------------|---------|----------|------------|----------|----------|---------|-------------------------|----------|
| | Model 1 | Model 2 | Model 1 | Model 2 | Model 1 | Model 2 | Model 1 | Model 2 |
| Work load | .075 | .092 | .211** | .234*** | .121 | .129 | -.152* | -.143* |
| Role ambiguity | .245*** | .276*** | .131 | .173* | .168* | .183* | .357*** | .374*** |
| Task changes | .196** | .114 | .178* | .070 | .142* | .103 | .166* | .121 |
| Autonomy | -.082 | -.070 | -.066 | -.050 | -.040 | -.034 | -.094 | -.088 |
| Voice | -.084 | -.060 | .087 | .118 | -.122 | -.111 | -.144 | -.131 |
| Relation w supervisor | .008 | .026 | .022 | .046 | -.109 | -.100 | .097 | .107 |
| Career opportunities | -.191** | -.115* | -.169* | -.070 | -.182** | -.146* | -.095 | -.054 |
| WAI score | | -.385*** | | -.506*** | | -.183** | | -.208*** |
| R ² | .303 | .432 | .172 | .396 | .310 | .339 | .291 | .329 |
| R ² Change | .303*** | .129*** | .172*** | .223*** | .310*** | .029** | .291*** | .038*** |

* p<.05; ** p<.01; *** p<.001

As a result, work ability and burnout are correlated, even when controlled for work characteristics. This correlation is strongest for emotional exhaustion. Therefore we conclude that WAI has good predictive value.

Additive value. Determining the added value of WAI, we compared the respondents with low WAI scores and/or high burnout scores with the database on absenteeism and visits to OHS. With this analysis we can determine whether respondents at risk (regarding work ability and/or burnout) are not already known by their supervisors or OHS. Our analysis shows that not all respondents with low work ability had an exceptional absenteeism pattern³³ or visited OHS in 2008. Approximately 25% of respondents with low work ability had an exceptional absenteeism pattern. Thus absenteeism rate is not a good predictor of people at risk with regard to work ability. Approximately 39% of these respondents visited OHS in 2008. As a result, visiting OHS is a better indicator for people at risk regarding work ability, but many respondents at risk are still not detected. Therefore we conclude that WAI indicates more people at risk than already known on the basis of absenteeism or visits to OHS.

Regarding the burnout scores, our analysis shows that UBOS detects even more respondents at risk; of the respondents with high burnout only 15% had an exceptional absenteeism pattern and only 25% visited OHS in 2008.

On the other hand, not all respondents with exceptional absenteeism patterns (9% of 264) and/or who visited OHS in 2008 (11% of 264) had a low work ability and/or high burnout. Only about half of these respondents were invited (on the basis of their WAI and UBOS scores) for a counseling visit with the OHS professional. This means that absenteeism and visits to the OHS not necessarily correspond with low work ability or high burnout. Besides, these data indicate that absenteeism and work ability correlate more strongly than absenteeism and burnout, because fewer respondents with high burnout than with low work ability have an exceptional absenteeism pattern (so far).

3. We defined an exceptional absenteeism pattern as more than two times and/or longer than 15 working days in one year.

As a result, WAI has good additive value as a screening instrument, because it detects more people at risk than could have been known on the basis of other data (absenteeism and visits to OHS). However, the additive value of UBOS is even greater, probably because the correlation between WAI and absenteeism is stronger than between UBOS and absenteeism.

Practical value. During the counseling visits the OHS professional kept a record of the following aspects: the reason for the visit (invitation based on WAI and/or UBOS), the primary line of approach of the interview (explanation of the scores or question for help), an indication of the nature of the problems or most prominent counseling topic (history of illness, work situation, other), and the nature of the advice to the respondents (support and/or advice). The results show that the nature of the counseling visits with respondents with low work ability differed from those with high burnout. Respondents with low work ability mainly talked about their history of illness and personal situation (60%) and less about work (30%). Respondents with high burnout mainly talked about their work situation (85%) and rarely about illness or personal situation (5%). This concurs with our conclusion that work ability, rather than burnout, is more related to illness and absenteeism. Burnout is more strongly related to work related aspects.

As a result, we conclude that the determinants of work ability are more personal and the determinants of burnout are more work related. Hence, WAI and UBOS detect different kinds of workers at risk and different kinds of risks. This implies that improving work ability and burnout has to be aimed at different aspects.

Conclusion

Based on qualitative and quantitative data, our explorative study on testing the Work Ability Index as a screening instrument for university personnel reveals that it is a useful instrument for detecting people at

risk with regard to work ability, because it has good predictive, additive and practical value. However, the causes of low work ability are mainly personal and worker related (illness history, general health, personal background, etc.); WAI detects employees who have troubles in balancing their personal life. As a result, the most important instrument for employers is to support employees in dealing with their limitations.

Another important result from this study is that screening for burnout is probably even more interesting when screening university personnel. Not only does screening for burnout detect more people at risk, it also enables employers to take more general measures in the prevention of occupational stress, an important predictor of illness and work disability. As opposed to work ability, the main causes of burnout are work related, which is easier for employers to manipulate. For instance, creating a better balance between job demands and job resources, through work redesign, might improve the work situation for more workers than just those currently at risk, also preventing future illness and work disability.

As a result, we conclude that for university personnel screening for work ability and burnout yield different results. Both kinds of results are useful and offer – albeit different – indications for improvements. A combination of both instruments detects the most people at risk of work disability or early retirement and, therefore, generates the broadest pallet of measures for improvement.

References

1. Tuomi K, Ilmarinen J, Klockars M, Nygård CH, Seitsamo J, Huuhtanen P, Martikainen R. Finnish research project on ageing workers in 1981–1992. *Scandinavian Journal of Work Environment & Health* 1997; 23, Supplement 1:7–11.
2. Ilmarinen J, Tuomi K, Klockars M. Changes in the work ability of active employees over an 11-year period. *Scandinavian Journal of Work Environment & Health* 1997; 23, Supplement 1:49–57.
3. Tuomi K, Ilmarinen J, Eskelinen L, Jarvinen E, Toikannen J, Klockars M. Prevalence and incidence rates of diseases and work ability in different work categories of municipal occupations. *Scandinavian Journal of Work Environment & Health* 1991; 17, Supplement 1:67–74.
4. Ilmarinen J, Rantanen J. Promotion of work ability during ageing. *American Journal of Industrial Medicine* 1999; Supplement 1:21–23.
5. Van den Berg TIJ, Alavinia SM, Bredt FJ, Lindeboom D, Elders LAM, Burdorf A. The influence of psychosocial factors at work and life style on health and work ability among professional workers. *International Archives of Occupational and Environmental Health* 2008; 81:1029–1036.
6. Van den Berg TIJ, Elders LAM, de Zwart BCH, Burdorf A. The effects of work-related and individual factors on the Work Ability Index: a systematic review. *Occupational and Environmental Medicine* 2009; 66:211–220.
7. De Zwart BCH, Frings-Dresen MHW, van Duivenbooden JC. Test-retest reliability of the Work Ability Index questionnaire. *Occupational Medicine* 2002; 52:177–181.
8. Martinez MC, Latorre MDDD. Health and work ability among office workers. *Revista de Saude Publica* 2006; 40:851–858.
9. Sjögren-Rönkä T, Ojanen MT, Leskinen EK, Mustalampi ST, Malkia EA. Physical and psychosocial prerequisites of functioning in relation to work ability and general subjective well-being among office workers. *Scandinavian Journal of Work Environment & Health* 2002, 28:184–190.
10. Kristensen TS, Bjorner JB, Christensen KB, Borg V. The distinctions between work pace and working hours in the measurement of quantitative demands at work. *Work & Stress* 2004; 18:305–322.
11. Karasek RA. Job demands, job decision latitude, and implications for job redesign. *Administrative Science Quarterly* 1979; 24:285–307.
12. Demerouti E, Nachreiner F, Bakker AB, Schaufeli WB. The Job Demands-Resources Model of burnout. *Journal of Applied Psychology* 2001; 86:499–512.

13. Siegrist J. Work, health and welfare: new challenges. *International Journal of Welfare* 2006; 15, Supplement 1:S5–S12.
14. Sluiter JK, de Croon EM, Meijman TF, Frings–Dresen MHW. Need for recovery from work related fatigue and its role in the development and prediction of subjective health complaints. *Occupational and Environmental Medicine* 2003; 60: Supplement 1: 62–70.
15. De Croon EM, Sluiter JK, Frings–Dresen MHW. Psychometric properties of the Need for Recovery after work scale: test-retest reliability and sensitivity to detect change. *Occupational and Environmental Medicine* 2006; 63:202–206.
16. Van Veldhoven M, Broersen S. Measurement quality and validity of the “need for recovery scale”. *Occupational and Environmental Medicine* 2003; 60, Supplement 1:3–9.
17. Sluiter JK, van der Beek AJ, Frings-Dresen MHW. The influence of work characteristics on the need for recovery and experienced health: a study on coach drivers. *Ergonomics* 1999; 42:573–583
18. De Boer AGEM, van Beek J-C, Durinck J, Verbeek JHAM, van Dijk FJH. An occupational health intervention programme for workers at risk for early retirement; a randomised controlled trial. *Occupational and Environmental Medicine* 2004; 61:924–929.
19. Schaufeli WB, Van Dierendonck D. *Utrechtse Burnout Schaal (UBOS)*. Lisse: Swets Test Publishers; 2000.
20. Van Veldhoven M, Meijman T. *Het meten van psychosociale arbeidsbelasting met een vragenlijst. De Vragenlijst Beleving en Beoordeling van de Arbeid*. Amsterdam: NIA; 1994.

The Effect of Job Control and Quantitative Workload on the different Dimensions of the Work Ability Index

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Abstract

Based on Karasek's Job Demand-Control model, we analyzed whether job control moderates the impact of quantitative workload on work ability and its dimensions. Furthermore, we investigated whether there is a difference in the occurrence of the interaction effect between self-reported dimensions and dimensions reporting diagnosed diseases or sick leave. Using WAI and SQUAW, 3,345 employees were questioned. The moderating effect of job control was found for the WAI Total score, self-reported work ability in relation to demands of the job, work impairment due to diseases, prognosis of work ability 2 years from now and mental resources.

Key terms: work ability, job control, quantitative workload.

Introduction

Karasek's (1) Job Demand-Control Model (JDC) has been a leading and frequently discussed work stress model in health psychology since the 1980s. According to the model an employees work environment can be characterized by a combination of job demands and job control, whereas the combination of high job demands and low job control is assumed to result in a psychological strain reaction, such as high blood pressure and low job satisfaction. Conversely, low job demands in combination with high job control lead to a lower than average number of health complaints (1, 2).

Figure 1 illustrates Karasek's hypotheses. The figure contains four types of jobs that might result from different combinations of job demands and job control. The diagonals actually represent two interactions: situations where job demands and job control match (B) and situations where they diverge (A) (2). Thus, relative to decreasing job control, strain increases if job demands increase. When job demands and job control are simultaneously high, the job is defined as "active". The other way around, when job demands and job control are low, the job is defined as "passive".

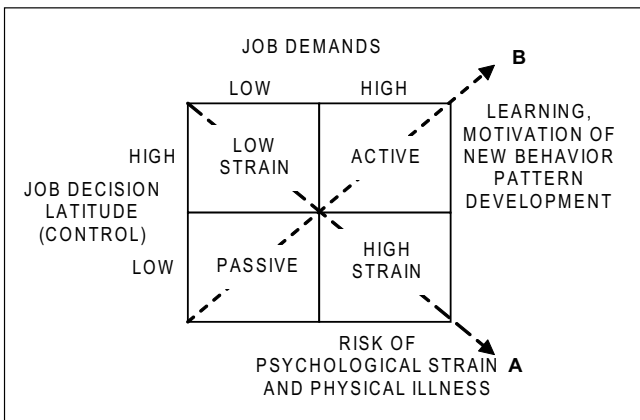


Figure 1. The demand-control model: according to Karasek (2)

Karasek's model assumes a positive relationship between job demands and psychological strain and a negative relationship between job control and psychological strain. An earlier study showed that a low individual control at the workplace was an important risk factor for increased sickness absence (3). A lack of freedom at work was also associated with impaired work ability (4). Additionally, research revealed that high job demands and psychosocial work stress are considered to be contributory factors to adverse health effects and work related disability (5, 6). For Karasek's (1) interaction hypothesis less support has been revealed in existing research. A meta-analysis by de Lange, Taris, Kompier, Houtman and Bongers (7) which was focussed on methodological issues of 45 longitudinal studies investigating the DC(S)-model found only modest support for the hypothesis that the combination of high demands and low control especially results in high job strain. Depending on the several outcome variables investigated, the results yielded a heterogeneous picture for the interaction hypothesis. However, they found good evidence for the effect of job characteristics on self-reported health or well-being.

Taking previous research into account, it seemed interesting to analyze Karasek's JDC model with work ability and its several dimensions as outcome variables. According to Ilmarinen and Tuomi (8), work ability may be understood as how able employees are to do their work with respect to work demands, health and mental resources. In design, the concept of work ability is heterogeneous, consisting of several self-reported measures, but also of fairly objective measures like "number of diseases diagnosed by a physician" and "sickness absence".

Objectives

The study objective was to ascertain the influence of job control and quantitative workload on work ability, and whether the combination of high quantitative workload and low job control results in lower work

ability than the combination of low quantitative workload and high job control. First of all, it was hypothesized that employees with high job control report higher work ability than employees with low work ability. It has also been stated that employees with high quantitative workload report lower work ability than employees with low quantitative workload. Besides these main effects, we expect an interaction effect. Taking the JDC model into account, our hypothesis is that high job control buffers the impact of workload on work ability. This would imply, that redesigning work processes to allow greater job control for employees, could increase or maintain their work ability.

Furthermore, following the recommendations of de Lange et al. (7) to focus on more specific outcome variables, several dimensions of work ability were investigated. The aim was to analyze, whether there is a difference in the occurrence of the interaction effect between self-reported work ability dimensions (dimensions 1, 2, 4, 6 and 7) and the fairly objective dimensions of the number of diseases diagnosed by a physician and sickness absence (dimensions 3 and 5).

Because Karasek (1) defines high work demands mainly as time pressure and work intensity, quantitative workload was taken as an independent variable and job control as a moderating variable.

Methods

Subjects

In this study, a heterogeneous sample of 3,345 employees from different industries (private services, public services, manufacturing and healthcare) was investigated. Of those surveyed, 59.1% were female, 23.6% were aged less than 31 years, 51.5% between 31 and 50 years and 24.9% were 50 years or over.

Measures and procedures

Work ability as the dependant variable was assessed by the German version of the Work Ability Index (WAI) (11). The WAI combines

subjective experiences of one's ability to cope with physical and psychological requirements at work with information on diseases, sick leave and mental resources. The seven dimensions of the Work Ability Index (WAI) can be found in Table 1. Recent studies have approved the predictive value of WAI for receiving work-related disability pensions and early retirement (12). The analyzed internal consistency of the scale was satisfactory for the sample of the study (Cronbach's alpha = .728).

The WAI consists of ten questions and a list of diseases. The questions and the disease list comprise seven distinct dimensions as listed in Table 1. For each dimension, a score can be obtained. The final WAI score is calculated by summing up all single item scores. The index can range from 7 to 49 points. Higher scores on the WAI indicate better work ability. Based on the WAI score, the individual's work ability can be classified into four categories: poor (7-27 points); moderate (28-36 points); good (37-43 points); and excellent (44-49 points).

One example for a WAI question is: "Do you believe, according to your present state of health, that you will be able to do your current job two years from now?" (dimension 6, Table 1).

Table 1. The seven dimensions of the Work Ability Index, WAI

| Dimension | Range in questionnaire | Range observed |
|--|------------------------|----------------|
| 1. Current work ability compared with lifetime best | 0 - 10 | 0 - 10 |
| 2. Work ability in relation to demands of a job | 2 - 10 | 2 - 10 |
| physical demands | 1 - 5 | 1 - 5 |
| mental demands | 1 - 5 | 1 - 5 |
| 3. Number of current diseases diagnosed by a physician | 0 - 14* | 0 - 10* |
| 4. Estimated work impairment due to diseases | 1 - 6 | 1 - 6 |
| 5. Sick leave during the past year (12 months) | 1 - 5 | 1 - 5 |
| 6. Own prognosis of work ability 2 years from now | 1 - 3 | 1 - 3 |
| 7. Mental resources | 0 - 12 | 0 - 12 |
| WAI-Total score | 7 - 49 | 9 - 49 |

* In contrast to all other dimensions, in dimension 3 high values indicate low work ability. This dimension is recoded for the calculation of WAI-Total score

Quantitative workload as the independent variable was measured with the corresponding scale of the German version (9) of the SQUAW – Short Questionnaire for Work Analysis by Prümper (10). SQUAW items measuring quantitative workload are: “I often work under time pressure” and “I have too much work”. The items were measured on a 5-point scale. The internal consistency of the scale was good (Cronbach’s alpha = .816).

Job control as a moderating variable was also measured with another scale of the SQUAW. The following items measured job control: “If you look at your overall operations, to what extent can you determine the order of individual operations yourself?” “How much influence do you have on the work that will be allocated to you?” and “During your work in general, do you have the opportunity to make your own decisions and arrangements?”. The internal consistency of the scale was good (Cronbach’s alpha = .815)

Statistical analysis

In this paper, as dependent variables, the WAI-Total score and its seven dimensions were investigated by stepwise moderated linear regression to analyze the moderating effect of job control.

For the statistical analyses, some methodical problems associated with the WAI have to be taken into account. Following the instructions of the instrument, the transformations of the raw values into the seven dimensions contain certain weightings of the raw values, which might lead to biased and cropped data (i. e. dimension 3). Therefore, in this paper, the raw values of the seven dimensions were analyzed¹. However, WAI Total score was calculated as described in the WAI instructions including the weightings.

Furthermore, most of the so called WAI dimensions are in fact single items (except items 2 and 7). The term dimension may therefore be misleading. Due to the widespread use of this term in the WAI

1. For dimension 3, the number of all diseases diagnosed by a physician was investigated as dependent variable. Most of the surveyed do not suffer from more than 4 diseases, therefore persons with four or more diseases were grouped.

literature, we will follow this convention. However, this limitation should be kept in mind.

Another aspect is the assumption of linearity of the dependent variables. For the WAI Total score and dimensions one to four and six to seven, linearity can be assumed. However, dimension five (sick leave) is clearly scaled exponentially (1: 0 days, 2: 1 to 9 days, 3: 10 to 24 days, 4: 25 to 99 days, 5: 100 to 365 days). In order to come up to the linearity assumption of regression analysis, the numeric relation from 1 to 5 can be considered a log-transformation of the exponential scale into a linear scale. Therefore, statistical procedures with assumptions of linearity can be performed. However, this has to be taken into account when regression coefficients (Bs) are examined. Bs may only be interpreted after retransformation. Yet, as the present paper specifically asks whether there is an interaction (or not), the interpretation of particular effects (especially dimension 5) is less important.

For all dependent variables, the tests were conducted identically. In the first regression step, the age was introduced as ordinal-scaled control variable (three groups).

The continuous SQUAW dimensions “quantitative workload” and “job control” were used as predictor and moderator in steps two and three. In the fourth step, according to Aiken and West (13), the interaction between predictor Quantitative Workload (QW) and moderator Job Control (JC) was tested by introducing the multiplicative term of both centered variables. A significant increase in the explained variance of the regression model R^2 may be considered as evidence for an interaction. Finally, post-hoc residual analyses were conducted to ensure validity of the regression models.

Results

The results of the analyses performed are presented in Table 2. At first, the regression models for all the seven dimensions and the WAI Total

score showed overall-significance of $p \leq .000$. The corrected explained variances by the different models vary between 4.2% (dimension 1) and 13.2% (WAI Total score). These values may seem to be relatively low but they are not unusual for multiple linear regression models in field studies. Tolerance as an indicator for collinearity of the predictors never undercut .926. Therefore, collinearity can be safely ruled out. Finally, the post-hoc residual analyses approved the validity of the regression models.

With regard to the covariate age (regression step 1), the results for WAI-Total score and all WAI-dimensions except dimension 7 showed that age is a significant predictor of work ability. With ascending age, the observed employees reported lower current work ability compared with lifetime best (dimension 1), lower work ability in relation to demands of a job (dimension 2a/b), more diagnosed diseases (dimension 3), greater work impairment due to diseases (dimension 4), longer sick leave during the past year (dimension 5) and poorer prognosis of work ability 2 years from now. Only the rating of the mental resources (dimension 7) is not influenced by age.

Table 2. Results of stepwise moderated linear regression analyses

| WAI-Dim. | step | Variable | R ² | Corr. R ² | ΔR ² | p(ΔR ²) | B | SE | β | p |
|---|------|----------|----------------|----------------------|-----------------|---------------------|---------|-----|--------|------|
| WAI-Total | 1 | Const. | .053 | .053 | .053** | .000 | 42.14** | .33 | | .000 |
| | 2 | Age | .108 | .108 | .053** | .000 | -1.76** | .16 | -.20** | .000 |
| | 3 | QC | .132 | .131 | .023** | .000 | -1.37** | .10 | -.24** | .000 |
| | 4 | QC x JC | .133 | .132 | .002* | .013 | .25* | .10 | .04* | .013 |
| WA compared to lifetime best | 1 | Const. | .009 | .009 | .009** | .000 | 8.23** | .16 | | .000 |
| | 2 | Age | .030 | .030 | .021** | .000 | -2.21** | .05 | -.08** | .000 |
| | 3 | QC | .043 | .043 | .013* | .000 | -.25** | .03 | -.15** | .000 |
| | 4 | QC x JC | .043 | .042 | .000 | .722 | .01 | .03 | .12** | .000 |
| WA in relation to physical job demands | 1 | Const. | .036 | .036 | .036** | .000 | 4.41** | .07 | | .000 |
| | 2 | Age | .054 | .054 | .018** | .000 | -2.11** | .02 | -.18** | .000 |
| | 3 | QC | .067 | .066 | .013** | .000 | -1.11** | .01 | -.13** | .000 |
| | 4 | QC x JC | .069 | .067 | .002* | .017 | .10** | .01 | -.12** | .000 |
| WA in relation to mental job demands | 1 | Const. | .015 | .015 | .015** | .000 | 4.30** | .07 | | .000 |
| | 2 | Age | .099 | .098 | .084** | .000 | -1.11** | .02 | -.08** | .000 |
| | 3 | QC | .127 | .126 | .028** | .000 | -.25** | .01 | -.29** | .000 |
| | 4 | QC x JC | .128 | .127 | .001* | .033 | .16** | .02 | .17** | .000 |
| Number of diseases diagnosed by a physician | 1 | Const. | .057 | .057 | .057** | .000 | 4.1** | .12 | | .001 |
| | 2 | Age | .070 | .070 | .013** | .000 | 44** | .02 | .22** | .000 |
| | 3 | QC | .073 | .072 | .003** | .002 | 15** | .02 | .11** | .000 |
| | 4 | QC x JC | .073 | .072 | .000 | .566 | -.08** | .03 | -.05** | .002 |
| Work impairment due to diseases | 1 | Const. | .033 | .033 | .033** | .000 | 6.01** | .09 | | .000 |
| | 2 | Age | .052 | .052 | .019** | .000 | -2.3** | .03 | -.15** | .000 |
| | 3 | QC | .053 | .053 | .001* | .038 | 1.4** | .02 | -.14** | .000 |
| | 4 | QC x JC | .055 | .054 | .002* | .012 | .04* | .02 | .04* | .032 |
| Sickness absence | 1 | Const. | .009 | .009 | .009** | .000 | 4.18** | .08 | | .000 |
| | 2 | Age | .013 | .012 | .004** | .000 | -1.2** | .02 | -.09** | .000 |
| | 3 | QC | .018 | .017 | .006** | .000 | -.06** | .02 | -.06** | .000 |
| | 4 | QC x JC | .018 | .017 | .000 | .855 | .07** | .02 | .08** | .000 |
| Prognosis of work ability 2 years from now | 1 | Const. | .014 | .014 | .014** | .000 | 2.99** | .03 | | .000 |
| | 2 | Age | .032 | .031 | .017** | .000 | -.06** | .01 | -.11** | .000 |
| | 3 | QC | .043 | .043 | .012** | .000 | -.05** | .01 | -.13** | .000 |
| | 4 | QC x JC | .045 | .043 | .001* | .047 | .05** | .01 | -.11** | .000 |
| Mental resources | 1 | Const. | .000 | .000 | .000 | .841 | 6.956** | .22 | .00 | .000 |
| | 2 | Age | .028 | .027 | .028** | .000 | 407** | .06 | -.17** | .000 |
| | 3 | QC | .096 | .095 | .068** | .000 | .712** | .05 | -.27** | .000 |
| | 4 | QC x JC | .097 | .096 | .002* | .011 | .104* | .04 | .04* | .011 |

QC: Quantitative Workload, ** p≤.01, * p ≤.05

The results for the main effects of the predictor quantitative workload and the moderator job control are easily reported (steps 2 and 3). For all dimensions and WAI-Total score, all main effects for QW and JC were significant and followed the expected directions. With increasing QW, the employees reported lower current work ability compared with lifetime best (dimension 1), lower work ability in relation to physical and psychological demands of the job (dimension 2a/b), more diagnosed diseases (dimension 3), greater work impairment due to diseases (dimension 4), longer sick leave during the past year (dimension 5), poorer prognosis of work ability 2 years from now and lower mental resources (dimension 7). With increasing job control, these effects can be observed exactly in the inverse way.

Finally, the interaction of quantitative workload and job control is considered. For WAI Total and the dimensions 2a/b, 4, 6 and 7, the increases in R^2 obtained by the inclusion of the interaction term (regression step 4) were significant and associated with better work ability. Employees experiencing high quantitative workload and high job control at the same time, reported higher WAI Total score, better work ability in relation to physical and psychological demands of the job (dimension 2a/b), lower work impairment due to diseases (dimension 4), better prognosis of work ability 2 years from now (dimension 6) and better mental resources (dimension 7) than employees facing high quantitative workload and low job control coincidentally. By contrast, when QW was rated low, no differences were revealed between employees experiencing high and low JC.

For dimensions 1, 3 and 5, the change in R^2 on introduction of the interaction term was not significant. When QW is high, employees facing high JC do not differ from employees experiencing low JC in relation to their current work ability compared with lifetime best (dimension 1), their diagnosed diseases (dimension 3) and their sick leave during the past year (dimension 5). All regression parameters can be retained from Table 2.

Discussion and Conclusion

The reported results largely support our hypotheses. The postulated moderating effect of job control as researched by Karasek (1) was found for WAI Total score. Moreover, the analyzed dimensions of work ability differed: for work ability in relation to demands of a job (dimension 2a/b), work impairment due to diseases (dimension 4), prognosis of work ability 2 years from now and mental resources (dimension 7) a moderating effect was revealed, whereas no moderating effect was found for current work ability in relation to lifetime best (dimension 1), number of diagnosed diseases (dimension 3) and sickness absence (dimension 5).

Therefore, the distinction between self-reported strain measures and more objective strain measures like diagnosed diseases or sickness absence seem to be helpful in explaining why the moderating effect of job control is sometimes found and sometimes not.

However, these results differ from the findings of de Lange et al.: Studies examined in this meta-analysis, i. e. Parkes, Mendham and von Rabenau (14) and Bromet, Dew, Parkinson and Schulberg (15) found significant Demand times Control interaction effects in predicting somatic symptoms. A possible explanation might be that the WAI dimension “number of current diseases diagnosed by a physician” is a heterogeneous sum of all kinds of diseases, more or less influenced by job characteristics (i. e. birth defects vs. mental disorders). Therefore, in further research focused on (psycho-)somatic symptoms, should this distinction be considered.

For predicted sickness absence, in de Lange et al.’s meta-analysis, interactions were found when social support was included, i. e. Vahtera, Kivimäki, Pentti and Theorell (16). Studies that disregarded social support, i. e. Parkes (17) found no moderating effect. As in our study social support was not considered, the results are consistent with these earlier findings.

A possible reason why no interaction was found for dimension 1 might be the fact that this item is closer to the more objective measures

like diagnosed diseases or sickness absence than to rather subjective self-reported measures, like dimensions 2, 4, 6 and 7. Perhaps, this global rating of current work ability compared with lifetime best can be considered as an overall rating of the current state that is not as much influenced by subjective appraisals as other dimensions. For example, in contrast to dimension 1, dimension 2 explicitly contains ratings of workplace demands. Likewise dimension 7 implicitly includes the assessment of mental resources which might also be present or absent in the private sector. This leads to the general question of how strongly the different dimensions of the WAI are influenced by subjective appraisals which should be investigated in further research on WAI and its dimensions.

In the following section, the effects of the variables entered in the regression equations will be discussed generally according to the order of their introduction. Although the observed effect sizes should be interpreted with caution due to the mentioned methodical issues, some annotations can be made. First, age is not the only and not always the strongest predictor of work ability. Only for dimensions 2a, 3, 4 and 5 which are associated with physical aspects, has age the greatest influence on work ability. The rating of mental resources (dim 7) is not determined by age at all. Therefore, the conclusion that work ability is just a function of age is over simplified. The results of this study clearly confirm the importance of job characteristics and adequate job redesign on work ability. Quantitative workload especially was proven to be significantly associated with work ability. These findings support previous observations of an impact of psychosocial work stress. It was also demonstrated that the associations are more serious for employees with low job control than for employees with high job control. Admittedly, high job control cannot fully compensate the adverse effects of quantitative workload. Although the assumed interactions were significant, its practical relevance could be very small. This has to be taken into account when job redesign is applied in order to maintain the work ability of employees. The negative effects of high quantitative workload on the work ability cannot only be compensated by increasing job control. Job redesign actions should

therefore focus on the reduction of quantitative workload meanwhile job control should be enhanced conjointly.

For the interpretation of the results, some limitations have to be taken into account. First, due to the cross-sectional design of this study, conclusions concerning causal relations are invalid. Although we assume that high quantitative workload determines a decrease in work ability, it is, for example, possible that people with poor work ability are more frequently exposed to high workload situations because of adverse employment chances. It is also possible that employees due to few mental resources perceive high workload. In this case mental resources would be treated as an independent variable and not, as in our study, as a dependant variable. Consequently, in order to confirm our results, longitudinal analyses are required. Second, the attributes of WAI have to be considered. The already mentioned statistical issues in the data might affect the reliability of the reported findings. On the other hand, the large size of the observed sample with more than 3,300 objectives enforces the statistical power of the applied tests. Nevertheless, the validity and structure of WAI should be investigated in further research. Finally, the big sample-size leads to another implication. Due to the fact that small effects tend to become significant more easily in big samples, the discussion of the practical importance of the findings may not be underestimated.

Despite these limitations the results of this study contribute to a clarification of the relationship between work-related stressors and work ability. Furthermore, they help to improve the insights of WAI and the concept of work ability.

In conclusion, the results confirmed that work ability has a heterogeneous structure. The results of de Lange et al. (7) were approximately replicated by investigating the concept of work ability and its dimensions as outcome variables. Moderating effects of job control were only found for the WAI Total score and for the fairly subjective WAI dimensions. In further studies, for a deeper understanding of the moderating effect of job control it therefore makes sense to consider each of the dimensions of the Work Ability Index (WAI) on its own.

References

1. Karasek, RA. Job Demands, Job Decision Latitude, and Mental Strain: Implications for Job Redesign. *Administrative Science Quarterly*. 1979; 24:285–308.
2. Karasek, R. Control in the Workplace and it's Health related Aspects. In: S.L. Sauter, J.J. Hurrell, & C.L. Cooper (Eds.), *Job Control and Worker Health*. New York: John Wiley and Sons; 1980, p.107–128.
3. Niederhammer I, Bugel I, Goldberg M, Leclerc A, Gueguen A. Psychosocial factors at work and sickness absence in the Gazel cohort: a prospective study. *Occupational Environmental Medicine*. 1998; 55:735–741.
4. Tuomi K, Eskelinen L, Toikanen J, Jarvinen E, Ilmarinen J, Klockars M. Work load and individual factors affecting work ability among aging municipal employees. *Scandinavian Journal of Environmental Health*. 1991; 17:128–134.
5. Alavinia SM, Duivenbooden C van, Burdorf, A. Influence of work-related factors and individual characteristics on work ability among Dutch construction workers. *Scandinavian Journal of Work and Environmental health*. 2007; 33:351–257.
6. Berg TIJ van den, Elders L A, de Zwart B C, Burdorf A. The effects of work-related and individual factors on the Work Ability Index: a systematic review. *Occupational and Environmental Medicine*. 2009; 66:211–220.
7. Lange AH de, Taris TW, Kompier MAJ, Houtman ILD, Bongers PM. “The Very Best of the Millennium”: Longitudinal Research and the Demand-Control-(Support) Model. *Journal of Occupational Health Psychology*. 2003; 8:282–305.
8. Ilmarinen J, Tuomi K. Past, Present and Future of Work Ability. In: Ilmarinen, J. & Lehtinen, S. *Past, Present and Future of Work Ability. People and Work – Research Reports 65*, Finnish Institute of Occupational Health; 2004.
9. Prümper J, Hartmannsgruber K, Frese M. KFZA. Kurz-Fragebogen zur Arbeitsanalyse. *Zeitschrift für Arbeits- und Organisationspsychologie*. 1995; 39:125–132.
10. Prümper J, SQUAW. Short Questionnaire for Work Analysis. Unpublished paper; University for Applied Sciences; 2010
11. Tuomi K, Ilmarinen J, Jahkola A, Katajarinne L, Tulkki A. ArbeitsbewältigungsindeX. *Work Ability Index*. Schriftenreihe der BAuA; 2006.
12. Zwart BCH de, Frings-Dresen MHW, Duivenbooden JC van. Test-retest reliability of the Work Ability Index questionnaire. *Occupational Medicine*. 2002; 52:177–181.

13. Aiken LS, West SG. *Multiple Regression: Testing and Interpreting Interactions*. Thousand Oaks: Sage; 1991.
14. Parkes KR, Mendham, CA, von Rabenau, C. Social support and the demand–discretion model of job stress: Tests of additive and interactive effects in two samples. *Journal of Vocational Behavior*. 1994; 44: 91–113.
15. Bromet EJ, Dew MA, Parkinson MS, Schulberg HC. Predictive effects of occupational and marital stress on the mental health of a male work force. *Journal of Organizational Behavior*. 1988; 9: 1–13.
16. Vahtera J, Kivimäki M, Pentti J, Theorell T. Effect of change in the psychosocial work environment on sickness absence: A seven year follow up of initially healthy employees. *Journal of Epidemiology and Community and Health*. 2000; 54: 484–493.
17. Parkes KR. Occupational stress among student nurses: A natural experiment. *Journal of Applied Psychology*. 1982; 6: 784–796.

II WORK ABILITY IN DIFFERENT JOBS

Age and Work Ability among Portuguese Nurses

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Abstract

The objective of this study was to investigate the interactions between age and work ability of nurses working in hospital wards. The methodology encompassed the work ability analysis using the Portuguese version of the WAI and the workplace characterization using the Mapo Index. Our sample consisted of 238 nurses working on 14 wards, with a mean age of 34.2 years. The average WAI was 38.7 corresponding to a good work ability and, by age group, there were significant differences in WAI. Among nurses the decrease of work ability can be accelerated due to factors present in the workplace (level of dependency of patients, number of staff, availability of mechanical lifts, room lay-out, shift work and others).

Keywords: aging; healthcare workers; hospital ergonomics; work ability index.

Introduction

In several European countries, hospital nurses belong to young age groups and many of them go into early retirement (1) before the legal retirement age, which is 65 years with Portuguese public administration. The heavy physical workload related to patient handling is one of the factors leading to this early retirement. With respect to the physical demands of the tasks, Millanvoye (2) considers that when physical demands are too high it can exclude older people from work. At hospitals, high physical demands of work related to patient handling tasks, but also the poor design of workplaces and the absence or inadequacy of equipment, influence the work practices of nurses (3, 4) and their work ability perception. Moreover, it is also recognized that there is a phenomenon of differential aging in hospitals related to working conditions (5). Thus, the study of age at work is indicative of several problems related to the work determinants and its impact on health and well-being.

The Work Ability Index (WAI) is based on the balance between the demands of work and the resources of the individual (6, 7, 8). The WAI has already been translated into Portuguese (9) and studies have been initiated in different activity sectors, namely in the healthcare sector (4).

The objective of this study was to investigate the interactions between age and work ability of nurses working in hospital wards.

Methods

The methodology encompassed a work ability analysis using the Portuguese version of the WAI (9) and a workplace characterization using the Mapo Index (10). The data collection comprised the self-administered WAI questionnaires, interviews with the head nurses in order to characterize organizational demands and worksite visits to characterize ward layout and equipment.

Participants

The target population consisted of all nurses working in the wards of a Portuguese central hospital.

Our sample consisted of 238 nurses working in 14 wards. Participants had a mean age of 34.2 years ($sd=10.02$), 82.4% were female and on average had spent 10 years ($sd=9.50$) in the current hospital. Most of the nurses were shift workers (83.2%), 60.5% did not take exercise regularly, 77.1% were non-smokers, 28.2% reported acute low back pain in the last 12 months and 94.5% identified the main work demands as both physical and mental.

Results

The average WAI for all nurses was 38.7 ($min=18$; $max=49$; $sd=5.84$) corresponding to a good work ability. If we look at the WAI by categories, the proportion of nurses with “good” work ability was the largest (47.1%), followed by the group with “moderate” work ability (27.3%) (Table 1).

Table 1. Results distribution by WAI categories.

| | | Frequency | Percentage (%) |
|----------------|-----------|-----------|----------------|
| WAI categories | Poor | 12 | 5.0 |
| | Moderate | 65 | 27.3 |
| | Good | 112 | 47.1 |
| | Excellent | 49 | 20.6 |
| | Total | 238 | 100.0 |

When the analysis is focused on those three items that have a higher predictive value, items 1, 2 and 4 are taken into consideration (9). With respect to item 1, an evaluation of nurses in comparison with the lifetime best (10-point scale) indicates that 50% of them rated their work ability with 8 or more. On item 2, the work ability in relation to job demands (1-10 points) shows 50% of the nurses with 7 or more. But from the point of view of physical demands, although the perception of the majority was “good” or “very good” (68.9%), there were 31.1% of the nurses considering it “moderate” or less (Table 2).

Table 2. Results of work ability in relation to physical and mental job demands.

| Item 2 | Physical capacity | | Mental capacity | |
|-----------|-------------------|-------|-----------------|-------|
| | Freq. | % | Freq. | % |
| Very poor | 1 | .4 | 0 | .0 |
| Poor | 8 | 3.4 | 1 | .4 |
| Moderate | 65 | 27.3 | 33 | 13.9 |
| Good | 129 | 54.2 | 144 | 60.5 |
| Very good | 35 | 14.7 | 60 | 25.2 |
| Total | 238 | 100.0 | 238 | 100.0 |

Concerning item 4, estimated work impairment due to diseases, only 31.1% reported no hindrance or diseases, 32.8% had symptoms related to the work and 34.9% reported slowing down the work pace or changing the work methods (Table 3).

Table 3. Estimated work impairment due to diseases.

| Item 4 | | Freq. | % |
|---------------------------|---|-------|-------|
| Estimated work impairment | Because of my disease, I feel I am able to do only part-time work | 3 | 1.3 |
| | I must often slow down my work pace or change my work methods | 24 | 10.1 |
| | I must sometimes slow down my work pace or change my work methods | 59 | 24.8 |
| | I am able to do my job, but it causes some symptoms | 78 | 32.8 |
| | There is no hindrance / I have no diseases | 74 | 31.1 |
| | Total | 238 | 100.0 |

The results by age group showed a decreasing WAI related to age (Figure 1). To test work ability differences between age groups a one-way ANOVA was used. The results showed that, by age group, there existed significant differences in WAI ($F_{(238;3)}=19,76; p=,000$). The WAI median for the group aged above 45 years was 35.5 (moderate).

The average work ability index decreased with age and there was a substantial prevalence (32.3%) of poor and moderate WAI.

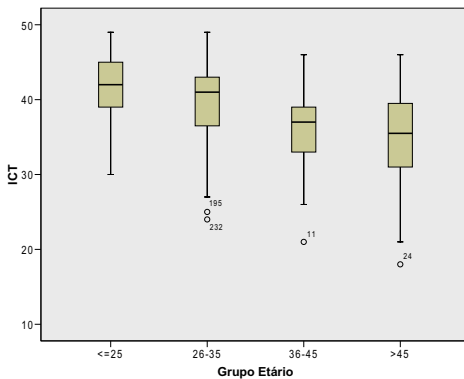


Figure 1. Work ability index results by age group.

On a second step, to study the variables that affected the WAI, multiple linear regression was chosen. First, the existence of significant associations between demographic variables and the Mapo Index with WAI was evaluated. Second, the variables age, gender, marital status, shift work and acute low back pain were considered to explore their explanatory power capacity in WAI. Finally the variables age, presence of acute low back pain and male gender were included in the model through the stepwise method. These three variables proved to be predictive of WAI ($p < 0.01$). The variables eliminated were those which had no significant explanatory ability. After examining the assumptions of the model for the normal distribution, homoscedasticity and independence of errors and analysis of outliers, the outliers and influential cases were eliminated and a model was obtained given by the estimated equation (Equation 1).

Equation 1.

$$\text{WAI} = 47.457 + 0.224 \times \text{Age} - 4.473 \times \text{Acute LBP} + 3.227 \times \text{Male Gender}$$

The model is significant overall ($F(3, 216) = 49.35, p = 0.000$), as well as for each of its parameters (t test with $p < 0.05$). The correlation coefficient was 0.641 and 0.403 of R^2 . The standard error of the regression was 4.051. In summary, the model obtained explains 40.3% of the total variation of the WAI and the remaining 59.7% can be explained by other factors not considered in this study.

Discussion

The average of the work ability index in this sample of nurses was found to decrease with age, which is in agreement with several studies (11, 12, 13). Slightly under half of the sample had a good index (47.1%), but there was a substantial prevalence (32.3%) of impaired WAI (poor and

moderate categories) which concurs with the results of other studies with healthcare workers (11, 12).

The work ability median for the group aged above 45 years was 35.5, which belongs to the “moderate” category. This value is lower than the reference values for the Portuguese population belonging to the age group 46-55, which was approximately 38 (good work ability) [9] and also lower than the index values for the Finnish population belonging to the age group 45-55, which was approximately 40 (good work ability) (8). These results can be explained by the nature of the work in hospital wards. People working in physically demanding jobs usually have lower average WAI than people working in mentally demanding jobs (13). Besides this fact, among nursing personnel the decrease in work ability can be accelerated due to several factors present in the workplace (12), namely the level of dependency of patients, the number of staff, the availability of mechanical lifts, room lay-out, shift work and others.

The multiple linear regression model identified the variables age, occurrence of acute low back pain and gender as predictors of WAI. Increasing age and the presence of acute low back pain contribute to the reduction of WAI and male gender to its increase. These results confirm the relation between age and the deterioration in work ability (1, 6, 11, 12, 13). With respect to gender, it is known that women have additional non-occupational activities, such as the care of children and domestic work, that may contribute to a loss of work ability (12). Also, predominantly physical work usually performed by nurses would explain the presence of acute low back pain and its relation to WAI (11, 13).

Psychosocial factors are potentially relevant to explain the variability of WAI and therefore if included could have increased the explanatory power of the model.

Conclusion

The study results imply a need for programs in the workplace in order to promote wellbeing. Work ability is the foundation of employability and employment which is becoming more important nowadays, to prevent discrimination against older nurses in the hospitals.

The Work Ability Index is an important tool for bringing together the working capabilities of ageing employees, identifying their needs and sustaining the choices of occupational health services in the development of programs to enable ageing employees to work.

References

1. Next Study Group, Working conditions and intent to leave the profession among nursing staff in Europe, Stockholm: University of Wuppertal, 2003.
2. Millanvoye M. Le vieillissement de l'organisme avant 60 ans. In Marquié JC, Paumés D & Volkoff S, coordinateurs. Le travail au fil de l'âge. Toulouse: Ed. Octares, 1995.
3. Hignett S, Crumpton E, Ruszala S, Alexander P, Fray M, Fletcher B. Evidence-Based Patient Handling. London: Routledge, 2003.
4. Cotrim, T.; Simões, A.; Ramalho F; Paes Duarte A., Why healthcare workers ask for early retirement at a central Portuguese hospital: Work ability preliminary results, International Congress Series, Vol. 1280, June, pp. 258–263, 2005.
5. Gonon, O, Dès regulations en lien avec l'âge, la santé et les caractéristiques du travail: le cas des infirmières d'un centre hospitalier français, Pistes, 2003: 5, pp. 1–22
6. Ilmarinen, J., Ageing workers in the European Union – Status and promotion of work ability, employability and employment (G. Oja, J. Savisaari & K. Savisaari, Trans.). Helsinki: Finnish Institute of Occupational Health, Ministry of Labour, 1999.
7. Ilmarinen, J., & Tuomi, K., Past, present and future of work ability. People and Work Research Reports, 2004: (65), 1–25.
8. Tuomi K, Ilmarinen J, Jahkola A, Katajarinne L, Tulkki A. Work Ability Index. Helsinki: Finnish Institute of Occupational Health, 1998.

9. Silva C, Rodrigues V, Sousa C, Cotrim T, Rodrigues P, Pereira A, Silverio J, Maia P, Índice de Capacidade para o trabalho – Portugal e PALOPs. Coimbra: FCT, 2006.
10. Menoni, O., Ricci, M. G., Panciera, D., & Battevi, N., Assessment of Exposure to Manual Patient Handling in Hospital Wards: MAPO INDEX. In A. Hedge, K. Brookhuis, E. Salas, H. Hendrick & N. Stanton (Eds.), Handbook of Human Factors and Ergonomics Methods: CRC Press, 2005.
11. Estryng-Behar M, Kreutz G, Le Nezet O, Mouchot L, Camerino D, Salles R et al, Promotion of work ability among French health care workers, In Costa, Goedhard et Ilmarinen (Eds) Assessment and Promotion of work ability, health and well being of ageing workers. Verona: Elsevier; 2005.
12. Fischer F, Borges F, Rotenberg L, Latorre MR, Soares N, Rosa P et al, Work ability of health care shift workers: what matters? Chronobiology International, 2006; 23(6), 1165–1179.
13. Ilmarinen J, Ageing workers in the European Union. Helsinki: Finnish Institute of Occupational Health, 1999.

Effort Reward Imbalance and Work Ability among nurses and call-center operators

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Abstract

The aim of the study is to investigate the relationship between effort/reward imbalance and work ability in the nursing and call-center sectors. A self-reported questionnaire was completed by 1,113 nurses and 1,106 call-center operators. Among the nurses, after adjustment for several confounders, high effort/reward imbalance was associated with poor/moderate work ability (O.R.=2.4; 95% C.I. 1.7-3.5). Considering the subscales, both “High Effort” and “Low Esteem” were associated with poor/moderate work ability. Among call-center operators high effort/reward imbalance was associated with poor/moderate work ability (O.R.=1.9; 95% C.I.=1.3-2.7). Considering the effort/reward imbalance subscales, only “Low Esteem” was significantly associated with poor/moderate work ability.

Key terms: Effort-Reward Imbalance, Work ability, Call-center, Nurses.

Introduction

Work Ability can be defined as the sum of factors enabling workers to successfully manage their work demands (1, 2).

Work demands and resources, environment, community, organization, process, and the whole work culture affect perceived work ability. Work stress is related to deterioration in work ability (3, 4).

Work stress was made operative in this study via the Effort/Reward Imbalance (ERI) model. This model assumes that stress emerges when efforts expended at work are not reciprocated by rewards received in return, in terms of esteem, career perspectives, job security and pay. The model emphasizes the central role of cognition and the balance between effort and rewards as instrumental for producing dissatisfaction and ill-health (5).

In the long run, the imbalance between efforts and rewards may increase susceptibility to illness through continuous experience of negative emotions and consequent strain (6). ERI has proved to be effective in predicting several outcomes related to health and well-being (7), including work ability (8, 9).

Two different jobs were considered in this study: nursing and call-center work. Several studies have shown that occupational stress is very prevalent among nurses (9), who face both mental and physical demands at the same time. Further studies have documented that work stress is also present in call-center operators (10, 11), but work tasks entail mental demand only.

The aim of the study is to evaluate the relationship between ERI, its components, and work ability among nursing professionals and call-center operators.

Methods

Samples and procedure

A self-reported questionnaire, including the ERI questionnaire and the Work Ability Index (WAI), was distributed in seven hospitals (both state-owned and private) and six call-centers located in Italy.

Presentations of goals and the procedures for the investigations were arranged with the management staff of each hospital department and call-center to increase commitment and support.

The self-reported questionnaire was answered by 1,113 nurses and 1,106 call-center operators (response rate=76.4% and 99.1% respectively).

The nurses responded to the questionnaire during working hours, the call center operators completed the questionnaire following routine worksite health surveillance.

Among nurses, 86.5% were women, 45.5% were aged 31-40 years and mean work experience was 12.6 (sd 8.8); among call-center operators, 77.4% were women, mean age was 33.4 years (sd 3.9) and mean work experience 8.0 (sd 2.2).

Measures

WAI

The WAI is based on a self-assessment of work ability and yields information about individual health, physical and mental demands in the job and in performance ability.

The WAI consists of the 7 items including subjective estimation of physical and mental work ability, diseases suffered, sick leaves and psychological resources (2). The WAI score ranges 7 to 49: work ability scores ranging from 7 to 27 are evaluated as “poor”, from 28 to 36 as “moderate”, from 37 to 43 as “good” and from 44 to 49 as “excellent”. In the present analysis, the categories “poor” and “moderate” were aggregated to represent a low work ability status.

ERI

To measure work stress according to the Effort/Reward Imbalance model, we used the ERI self-report questionnaire (ERI-Q) (12). The ERI-Q includes 17 items, 6 of which measure the component “Effort” and 11 the component “Reward”. The “Effort” component refers to individual stress experienced in relation to job demanding aspects (quantitative and qualitative demands, overtime, responsibility, etc.). The “Reward” component includes three subscales: esteem reward, reward related to job security, and promotion prospects and financial reward. The subjects were invited to rate the amount of distress experienced in relation to each work characteristic on a four point scale (from “not at all distressed” to “very distressed”). The final score for Effort/Reward Imbalance was calculated on the Effort/Reward basis ratio. Following the theoretical background, the ERI continuous score was dichotomized so that $ERI > 1$ indicates work stress with efforts higher than rewards, while $ERI \leq 1$ points to a non-stress situation.

Statistical analysis

The statistical package SPSS 17.0 for windows was used for data analysis. A logistic regression analysis was carried out to test the association between ERI and WAI.

Results

Among nurses, 16.2% reported ERI scores > 1 and 33.4% had poor/moderate WAI (29.3% moderate, 4.1% poor). After adjustment for sex, age, marital status, number of children, job seniority, workload, overcommitment and working time, “High ERI” was associated with poor/moderate WAI (O.R.=2.40; 95% C.I.=1.70-3.50). Considering the ERI score tertiles, the medium and high tertiles (as compared with low tertile) were significantly associated with poor/moderate WAI

(O.R.=1.78; 95% C.I.=1.18-2.67 and O.R.=4.16; 95% C.I.=2.73-6.32 respectively).

Among call-center operators, 27.7% reported ERI scores >1 and 19.8% a poor/moderate WAI (18.1% moderate, 1.7% poor). After adjustment for sex, age, marital status, number of children, education, job seniority, commuting time, overcommitment, job task (inbound/outbound calls), and working time, “High ERI” was significantly associated with poor/moderate WAI (O.R.=1.87; 95% C.I.=1.29-2.72). Considering the ERI score, the medium and high tertiles (compared to the low tertile) were associated with poor/moderate WAI (medium tertile O.R.=2.55; 95% C.I.=1.43-4.54; high tertile O.R.=3.13; 95% C.I.=1.72-5.69).

To compare the two ERI components (Effort and Reward), the direction of the Reward scale was inverted (higher values mean less reward) and all measures were rescaled to the same range and categorized into tertiles.

Table 1 shows the results of testing for an association between Effort and Reward score and poor/moderate WAI.

Among nurses, both Effort and Reward were significantly associated with poor/moderate WAI. “Low Reward” *vs* “High Reward” and “High Effort” *vs* “Low Effort” were more strongly associated with poor/moderate WAI (O.R.=2.79; 95% C.I.=1.72-4.54 and O.R.=1.70; 95% C.I.=1.05-2.77, respectively).

Among call-center operators, only the Reward component was associated with poor/moderate WAI (“Low Reward” *vs* “High Reward” O.R.=3.82; 95% C.I.=2.21-6.33).

Table 1. Associations between Effort, Reward score and Poor/Moderate Work Ability.

| | Call Center Operators** | Nurses* |
|---------------------------|------------------------------------|------------------------------------|
| Predictors | Poor/moderate WAI | |
| Medium Effort (ref. Low) | O.R. (95%C.I.) 0.83 (0.48-1.41) | O.R. (95%C.I.) 1.51 (0.97-2.33) |
| High Effort (ref. Low) | 1.02 (0.59-1.76) | 1.70 (1.05-2.77) |
| Medium Reward (ref. High) | 1.80 (1.04-3.11) | 2.44 (1.54-3.87) |
| Low Reward (ref. High) | 3.82 (2.21-6.33) | 2.79 (1.72-4.54) |

* O.R. are adjusted for sex, age, marital status, number of children, education, job seniority, commuting time, overcommitment, job task, working time and all the predictors

**O.R. are adjusted for sex, age, marital status, number of children, job seniority, workload, overcommitment, working time and all the predictors

Table 2 shows the association between Reward subscales and poor/moderate WAI.

Among nurses “Low Esteem” (compared to “High Esteem”) was associated with poor/moderate WAI (O.R.=1.81; 95%C.I.=1.14-2.87).

Considering call-center operators only, “low Esteem” was associated with poor/moderate WAI (O.R.=2.59; 95%C.I.=1.62-4.15), but “Low Promotion/Salary” also appears to have some relevance (O.R.=1.71; 95%C.I.=0.99-2.97).

Table 2. Associations between Reward components and Poor /moderate Work Ability

| | Call Center Operators** | Nurses* |
|-------------------------------------|-------------------------|------------------|
| Predictors | Poor/moderate WAI | |
| | O.R. (95% C.I.) | O.R. (95% C.I.) |
| Medium Job Security (ref. High) | 1.24 (0.85-1.82) | 1.23 (0.70-2.03) |
| Low Job Security (ref. High) | 1.48 (0.85-2.57) | 1.18 (0.68-2.01) |
| Medium Esteem (ref. High) | 1.38 (0.89-2.12) | 1.07 (0.68-1.69) |
| Low Esteem (ref. High) | 2.59 (1.62-4.15) | 1.81 (1.14-2.87) |
| Medium Promotion/Salary (ref. High) | 1.08 (0.70-1.67) | 0.95 (0.59-1.53) |
| Low Promotion/Salary (ref. High) | 1.71 (0.99-2.97) | 1.32 (0.80-2.15) |

* O.R. are adjusted for sex, age, marital status, number of children, education, job seniority, commuting time, overcommitment, job task, working time, Effort tertiles and all the predictors

**O.R. are adjusted for sex, age, marital status, number of children, job seniority, workload, overcommitment, working time, Effort tertiles and all the predictors

Conclusions

Among the nursing professionals and call-center operators, high ERI proves to be associated with poor/moderate Work Ability Index.

This supports the rationale of work ability (13), claiming individual work ability to derive from the balance between job demands and available resources to meet them. Imbalances between efforts and resources (in terms of rewards given) may in turn reduce, through continuous experiences of strain, the individual’s sense of ability to adjust to the work environment. Indeed, in the study by Ilmarinen et al. (13), adverse psychosocial job characteristics, which are relevant antecedents of work stress, proved to be important factors in explaining work ability.

Going through the two components of ERI (Effort and Reward), “Effort” was associated with low work ability only in nursing professionals and “Reward” was the factor more strongly associated with poor/moderate work ability in both professions considered. “Effort” seemed to be most important in job with physical demands.

Given the three Reward factors (esteem, job promotion/salary and job security), “low esteem” is the Reward component more strongly associated with poor/moderate work ability.

Tsutsumi and Kawakami (14) in a review of empirical studies on the ERI model, suggested different interventions to approach occupational stress reduction in accordance with the different factors of ERI.

Thus, actions to promote work ability, have to consider the prevalence of possible negative work characteristics in detail, with focus on impact of different factors of ERI.

Limitations of the study are its cross-sectional nature, affecting the possibility to draw firm conclusions on causal relationships, and its self-report measures of working and health condition assessment.

References

1. Tuomi K, Huuhtanen P, Nykyri E, Ilmarinen J. Promotion of work ability, the quality of work and retirement. *Occ. Med.* 2001; 51(5):318–24.
2. Tuomi K, Ilmarinen J, Jahkola A, Katajarinne L, Tulkki A. *Work Ability Index* (2nd ed.). Helsinki: Finish Institute of Occupational Health, 1998.
3. Tuomi K, Vanhala S, Nykyri E, Janhonen M. Organizational practices, work demands and the wellbeing of employees: a follow-up study in the metal industry and retail trade. *Occ Med.* 2004; 54(1):115–21.
4. Goedhard R, Goedhard W, Ilmarinen J, eds. *Assessment and Promotion of Work Ability, Health and Well-being of Ageing Workers*. Elsevier, International Congress Series. 2005; 1280:79–83.
5. Siegrist J. Adverse health effects of high Effort-low Reward conditions at work. *J Occup Health Psychol.* 1996; 1:27–43.
6. Siegrist J, Starke D, Chandola T, Godin, I, et al. The measurement of Effort-Reward imbalance at work: European comparisons. *Soc Sci Med.* 2004; 58, 1483-99.
7. van Vegchel N, de Jonge J, Bosma H, Schaufeli W. Reviewing the Effort-Reward imbalance model: drawing up the balance of 45 empirical studies. *Soc Sci Med.* 2005; 60:1117–31.
8. Camerino D, Conway PM, Sartori S, Campanini P, et al. Factors affecting work ability in day and shift-working nurses. *Chronobiol Int.* 2008; 25(2):425-42.
9. Hasselhorn HM, Tackenberg P, Peter R. Next-Study Group. Effort-Reward imbalance among nurses in stable countries and in countries in transition. *Int J Occup Environ Health.* 2004; 10(4):401–8.
10. Zapf D, Isic A, Bechtoldt M, Blau P. What is typical for call centre jobs? Job characteristics. and service interactions in different call centres. *Europ J of Work Org Psychol.* 2003; 12:311–40.
11. Holman D, Chissick C, Totterdell P. The Effects of Performance Monitoring on Emotional Labor and Well-Being in Call Centres. *Motivation and Emotion.* 2002; 26:57–8.
12. Siegrist J, Peter R. *Measuring Effort-Reward Imbalance at Work: Guidelines*. Institut für Medizinische Soziologie, Düsseldorf, 1996.
13. Ilmarinen J, Tuomi K, Seitsamo J. New dimensions of work ability. In: Costa G, Goedhard W. and Ilmarinen J. (eds). *Assessment and Promotion of Work Ability, Health and Well-Being of Ageing Workers*: Amsterdam: Elsevier. pp 3–7; 2005.
14. Tsutsumi A, Kawakami N. A review of empirical studies on the model of Effort-Reward imbalance at work: reducing occupational stress by implementing a new theory. *Social Science & Medicine.* 2004; 59:2335–59.

Effort-Reward Imbalance and Work Ability Index among Italian Female Nurses: The Role of Family Status and Work-Family Conflict

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Abstract

While research is mainly focused on the role of gender and biological/chronological age in the relationship between Work Ability Index and Effort/Reward Imbalance, this study addresses the association between work-related stress and work ability, taking into account the role of family status and work-family conflict. In a representative sample of 3949 female Italian nurses, relationships were analyzed by means of Random Forests Analysis and General Linear Models (GLM). The results confirm that, among Italian nurses, work-related stress and work family conflict are associated with lower work ability and these variables affect work ability mostly in an independent way.

Key terms: Work Ability Index, Effort Reward Imbalance, Work-family conflict, Self effectiveness, Health

Introduction

The well known international questionnaires Effort Reward Imbalance (ERI-Q), Work to Family Conflict (W/F_C) and Work Ability Index (WAI) are all based on the principle of balance/imbalance.

The Effort Reward Imbalance model emphasizes the crucial role of cognition and the balance between efforts and rewards as instrumental for job satisfaction and health development. Such imbalance may result in a state of social reward frustration, stimulating the meso-limbic dopamine system and activating several stress axes within the organism, including autonomic, neuroendocrine, immune and inflammatory responses by the central nervous system; this may lead to diseases of the body (2).

Another kind of imbalance is considered to be Work-Family Conflict, which is based on the Role stress theory (3), triggered by simultaneous pressures of demand in the work and family roles (4).

The Work Ability Index also assesses a particular kind of balance/imbalance. As summarized by Louhevaara and Järvelin (5): work ability is characterized by the balance between a worker's individual resources and demands of the work incorporating environment and work organization. The principal individual resources included health, capacities, competence and values.

On the basis of this common balance/imbalance concept, we assume that a relationship among these measures may be due to a common variance shared by these factors, which accordingly can be seen as aspects of the same latent factor. Alternatively we assumed that an Effort/Reward imbalance and/or a Work-family conflict can determine a lower Work Ability through the perception of low effectiveness and lack of well-being.

Objectives

The need to maintain good health and work ability with aging due to the supportive role of organizations becomes increasingly important as the workforce grows older. While most studies are focused on the role of gender and biological/chronological age as moderators in the relationship between stressors and Work Ability Index, our aim is to evaluate, in a representative sample of female Italian nurses, the association between work-related stress and work ability, considering the role of family status and work-family conflict. In this regard, it is worth recalling the words of Gould and colleagues, who recognized that a reconciliation between family life and work is essential to work ability (1).

Methods

To validate our hypotheses, a total of 3,949 female nurses (aged 21-64) were included in the analyses: 3,623 from the Italian NEXT study (6) and 326 from six representative healthcare institutions of the Lazio Region, Italy (7). The Work Ability Index and its subscales were considered as the outcomes. As potential predictors we selected the Effort-Reward Imbalance questionnaire by Siegrist (8) and the Work-Family Conflict by Netemeyer *et al.* (9), but also *work-time schedule, family status, number of children < 7 yrs of age, additional off-work caring responsibilities and age*. The importance of these covariates was estimated by Random Forest (10) following the methods proposed by Sandri and Zuccolotto (11). An explorative factor analysis was then performed to check the uniqueness of each covariate and the relationships between the standardized variables of interest were finally analyzed by Generalized Linear Models (GLM).

Results

About one-third of respondents (27.2%) reported low work ability scores (WAI<37) and 30.1% an ERI ratio higher than 1 which indicates a presence of work-related stress in this population.

The Random Forests analysis (see Fig. 1) showed that all scales of ERI and W/FC were the most important predictive covariates of WAI. Work schedule, age, family status, additional off-work caring responsibilities and number of children <7yrs of age proved to be weak or non-significant predictors.

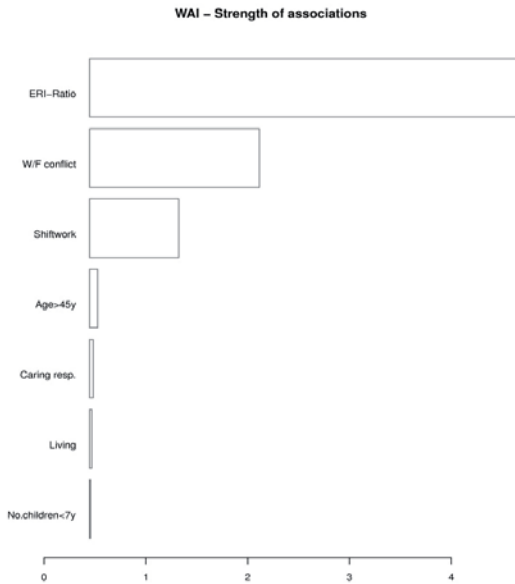


Figure 1. Random Forest Analysis. Strength of associations with WAI.

In the explorative factor analysis, ERI-ratio, W/FC and WAI loaded on one factor only, which explains 52.79% of the total variance; still each variable showed a high value of uniqueness: Effort/Reward Imbalance

= 0.59; Overcommitment = 0.60; Work – family conflict =0.66 and Work Ability Index = 0.77.

GLM results (adjusted for age, shift work, family status, number of children under 7 years and additional off-work caring responsibilities) showed that lower levels of WAI were associated with higher ERI-ratio and W/FC (fig.2). No interaction was found between ERI ratio and W/FC. Age groups and additional off-work caring responsibilities were also associated with lower perceived work ability, while work schedule and number of children <7yrs of age were inversely associated with higher work ability.

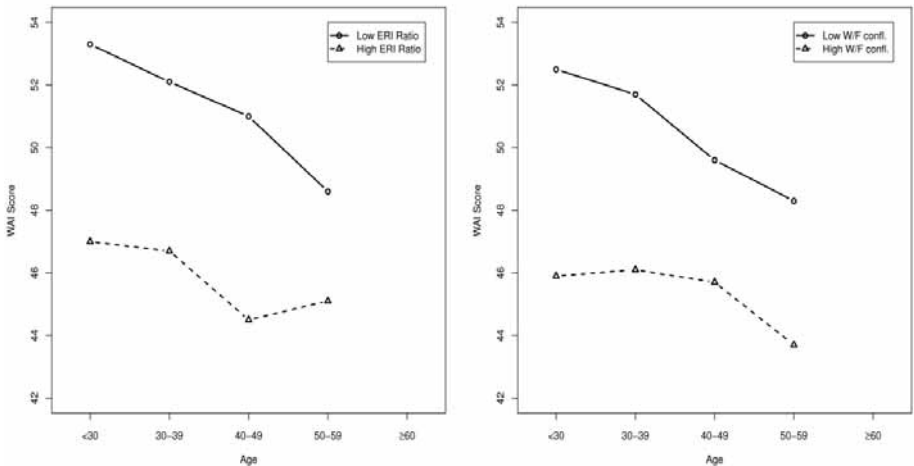


Figure 2. Mean of standardized WAI by age, ERI-Ratio and W/F_C.

Lower WAI levels related to aging were clear for WAI sub-items 3, 4 and 6, while sub-item 5 was lower among adults living alone with children (Table 1).

Table 1. WAI - General Linear Models (GLM), significant coefficients

| | WAI | WAI1 | WAI2 | WAI3 | WAI4 | WAI5 | WAI6 | WAI7 |
|--|---------|--------|-------|---------|--------|--------|--------|---------|
| <=45 yrs | 1.9*** | | | 2.8*** | 1.2** | 0.3 | 1.9*** | |
| Off-work caring resp.p. | -1.2** | | | -2.2*** | -1.0* | 1.0* | -1.0* | |
| Living alone | | | | | | | | |
| Living as the only adult with children | -1.4* | | | -2.8*** | | -2.8** | | |
| Living with another adult | | | | | 0.9* | | | |
| Irregular day working hours | | | | | | | | 2.1* |
| Night shift only | | | | | | | | |
| Shiftwork with nights | 4.0*** | 2.8*** | 1,2* | 3.8*** | 1.9*** | 3.1*** | | 3.6*** |
| Shiftwork without nights | 1.1* | | | 1.6** | | 1.3* | | 3.0*** |
| No. of children <7 yrs | 0.6* | | | 0.6* | | | 0.9** | |
| W/F_C | -0.2** | | -0,2* | -0.4*** | -0.2* | | | -0.2* |
| ERI Ratio | -0.3*** | | -0,2* | -0.5*** | -0.2* | | | -0.3*** |
| W/F_C*ERI_Ratio | | | | 0.0*** | | | 0.0** | |

* p < 0.05

** p < 0.01

*** p < 0.001

Discussion and Conclusion

Few studies have analyzed the relationship between Effort Reward Imbalance and Work Ability. Freude et al. (12, 13) observed this association in a sample of teachers, Sartori (14) identified a 2.5 fold higher risk of having a poor WAI in subjects with high ERI-imbalance after adjusting for sex, age, work schedule and professional area, while De Jonge (12) found a significant but different impact of the ERI component “Reward” between younger and older workers.

As a whole, women obtain lower scores in WAI than men, which could be due to their lower social status and higher commitment in the family context. Indeed, multiple roles could have different consequences: on the one hand they can generate more resources and opportunity for energy restoration through enhanced self-esteem (15), on the other hand they may generate more pressure from work and family, if these are mutually incompatible.

Our results confirm that among Italian nurses work-related stress as measured with the ERI-Q and Work-family conflict are significantly associated with lower work ability. These associations proved not to be due to common variance resulting from a shared inclusive imbalance background. W/FC proved valid regardless of the ERI ratio, which means that low balance between efforts and reward does not necessarily determine work-family conflict and vice versa. The R^2 of the GLM showed that all these variables explain only 0.17% of the total WAI variance. It is important to remember that other measures such as job demands, job control, motivation, job meaning etc. play a relevant role in WAI.

The literature shows that younger people perceive work ability much better than do older people (16, 17, 18), and this is also true with regard to the functional age index (19). Our data confirm that WAI sub items dealing with disease, work impairment due to disease, prognosis of work ability *two years from now* discriminate between younger and older nurses. The same sub items were noted by Sartori (14) in a different population.

Shift with night work and one or more children < 7 yrs had positive associations with work ability. We can assume that nurses also working on night shifts are generally more healthy and that nurses with children are younger and can avail themselves of more support.

To maintain and promote work ability, healthcare organizations should consider both work- related stress and work-family conflict. As specific options for older workers it is possible to promote the availability of flexible working arrangements, include part-time employment, job sharing and home-based work.

References

1. Gould R, Ilmarinen J, Järvisalo J, Koskinen S. Dimensions of Work Ability. Finnish Institute of Occupational Health; 2008.
2. Siegrist J, Rödel A. Work stress and health risk behavior. *Scand J Work Environ Health* 2006; 32: 473–81.
3. Kahn RL, Wolfe DM, Quinn R, Snoek JD, Rosenthal RA. *Organizational Stress*. New York, Wiley; 1964.
4. Kahn RL, Wolfe DM, Quinn R, Snoek JD, Rosenthal RA. *Organizational Stress*. New York, Wiley; 1964.
5. Louhevaara V, Järvelin S. Verifying of the theoretical model of perceived work ability in the field of teaching. In *Promotion of Work Ability towards Productive Aging. Selected papers of the 3rd International Symposium on Work Ability, Hanoi, Vietnam, 22–24 October 2007*. CRC Press/Balkema 2007; p. 75–81.
6. Camerino D, Conway PM, Sartori S, Campanini P, Estryñ-Béhar M, van der Heijden BIJM, Costa G. Factors affecting work ability in day and shift-working nurses. *Chronobiology International* 2008; 25: 425–42.
7. Camerino D, Sandri M, Sartori S, Destrebecq AL e Lusignani M Prevenzione e benessere degli infermieri nelle strutture sanitarie del lazio: problemi di genere e di età. *Giornale Italiano di Medicina del Lavoro ed Ergonomia* 2009; XXXI, 3: 342–43.
8. Siegrist J, Starke D, Chandola T, Godin I, Marmot M, Niedhammer I, Peter R. The measurement of Effort–Reward Imbalance at work: European comparisons. *Social Science & Medicine* 2004; 58:1483–99.

9. Netemeyer RG, Boles JS, McMurrian R. Development and validation of work–family conflict and family-work scales. *J Appl Psychol.* 1996; 81:400–10.
10. Breiman L. Random Forests. *Machine Learning* 2001; 45.
11. Sandri M, Zuccolotto P. Variable selection Using Random Forest. in Zani S, Cerioli A, Riani M, Vichi M. *Data Analysis, Classification and Forward Search*, Springer, Berlino; 2006.
12. De Jonge J. Job strain, Effort-Reward Imbalance and Employee Health: Are Older Employees Worse Off? EAWOP Meeting on Aging and Work. Tilburg, the Netherlands 2007; pp. 1–24.
13. Freude G, Jakob O, Martus P, Rose U, Seibt R. Predictors of the discrepancy between calendar and biological age. *Occup Med* 2010; 60: 21–8.
14. Sartori S, Conway PM, Dotti R, Costa G. Il Work ability Index (WAI) come strumento per il monitoraggio della capacità funzionale di lavoro in relazione all'invecchiamento. 31 Congresso annuale Associazione Italiana di Epidemiologia L'epidemiologia dell'invecchiamento. Marina di Ostini, 17–19 ottobre 2007; p. 154.
15. Greenhaus JH, Beutell NJ. Sources of conflict between work and family roles. *Academy of Management Review* 1985; 10:76–88.
16. Ilmarinen J, Tuomi K, Klockars M. Changes in the work ability of active employees over an 11-year period. *Scand J Work Environ Health* 1997, 23: 49–57.
17. Ilmarinen J, Tuomi K. Past, present and future of work ability. *People and Work. Research Report* Finnish Institute of Occupational Health 2004; p.1–25.
18. Goedhard RG, Goedhard WJA. Extending the working life. In *Promotion of Work Ability towards Productive Aging*. Selected papers of the 3rd International Symposium on Work Ability. Hanoi, Vietnam, 22–24 October 2007. CRC Press Taylor & Francis Group, London 2009; p. 139–42.
19. Seibt R, Spitzer S, Blank M, Scheuch K. Predictors of work ability in occupations with psychological stress. *Journal of Public Health* 2009, 17: 9–18.

Aspects of stress, shift work and work ability in relation to age

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Abstract

In this study the effects of perceived work stress and shift work on work ability were examined in a group of 23 nurses working on a cardiology ward, and 35 hospital staff employees working at the HRM department. The relationship of WAI and perceived work stress was examined using a stress questionnaire. Analysis showed markedly negative correlations of work ability and several work stress factors. Shift work, however, did not significantly lower the WAI scores for the nurses. Work stress factors possibly intensify the age associated decline in work ability.

Keywords: WAI, work ability, work stress, shift work, aging worker

Introduction

In studies on work ability in different countries a statistically negative relationship has been observed between work ability and chronological age. However, age has been found to explain a relatively small amount (5–10%) of variance in the WAI score (1).

Aim of the study

In several studies it has been found that work stress may affect the work ability of aging workers. Shift work is possibly an additional stress variable that may have adverse effects on aging workers (2). In this study the effects of shift work and other stress work stress factors on work ability were examined.

Methods

The study comprised 58 hospital workers of a general hospital consisting of 25 nurses (staff members of a cardiology department, all nurses were engaged in shift work), and 33 hospital staff employees belonging to the human resource management (HRM) department of the hospital. Use was made of the Work Ability Index (WAI) and the Work Stress Index (WSI) to record perceived work stress. Relationships were studied between the scores obtained with the WAI and WSI respectively and calendar age of the studied subjects. Details about the WSI have been reported earlier (3).

Results

Table 1 presents some results of the groups studied.

Table 1. Mean age and mean WAI scores of the two study groups. The differences in WAI scores are not statistically significant.

| Studied population | N | mean age \pm s.d. | mean WAI \pm s.d. | % WAI <37 (poor –moderate) |
|--------------------|----|---------------------|---------------------|-------------------------------|
| Cardiology | 25 | 43.2 \pm 9.8 | 41.7 \pm 4.3 | 8.0 % |
| HRM | 33 | 41.6 \pm 11.0 | 43.1 \pm 3.9 | 0.3 % |
| All | 58 | 42.3 \pm 10.4 | 42.5 \pm 4.1 | 5.2 % |

Work ability and age

The WAI scores obtained were related to calendar age by means of linear regression analysis. The results are shown in Table 2. A remarkable difference in explained variance was found between the cardiology group and the HRM group. In the cardiology group (nurses) age seemed to affect work ability much more than in the HRM group

Table 2. Results of the linear regression analysis

| Studied population | N | Regression analysis | Age vs. WAI R ² (explained. variance) |
|--------------------|----|-------------------------|--|
| Cardiology | 25 | WAI = 49.0 - 0.17 * age | 0.146 (14.6 %) |
| HRM | 33 | WAI = 45.5 - 0,06 * age | 0.030 (3.0 %) |
| All | 58 | WAI = 46.9 - 0.10 * age | 0.070# (7.0%) |

= $p < 0.05$

Perceived work stress

Perceived work stress results are presented in Table 3. Details of the six stress factors (sf) indicate that significant work stress average stress score (aws) perceived 53% of all the subjects. A stress factor was considered high if its score was higher than or equal to 2.0 (on a scale of 1–5).

Table 3 shows that the majority of the nurses reported high work stress, in particular sf3 and sf6 (i.e. quantitative overload and unfavorable work environment respectively). The high score of sf6 was probably due to poor air-conditioning in the cardiology department giving rise to complaints from many about too high temperatures of the work environment.

Table 3. Mean scores of the different stress factors and percentages of subjects with stress factor scores of 2.0 and higher.(for explanation see text and reference³)

| Stress factor | Cardiology | | HRM | | All | |
|-----------------------------|------------|-------|--------|--------|--------|-------|
| | Score | % ≥ 2 | Score | % ≥ 2 | score | % ≥ 2 |
| Sf1 | 1.53 | 12 % | 1.59 | 21 % | 1.57 | 17 % |
| Sf2 | 1.57 | 4 % | 1.64 | 21 % | 1.61 | 14 % |
| Sf3 | 1.99 | 68 % | 2.19 | 70 % | 2.10 | 69 % |
| Sf4 | 1.52 | 8 % | 1.38 | 3 % | 1.44 | 5 % |
| Sf5 | 1.80 | 36 % | 1.77 | 36 % | 1.79 | 36 % |
| Sf6 | 1.92 | 56 % | 1.73 | 42 % | 1.81 | 48 % |
| Average stress score | 1.72 | | 1.81 | | 1.91 | |
| ≥ 2 sf ≥ 2 | N = 14 | 56 % | N = 17 | 51.5 % | N = 31 | 53% |

Perceived work stress and work ability

To identify a possible relationship between work ability and perceived work stress the mean score of the different stress factors were calculated for each subject. By means of linear regression analysis it was found that work stress makes a considerable contribution in explaining the variance of the WAI score. The results are shown in Table 4.

Table 4. Effects of stress on work ability; results of linear regression analysis

| Studied population | N | Model WAI vs. Stress (AVS = average stress score) | WAI vs AVS R ² (exp.variance) |
|--------------------|----|---|--|
| Cardiology | 25 | WAI = 57.3 - 9.09 * AVS | 0.256 (25.6 %) |
| HRM | 33 | WAI = 52.1 - 5.23 * AVS | 0.214 (21.4 %) |

There appear to be considerable differences in WAI score between workers who report work stress and those who do not. This is shown in Table 5. In the cardiology group the difference in work ability is statistically not significant; in the HRM group the difference in WAI score is statistically significant (P < 0.01)

Table 5. Effects of Stress on WAI (stress is considered to be present if WSI scores of 2 or more sf are higher than 2.0)

| | Stress | Mean WAI score | p-value |
|-------------------|----------------------|----------------|---------|
| Cardiology | No stress | 42.7 | 0.158 |
| | Work stress reported | 40.9 | |
| HRM | No stress | 45.2 | 0.001 |
| | Work stress reported | 41.1 | |

Discussion

The results of this study in a working population in a general hospital show that work ability is affected by calendar age as well as by perceived work stress. The latter seems to explain more of the variance in work ability than age. In the group of nurses (cardiology) shift work did not result in significantly lower WAI scores. However, other stress factors like unfavorable environmental conditions added significantly to the perceived work stress and subsequently to a decline in work ability. In the group of HRM workers work stress played an important role in explaining average work ability. When looking in more detail at the different reported stress factors of this group, it was found that high work stress was mainly caused by too high work pressure, unfavorable work prospects and unfavorable work environments.

The general conclusion can be reached that work stress factors may contribute considerably to the explained variance of work ability and possibly intensify the age associated decline in work ability.

References

1. Goedhard WJA. WAI scores and its different items in relation to age: a study in two industrial companies in the Netherlands. In: Ilmarinen J. and Lehtinen S. (eds) Past, Present and future of work ability. FIOH, Helsinki Res. Report 65, 2004, 26–32.
2. Costa G. Some considerations about aging, shift work and work ability. In: Costa G., Goedhard WJA. and Ilmarinen J. (eds). Assessment and promotion of work ability, health and well-being of ageing workers. Elsevier, Amsterdam. Int. Congress series 1280, 2005, 67–72.
3. Goedhard, RG. and Goedhard WJA. Work ability and perceived work stress. In: Costa G., Goedhard WJA. and Ilmarinen J. (eds). Assessment and promotion of work ability, health and well-being of ageing workers. Elsevier, Amsterdam. Int. Congress series 1280, 2005, 79–83.

Physical Capacities for Predicting the Perceived Work Ability of Firefighters

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Abstract

This study aimed to investigate the predictive values of physical capacity tests in respect to perceived work ability among firefighters, using 3 and 13-year follow-ups. The subjects comprised 74 male firefighters aged from 31 to 45 in 1996. The outcome variable was perceived physical work ability, and the predictors were the physical capacity tests. Logistic regression models showed that the best predictor of decreased perceived physical work ability among firefighters after both 3 and 13 years was poor agility. These results support the work-related and predictive validity, in terms of perceived work ability, of agility tests in measuring physical capacity among firefighters.

Key terms: Work Ability, Physical Capacity, Agility, Firefighters, Follow-up study

Introduction

Smoke-diving, roof work, and handling patients and heavy tools are typical fire and rescue work tasks in which physical capacity is critical for safe and efficient work performance (1, 2). Temporary thermal and ground conditions, and the use of protective equipment further increase the load on the cardiorespiratory and musculoskeletal systems, as does the requirement of postural and movement control (1, 3, 4).

Three and six-year follow-ups among firefighters have previously shown that losing control through making errors, slow performance time in the functional balance test, and a high amplitude of postural sway with eyes closed significantly predict decreased perceived physical work ability (PWA) (5, 6). In addition, during the three-year follow-up, poor categories in the functional balance tests and sway amplitude with the eyes closed indicated 3.6- and 2.3-fold risks respectively, of a decline in the work ability index (5). The predictive values of cardiorespiratory, musculoskeletal and agility tests among firefighters have not previously been studied.

Good physical capacity is one of the basic elements of the work ability of firefighters throughout their careers, in addition to the psychological dimensions of work ability. Regarding early prevention of impaired work ability, it is necessary to know the predictive values of the physical tests. This study aimed to investigate the predictive values of physical capacity tests on PWA among firefighters in 3 and 13-year follow-ups.

Subjects and Methods

Subjects

The subjects comprised 74 male firefighters, mean age of 37.3 (31 to 45) in 1996, who took part in all three cross sectional studies of physical fitness in 1996, 1999, 2009, and responded to our questionnaires. The data is based on a large 3 and 13-year follow-up study of the health and

physical and mental capacity of Finnish professional firefighters (7, 8), which consists of a nationwide questionnaire and research on physical capacity and physical work capacity while wearing fire protective equipment. The subjects of the present study belong to the physical capacity study. At baseline in 1996, for the physical capacity study, 210 professional, operational male firefighters were selected from central and southern Finland by stratified sampling from age groups 30-34, 40-44 and 50-54 (9). Altogether 187, 137 and 86 firefighters' physical capacity was tested in 1996, 1999 and 2009 respectively. A total of 101 subjects dropped out after the 13-year follow-up, the reasons this being: old-age pension (n=47), disability pension (n=13), sick leave of 6-12 months (n=10), death (n=6), change of job or being on leave (n=11) and no wish to participate (n=22) (8).

The PWA and physical capacity test results (except squatting) did not differ significantly at baseline between the study sample (n=74) and the dropouts (n=101).

Outcome Variable

The outcome variable was perceived physical work ability (PWA), assessed in 1996, 1999 and 2009. PWA was included in the work ability index and determined using the question "How do you rate your current work ability with respect to the physical demands of your work?" (10). Response rates in 1996, 1999 and 2009 were 76%, 72% and 68% respectively. The scale for the question was: 1=very poor, 2=rather poor, 3=moderate, 4=fairly good, 5=very good. Categories 1-3 and 4-5 were combined for the analysis because of the small number of subjects.

Predictive Variables

The predictors assessed in 1996 mainly involved physical tests designed to follow up the physical work capacity of firefighters in Finland (1). These tests included the direct determination of maximal oxygen consumption on a bicycle ergometer, and the evaluation of dynamic muscle strength and endurance through sit-up (repetitions/60 s), bench press (45 kg; repetitions/60 s), squatting (45 kg; repetitions/60 s)

and pull-up tests (max repetitions). In addition, the flexibility of the lower limbs and lower back were measured using a sit-and-reach test (cm) (11). Trunk side-bending (mean of left and right, cm) was also measured (12).

Motor control, i.e. co-ordination, reaction time, agility, and balance were tested with simple functional tests and postural sway. In the multi-limb co-ordination test, the subject was placed on a chair in front of a table; hands on the table 80 cm apart and feet 50 cm apart below the table (13). On command, the subject moved his hands to the midline and back to start position and simultaneously moved his legs: left foot over midline and back to start position and then right foot etc. The cycle was repeated 25 times as fast as possible. The time of 25 successful performances was measured. Hand reaction time (mm) was measured by how fast the subject caught a suddenly dropped ruler between his thumb and index finger (14).

The agility tests simulated typical movements in physically demanding work i.e. squatting, reaching upwards, bending and rotating the trunk (15, 16). At the beginning of tests 1 and 2, the subject stood in front of a shelf in footprints marked on the floor. In test I, the subject was asked to lift 20 small wooden bricks, one by one, as fast as possible from the floor to the shelf at the height of his head. The subject first lifted ten bricks from his right side with his right hand to the left side of the shelf. Then the same was repeated using the opposite side. The subject was otherwise free to choose the technique for the task. Agility test II was shorter: five bricks were alternately lifted from the left side using the right hand, and from the right side using the left hand. Performance time was measured in both agility tests. Finally, balance was measured as postural sway (s), by the subjects standing on a force plate with their eyes either open or closed (17).

Statistical methods

Logistic regression analysis (18) was used to examine the associations between the outcome and the predictive variables. The validity of the proportional odds assumption, i.e. the homogeneity of the odds ratios

across all possible cutpoints of the response, was confirmed using the score test for the proportional odds assumption (19). First, the models were estimated with one predictor (crude associations) separately when the outcome was from 1999 and 2009, then age was added to the models. Finally, they were estimated by adding the previous outcome (PWA 1996) into the models (i.e., transition models) (20). The analysis was performed separately after the 3 and 13-year follow-ups. We calculated odds ratios (OR) and 95% confidence intervals (CI). A 5% level was considered to be statistically significant.

Results

PWA was the same in 1996 and 1999 for 61% of the subjects, but had decreased for 33% and increased for 6% of the subjects. At baseline and at three-year follow-up, none of the subjects rated their PWA as poor. Correspondingly, the proportion of subjects whose PWA category was the same at baseline and in 2009 was 36%. PWA decreased by 53% and increased by 11% of the subjects. In 2009 four subjects rated their category as poor.

After the three-year follow-up, most of the physical capacity test results were associated with the PWA when the 1996 test result only was added in to the model (Table 1). After 13-year follow-up, only agility and postural sway with eyes closed were significant. Co-ordination, postural sway with eyes open, and oxygen consumption were not significant after either follow-up. These tests were excluded from Table 1, and also from further analysis.

Table 1. Crude odds ratios (OR) and 95% confidence intervals (CI) for physical capacities associated with PWA categories in 1999 and 2009, (n=74).

| | PWA | | | |
|-------------------------------|-----------|-------------|-----------|-----------|
| | 1999 | | 2009 | |
| Predictors 1996 | OR | CI | OR | CI |
| Risk factors | | | | |
| Reaction time (mm) | 1.27 | 1.07-1.51 | 1.12 | 0.97-1.30 |
| Postural sway eyes closed (s) | 1.00 | 0.99-1.02 | 1.01 | 1.00-1.03 |
| Agility I (s) | 1.28 | 1.10-1.50 | 1.14 | 1.00-1.30 |
| Agility II (s) | 1.75 | 1.27-2.41 | 1.21 | 0.96-1.54 |
| Protective factors | | | | |
| Sit and reach (cm) | 0.94 | 0.89-0.99 | 0.98 | 0.93-1.02 |
| Trunk side bending (cm) | 0.87 | (0.75-1.02) | 1.00 | 0.89-1.14 |
| Sit-up; reps/60 s | 0.94 | 0.89-0.99 | 0.97 | 0.92-1.02 |
| Bench press, 45 kg; reps/60 s | 0.94 | 0.88-0.99 | 0.98 | 0.94-1.03 |
| Squatting, 45 kg; reps/60 s | 0.93 | (0.86-1.00) | 0.98 | 0.92-1.04 |
| Pull-up; max reps | 0.86 | 0.76-0.97 | 0.94 | 0.85-1.03 |

italics: significant, in parentheses: reaching statistical significance

When the models were adjusted for age, the tests shown in Table 2 were still statistically significant or at least reaching significance. Area of motor control, flexibility, and muscular strength and endurance were all represented.

The final logistic regression models showed that poor agility and high postural sway with eyes closed were significant risk factors of decreased PWA after 13-year follow-up (Table 3). Poor reaction time was a risk factor for decreased PWA, and good flexibility protected against a decrease in PWA after the three-year follow-up. However, these as-

sociations were not significant after longer follow-up. Good sit-up test results are reaching significance in the prediction of good PWA.

Table 2. Age-adjusted odds ratios (OR) and 95% confidence intervals (CI) for physical capacities associated with the PWA categories in 1999 and 2009, (n=74).

| Predictors 1996 | PWA | | | |
|-------------------------------|------|-------------|------|-------------|
| | 1999 | | 2009 | |
| | OR | CI | OR | CI |
| Risk factors | | | | |
| Reaction time (mm) | 1.25 | 1.04-1.49 | 1.12 | (0.97-1.30) |
| Postural sway eyes closed (s) | 1.00 | 0.99-1.02 | 1.01 | 1.00-1.03 |
| Agility I (s) | 1.24 | 1.06-1.46 | 1.15 | 1.00-1.32 |
| Agility II (s) | 1.73 | 1.24-2.40 | 1.23 | (0.97-1.57) |
| Protective factors | | | | |
| Sit and reach (cm) | 0.94 | 0.89-0.99 | 0.98 | (0.93-1.02) |
| Sit-up; reps/60 s | 0.96 | (0.90-1.02) | 0.95 | (0.89-1.00) |
| Pull-up; max reps | 0.90 | (0.79-1.04) | 0.89 | (0.79-1.00) |

in parentheses: reaching statistical significance

Table 3. Significant odds ratios (OR) and 95% confidence intervals (CI) for predictors of PWA models (final) adjusted for age and baseline PWA (1996), (n=74).

| Predictors 1996 | PWA | | | |
|---------------------------|------|-----------|------|------------|
| | 1999 | | 2009 | |
| | OR | CI | OR | CI |
| Risk factors | | | | |
| Reaction time (mm) | 1.3 | 1.0-1.5 | - | ns |
| Postural sway (s) | 1.0 | 0.99-1.02 | 1.0 | 1.0-1.03 |
| Agility I (s) | 1.2 | 1.1-1.5 | 1.2 | 1.0-1.3 |
| Agility II (s) | 1.7 | 1.2-2.4 | 1.2 | 1.0-1.6 |
| Protective factors | | | | |
| Sit and reach (cm) | 0.94 | 0.88-0.99 | 0.98 | (0.9-1.0) |
| Sit-up; reps/60 s | 0.96 | (0.9-1.0) | 0.95 | (0.89-1.0) |

in parentheses: reaching statistical significance

Discussion

Good muscular capacity test results were significant protective factors against decreased PWA after three-year follow-up. Furthermore, poor motor control was a significant risk factor for decreased PWA, also after 13-year follow-up. These results support earlier findings that poor categories in balance and muscle strength and endurance are risk factors for decreased work ability among workers in physically demanding work (5, 6, 21). Correlations between muscular capacities and work ability index were also reported among other municipal workers (22).

Although cardiorespiratory fitness is important with respect to the demands of fire and rescue work, especially smoke-diving, aerobic capacity was not a significant predictor for PWA. Smoke-diving is one important part of firefighters' work, but there are several other tasks such as working with heavy tools, rescuing and carrying patients and victims, roof work, which firefighters meet more frequently and demands a great deal of muscular strength and endurance as well as balance and agility; in some cases more than aerobic capacity. It seems that the firefighters had a comprehensive opinion of the physical demands of fire and rescue work when rating their PWA. Aerobic capacity was also not a major factor in work-related fitness among female home care workers (21). Good cardiorespiratory fitness, however, decreases metabolic and cardiovascular risks among firefighters (23). In this population, aerobic fitness was higher than the reported levels of increased risk of cardiovascular mortality and morbidity (24). This might reduce their risk of aerobic fitness-related impairment in functioning. The firefighters in the current study had a great deal of musculoskeletal complaints and injuries, especially in 2009. This might also affect their PWA ratings and be one reason why muscular and motor control test results were stronger predictors than aerobic capacity.

The number of dropouts was quite high because the subjects in the oldest age group had all retired. Nevertheless, the subjects in this study can be considered a good representation of average Finnish firefighters. They were carefully selected by stratified sampling at baseline and therefore included firefighters of different fitness levels. Secondly,

the PWA and physical capacity of the study sample and dropouts did not differ significantly at baseline. Thirdly, the average age of Finnish firefighters corresponds well to the mean age of firefighters in this study at baseline. The mean age of Finnish firefighters will increase in the future.

Conclusions

These results support the work-related and predictive validity, in terms of PWA, of agility, postural sway and muscular tests in measuring work-related physical capacities among firefighters. The results also suggest that, in addition to muscular strength and endurance and aerobic capacity, when the work ability of firefighters is being followed-up, motor control, especially agility and balance, should also be taken into account. With respect to early prevention of decreased work ability, agility and balance tests may be useful as a screening method in occupational health care.

References

1. Lusa S. Job demands and assessment of the physical work capacity of fire fighters. *Studies in sport, physical education and health* 33. Jyväskylä: University of Jyväskylä; 1994.
2. Holmér I, Gavhed D. Classification of metabolic and respiratory demands in fire fighting activity with extreme workloads. *Appl Ergon.* 2007; 38:45–52.
3. Ilmarinen R, Mäkinen H, Lindholm H, Punakallio A, Kervinen H. Thermal strain in fire fighters while wearing task-fitted versus en 469:2005 protective clothing during a prolonged rescue drill. *Int J Occup Saf Ergon.* 2008; 14(1):7–18.
4. Punakallio A, Lusa S, Luukkonen R. Protective equipment affects balance abilities differently in younger and older firefighters. *Aviat Space Environ Med.* 2003; 74:1151–6.
5. Punakallio A, Lusa S, Luukkonen R. Predictive values of functional and postural balance tests and perceived balance abilities for work ability of firefighters. *Int Arch Occup Environ Health* 2004; 77:482–490.
6. Punakallio A, Lusa S, Luukkonen R. Predictive values of balance tests for physical work ability in fire and rescue work. In: Costa G, Goedhard JA and Ilmarinen J editors. *Proceedings of the 2nd International Symposium on Work Ability.* International Congress Series; 2005; 1280:301–303.
7. Punakallio A, Lusa-Moser S. Eri-ikäisten palomiesten terveys ja toimintakyky: Kolmen vuoden seuranta tutkimus. Loppuraportti Palosuojelurahastolle ja Sisäasiainministeriön pelastusosastolle. Helsinki: Työterveyslaitos; 1999. [In Finnish. [In English Health and physical capacity of firefighters in different ages. Three-year follow-up study]]
8. Punakallio A, Lusa-Moser S. Eri-ikäisten palomiesten terveys ja toimintakyky: 13 vuoden seuranta tutkimus. Unpublished report; 2010. In Finnish. [In English Health and physical capacity of firefighters in different ages. Thirteen-year follow-up study]]
9. Punakallio A, Lusa-Moser S, Louhevaara, V, Viikari-Juntura E, Ilmarinen R, Ollila J et al. Health, physical and mental capacity of fire fighters in different age groups. In: Ilmarinen J, Louhevaara V, editors. *FinnAge – respect for the aging: action programme to promote health, work ability and well-being of aging workers in 1990–96.* Helsinki: People and work – Research reports 26. Helsinki: Finnish Institute of Occupational Health; 1999:117–27.
10. Tuomi K, Ilmarinen J, Jahkola A, Katajarinne L, Tulkki A. Work ability index. *Occupational health care* 19. Helsinki: Finnish Institute of Occupational Health, 1998.

11. Pollock M, Wilmore J. Exercise in health and disease. Evaluation and prescription for prevention and rehabilitation. 2th edition. WB Saunders Company; 1990.
12. Frost M, Stuckey S, Smalley LA, Dorman G. Reliability of measuring trunk motions in centimeters. *Phys Ther*; 1982;62:1431–7.
13. Taimela S, Österman K, Kujala U, Lehto M, Korhonen T, Alaranta H: Motor ability and personality with reference to soccer injuries. *J Sports Med Physical Fitness*. 1990; 30 (2):194–201.
14. Philips D, Hornak J: Measurement and evaluation in physical education. New York: John Wiley & Sons; 1979.
15. Punakallio A, Pohjonen T, Louhevaara V. Development and evaluation of a test for assessing motor skill required of workers in physically demanding jobs. 5th European Congress on Research in Rehabilitation. European Federation for Research in Rehabilitation. 1995; Abstracts:248.
16. Punakallio A, Louhevaara V, Suikki M-R. Motor abilities and work related accidents of carpenters in different age groups. In: Kumar S, editor. *Advances in occupational ergonomics and safety 2. Proceedings of the XIIIth Annual International Occupational Ergonomics and Safety Conference*. USA, 1998:583–6.
17. Takala E-P, Korhonen I, Viikari-Juntura E. Postural sway and stepping response among working population: reproducibility, long-term stability, and associations with symptoms of the low back. *Clin Biomech* 1997; 12:429–37.
18. SAS Institute Inc. SAS/STAT® 9.2 User's Guide. Cary, NC: SAS Institute Inc, 2008.
19. Peterson B, Harrell F. Partial proportional odds models for ordinal response variables. *Applied Statistics*. 1990; 39:205–217.
20. Diggle P, Liang K-Y, Zeger SL. *Analysis of longitudinal data*. Oxford: Clarendon Press; 1994.
21. Pohjonen T. Age-related physical fitness and the predictive values of fitness tests for work ability in home care work. *J Occup Environ Med*. 2001a; 43:723–39.
22. Nygård C-H, Eskelinen L, Suvanto S, Tuomi K, Ilmarinen J. Associations between functional capacity and work ability among elderly municipal employees. *Scand J Work Environ Health*. 1991; 17(suppl 1):122–127.
23. Kodama S, Saito K, Tanaka S, Maki M, Yachi Y, Asumi M et al. Cardiorespiratory fitness as a quantitative predictor of all-cause mortality and cardiovascular events in healthy men and women: a meta-analysis. *JAMA*. 2009; 301:2024–2035.
24. Donovan R, Nelson T, Peel J, Lipsey T, Voyles W, Israel RG. Cardiorespiratory fitness and the metabolic syndrome in firefighters. *Occup Med (Lond)*. 2009; 59:487–492.

Factors Predicting Perceived Work Ability of Finnish Firefighters

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Abstract

The objective of this questionnaire study was to investigate the factors predicting the work ability of firefighters at 3 and 13-year follow-ups. The subjects were 361 firefighters aged 22 to 49 in 1996. The outcome variable was the work ability index in 1999 and 2009. Individual life-style and work-related factors predicted decreased work ability index at both follow-up times. In 13-year follow-up, the role of psychosocial and work-related factors seemed to be strong. Measures aiming to maintain the work ability of firefighters should be versatile, and part of every day leadership.

Key terms: Work ability, firefighters, follow-up study, work-related and individual factors

Introduction

In Finland, the number of full-time workers in the fire and rescue sector (including firefighters and paramedics/ambulance drivers) is approximately 5,000. In addition to this, about 14,000 part-time employees and voluntary fire brigade members are available for emergency situations (1). The emergency tasks of Finnish firefighters consist of extinguishing fires, rescue operations, medical first aid (first response), checking and verification, and assistance-type operations. Today, some 100,000 emergency operations are carried out by firefighters each year in Finland, and this number has doubled over the last ten years. In addition, approximately 200,000 urgent ambulance call-outs are also answered by firefighters in Finland each year (1). Finnish firefighters' retirement age is currently 65, and early retirement increases after 40 years of age. The mean age of early retirement in 1998–2007 was 50 and only about half of the firefighters worked until their normal retirement age. The most common reasons for early retirement were musculoskeletal, mental and cardiovascular disorders (2).

Problems in everyday life at fire stations related to firefighters' work ability, as well as health and safety are increasing. The Ministry of the Interior co-ordinated the 'Operational capacity of regional rescue services and their personnel' project in Finland 2007–2009. The comprehensive model for the occupational health and safety (OHS) actions in the rescue service has become part of everyday (safety and human resources) management (3). However, there is an obvious need to gain more objective knowledge of which factors are the most significant in maintaining the long-term work ability of firefighters. This study aimed to investigate the factors predicting the work ability of firefighters at 3 and 13-year follow-ups.

Subjects and Methods

Subjects

The subjects comprised 361 firefighters. Their mean age was 36 (22-49 years) in 1996. The data is based on a large 3 and 13-year follow-up study of the health, and physical and mental capacity of Finnish professional firefighters (4,5,6). Our research consists of a nationwide questionnaire study, and studies of physical capacity and physical work capacity in fire protective equipment. The subjects of the current study belong to the questionnaire study. At baseline in 1996, 1,124 professional, operational male firefighters were selected from all over Finland by stratified sampling (7). Altogether 849 (76%), 794 (72%) and 721 (68%) firefighters answered in 1996, 1999, and 2009 respectively. All the subjects of this study responded to each questionnaire, in 1996, 1999, and 2009.

From the 2009 sample, 65% (n=451) were still working in the fire and rescue sector. The most common reasons for drop-out were old-age retirement (18%, n=125), disability pension (7%, n=48), change of job (4%, n=28) and sick leave (3%, n=23).

Outcome Variable

The outcome variable was the Work Ability Index (WAI), assessed in 1999 and 2009 (8). It has four categories: excellent (44-49 points), good (37-43 points), moderate (28-36 points) and poor (7-27 points). Many subjects did not answer the question rating disability caused by illness due to technical reasons (the question was situated at the end of the page and was thus sometimes missed out), and was thus left out of WAI. In the modified version, the categories were: excellent (38-43), good (32-37), moderate (24-31) and poor (7-23). However, 95% of the subjects still remained in the same category as before the modification.

Predictive Variables

The predictors assessed in 1996 were demographic, lifestyle, psychological, psychosocial, work-related and individual factors, elicited through a self-administered questionnaire.

Statistical methods

Logistic regression analysis was used to examine the associations between the outcome and the predictive variables. The validity of the proportional odds assumption, i.e. the homogeneity of the odds ratios across all possible cutpoints of the response, was confirmed using the score test for the proportional odds assumption (9). First, the models were estimated using one predictor separately (crude associations); then age was added. We carried out the analyses separately after 3 and 13-year follow-ups, and calculated the odds ratios (OR) and 95% confidence intervals (CI). A 5% level was considered statistically significant (10).

Results

In 1996 and 1999, over 80% of firefighters had at least good WAI. In the three-year follow-up, most firefighters' WAI remained the same (69%, n=232), for 10% it increased (n=34), and for about one fifth (21 %, n=69) it decreased.

In the 13-year follow-up, the proportion of firefighters with either good or excellent WAI had decreased from 85% to 41%. For 33% (n=94) it remained the same, for 2% (n=6) it increased, and for 65% (n=187) it decreased.

Age was strongly associated with WAI in both follow-up times. The risk for poor work ability was as high as seven-fold for firefighters over 45 years compared to those under 30 (Table 1).

Table 1. Crude odds ratios (OR) and 95% confidence intervals (CI) for age categories (in 1996) associated with WAI categories in 1999 and 2009.

| Age 1996 (years) | WAI | | | |
|------------------|---------|----------|---------|----------|
| | 1999 OR | CI | 2009 OR | CI |
| <30 | 1.0 | | 1.0 | |
| 30-35 | 3.1 | 1.5-6.1 | 2.4 | 1.1-5.1 |
| 35-40 | 4.9 | 2.4-9.9 | 3.9 | 1.8-8.2 |
| 40-45 | 6.7 | 3.1-14.2 | 6.8 | 3.0-15.2 |
| 45-50 | 7.7 | 2.5-23.3 | 7.2 | 1.9-26.6 |

Individual factors such as lack of physical exercise, alcohol consumption, perceived mental stress, poor stress tolerance, and dissatisfaction with one’s life predicted a decreased WAI for the subjects at three-year follow-up when standardized by age. The last three variables also remained statistically significant predictors in 13-year follow-up. Perceived dissatisfaction with life (in 1996) increased the risk of a lowered WAI five-fold in 1999 and three-fold in 2009. (Table 2)

Table 2. Age-adjusted odds ratios (OR) for individual risk factors associated with WAI categories in 1999 and 2009.

| Risk factors 1996 | WAI | | | |
|-----------------------------------|---------|--|---------|--|
| | 1999 OR | | 2009 OR | |
| Lack of regular physical exercise | +++ | | - | |
| Alcohol consumption | ++ | | - | |
| Perceived mental stress | +++ | | ++ | |
| Poor perceived stress tolerance | ++ | | + | |
| Dissatisfaction with life | +++ | | ++ | |

+ OR ≤2.5, ++ 2.5 <OR≤5.0, +++ OR>5.0

The following work-related risk factors were most powerful at both follow-up times (over five-fold risk for decreased WAI): feelings of unfair division of work tasks, and insufficient training and instructions. Lack of opportunities to use knowledge and skills at work was also a dominant factor. Poor leadership, insufficient opportunities to exert influence, and dissatisfaction with work were strong in both time pe-

riods (2.5-5.0-fold risk). Poor working postures were also a significant risk factor (<2.5 fold risk).

In addition to the above-mentioned factors, factors related to the relationships between co-workers and supervisors, as well as decreased significance and respect of work both in and outside the fire station were also highlighted at three-year follow-up. In the 13-year follow-up, work-related and other accidents reached significance as risk factors, whereas in three-year follow-up they were not statistically significant risk factors. (Table 3)

Table 3. Age-adjusted odds ratios (OR) for work-related risk factors associated with WAI categories in 1999 and 2009.

| Risk factors 1996 | WAI | |
|---|---------|---------|
| | 1999 OR | 2009 OR |
| Work accidents | - | + |
| All kinds of accidents | - | ++ |
| Poor working postures | + | + |
| Poor co-worker relationships | ++ | - |
| Poor relationships between workers and supervisors | ++ | - |
| Poor working atmosphere | ++ | - |
| Poor leadership | ++ | +++ |
| Low superiors' support | ++ | - |
| Insufficient opportunities to influence work issues related to themselves | ++ | ++ |
| Dissatisfaction with work | ++ | ++ |
| Many difficult work tasks | ++ | - |
| Many work tasks with insufficient training and instructions | +++ | +++ |
| Lack of opportunities to use knowledge and skills at work | +++ | +++ |
| Unfair division of work tasks | +++ | +++ |
| Decreased significance of own work | + | - |
| Decreased respect of work inside fire station | +++ | + |
| outside fire station | ++ | - |

+ OR ≤2.5, ++ 2.5 <OR≤5.0, +++ OR>5.0

Interestingly, it was found that the significance of poor leadership as a risk factor for decreased WAI increased in 13-year follow-up compared to three-year follow-up (Table 4). In three-year follow-up, the risk of decreased WAI was about three-fold and in 13-year follow-up, about six-fold when firefighters were very dissatisfied with leadership compared to the opinion that they were very satisfied. Age had almost the same significance as a risk factor in both time periods; about seven-fold for firefighters over 40.

Table 4. Odds ratios (OR) and 95% confidence intervals (CI) for age categories and categories of opinions of leadership (in 1996) associated with WAI categories in 1999 and 2009. (Example of Table 3)

| Risk factor 1996 | WAI | | | |
|--------------------------------|---------|----------|---------|----------|
| | 1999 OR | CI | 2009 OR | CI |
| Age (years) | | | | |
| <30 | 1.0 | | 1.0 | |
| 30-40 | 4.0 | 2.1-7.7 | 3.0 | 1.5-6.1 |
| >40 | 6.6 | 3.2-13.8 | 6.8 | 3.1-15.0 |
| Opinion of leadership | | | | |
| very satisfied | 1.0 | | | |
| fairly or moderately satisfied | 1.4 | 0.8-2.4 | 1.6 | 0.9-2.9 |
| rather dissatisfied | 2.1 | 1.2-3.8 | 2.6 | 1.4-4.8 |
| very dissatisfied | 2.7 | 1.3-5.6 | 5.6 | 2.6-12.0 |

Discussion

The representativeness of this study population is good. The response rate at base-line and in both follow-up studies was sufficient (68-76%). The main reason for drop-out during follow-up was normal old-age pension. Many retired subjects answered the questionnaire, but were left out of the analysis because their life situation was totally different from that while at work.

Taking into account the many kinds of demands of fire and rescue work, the decrease in WAI was considerable at 13-year follow-up especially, and this became more evident in the older age groups.

Firefighters had to be healthy enough to perform operative work tasks, and WAI effectively reflects the health and work ability of firefighters. However, as fire and rescue work involves team work of the whole shift, psychological and social aspects are also important.

Individual lifestyle factors were very powerful risk factors at three-year follow-up, but no longer in the later follow-up. Factors related to work skills and the organization of work were emphasized in both time periods. The significance of the factors related to leadership even increased in the longer time period. This may be due to the many changes which have taken place in the fire and rescue sector in Finland in recent years. Older workers in particular may have difficulties in coping with new work demands. Deeper analysis (using transition models) of the three-year follow-up study (4) found that in addition to age, life dissatisfaction and lack of positive feedback regarding work were associated with WAI. A follow-up study of factors associated with changes in perceived strain found that many work-related factors were predictors of physical and mental strain (5). Furthermore, accidents were found to predict increased physical and mental strain. This result is in line with the result of this study. Accidents have a clear effect on firefighters' abilities to perform heavy physical work.

Conclusions

This study indicates that developmental activities aiming to promote the work ability of firefighters should focus on human resources management in addition to traditional lifestyle factors. Health, safety and work ability issues should be an integral part of the safety and human resources management of every daylife in fire stations.

References

1. Rescue services in Finland. Ministry of the Interior of Finland, Rescue department, 2010 [cited 2010 August 16]. Available at: <http://www.pelastustoimi.fi/en/>
2. The Local Government Pensions Institution. Personal communication 2009.
3. Operational capacity of regional rescue services and their personnel – Project. Ministry of the Interior of Finland, Rescue department, 2009 [cited 2010 August 16]. Available at: <http://toimintakyky.pelastustoimi.net/> (in Finnish)
4. Lusa S, Punakallio A, Luukkonen R. Factors predicting the perceived work ability of Finnish fire fighters: A three-year follow-up study. Proceedings of the 1st International Symposium on Work Ability. People and Work. Past, present and Future of Work ability. Ed. J Ilmarinen, S Lehtinen. People and work – research reports 2004; 65:96–105.
5. Lusa S, Punakallio A, Luukkonen R, Louhevaara V. Factors associated with changes in perceived strain at work among fire fighters: A 3-year follow-up study. *Int Arch Occup Environ Health*. 2006; 79:419–426.
6. Punakallio A, Lusa-Moser S. Eri-ikäisten palomiesten terveys ja toimintakyky: Kolmen vuoden seurantatutkimus. Loppuraportti Palosuojelurahastolle ja Sisäasiainministeriön pelastusosastolle. Helsinki: Työterveyslaitos; 1999. In Finnish.
7. Punakallio A, Lusa-Moser S, Louhevaara, V, Viikari-Juntura E, Ilmarinen R, Ollila J et al. Health, physical and mental capacity of fire fighters in different age groups. In: Ilmarinen J, Louhevaara V, editors. *FinnAge – respect for the aging: action programme to promote health, work ability and well-being of aging workers in 1990–96*. Helsinki: People and work – Research reports 26. Helsinki: Finnish Institute of Occupational Health; 1999. p. 117–27.
8. Tuomi K, Ilmarinen J, Jahkola A, Katajarinne L, Tulkki A. Work ability index. *Occupational health care* 19. Helsinki: Finnish Institute of Occupational Health, 1998.
9. Peterson B, Harrell F. Partial proportional odds models for ordinal response variables. *Applied Statistics*. 1990; 39:205–217.
10. SAS Institute Inc. *SAS/STAT® 9.2 User's Guide*. Cary, NC: SAS Institute Inc. 2008.

Physical and mental strain in the food industry: A 4-year follow-up study

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Abstract

This study examined the associations between working conditions and the changes in strain among food processing employees. Blue-collar (n=248) workers aged from 20 to 60 years were followed. Mental strain had increased significantly whereas physical strain remained unchanged at follow-up. The changes in mental strain for the older employees were positively correlated with the changes in physical strain ($\beta = 0.25, p=0.05$). We conclude that the increase in unfavorable ergonomics may increase physical strain but may also increase mental strain, especially among older employees.

Key words: Mental strain, physical strain, physical factors, food factory, follow-up study

Introduction

Food manufacturing is a branch where the work still includes a lot of lifting and carrying, repetitive movements and other heavy physical loads. The work environment of the food processing industry is characterized by extreme temperatures, draught, noise and bad lighting, which are risk factors for early retirement from working life (1). The most prevalent group of work-related diseases in the food processing industry in Finland is repetitive strain injuries (2). This indicates that food industry workers are highly susceptible to strain in the hands, wrists, and elbows. The risk for sick leaves and early retirements is typically increased in such of working conditions (3-5), and food industry workers have been shown to have twice as many sick leaves as the average among industrial workers in Finland and the EU (6-8). Indeed, the branch is also at the top of the early retirement statistics (1, 3). As regards the associations of physically stressful working conditions to strain among the workers, the food processing industry serves as a good source for research material. The aim of the present study was to analyze whether changes in the work environment and ergonomics are related to changes in physical and mental strain.

Materials and methods

Study setting and data

The study subjects were employees from four factories and from the office department of a food industry company in Finland. A questionnaire survey in the company in 2003 yielded, with the response rate 77%, 1,120 respondents and the corresponding figures were 90% and 1,564 respondents in the follow-up 2007. This study concerns the blue-collar employees (N= 248) who responded to both questionnaires. Their mean age was 39 years (SD=9.5) ranging from 20 to 60 years at the beginning of follow-up. The study was approved by the ethical committee of Pirkanmaa Hospital District.

Measures

Strain:

Mental strain was assessed by a single question (“Strain means the situation in which a person feels excited, apprehensive/concerned, nervous or distressed or she/he can’t sleep affected by the things on her/his mind. Do you feel this kind of strain nowadays?”) with reply options from 0 (not at all) to 10 (very much). The question from Borg (9), with a scale from 6 (not at all) to 20 (very much), was used to measure physical strain.

Working conditions:

The variable describing environmental exposure was constructed of the questions concerning draught, noise, bad indoor climate, heat, cold and blinding light by summing up the replies (scaled from 1=not at all to 5=very much) into a single variable ranging from 6 to 30. In a similar way, the variable describing ergonomics was summed up of the questions concerning repetitive movements, uncomfortable working postures and restlessness into a variable ranging from 3 to 15.

Statistical methods

Changes in strain during follow-up were calculated by subtracting the values for 2003 from the values for 2007. Associations between changes in ergonomics and environmental exposure with the changes in mental and physical strain were first studied with Spearman’s correlation coefficients. Then corresponding multifactorial analysis was conducted using linear regressions with the Enter method, with age, gender and work ability in the model. Perceived work ability was assessed on a scale from 0 (poor) to 10 (excellent) (10). Distributions of the change from 2003 and 2007 were shown as means and standard deviations and tested by paired samples t-test. We were particularly interested in studying aging workers; therefore the participants were divided into those aged 45 or under (young) and those over 45 years (old) (11). Statistical analyses were performed using SPSS for Windows version 16.0.2.

Results

Table 1 describes that environmental exposure and ergonomics remained almost unchanged during follow-up. Mental strain had increased significantly ($p = 0.04$) whereas physical strain remained unchanged.

Table 1. Descriptive statistics of the participants ($n=248$) and means of the variables at baseline in 2003 and at follow-up in 2007.

| Variables | Baseline | Follow-up | P- value ¹ |
|---------------------------------------|--------------|--------------|-----------------------|
| Gender | | | |
| Men | 30 % | - | |
| Women | 70 % | - | |
| Age | | | |
| All (Mean) | 39 yrs | | |
| ≤45 yrs | 68.5 % | - | |
| >45 yrs | 31.5 % | - | |
| Work ability (mean, SD) (0-10) | 8.39 (1.18) | 8.37 (1.28) | 0.60 |
| Work environment (mean, SD) | | | |
| Ergonomics (3-15) | 9.08 (2.83) | 8.95 (2.88) | 0.79 |
| Environmental exposure (6-30) | 17.28 (4.02) | 17.15 (4.11) | 0.41 |
| Strain (mean, SD) | | | |
| Physical (6-20) | 14.47 (2.93) | 14.49 (3.05) | 0.93 |
| Mental (0-10) | 3.67 (2.52) | 4.07 (2.82) | 0.04 |

¹ P-value tested from paired sample t-test

Table 2 shows the un-standardized β – coefficients with 95% confidence intervals and p-values from age, gender and work ability adjusted linear regression models. The change in mental strain was correlated with the change in physical strain among older workers ($\beta = 0.25$, $p=0.05$). As to the change in physical strain, statistically significant correlations were seen with the changes in ergonomics both among the young and the old workers, and there was also a significant correlation with the change in mental strain among the older employees.

Table 2. Associations of the change in mental or physical strain, change in ergonomic and environmental factors for change in mental and physical strain from 2003 to 2007 separately for workers under 45 and older than 45 years. Adjusted linear regression models with enter method (N=248).

| | Change in mental strain | | | | | |
|--|-------------------------------------|----------------------|----------------|-------------------------------------|----------------------|------|
| | ≤45 yrs (n=170) | | | > 45 yrs (n=78) | | |
| | Un-standardized coefficient β | (95% CI) for β | P ² | Un-standardized coefficient β | (95% CI) for β | p |
| ³ Change in physical strain | 0.06 | -0.08-0.21 | 0.40 | 0.25 | 0.00-0.51 | 0.05 |
| Change in ergonomics | 0.16 | -0.03-0.36 | 0.09 | 0.10 | -0.27-0.49 | 0.57 |
| Change in environmental exposure | 0.04 | -0.07-0.15 | 0.46 | -0.02 | -0.23-0.19 | 0.85 |
| | Change in physical strain | | | | | |
| | ≤45 yrs (n=170) | | | > 45 yrs (n=78) | | |
| | Un-standardized coefficient β | (95% CI) for β | p | Un-standardized coefficient β | (95% CI) for β | p |
| ⁴ Change in mental strain | 0.06 | -0.09-0.22 | 0.40 | 0.22 | 0.00-0.45 | 0.05 |
| Change in ergonomics | 0.26 | 0.06-0.46 | <0.01 | 0.30 | 0.04-0.74 | 0.02 |
| Change in environmental exposure | 0.05 | -0.06-0.17 | 0.34 | 0.02 | -0.17-0.22 | 0.82 |

The linear regression model was adjusted for age, gender and changes in work ability

² P-value; the level of significance is 5%

³ Exposure variable for outcome changes in mental strain

⁴ Exposure variables for outcome changes in physical strain

Discussion

In this study we found an association between a change in unfavorable ergonomics and changes in physical strain among both the young and among the older workers, whereas the associations of environmental exposure with both the physical and the mental strain proved non-significant.

In our study changes in ergonomic stress were positively correlated with the changes in physical strain. Employees in the food factory often stand for long periods and may be required to lift heavy objects or use cutting, slicing, grinding, and other dangerous tools and machines, which may be non-ergonomic. Tuomi (12) explained that people involved in high physical demands at work, poor physical environment and poor work postures were more physically strained than other people. Within occupations with comparable work demands for all employees, individual differences in e.g. actual working methods may finally result in a variation in working postures (13, 14) and add to the strain.

The high physical strain among the employees is important. The physical strain in this study had not changed at follow-up despite the technical changes in the working environment intended to improve the ergonomics during the follow-up years, for instance modernization of the production lines. However, mental strain had increased significantly during follow-up, which could be due to changes in environmental conditions which are considered the prime cause of mental strain (15). Thus, awareness of problematic ergonomics is important, in particular because food processing work includes many females and there are also older people. It has been shown (16) that older employees experience more strain than younger employees. Our study also shows higher perceived physical strain among younger employees than their older counterparts.

This study might have some bias because all the information regarding mental and physical strain and perception of work environment was collected using a questionnaire, i.e. no objective measurements for the work environment were taken. The study concerned only the food

processing industry, and the specific environment and homogenous employee group are one of the strengths of the study. There is a need for future research with corresponding design, as other types of workplaces may have different challenges in the physical environment and different strain-physical environment interaction. It can be concluded that the increase in unfavorable ergonomics may increase physical strain but also increase mental strain, especially among older employees.

References

1. Salonen P, Arola H, Nygård CH, Huhtala H, Koivisto AM. Factors associated with premature departure from working life among ageing food industry employees. *Occup Med (Lond)* 2003; 53:65–68.
2. Karjalainen A, Palo L, Saalo A, Jolanki R, Mäkinen I and Kauppinen T. 2009. Ammattitaudit ja ammattitautiepäilyt 2007. Työperäisten sairauksien rekisteriin kirjatut uudet tapaukset. [Recognised and suspected cases of occupational diseases in 2007] Työterveyslaitos Helsinki. Vammalan Kirjapaino Oy, pages 35–36
3. Ilmarinen J, Tuomi K, Klockars M. Changes in the work ability of active employees over an 11-year period. *Scand J Work Environ Health* 1997 (suppl 1) 23:49–57
4. Nygård CH, Arola H, Siukola A, Savinainen M, Luukkaala T, Taskinen H, Virtanen P. Perceived work ability and certified sickness absence among workers in a food industry. *Int Congr Ser* 2005; 1280:296–300
5. Sell L. Predicting long-term sickness absence and early retirement pension from self-reported work ability. *Int Arch Occup Environ Health* 2009; 82:1133–1138 doi: 10.1007/s00420-009-0417-6
6. Ilmarinen J. Aging workers in the European Union status and promotion of work ability, employability and employment. Helsinki: Finnish Institute of Occupational Health, Ministry of Social Affairs and Health, Ministry of Labour; 1999
7. Vahtera J, Kivimäki M. Sairauspoissaolot (Sickness absences). In: Kauppinen T, Hanhela R, Heikkilä P, Lehtinen S, Lindström K, Toikkanen J, Tossavainen A (eds) *Work and Health in Finland 2003* (In Finnish, Työ ja terveys Suomessa 2003), Finnish Institute of Occupational Health, Helsinki, 2004, pp 178–182

8. Gimeno D, Benavides FG, III, Benach J, Amick BC. Distribution of sickness absence in the European Union countries. *Occup Environ Med* 2004; 61:867–869. doi:10.1136/oem.2003.010074
9. Borg G. Perceived exertion as an indicator of somatic stress. *Scand J Rehabil med* 1970; 2:92–98
10. Tuomi K, Ilmarinen J, Seitsamo J, Huuhtanen P, Martikainen R, Nygård C-H, Klockars M. Summary of the Finnish research project (1981–1992) to promote the health and work ability of aging workers. *Scand J Work Environ Health* 1997; 23: 66–77
11. World Health Organization. Aging and Working Capacity, Report of a WHO Study Group. WHO Technical Series no 835. WHO, 1993
12. Tuomi K, Eskelinen L, Toikkanen J et al. Work load and individual factors affecting work ability among aging municipal employees. *Scand J Work Environ Health* 1991; 23 (Suppl 1):128–34
13. Burdorf A. Sources of variances in exposure to postural load on the back in occupational group. *Scand J Work Environ Health* 1992; 18:361–367
14. Kilbom Å and Persson J. Work technique and its consequences for musculoskeletal disorders. *Ergonomics* 1987; 30: 273–279
15. Cooper CL and Roden J. Mental health and satisfaction among tax officers. *Social Science Medicine* 1985; 21:147–751
16. Nygård C-H, Huuhtanen P, Tuomi K, Martikainen R. Perceived work changes between 1981 and 1992 among aging workers in Finland. *Scand J Work Environ Health* 1997; 23(suppl 1): 12–9

WAI in Israeli nurses – First time utilization of the Hebrew version of the Questionnaire

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Abstract

The Hebrew version of the Work Ability Index (WAI) questionnaire was used for the first time in Israel in order to evaluate work ability in a group of 515 nurses from 2 general hospitals. The mean WAI score found in Israeli female nurses was 41.8 ± 5.2 , which is relatively high compared to that of European nurses. Mean WAI is negatively correlated with age (or duration of employment) and number of reported illnesses ($p < 0.001$). Mean WAI score is significantly lower in practical nurses than registered nurses. The 3 most common reported illnesses as diagnosed by a physician were: musculo-skeletal disorders, endocrin/metabolic diseases and cardiovascular diseases. In contrast, the third most common illness, as reported by self evaluation of the nurses, was mental disorders.

Key words: WAI, Israeli nurses

Introduction

The WAI questionnaire has been used extensively and for quite some time in many countries and in several languages (1,2). Major studies on nursing personnel were conducted in Europe and elsewhere (3,4). It was shown that utilizing this questionnaire makes it possible to identify individuals with low WAI score and to introduce certain rehabilitation measures in order to keep them in the workforce (5).

Objectives

The main objectives of this study were

1. To evaluate the feasibility of applying the Hebrew version of the WAI questionnaire to workers in Israel
2. To compare the mean WAI score in Israeli nurses with that of European nurses
3. To identify factors that may affect WAI in Israeli nurses
4. To investigate the relationship between illnesses reported in the questionnaire, as diagnosed by physicians and illnesses as stated in self-evaluation of the nurses.

Methods

This cross-sectional study included 515 nurses from two general hospitals in Israel during 2007. Eighty-nine percent (460/515) of the subjects were females.

Results

The mean WAI score of the female nurses was 41.8 ± 5.2 . The mean score of women nurses did not differ significantly from that of male nurses ($p=0.35$), nurses born in Israel vs. those born in other countries ($p=0.82$) or the type of ward where they work ($p=0.24$), (see Table 1). However, mean WAI score differed significantly among nurses in relation to position held ($p=0.017$).

About 44% of the interviewees were classified in the “excellent” WAI category (scores in the range of 44 to 49), 41% in the “good” category (score 37-43), about 15% in the moderate (score 28-36) and only less than 1% in the poor WAI score category (score 7-27).

Mean WAI score was negatively correlated with age ($r=-0.17$, $p<0.001$), seniority ($r=-0.15$, $p<0.01$) and number of reported illnesses ($r=-0.65$, $p<0.001$).

About 22% of the nurses reported suffering from 1 disease and an additional 29% reported on 2 or more illnesses. As expected, mean WAI score was significantly higher in nurses reporting no disease than in those reporting 1 or more diseases, 44.7 ± 3.7 vs. 39.2 ± 4.7 ($p<0.001$) respectively. There was also a gradual decrease in mean WAI score in relation to the number of diagnoses ($p<0.001$ for trend), (see Table 2).

Table 1. Characteristics of the study group in relation to WAI score (categorical factors)

| Factors | Number | Mean WAI ± S.D | P value | |
|-------------------------------|---------------------------|----------------|------------|-------|
| <u>Socio - demographic</u> | | | | |
| Gender | female | 460 | 41.8 ± 5.2 | 0.35 |
| | male | 55 | 42.3 ± 4.3 | |
| Family status | with spouse | 398 | 41.9 ± 5.0 | 0.59 |
| | without spouse | 113 | 41.6 ± 5.4 | |
| Basic education | graduate | 475 | 42.0 ± 5.0 | 0.057 |
| | undergraduate | 33 | 39.9 ± 6.0 | |
| Country of birth | Other | 257 | 41.9 ± 5.1 | 0.82 |
| | Israel | 232 | 41.8 ± 5.0 | |
| <u>Occupational</u> | | | | |
| Professional education | Registered nurse | 440 | 42.0 ± 4.9 | 0.082 |
| | Practical nurse | 71 | 40.7 ± 5.9 | |
| Position | practical nurse | 19 | 38.6 ± 7.4 | 0.017 |
| | registered nurse | 356 | 41.9 ± 4.9 | |
| Departments | clinical instructor nurse | 19 | 43.6 ± 5.4 | 0.24 |
| | head / deputy nurse | 63 | 42.1 ± 4.8 | |
| | surgery | 211 | 41.8 ± 5.1 | |
| | internal medicine | 165 | 41.4 ± 5.2 | |
| | pediatrics | 65 | 42.4 ± 5.1 | |
| | gynecology/ obstetrics | 62 | 42.9 ± 4.2 | |
| | administration | 3 | 44.0 ± 3.6 | |
| | | | | |
| Work demands | mental & physical | 479 | 41.8 ± 5.1 | 0.38 |
| | mental | 18 | 43.4 ± 4.5 | |
| | physical | 11 | 42.5 ± 2.7 | |
| <u>Health behavior</u> | | | | |
| Smoking | no | 381 | 41.9 ± 5.1 | 0.68 |
| | yes | 124 | 41.7 ± 5.2 | |

Table 2. Relation between WAI score and illness factors based on self-evaluation.

| Illness factors | Self-evaluation | | | Physician diagnosis | | |
|------------------------------------|-----------------|----------------|--------|---------------------|----------------|--------|
| | N | Mean WAI ± S.D | p | N | Mean WAI ± S.D | p |
| Presence of illness | no | 43.1 ± 4.6 | <0.001 | 249 | 44.7 ± 3.7 | <0.001 |
| | yes | 39.9 ± 5.2 | | 266 | 39.2 ± 4.7 | |
| Number of illnesses | 0 | 43.1 ± 4.6 | <0.001 | 249 | 44.7 ± 3.7 | <0.001 |
| | 1 | 41.2 ± 5.1 | | 116 | 41.5 ± 3.7 | |
| | 2 | 38.6 ± 4.8 | | 73 | 39.4 ± 4.0 | |
| | 3 | 38.5 ± 5.1 | | 33 | 37.2 ± 3.8 | |
| | 4+ | 37.3 ± 5.0 | | 44 | 34.4 ± 4.4 | |
| Most frequently reported illnesses | | | | | | |
| Musculoskeletal | not present | 42.7 ± 4.8 | <0.001 | 386 | 43.2 ± 4.2 | <0.001 |
| | present | 39.1 ± 5.1 | | 129 | 37.8 ± 4.7 | |
| Injury/accident | not present | 42.2 ± 5.0 | <0.001 | 419 | 42.7 ± 4.8 | <0.001 |
| | present | 39.2 ± 4.9 | | 96 | 38.0 ± 4.6 | |
| Endocrine/ metabolic | not present | 42.0 ± 5.0 | 0.06 | 451 | 42.5 ± 4.8 | <0.001 |
| | present | 40.0 ± 5.7 | | 64 | 37.5 ± 4.6 | |
| Mental disorder | not present | 42.3 ± 4.8 | <0.001 | 514 | 41.9 ± 5.1 | 0.12 |
| | present | 36.3 ± 4.9 | | 1 | 34.0 | |

Based on frequency of illnesses as reported by physician

The most frequently reported diagnoses (as made by physicians) were: musculoskeletal disorders (25%) injury/accident (18.6%), endocrine/metabolic and cardiovascular diseases (about 12% each) and gastrointestinal problems (9.5%). Age was positively correlated with musculoskeletal disorders ($p < 0.001$).

Poor agreement was found between reports on disease as made by physicians and as made by self-evaluation (both options are provided in the questionnaire). Kappa statistics showed only 16.4% agreement between the 2 report methods ($p < 0.001$). For example, the rate of reported illnesses as made by physicians was 51.7% while only 37.9% as made by self-evaluation.

The three most frequent illnesses as determined by self evaluation were: musculoskeletal (22.3%), injury/accident (12%) and mental disorders (7.4%). Here, the last category is quite different from the third (and even the fifth) most frequent category of illnesses as determined by a physician (see above).

The number of reported diseases as ascertained by a physician, is one of the parameters included in the calculation of the individual WAI score. Thus, to avoid autocorrelation we have used in the following evaluations only diagnoses as reported by self evaluation.

Table 3 shows the results of multiple liner regression analysis of WAI score on several independent factors. About 17% of the variance of the WAI score is “explained” by the following factors: gender (male vs. female), seniority (as well as age), job/position (vs. being a practical nurse), professional education, number of reported diagnoses and having musculoskeletal complaints (vs. no complaints).

Table 3. Predictors of WAI score using multiple linear regression analysis

| Variables | Coefficients | | | | 95% Confidence Interval for B | |
|---------------------------------|--------------|------------|--------|-------|-------------------------------|-------------|
| | B | Std. Error | Beta | Sig. | Lower Bound | Upper Bound |
| Gender (male vs. female) | -0.069 | 0.732 | -0.004 | 0.925 | -1.507 | 1.370 |
| Professional seniority | -0.070 | 0.024 | -0.141 | 0.004 | -0.118 | -0.022 |
| Registered nurse | 4.074 | 1.379 | 0.335 | 0.003 | 1.364 | 6.783 |
| Clinical instructor nurse | 5.875 | 1.704 | 0.231 | 0.001 | 2.525 | 9.224 |
| Head /deputy nurse | 4.455 | 1.450 | 0.310 | 0.002 | 1.604 | 7.306 |
| Professional education | -0.329 | 0.735 | -0.023 | 0.655 | -1.773 | 1.115 |
| Num. of self reported illnesses | -1.209 | 0.322 | -0.243 | 0.000 | -1.842 | -0.576 |
| Musculoskeletal diseases | -1.560 | 0.791 | -0.127 | 0.049 | -3.115 | -0.006 |

Discussion

The mean WAI score found in Israeli nurses utilizing the Hebrew version of the widely used WAI questionnaire was 41.8 ± 5.0 . This mean score is relatively high with respect to the mean value in European nurses (6). About 44% of the interviewees were classified in the “excellent” category according to the established categorization criteria with only less than 1% was classified in the “poor” category.

Like other studies (7,8) we have shown that WAI score gradually decreases with age and is positively correlated with professional position and is borderline correlated with level of education.

An intriguing finding of our study was the poor agreement between the two ways in which illnesses are reported in the questionnaire – self-evaluation by the respondent and diagnoses as determined by a physician ($\kappa=16.6\%$). This poor agreement is also apparent when the frequency of illnesses is compared between the 2 methods. While the five most frequent diseases reported by physicians are musculoskeletal, injury/accident, endocrine/metabolic and cardiovascular, the three most frequent disorders reported by self-evaluation are musculoskeletal, injury/accident and mental. Thus, when nurses are subjectively classifying their main health problems affecting their work ability, they tend to rank mental problems higher than appears by diagnoses made by physicians. This point is particularly significant when we consider that this specific sector of workers is quite familiar with medical terminology. Thus, these aspects deserve further evaluation in order to better understand the role of mental stress on work-ability.

References

1. Tuomi K, Ilmarinen J, Eskelinen L, Jarvinen E, Toikkanen J, Klockars M. Prevalence and incidence rates of diseases and work ability in different work categories of municipal occupations. *Scand J Work Environ Health* 1991;17 (suppl 1):67–74
2. Monteiro MS, Gomes JRG, Ilmarinen J, Korhonen, O. Aging and work ability among Brazilian workers. In: Goedhard WJA. ed. *Aging and work 4-healthy and productive aging of older employees*. The Hague, ICOH Scientific Committee. *Aging and Work*, 2000.
3. Hasselhorn HM, Tackenberg P, Kuemmerling A, Wittenberg J, Simon M, Conway PM, et al. Nurses' health, age and the wish to leave the profession – findings from the European NEXT-Study. *Med Lav* 2006; 97:207–214.
4. Chiu M C, Wang M J, Lu C W, Pan S M, Kumashiro M, Ilmarinen J. Evaluating work ability and quality of life for clinical nurses in Taiwan. *Nursing Outlook*. 2007; 55:318–326. (SCI).
5. Ilmarinen J, Tuomi K, Klockars M. Changes in the work ability of active employees over an 11-year period. *Scand J Work Environ Health*. 1997;23 (Suppl 1) :49–57.
6. Hasselhorn H M, Tackenberg P, Buescher A, Simon M, Kuemmerling A, Mueller B H. *Work ability among nurses in Europe*. In: NEXT Scientific Report. 2005 (July). Wuppertal, Germany.
7. Costa G , Sartori S. Ageing, working hours and work ability. *Ergonomics*, 2007;50: 1914–1930.
8. Camerino D, Conway P M, Van der Heijden B I J M, Estryng-Behar E, Consonni D, Gould D et al. Low-perceived work ability, ageing and intention to leave nursing: A comparison among 10 European countries. *J Adv. Nursing*. 2006; 56: 542–552.

III EXTENDING WORKING LIFE

Retaining older workforces in aged care work

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Abstract

The study examined the applicability of the work ability concept and Work Ability Index (WAI) to retaining older workforces in Australian aged care work. Regression analyses of Work Ability Survey (WAS) items identified predictors of the WAI, individual WAI items and work pace. “Management respects you” was found to be the strongest predictor and “work-home balance” predicted “pace of work”. The WAI was correlated with the WAS for residential and home care workers. The chapter draws inferences regarding the application of the WAI and ‘extended’ work ability concept to retaining aged care workers.

Key Terms: Work ability, aged care work, retention

Introduction

The demand for aged care workers is projected to increase in accordance with Australia's ageing population. In 2007, 1.6 percent of the population was aged 85 years and over while by 2056, this figure is estimated to escalate to 4.9 percent, the highest expected growth rates of all age cohorts. (1) These population projections have significant implications for the need to retain workers in the aged care sector. The applicability of the Work Ability Index (WAI) in the health sector has been validated in a large scale population study of over 38,000 nurses. (2) Other studies involving nurse populations have linked intention to exit the profession with factors correlated with low work ability. Camerino et al. found that intention to exit was greater amongst younger than older nurses with low work ability. (3) In the aged care sector, few studies of work ability have been conducted. In one key study of personal care assistants working in home settings, work ability was correlated with organisational demand factors. Workplace ergonomics, possibilities to control one's own work and time pressure and management predicted work ability, irrespective of age. (4) In another study of home care workers Dellve, Lagerström, and Hagberg found lack of organisational support, controllability, work ergonomics, time pressure and poor work atmosphere to be the strongest risk factors five years prior to disability pension entitlement. (5)

Objectives

The objectives of the chapter were firstly to test the applicability of the (WAI) in the Australian context to explain the retention of older aged care workers in both residential and home care workplaces; secondly, to investigate the contributions of individual WAI items on the work ability of aged care workers; thirdly, to identify factors influencing Work ability scores in both home and residential care workplaces; and fourthly, to examine the factors contributing to the pace of work in

aged care employment. Finally, inferences were drawn regarding the explanatory power of the work ability concept in relation to retention. The chapter findings also elucidate the applicability of the more recent 'extended work ability' concept which includes the work/family, institutional and operational work environments. (6)

Methods

The data were collected from staff in a residential care facility site (n=68) within a larger nursing home agency (n=500) and in a home care agency site (n=45) within a larger agency (n=2000). Participants included a total of 29 female residential workers with a mean age of 48 years ($SD= 8.4$) and 32 community care participants (male, n= 9, female, n= 22) with a mean age of 49 years ($SD= 8.0$). Additionally, 11 aged care managers (male, n=9, female, n= 10) with a mean age of 42 years ($SD= 10.2$) participated. Efforts were made to increase the sample size by reminder mail-outs and information sessions were held for workers prior to completing the survey. The respondents were also asked if they were willing to participate in confidential interviews.

The Work Ability Index (WAI) and the Work Ability Survey (WAS) developed by Philip Taylor and Libby Brooke for the Redesigning Work for an Ageing Society project has been applied to measure Work ability in aged care employment. The WAS is a comprehensive organisational survey containing items aligning with the four floors of the work ability 'house' based in validated measures of physical and psychosocial work demands, e.g. pace of work, trust, support and recognition, control, training, work/life balance etc. Item sources include the Copenhagen Psychosocial Questionnaire and the European Foundation of Living and Working Conditions survey¹. The (WAS) was adapted to aged care work tasks particularly in the ergonomics section and included bathing, making beds, vacuuming etc.

1. Redesigning Work for an Ageing Society. Australian Research Council (2006–8). Chief Investigators: Taylor, Brooke, Bohle, Steinberg and Rolland.

Statistical procedures

Four statistical procedures tested at the 5% significance level were applied to WAI and WAS data using PASW software. Firstly, predictors of the WAI were obtained through a multiple regression analysis using WAS items as independent variables. Secondly, predictors of individual WAI were obtained applying an ordinal logistic regression analysis. Thirdly WAI scores were coded into measures of low and high work ability, with home care and residential workers with high work ability defined as a score of 36 or greater. Chi square tests of significance were applied to correlate WAS items with the high and low WAI scores. Finally, correlated items using Pearson's correlation in the WAS were combined to establish variables of "pace of work", "meaningful work", "work-home balance", "physical overload" and "control over work" and stepwise multiple regression was applied to establish predictors of "pace of work". These data were based on the sample of predominantly older workers (40+).²

Results

Three predictors of the WAI resulted from the regression analysis of the WAS combined data on residential and home care workers. The variables of "management respects you", "working beyond physical capacity" and "unevenly distributed work", accounted for 42% of the variation in the WAI (Table 1). The strongest predictor of the WAI was "management respects you", with a positive relationship. When controlling for all variables, "management respects you" and "uneven distribution of work" (a negative relationship) provided the greatest independent contributions to the WAI score.

2. Acknowledgement to Chris McLoughlin and Tia Di Biase for their contribution to the 'Pace of work' analysis.

Table 1. Predictors of WAI.

| Variable | B | t | Semi-partial correlation |
|----------------------------------|---------|---------|--------------------------|
| Unevenly distributed work | -0.59** | -3.32** | -0.12** |
| Working beyond physical capacity | -0.57* | -2.46* | 0.12* |
| Management respects you | 1.24** | 3.31** | -0.06** |

Note: *p<.05,**P<.01,***p<.001
N=58, R-square = .417

Table 2 displays the significant WAS predictors obtained for three WAI individual items of seven possible WAI items: ‘Current work ability compared to lifetime best (Item 1), “Work ability regarding physical and mental demands” (Item 2) and “Personal resources, life in general” (Item 7), derived through the composite measure of “enjoyment of daily activities”, “being active and alert” and “feeling optimistic about the future”. “Management respects you” was found to be the predominant predictor.

Table 2. Significant predictors of the WAI items.

| Variables | Wald Ratio | Parameter Estimate |
|---|------------|--------------------|
| WAI 1 -Current work ability compared to lifetime best | | |
| Management respects you | 10.63** | 1.97** |
| Unevenly distributed work | 6.51* | -0.82* |
| Working beyond physical capacity | 8.80** | -1.22** |
| WAI 2 – Work ability regarding physical and mental demands | | |
| Management respects you | 13.52*** | 3.29*** |
| Working beyond mental capacity | 7.73** | -1.08** |
| WAI 7 - Personal resources, life in general | | |
| Management respects you | 5.75* | 1.52* |

Note: *p<.05,**P<.01,***p<.001
N=58

Comparisons between residential and home care workers

Items significantly associated with low and high WAI scores are presented in Tables 3 and 4. These items also indicate whether factors were associated with organisational capacity factors or personal capacities of individuals. The items significantly correlated with the WAI differ between types of aged care organisations, with organisational capacity items associated with high WAI scores for home care in contrast with residential care. The personal capacity factor of the importance of work, organisational trust and a psychological measure of optimism is indicative of the importance of organisational culture to high work ability in residential care.

Table 3. Chi square significance tests for work ability items based on residential care workers.

| | Item | Significance |
|--------------------------------|----------------------------------|---------------------|
| High workability | | |
| Organisational capacity | Management trusts employees | 0.026 |
| Personal capacity | Importance of work | 0.026 |
| | Optimistic about the future | 0.039 |
| Low workability | | |
| Personal capacity | Being stressed | 0.033 |
| | Working beyond mental capacity | 0.012 |
| | Working beyond physical capacity | 0.047 |

Note: N=28

Table 4. Chi square significance tests for Work ability items based on home care workers

| | Item | Significance |
|---|---|--------------|
| High workability Organisational factor | Feel like part of a community at work | 0.044 |
| | Receive information needed | 0.043 |
| | There is good co-operation between colleagues | 0.044 |
| Low workability Personal factor | Being stressed | 0.043 |
| | Working beyond mental capacity | 0.017 |
| | Working beyond physical capacity | 0.008 |
| Organisational factor | Unevenly distributed work | 0.029 |

Note: N=28

The pace of work

Results of the stepwise regression reveals significant negative relationships between “pace of work” and “meaningful work” ($r = -.30, n=38, p=.03$), “control over work” ($r = -.45, n=38, p=.002$) and “work-home balance” ($r = -.54, n=38, p < .001$) (Table 5). The relationship between “work-home balance”, “meaningful work” and “control over work” accounts for 69% of the variation in “pace of work”, with “work-home balance” the strongest predictor. A separate analysis conducted on the relationship between “pace of work” and the WAI showed that no significant relationship exists.

Table 5. Results of the stepwise regression, with pace of work as the dependent variable

| Variable | Stage 1 | | Stage 2 | | Stage 3 | |
|-------------------|----------------------------------|-------------------------------------|----------------------------------|-------------------------------------|----------------------------------|-------------------------------------|
| | Squared semi-partial correlation | Standardised regression coefficient | Squared semi-partial correlation | Standardised regression coefficient | Squared semi-partial correlation | Standardised regression coefficient |
| Work-home balance | 0.30 | -0.548*** | 0.30 | -0.549*** | 0.09 | -0.368* |
| Meaningful work | | | 0.09 | -0.305* | 0.13 | -0.382** |
| Control over work | | | | | 0.08 | -0.352* |

Note: * p < .05, ** p < .01, ***p<.001

N = 38

R²= 0.69

Discussion

The findings of the regression analysis signifying “management respects you” to be the strongest predictor of the WAI, are consistent with those observed by Pohjonen. (3) In addition, aged care workers “working beyond physical capacity” was correlated with low WAI scores, providing support for the finding confirmed in the literature that poor workplace ergonomics is a predictor of low WAI scores. (3, 7, 8) This finding coincides with previous research showing interventions encouraging physical exercise maintained a good level of work ability while improving overall health status from ‘poor’ to ‘good’ in 75% of participants. (8) The interactive effect of “management respects you”, “working beyond physical capacity” and “unevenly distributed work” suggests that management has a vital role to play in modelling a fair work culture.

“Management respects you” is also a predictor of the individual WAI factors of “physical and mental demands” of work and the psychological measure of “personal resources, life in general”, indicating that positive mental health for aged care workers is associated with being respected in organisations. The results also show that aged care workers who “work beyond mental capacity” are at risk of low work ability in relation to the “physical and mental demands of the job”. Organisational capacity factors are significantly associated with high work ability scores in home care workers, supporting findings by Heijden, Van Dam and Hasselhorn where strong social support among nurse work colleagues was imperative for job satisfaction and occupational commitment. (9) The solitary nature of home care work could be one explanation for the great importance of work cohesion among home care workers. Home care workers experiencing “unevenly distributed work” also have a higher risk of low work ability.

Uneven work distribution negatively impacts on the physical and mental capacity of workers, substantiating a link between the first and fourth floors of the Work Ability House Model. (6) For residential care workers, high work ability scores were associated with personal

capacity factors of meaning of work, optimism and trust, which are integral to the third floor of values and attitudes of the work ability 'house' model. (6)

The analysis supports findings by Pohjonen, showing that fast work pace is related to home care workers' lack of control over their work, not feeling their work is meaningful and not having a desirable work-home balance. (3) Interestingly, work-family balance, which is not directly tested within the WAI, is the strongest predictor of the "pace of work", coinciding with related research indicating that interference between work and family life of nurses was associated with nurses considering a change in profession. (9) The lack of a significant relationship between "pace of work" and WAI, may be indicative of the importance of the meaning of work and work-home balance in the extended work ability 'house' model applied to aged care workers.

Conclusion

Organisational capacity factors of management trust and respect and quality of the work community are significant factors in high work ability, corresponding to the first, third and fourth floors of the Work Ability House Model proposed by Ilmarinen. (6) The combined analysis shows that the high work ability of residential aged careers is strongly linked to the meaning of their work, while the high work ability of home careers is more likely to be influenced by the work community, probably due to the relative isolation of their work. The retention of older workers in aged care requires that organisations respect and support their capacity to realise the meaning of their care giving which is simultaneously thwarted by high work pace. The extended work ability model includes the interface of the 'house' and community, providing a fuller explanation of retention factors than the WAI as a stand-alone measure. It is at the interface that work/family issues and operational pressures influence the pace and distribution of work, increasing pressures on aged care facilities which ration tasks according to funding.

Given the cross sectional nature of the research in the Australian context, both the WAI and the extended Work Ability 'house' concept assist in understanding retention, although lacking a longer time dimension.

References

1. Palmer J. Population projection [Internet]. Canberra: Australian Bureau of Statistics; 2006 Jun 14 [updated 2008 Jul 3; cited 2010 July 20]. Available from: <http://www.abs.gov.au>
2. Radkiewicz P, Widerszal-Bazyl, M. Psychometric properties of work ability in the light of comparative survey study. Elsevier. 2005 Jun; 1280: 304–309
3. Camerino D, Conway P, Heijden B, Estryng-Behar M, Consonni D, Gould D, Hasselhorn H. Low-perceived work ability, ageing and intention to leave nursing: a comparison among 10 European countries. *J Adv Nurs*. 2006 May 10; 56 (5): 542–552.
4. Pohjonen T. Perceived work ability of home care workers in relation to individual and work-related factors in different age groups. *Occup Med*. 2001 Feb 14; 51 (3): 209–217
5. Dellve L, Lagerström M, Hagberg M. Work-system risk factors for permanent work disability among home care workers: a case-control study. *Occup Environ Health*. 2003 March; 76: 216–224
6. Ilmarinen, J. Work ability: a comprehensive concept for occupational health research and prevention. *Scand J Work Environ Health*. 2009 Jan 1; 35(1)1–5
7. Craib KJP, Hacket G, Back C, Cvitkovich Y, Yassi, A. Injury rates, predictors of workplace injuries, and results of an intervention program among community health workers. *Public Health Nurs*. 2007 Feb 20; 24 (2) 121–131
8. Pohjonen T, & Ranta R. Effects of worksite physical exercise interventions on physical fitness, perceived health status, and work ability among home care workers: five-year follow-up. *Prev Med*. 2001; 32: 465–475
9. Van der Heijden, BIJM, van Dam K, Hasselhorn HM; NEXT study group. Occupational turnover: understanding nurses intent to leave the nursing profession. Paper presented at: The 22nd Annual Conference of the Society of Industrial and Organisational Psychology; 2007 May 27–29. New York, USA.

Predicting factors of nurses' intention to continue in nursing

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Abstract

Population aging increases pressure on the health care service in many countries, including Finland. At same time health care is facing a shortage of nurses due to the lack of new nurses entering the workforce, nurses leaving their profession and nurses retiring early (1). Managers are in a key role in developing workplaces to be attractive to new employees and in retaining their professional employees. The aim of this study was to examine how job satisfaction, organizational commitment, self-perceived health and nurse managers' leadership behavior relate to nurses' intention to continue in nursing.

Key terms: intent to continue, nurse, leadership, job satisfaction, organizational commitment

Introduction

Particularly in Europe the population is aging rapidly due to increasing life expectancy and declining birth rates. The aging population needs more hospital care, but at the same time there is an increasing shortage of nurses. An aging nursing workforce and shortage of nursing challenge the health care services' recruitment and retention strategies. Many studies have indicated the connection between leadership behavior, job satisfaction and organizational commitment (2, 3, 4) and have shown that job satisfaction and commitment are immediate antecedents of intention to leave the workplace and turnover (5). However, nurses' intention to leave the profession has been widely studied, but it is also important to recognize the factors affecting their intention to continue in nursing and to develop these in order to retain experience nurses in working life.

Background of the study

To be able to provide public health care services it is essential to have enough nursing workforce. Therefore the ability to retain nursing professionals has become one of the key issues of health care leaders. The important predictor of retention is an intention to stay in an organization (6). Studies have shown positive relationship between job satisfaction and intent to stay (7, 8), and organizational commitment has been found to decrease willingness to leave organization (9). Nurses' dissatisfaction in turn has been found to be the major predictor of intent to leave (8, 10, 11).

The way nurse managers implement the leadership role can have a significant effect on nurses' job satisfaction and organizational commitment. The use of transformational leadership has been seen as a solution in developing sustainable health care reform (12), to increase employees' trust, confidence (10), satisfaction and organizational commitment (13, 14), and to enhance recruitment, retention and healthy work environ-

ment (15). Transformational leadership refers to the leader moving the follower beyond immediate self-interest through idealized influence, inspiration, intellectual stimulation, and individualized consideration as transactional leadership in turn refers to the exchange relationship between leader and follower to meet their own self-interests. (16.)

In a comparison study among 10 countries in Europe a significant association was found between low perceived work ability and intention to leave nursing (17). The Work Ability Index (WAI) covers the subjective estimation of present work ability compared with the lifetime best, subjective work ability in relation to both physical and mental demands of the work, number of diagnosed diseases, subjective estimation of work impairment due to disease, sickness absence during past year, own prognosis of work ability after 2 years and psychological resources (18).

Objectives

The objectives of the study were to extract those elements of leadership behavior and other study variables in public health care environment which enable nurses of different ages to continue in their profession.

Methods

In this study the relationship between the demographic and employment variables, nurse managers' leadership behavior, job satisfaction, organizational commitment, self-perceived health (work ability) and nurses' intent to continue in their profession was examined in a sample of different aged nurses. The study population consists of randomly selected (N = 937) full and part-time, permanently or temporarily employed, registered nurses working in a university hospital in Finland. A questionnaire was sent to the nurses in December 2006 and in January 2007. The response rate of the study was 54.4 % (n = 510). No statis-

tically significant differences were detected between respondents and non-respondents in terms of demographic data. All statistical analyses were carried out with SPSS 15.0.

Leadership behavior was measured using the Deep Leadership scale which is based on Bass's transformational and transactional leadership measurement. Deep leadership behavior is modeled on three dimensions: deep leadership, controlling/corrective leadership and passive leadership. The main dimension, deep leadership, is divided into four factors: 1) building trust and confidence, which are displayed e.g. when leader can put the needs of subordinates above his own needs, 2) inspirational motivation is displayed e.g. when goals are set high and the leader encourages his subordinates exceed their normal performance level to achieve the goals, 3) intellectual stimulation is displayed e.g. when the leader supports the innovativeness and creativity, new solutions and approaches to work and the leader can give and receive feedback, and 4) individualized consideration is displayed e.g. when the leader knows his/her subordinates personally and recognizes everyone's individual needs to grow and develop. (19.)

Job satisfaction was measured with a sixteen-item scale from the Job Diagnostic Survey adapted from Hackman and Oldham (20) providing measures of satisfaction with job security, peers and co-workers ("social" satisfaction), pay and other compensation (pay satisfaction), supervision and opportunity for personal growth and development on the job ("growth" satisfaction). Occupational commitment was measured with a three-component scale adapted from Allen and Meyer (21,22), where affective commitment refers to emotional attachment to the organization, continuance commitment to employee's recognition of the costs associated with leaving and normative commitment to a sense of obligation to the organization (22). Self-perceived health was measured with the three items from the Work Ability Index, WAI (18) concerning employees' physical and mental health capacities in relation to the current work and the capacity to continue working in the same profession for a period of two years. Nurses' intention to continue in nursing was gathered with the question: "I will continue working in

nursing as long as possible” modified from the scale by Armstrong-Stassen (23). The item was scored on a scale 1-5, with higher values indicating a greater likelihood of continuing (1 = totally disagree – 5 = totally agree).

Results

The majority of the 510 respondents were female (82.9 %). The mean age was 41.5 years. Age was categorized into three age groups: under 35-year-olds (n = 146), 35-44-year-olds (n = 153) and 45-years and older (n = 211). Of the respondents 384 were permanently employed whereas 120 were temporarily employed. The nurses had an average of 14.4 years of work experience in the nursing profession. Tenure was divided into four categories: 0-4 years, 5-10 years, 11-18 years and 19-36 years of work experience. Respondents’ educational background was recoded into two groups: college level registered nurse education (9.5 %) and bachelor’s degree in nursing (90.5 %). Nurses’ monthly gross income was 2145 Euros. Several demographic variables were entered into the model. The final model contains only the statistically significant variables. All non-significant variables such as marital status, professional education and number of dependents in the household as well as the non-significant dimensions of job satisfaction, organizational commitment and deep leadership scales were excluded. Table 1 shows the number of respondents, mean scores, standard deviations and Cronbach’s alphas for the scales used and Table 2 the correlations among independent variables.

Table 1. Number of respondents, means, standard deviations and Cronbach's alphas for variables included in the multinomial logistic regression analysis.

| Variables | n | Mean | sd. | Cronbach alphas | Scale |
|----------------------------------|-----|------|------|-----------------|-------|
| <i>Deep leadership</i> | | | | | |
| Inspirational motivation | 507 | 3.23 | 1.05 | 0.916 | 1-5 |
| Intellectual stimulation | 506 | 3.42 | 0.93 | 0.888 | 1-5 |
| <i>Organizational commitment</i> | | | | | |
| Affective commitment | 496 | 3.05 | 0.83 | 0.829 | 1-5 |
| Continuance commitment | 497 | 3.11 | 1.07 | 0.717 | 1-5 |
| <i>Job Satisfaction</i> | | | | | |
| Pay satisfaction | 504 | 1.93 | 0.87 | 0.697 | 1-5 |
| Growth satisfaction | 497 | 3.70 | 0.64 | 0.760 | 1-5 |
| <i>WAI</i> | | | | | |
| Self-perceived health | 501 | 4.19 | 0.76 | 0.824 | 1-5 |

Table 2. Correlations among independent variables.

| Determinant | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. |
|--------------------------|---------|---------|---------|--------|--------|--------|--------|-------|--------|-----|
| 1. Employment | 1 | | | | | | | | | |
| 2. Age | -.413** | 1 | | | | | | | | |
| 3. Self-perceived health | .156** | -.312** | 1 | | | | | | | |
| 4. Tenure | -.556** | .689** | -.269** | 1 | | | | | | |
| 5. Pay sat | .076 | .002 | .065 | .007 | 1 | | | | | |
| 6. Growth sat | .022 | .064 | .179** | .045 | .172** | 1 | | | | |
| 7. AOC | -.085 | .147* | .110** | .144** | .187** | .527** | 1 | | | |
| 8. COC | -.173** | .170** | -.249** | .136** | -.063 | -.039 | .147** | 1 | | |
| 9. IM | .019 | .101* | .114* | .051 | .138** | .335** | .285** | -.037 | 1 | |
| 10. IS | -.016 | .102* | .118** | .044 | .102* | .331** | .300** | -.029 | .842** | 1 |

* p=0.10, 2-tailed, **p=0.05, 2-tailed

As Table 3 shows, of the total sample, 53.4 % of nurses had the intention to continue in nursing, 18.5 % had no opinion and 28.1 % had no intention to continue. I used a multinomial logistic model to look at the differences among those three groups of nurses. The results of the multinomial logistic model are presented in Table 4. In the model R-squared estimates were 0.31 (Nagelkerke $R^2 = 0.311$).

Table 3. Descriptive summary of categorical variables.

| | Intent to continue (n=222) | No opinion (n=77) | No intent to continue (n=177) | Number of nurses 476 |
|--------------------|-------------------------------|----------------------|----------------------------------|-------------------------|
| Number of nurses | 53.4 % | 18.5 % | 28.1 % | |
| Experience (years) | | | | |
| < 5 | 55.2 % | 24.1 % | 20.7 % | 87 |
| 5-10 | 49.6 % | 22.8 % | 27.6 % | 127 |
| 11-18 | 57.4 % | 17.4 % | 25.2 % | 115 |
| 19-36 | 54.5 % | 12.7 % | 32.8 % | 165 (n=494) |
| Gender | | | | |
| Male | 51.8 % | 16.5 % | 31.7 % | 85 |
| Female | 54 % | 18.5 % | 27.5 % | 417 (n=502) |
| Age | | | | |
| <35 | 50.3 % | 23.8 % | 25.9 % | 143 |
| 35-44 | 50.7 % | 18 % | 31.3 % | 150 |
| >45 | 57.9 % | 14.4 % | 27.8 % | 209 (n=502) |
| Education | | | | |
| College level | 59.6 % | 21.3 % | 19.1 % | 47 |
| Bachelor's degree | 53.4 % | 17.4 % | 29.2 % | 438 (n=485) |

The first pair comparison “no intent to continue” vs. “intent to continue” showed that age, self-perceived health, tenure, pay and growth satisfaction as well as affective and continuance commitment were related to nurses’ intention to continue in nursing. Under 35-year-old nurses were almost three times and 35-44-year-old nurses over two times more likely to leave nursing than nurses over 45 years old. A one-point increase on the 5-point self perceived health scale almost doubled the likelihood of continuing in nursing (OR = .587, CI = 1.18-2.45). Pay and growth satisfaction, as well as affective and continuance

commitment had a similar effect. Tenure instead increased the odds of intentions to leave nursing (OR = 1.51, CI = 1.05 - 2.16).

The second pair comparison “no opinion” vs. “intent to continue” showed that growth satisfaction (OR = .494, CI = .301 - .813), affective commitment (OR = .656, CI = .441 - .975) and perceived inspirational motivation in leadership (OR = .612, CI = .387 - .968) all increased the odds of intent to continue in nursing. High perceived intellectual stimulation (OR = 2.09, CI = 1.23 – 3.57) in head nurses’ leadership behavior doubled the odds risk of belonging into the “no opinion” group instead of the “intent to continue” group. Permanent employment (OR = 2.21, CI = 1.06 – 4.60) had a similar effect.

In the third pair comparison “no opinion” vs. “no intent to continue” self-perceived health, continuance commitment, inspirational motivation, intellectual stimulation and tenure were statistically significant variables. A one-point increase in self-perceived health scale (OR = 1.61, CI = 1.05 – 2.47) increased the odds 1.6 times of belonging to the “no opinion” group instead of the “no intent to continue” group. Continuance commitment (OR = 1.44, CI = 1.07 – 1.94) and intellectual stimulation (OR = 1.95, CI = 1.1 – 3.46) had a similar effect. Instead inspirational motivation (OR = .520, CI = .316 - .856) and long work experience increased the odds of intent to leave nursing.

Discussion

The results of the multinomial logistic regression analysis showed that the specific measures of job satisfaction namely satisfaction with pay and opportunities for personal growth and development on the job (growth satisfaction) were both statistically significant predictors of nurses’ intent to continue in nursing. Earlier studies have shown a similar positive relationship between job satisfaction and intent to stay (7, 8). Dissatisfaction in turn has been identified to be the most important reason why nurses leave their job (8, 10, 11). The findings of this study also indicate that good self-perceived health, older age, shorter work

Table 4. Multinomial logistic regression.

| Indicator | "No intent to continue" vs. "Intent to continue" | | | "No opinion" vs. "Intent to continue" | | | "No opinion" vs "No intent to continue" | | |
|-----------------------|--|------|------|---------------------------------------|------|------|---|------|------|
| | OR | 95 % | CI | OR | 95 % | CI | OR | 95 % | CI |
| Permanent employment | 1.34 | .649 | 2.77 | 2.21** | 1.06 | 4.60 | 1.65 | .710 | 3.83 |
| Age (< 35) | 2.68* | 1.10 | 6.52 | .494** | .301 | .813 | .649 | .243 | 1.73 |
| Age (35-44) | 2.32* | 1.21 | 4.45 | .656* | .441 | .975 | .622 | .286 | 1.35 |
| Self perceived health | .587** | .407 | .844 | .946 | .630 | 1.42 | 1.61** | 1.05 | 2.47 |
| Tenure | 1.51* | 1.05 | 2.16 | .781 | .545 | 1.12 | .519*** | .344 | .785 |
| Pay Satisfaction | .573*** | .419 | .783 | .759 | .551 | 1.04 | 1.33 | .906 | 1.94 |
| Growth Satisfaction | .492** | .308 | .786 | .494** | .301 | .813 | 1.00 | .597 | 1.69 |
| AOC | .474*** | .326 | .690 | .656* | .441 | .975 | 1.38 | .891 | 2.15 |
| COC | .573*** | .445 | .738 | .826 | .629 | 1.08 | 1.44** | 1.07 | 1.94 |
| IM | 1.18 | .767 | 1.80 | .612* | .387 | .968 | .520** | .316 | .856 |
| IS | 1.07 | .663 | 1.74 | 2.09** | 1.23 | 3.57 | 1.95* | 1.10 | 3.46 |

*p<.05, **p<.01, ***p<.001

experience (tenure) and affective and continuance commitment were the strongest predictors of nurses' intent to continue. Results concerning the statistically significant dimensions of transformational leadership, inspirational motivation and intellectual stimulation, were rather complicated. Perceived inspirational motivation in head nurses' leadership behavior increased the risk of belonging into the uncertain group; those nurses were not sure if they wanted to continue or not. Perceived intellectual stimulation in turn increased certainty; those nurses either intended to continue or they did not intend to continue.

Conclusion

Intent to stay is defined as an important predictor of retention and intention to leave as an important predictor of actual turnover. On the basis of this study 53.4 % of nurses intend to continue in nursing and 28.1 % do not. It is also worth noting the group of nurses with no opinion so far (18.1 %). Improving retention includes supporting and enabling nurses' work ability e.g. developing the occupational health care system to be more proactive, offering development and training opportunities for nurses of all ages and developing remuneration policies. Leaders and managers in health care services are facing a challenging task in reforming recruitment and retention strategies in order to attract the new nurses and improve retention of present nurses.

References

1. Hasselhorn, HM, Tackenberg, P, Müller, B. H. 2003. (ed.) Working conditions and intent to leave the profession among nursing staff in Europe. SALTSA, Stockholm, Report No 7:2003.
2. Pool, S.W. 1997. The Relationship of Job Satisfaction with Substitutes of Leadership, Leadership Behavior, and Work Motivation. *The Journal of Psychology*, 131(3), 271–283.
3. Lok P, Crawford J. 1999. The relationship between commitment and organizational culture, subculture, leadership style and job satisfaction in organizational change and development. *Leadership & Organization Development Journal*, 20(7), 365–373.
4. Yu, H–C, Miller, P. 2005. Leadership style. The X Generation and Baby Boomers compared in different cultural context. *Leadership & Organization Development Journal* 26(1), 35–50.
5. Stordeur S, D’hoore W, van der Heijden B, Dibisceglie M, Laine M, van der Schoot E et al. 2003. Leadership, job satisfaction and nurses’ commitment. In Hasselhorn HM, Tackenberg P, Müller BH, editors. Working conditions and intent to leave the profession among nursing staff in Europe. Stockholm: SATLISA Report No. 7.
6. Price, J.L, Mueller, C.W. 1981. A Causal Model of Turnover for Nurses. *The Academy of Management Journal*, 24 (3), 543–565.
7. Cavanagh, S.J, Collin, D.A. 1992. Staff turnover among hospital nurses. *Journal of Advanced Nursing*, 17, 1369–1376.
8. Gauci Borda, R, Norman, I. J. 1997. Factors influencing turnover and absence of nurses: a research review. *International Journal of Nursing Studies* 34 (6), 385–394.
9. Allen, N.J, Meyer, J.P. 1996. Affective, Continuance, and Normative Commitment to the Organization: An Examination of Construct Validity. *Journal of Vocational Behavior*, 49, 252–276.
10. Lum, L, Kervin, J, Clark, K, Reid, F, Sirola, W. 1998. Explaining nursing turnover intent: job satisfaction, pay satisfaction, or organizational commitment. *Journal of Organizational Behavior* 19, 305–320.
11. Larrabee, J.H, Janney, M.A, Ostrow, C.L, Withrow, M.L, Hobbs, G.R.Jr, Burant, C. 2003. Preidicting Registered Nurse Job Satisfaction and Intent to Leave. *Journal of Nursing Administration*, 33, 5, 271–283.
12. Block, L.A, Manning, L.J. 2007. A Systematic Approach to Developing Frontline Leaders in Healthcare. *Leadership in Health Services* 20(2), 85–96.

13. Bass, B.M. 1990. From Transactional to Transformational Leadership: Learning to Share the Vision. *Organizational Dynamics* , 18(3):19–31.
14. Podsakoff, P.M, Mackenzie, S.B, Bommer, W.H. 1996. Transformational Leader Behaviors and Substitutes for Leadership as Determinants of Employee Satisfaction, Commitment, Trust, and Organizational Citizenship Behaviors. *Journal of Management* 22(2), 259–298.
15. Cummings, G.G., MacGregor, T., Davey, M., Lee, H., Wong, C.A., Lo, E., Muise, M. et al. 2010. Leadership styles and outcome patterns for the nursing workforce and work environment: A systematic review. *International Journal of Nursing Studies*, 47, 363–385.
16. Bass, B.M. 1999. Two Decades of Research and Development in Transformational Leadership. *European Journal of Work and Organizational Psychology*, 8(1), 9–32.
17. Camerino, D., Donway, P.M., Van der Heijden, B.I.J.M., Estryng-Behar, M. Consonni, D., Gould, D, Hasselhorn, H-M. et al. 2006. Low-perceived work ability, ageing and intention to leave nursing: a comparison among 10 European countries. *Journal of Advanced Nursing* 56 (5), 542–552.
18. Tuomi, K, Ilmarinen, J, Martikainen, R, Aalto, L, Klockars, M. 1997. Aging, work, life-style and work ability among Finnish municipal workers in 1981–1992. *Scandinavian Journal of Work Environment and Helth*, 23 (1), 58–65.
19. Nissinen, V. 2001. Military Leadership. A Critical Constructivist Approach to Conceptualizing, Modeling and Measuring Military Leadership in the Finnish Defence Forces. Doctoral dissertation. Faculty of Education, University of Helsinki.
20. Hackman, J.R, Oldham, G.R. 1975. Development of the Job Diagnostic Survey. *Journal of Applied Psychology*, 60, 2, 159–170.
21. Allen, N.J, Meyer, J.P. 1996. Affective, Continuance, and Normative Commitment to the Organization: An Examination of Construct Validity. *Journal of Vocational Behavior*, 49, 252–276.
22. Meyer, J.P, Allen, N.J, Smith, C.A. 1993. Commitment to Organizations and Occupations: Extension and Test of a Three-Component Conceptualization. *Journal of Applied Psychology*, 78, No. 4, 538–551.
23. Armstrong–Stassen, M, Templer, A. 2004. What factors are important in retaining older employees? ASAC 2004, Québec. Available from: <http://libra.acadiau.ca/library/ASAC/v25/articles/Armstrong-Stassen-Templer.pdf>.

Perceived work ability and turnover intentions: a prospective study among Belgian healthcare workers

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Abstract

The impact of the Work Ability Index (WAI) and its change over time was investigated among 1,531 Belgian healthcare workers regarding their intentions to leave the organization (ITL organization) and different forms of intent to leave the profession (ITL profession) one year later. Within a population showing low ITL at baseline, analysis revealed that poor WAI, repeated poor WAI and substantial deterioration in WAI, increased the risk of high ITL organization. The latter two were also found to be predictors of particular forms of ITL profession. Consequently, poor WAI and an adverse development in WAI, are risk factors for developing high turnover intentions.

Key terms: nursing, Work Ability Index, intent to leave, measuring change

Introduction

Turnover of nursing staff is a major challenge for healthcare settings and for healthcare in general. Nurse turnover can be viewed as contributing to the positive growth of an organization through renewal of personnel, the infusion of new ideas, and the introduction of new practices (1, 2). Nevertheless, turnover can be dysfunctional when it occurs at a high rate, since it is one of the most important causes of declining productivity and deteriorating staff morale (2).

One of the strongest and most important predictors of actual turnover besides job dissatisfaction was found to be turnover intention (1-3). Intent to leave is one of the stages in a complex decision-making process that can lead to turnover behavior (4). A distinction can be made between organizational and professional turnover intentions, since organizational turnover is in particular the concern of the management of an individual healthcare facility, whereas professional turnover also has a societal impact, since the knowledge and skills of those who leave are lost to the nursing workforce (5).

Several individual, organizational and economic factors have been found to predict nurses' turnover intentions, such as a high education level, low organizational and professional commitment and job dissatisfaction (1, 3). Recently, the concept of work ability has received growing attention in this matter (6, 7). The concept is based on the assumption that work ability is determined by a person's perceptions of the work demands and of their ability to cope with these demands and can be measured by the Work Ability Index (WAI) (8). The WAI has proved to be a predictive measure of early retirement (9, 10) and other related outcomes such as long-term sickness absence (11), disability unemployment (9), mortality (12) and also change of employer and/or profession (7). The majority of these prospective studies are commonly based on a single assessment of work ability.

However, it is also important to investigate the evolution in work ability, since work ability is a dynamic process that varies throughout an individual's working life. Changes in work ability result from the inter-

action between individual characteristics, work conditions (i.e. changes in work organization) and society (13, 14). Personal resources change, for example, with age, whereas work demands change for example, with globalization and implementation of new technologies. The factors influencing work ability are therefore continuously changing (13). So far, only a few longitudinal studies have been examining work ability and its change over time (10, 13, 15). Changes in work ability have mainly been investigated on group level as changes in the mean WAI score (10, 15). By analyzing the mean scores in predefined groups, no information is gained about any atypical evolution in work ability (e.g. improvement in WAI over time) on an individual level (10).

Objectives

In the present study, we wanted to explore the prospective relations between work ability and two turnover intentions, namely intent to leave the organization (ITL organization) and intent to leave the profession (ITL profession). The first objective was to examine the relation between a single measurement of work ability and the risk of developing turnover intentions one year later. A second more methodological objective was to study change in WAI over a one-year period. Given that measuring change is a complex issue (16), two different operationalizations of change were used to investigate the impact of development in work ability on both intent to leave outcomes (see Method).

Methods

Study population

The associations between work ability and turnover intentions were assessed in the Belgian sample from the Nurses' Early Exit Study (NEXT) (17). A prospective questionnaire-based design was used for data collection. Two similar self-administered questionnaires with a

time lag of one year were distributed among all nursing staff employed in 37 healthcare organizations.

At baseline, a total of 4,257 questionnaires, with an overall response rate of 61.3% was returned. One year after the baseline assessment 2,857 participants completed a second questionnaire. Here the response rate was 48.0%. A total of 1,531 participants, who continued working in their organization during the one-year follow-up, completed both questionnaires and were included in the prospective analyses. The mean age of the participants was 38.4 (SD 8.8) years. The majority (92.5%) of them were women. The nursing staff consisted of 73.1% registered nurses, 19.7% specialized nurses and 7.2% practical nurses. They were employed in three different kinds of settings: 44.7% in hospitals, 6.0% in nursing homes and 49.3% in home care settings.

Measures

Work Ability Index

Perceived work ability was measured by means of the Work Ability Index (WAI) comprising seven items (8). The total score is calculated by summing up all item scores (8) and ranges from 7 to 49 points, with higher scores indicating higher perceived work ability. Participants who achieved a score below 37 points were in the present study classified as having poor WAI, participants having a score of 37 points or higher were considered to have good WAI. The mean WAI score of the nursing staff was 40.3 with a total of 271 healthcare workers (19%), reporting a poor perceived WAI (< 37).

Intent to leave the profession

ITL profession was measured by three items based on one general question: “How often do you think about (1) further qualification outside nursing; (2) giving up nursing; (3) giving up nursing and starting a different kind of job”. Each item had five response options, ranging from ‘never’ to ‘every day’. The ITL profession variable was dichotomized. Participants reporting thinking about the content of at least one item several times a month or more were considered to have

high ITL profession. By contrast, considering leaving a couple of times a year could be seen as natural for most professionals (17).

Intent to leave the organization

ITL organization was measured by one question in the NEXT study (17): "How often do you think about leaving the current institution." Five response options ranging from 'never' to 'every day' were used. Thinking some times a month or more often about leaving the current institution was considered to indicate high ITL organization and thinking never or some times a year about leaving was classified as low ITL organization.

Statistical analyses

To assess the impact of work ability on both outcome variables, participants reporting high intent to leave (e.g. high ITL profession, high ITL organization) at baseline, were excluded from further analyses. For ITL profession and ITL organization 1,187 and 1,368 healthcare workers were included respectively.

The impact of WAI on both outcomes was assessed by three multiple logistic regression models. For the first regression model, the WAI score measured at baseline was entered in the model, using participants with a good WAI as reference category (Model 1).

For the second model four groups were created: (1) those with poor WAI scores at baseline and at follow-up, (2) those with good WAI scores at both observations, (3) those evolving from good WAI score to a poor WAI, and (4) those experiencing poor WAI at baseline and good WAI at follow-up. Those having a repeated good WAI score were the reference category (Model 2). Measuring change as a movement between categories may suggest that change has taken place when it is not more than day-to-day variability (16). According to Model 2, it was possible that participants moved from a score of 39 to a score of 36 one year later. This implied a decline from good WAI to poor WAI, despite the relatively small absolute difference. At the same time people who experienced a substantial deterioration in their WAI score (i.e. from 42 to 30), also decreased from a good WAI to a poor WAI.

To overcome this problem, a second approach (cf. Model 3) was introduced to operationalize the change in work ability. For this third model, a change in WAI (Δ WAI) was computed by subtracting the WAI score at baseline (T1) from the WAI score at follow-up (T2), followed by dividing this subtraction by the WAI score at baseline $[(\text{WAI T2} - \text{WAI T1}) / (\text{WAI T1})] \times 100$. Based on this percentage change, three groups were defined. Those with a Δ WAI score between -1 and +1 standard deviation of the mean Δ WAI in the study population, were defined as respondents whose WAI score did not change substantially between measurements. When the Δ WAI differed more than 1 standard deviation from the mean, this meant that either the WAI score substantially improved ($> +1$ SD) or substantially decreased (< -1 SD) between both measurements. For this method, respondents whose WAI score remained relatively stable between both measurements were used as the reference category (Model 3). In all three models, adjustments were made for age, gender, type of healthcare organization, education level, family situation, number of working hours and work schedule and all variables were entered in a single step. Analyses were performed using SPSS 15.0 software.

Results

Prospective analyses showed that a poor WAI at baseline (Model 1) was a significant predictor of high ITL organization (OR 3.25; 95% CI 1.83-5.78) one year later.

Repeated poor WAI (Model 2) was associated with more elevated risk of developing a high ITL organization one year later (OR 6.71; 95% CI 3.32-13.58). Participants evolving from a good WAI at baseline to a poor WAI (Model 2) in the course of one year, had also an increased risk of having a high ITL organization (OR 2.30; 95% CI 1.08-4.92) compared to healthcare workers whose work ability remained good.

Participants experiencing a substantial deterioration of WAI between both measurements (Model 3) had a more than 2 times higher

risk (OR 2.22; 95% CI 1.14-4.32) of having a high ITL organization one year later, compared to healthcare workers whose work ability remained relatively stable. Similar trends were observed for ITL profession but no significant results were obtained (see Table 1).

Subsequently, analyses were performed separately for the three items constituting ITL profession. (Data not shown). For the first item “Taking further qualification outside nursing”, only repeated poor WAI (OR 1.87; 95% CI 1.01-3.44) was found to be a significant predictor of this form of high ITL profession.

For the second item “Giving up nursing completely”, health care workers going from a good WAI at baseline to a poor WAI one year later (OR 3.76; 95% CI 1.58-8.93) and participants with a substantial deterioration of WAI (OR 2.53; 95 % CI 1.07-5.98) had an increased risk of developing this form of high ITL profession.

Finally, for the third item “Giving up nursing completely to start a different kind of job”, repeated poor WAI (OR 4.01; 95% CI 1.51-10.66), the shift from good to poor WAI (OR 4.27; 95% CI 1.82-10.02) and a substantial deterioration of WAI (OR 2.88; 95% CI 1.30-6.37) were significantly associated with this form of high ITL profession.

Discussion

In the present study among 1,531 Belgian healthcare workers we investigated prospective relations between work ability and intent to leave. Irrespective of the model used, a significant association was found each time between work ability and ITL organization. Baseline poor WAI (Model 1), repeated poor WAI (Model 2), moving from good WAI to poor WAI one year later (Model 2) and a substantial deterioration of WAI (Model 3) between both measurements were significant predictors of ITL organization. Although similar trends were observed for ITL profession, a multiple item construct, no significant associations were found. Therefore, the impact of WAI was further investigated on

Table 1. Multivariate associations between work ability index (WAI) operationalized by 3 methods and intent to leave (ITL), one year later (T2).

| ITL organization | | | | | ITL profession | | | |
|-------------------------------|------|------------|--------|--------------|----------------|-----------|-------|------------|
| WAI | OR | 95% CI | P | n (%) | OR | 95% CI | P | n (%) |
| Baseline (T1) poor WAI | | | | | | | | |
| good | 1.00 | | | 1,050 (82.5) | 1.00 | | | 927 (83.7) |
| poor | 3.25 | 1.83-5.78 | <0.001 | 233 (17.5) | 1.02 | 0.60-1.76 | 0.933 | 180 (16.3) |
| Repeated poor WAI | | | | | | | | |
| good T1- good T2 | 1.00 | | | 861 (70.5) | 1.00 | | | 764 (71.3) |
| good T1- poor T2 | 2.30 | 1.08-4.92 | 0.032 | 143 (11.7) | 1.17 | 0.63-2.19 | 0.613 | 128 (12.0) |
| poor T1- good T2 | 1.01 | 0.29-3.47 | 0.989 | 100 (8.2) | 0.58 | 0.24-1.42 | 0.235 | 87 (8.1) |
| poor T1- poor T2 | 6.71 | 3.32-13.58 | <0.001 | 117 (9.6) | 1.46 | 0.74-2.87 | 0.277 | 92 (8.6) |
| Δ WAI | | | | | | | | |
| mean ± 1 SD | 1.00 | | | 940 (77.0) | 1.00 | | | 831 (77.6) |
| > + 1 SD | 0.93 | 0.35-2.45 | 0.876 | 133 (10.9) | 0.90 | 0.43-1.81 | 0.775 | 112 (10.5) |
| < - 1 SD | 2.22 | 1.14-4.32 | 0.020 | 148 (12.1) | 1.30 | 0.71-2.36 | 0.395 | 128 (12.0) |

Adjusted for age, gender, type of healthcare organization, family situation, number of working hours and work schedule, education level

item level and this also enabled comparison with other international studies concerning identified forms of turnover intentions. Findings showed that baseline WAI was a significant predictor for none of the three items of ITL profession (i.e. taking further education outside nursing, giving up nursing completely and giving up nursing completely to start a different kind of job). These findings were inconsistent with the results obtained by Camerino et al., 2008 (7), who among Italian nurses younger than 45 years found that poor perceived work ability at baseline was associated with a greater wish to undertake further education, and a firmer intention to leave the institution and the nursing profession.

Another difference from the study by Camerino et al. (2008) (7) is that they only used a single assessment of WAI at baseline instead of multiple measurements, due to which it was impracticable to study change in WAI. In our study, repeated poor WAI, moving from good WAI to poor WAI and a substantial deterioration in WAI were found to be significant predictors of particular forms of ITL profession.

A possible explanation for not finding a significant relation between baseline poor WAI and different forms of ITL profession may be that leaving the profession is probably a more complex and time-consuming decision process than deciding to leave the current organization. Presumably, a long-term adverse development in WAI (e.g. repeated poor WAI) is a better predictor of ITL profession than a single measurement of WAI. In addition, another explanation may be that although the relationship between work ability and intent to leave depends on both the present and the past working experience, the current WAI (after one year follow-up) has a greater impact on the development of professional turnover intentions than a single assessment of WAI at baseline.

A notable limitation of the present study is that sample attrition may have affected our results. Of the initial 4,257 participants, only 1,531 were involved in both measurements over a relatively short time period (one year). A comparison between respondents and non-respondents suggested a healthy worker effect. Those who did not return

the second questionnaire were those who suffered from more adverse working conditions at baseline (i.e. lower WAI). Consequently, our findings may be underestimated due to this sample bias.

Another possible weakness is the use of self-reported measures for the predictor and both dependent variables (ITL profession and ITL institution), through which a common-method bias might have played a role. Nevertheless, Spector (2006) (18) recently stated that these influences are not as high as might be expected.

Conclusion

In this prospective study, in which participants with a high intent to leave at baseline were excluded to ensure an appropriate design, work ability was found to be a predictor for developing turnover intentions. We recommend taking not only a single WAI measurement into account but paying more attention to the change in work ability. The added value of measuring change is that individuals who are at risk for developing turnover intentions (i.e. those with (repeated) poor WAI or a decline in WAI) can be identified more easily and accurately and subsequently further monitored. Given our results, more effective tailor-made interventions programs addressing work ability are needed in order to promote employees' well-being and to reduce high organizational and professional turnover intentions.

References

1. Hayes LJ, O'Brien-Pallas L, Duffield C, Shamian J, Buchan J, Hughes F, et al. Nurse turnover: A literature review. *International Journal of Nursing Studies* 2006;43(2):237–63.
2. O'Brien-Pallas L, Shamian J, Buchan J, Duffield C, Hughes F, Laschinger HKS. The impact of Nurse Turnover on Patient, Nurse, and System Outcomes: A Pilot Study and Focus for a Multicenter International Policy. *Policy, Politics, & Nursing Practice* 2006; 7, 169–178.
3. Stordeur S, D'Hoore W. Organizational configuration of hospitals succeeding in attracting and retaining nurses. *Journal of Advanced Nursing* 2007;57(1):45–58.
4. Sager EK, Griffeth RW, Hom PW. A comparison of structural models representing turnover cognitions. *Journal of Vocational Behavior* 1998;53(2):254–73.
5. Parry J. Intention to leave the profession: antecedents and role in nurse turnover. *Journal of Advanced Nursing* 2008;64(2):157–67.
6. Camerino D, Conway PM, van der Heijden BIJM, Estryng-Behar M, Consonni D, Gould D, et al. Low-perceived work ability, ageing and intention to leave nursing: a comparison among 10 European countries. *Journal of Advanced Nursing* 2006;56(5):542–52.
7. Camerino D, Conway PM, van der Heijden BIJM, Estryng-Behar M, Costa G, Hasselhorn HM. Age-dependent relationships between work ability, thinking of quitting the job, and actual leaving among Italian nurses: A longitudinal study. *International Journal of Nursing Studies* 2008;45(11):1645–59.
8. Tuomi K, Ilmarinen J, Jankola A, Katajarinne L, Tulkki A. *Work Ability Index*, 2nd revised edition. Helsinki: 1998.
9. Alavinia SM, De Boer AGEM, van Duivenbooden JC, Frings-Dresen MHW, Burdorf A. Determinants of work ability and its predictive value for disability. *Occupational Medicine-Oxford* 2009;59(1):32–7.
10. Feldt T, Hyvönen K, Mäkikangas A, Kinnunen U, Kokko K. Development trajectories of Finnish managers' work ability over a 10-year follow-up period. *Scandinavian Journal of Work Environment & Health* 2009;35(1):37–47.
11. Sell L. Predicting long-term sickness absence and early retirement pension from self-reported work ability. *International Archives of Occupational and Environmental Health* 2009;82(9):1133–8.
12. Tuomi K, Ilmarinen J, Seitsamo J, Huuhtanen P, Martikainen R, Nygård CH, et al. Summary of the Finnish research project (1981–1992) to promote the health and work ability of aging workers. *Scandinavian Journal of Work Environment & Health* 1997;23:66–71.

13. Ilmarinen J. Work ability a comprehensive concept for occupational health research and prevention. *Scandinavian Journal of Work Environment & Health* 2009;35(1):1–5.
14. Ilmarinen JE. Aging workers. *Occupational and Environmental Medicine* 2001;58(8):546–52.
15. Liira J, Matikainen E, Leino-Arjas P, Malmivaara A, Mutanen P, Rytönen H, et al. Work ability of middle-aged Finnish construction workers – a follow-up study in 1991–1995. *International Journal of Industrial Ergonomics* 2000;25(5):477–81.
16. Smith P, Beaton D. Measuring change in psychosocial working conditions: methodological issues to consider when data are collected at baseline and one follow-up time point. *Occupational and Environmental Medicine* 2008;65(4):288–96.
17. Hasselhorn HM, Tackenberg P, Peter R. Effort-reward imbalance among nurses in stable countries and in countries in transition. *International Journal of Occupational and Environmental Health* 2004;10(4):401–8.
18. Spector PE. Method variance in organizational research – Truth or urban legend? *Organizational Research Methods* 2006;9(2):221–32.

Finnish workers' work ability and opinions on continuing at work after the age of 63

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Abstract

The aim of this paper is to present Finnish workers' opinions on continuing work after the age of 63 and to find out if their work ability is related to these opinions. Two out of three workers were able to provide a reason for continuing at work after the age of 63. This proportion had increased significantly from 2006, especially among women and 55-59 year-olds. Perceived work ability was strongly connected to thoughts of continuing at work after the age of 63. People whose work ability was good were more inclined to continue.

Introduction

Although people's life spans have been increasing significantly over the last few decades, the length of work life has not increased at the same pace. Over the last 40 years, life expectancy has increased by eight years for both men and women in the European Union. In 2009, life expectancy at birth was 76 years for men and 83 years for women in Finland.

Many countries in the European Union have either implemented or planned pension reforms with the objective of extending work life by two to three years. In Finland, the reform of the earnings-related pension system came into force in 2005. It offers economic incentives to continue working after the age of 63. In the private sector, retirement is flexible, and can begin between the ages of 63 and 68 years. For state and local government employees, the retirement age may be lower than 63. Currently, the mean age of retirement for those 25 years of age is 59.8 years and for those 50 years of age 61.7 years. (1).

The aim of this paper is to present Finnish workers' opinions on continuing work after the age of 63 and to find out if their work ability is related to these opinions.

Subjects and Methods

This study is a part of The Finnish National Work and Health Survey, which, since 1997, has been conducted every three years by the Finnish Institute of Occupational Health. The subjects were a random sample of the Finnish population aged 25-64. The sampling was taken from the Finnish Employment Statistics in 2009 and from the Finnish Population Register in 1997-2006. The response rate varied from 58% to 72%. Retired, unemployed, redundant (over one month), those on long-term sick leave (over 6 months), or full-time housewives or househusband, and students who had worked less than 15 hours a week for one month, were excluded from the survey. The size of the study population varied from 2,031 to 2,335. In total, the respondents were representative of the Finnish working-age population with reference to sex, age, occupation and socioeconomic status, and region. (2,3).

Opinions on continuing work were elicited from those aged 45-64 in 2006 and 2009. The final study group included 1,363 currently working Finns aged 45 to 64 in 2006, and 1,167 in 2009.

The data was collected through computer-assisted telephone interviews (CATI). The average length of an interview was 36 minutes.

The structure of the interview was planned by a group of experts at the Finnish Institute of Occupational Health, and the questions focused on the following topics: socioeconomic and workplace-related background factors, physical and chemical work environment, physical and mental workload, organizational factors at work, work climate, gender and age equality, vocational skills, job satisfaction, perceived health and work ability, health-related behavior, reconciliation of work and family life, and the functioning of occupational health services. (3)

The dependent variables were based on the following questions:

- The objective of the Ministry of Social Affairs and Health is that working conditions and workers' health will improve so that people can continue in work life for longer. What factors would motivate you to continue working beyond the age of 63? (State the reasons why you would consider working after the age of 63? Hints regarding alternative answers may not be given to the respondent, there may be several alternatives)
 - Good work community (colleagues and social relations at work, good management, atmosphere at work, enjoying work) (no/yes)
 - Good work environment (no/yes)
 - Financial reasons (higher level of occupational pension, salary) (no/yes)
 - Meaningful, interesting and challenging work (opportunity to exert influence, respect, part of life) (no/yes)
 - Lighter workload (reduction in amount of work, age taken into consideration, reduction in physical and mental loading of work) (no/yes)
 - Working hours (flexible hours, part-time work, reduction in working hours) (no/yes)
 - Own health (no/yes)
 - Other, what (no/yes)
 - Nothing

The results are presented in strata according gender (male, female) in different age groups (45-49, 50-54, 55-59, 60-64). The other independent variables were based on the following questions:

- Let us assume that your best possible work ability is rated 10 points on a rating scale. How would you rate your work ability today on a scale of 0-10? A rating of 0 would mean that you are unable to work. (0-7/8/9-10)
- How do you rate your current work ability with respect to the physical demands of your work? (very good/fairly good/moderate, fairly poor, very poor)
- How do you rate your current work ability with respect to the mental demands of your work? (very good/fairly good/moderate, fairly poor, very poor)
- Do you believe that, from the standpoint of your health, you will be able to do your current job until retirement age? (not, probably not/probably, yes)

Cross-tabulations were used to analyze the associations between gender, age, and opinions regarding continuing work after the age of 63. Logistic regression was used for adjusting age, gender and year of data collection to analyze the associations between work ability and opinions on continuing at work after the age of 63. In logistic regression analysis, the data from 2006 and 2009 were combined. The statistical analysis was carried out by SAS (statistical analysis system) software (version 9.1).

Results

In 2009, own health (24%); financial reasons, such as salary and better pension (23%); meaningful, interesting and challenging work (20%); lighter workload (16%); flexible working hours or part-time work (15%) good work community (11%) and a good work environment

(7%) were stated as the prerequisites for continuing work after the age of 63. One in three (36%) workers said that they would not continue working after the age of 63. This proportion had decreased significantly from 2006 (42 %) ($p=0.0009$), especially among women ($p=0.0017$) and 55-59 year-olds ($p=0.0098$) (Figure 1).

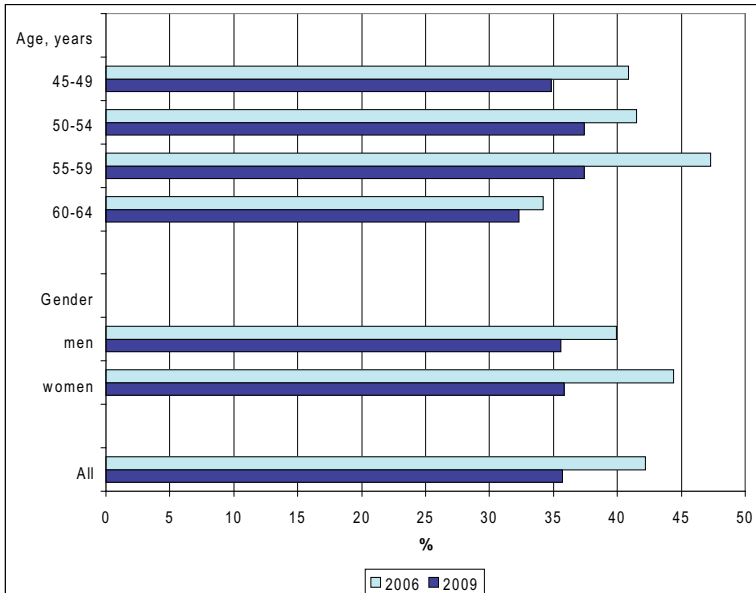


Figure 1. Proportion of those reporting that nothing would convince them to continue working after the age of 63, $n=1,363$ in 2006 and $n=1,167$ in 2009, %.

In 2009 one respondent in three (36%) rated work ability as 9 or 10 on a scale from 0 to 10, 35% and 31% considered current work ability very good with respect to physical and mental demands respectively. Three in four (77%) considered themselves able to continue working until old age from the standpoint of their own health.

Perceived work ability was strongly connected with thoughts of continuing working after the age of 63. People whose work ability was

good were more inclined to continue (Table 1). Lighter workload was stated as the prerequisite for continuing at work after the age of 63 more often if work ability was impaired. Workers whose work ability was very good reported meaningful, interesting and challenging work and good work community as prerequisites more often than those whose work ability was not so good.

Table 1. Odds ratios (OR) for continuing at work after the age of 63 with 95% confidence intervals (95% CI) in different work ability categories (adjusted for age, gender and year of data collection)(n=2533).

| Independent variable | Some reason to continue working | | |
|---|---------------------------------|-----|------------|
| | n | OR | 95% CI |
| Work ability on scale 0-10 | | | |
| 9-10 | 907 | 1.0 | |
| 8 | 1050 | 0.9 | 0.7 to 1.0 |
| 0-7 | 566 | 0.6 | 0.5 to 0.8 |
| Work ability in relation to physical demands | | | |
| very good | 814 | 1.0 | |
| fairly good | 1182 | 0.7 | 0.6 to 0.9 |
| moderate, fairly poor, very poor | 525 | 0.6 | 0.5 to 0.8 |
| Work ability in relation to mental demands | | | |
| very good | 715 | 1.0 | |
| fairly good | 1353 | 0.7 | 0.6 to 0.8 |
| moderate, fairly poor, very poor | 454 | 0.7 | 0.5 to 0.9 |
| Own prognosis regarding ability to perform one's current job until retirement age | | | |
| yes, probably | 1966 | 1.0 | |
| no, probably not | 531 | 0.7 | 0.5 to 0.8 |

Conclusion

Two out of three workers were able to provide a reason for continuing at work after the age of 63. This proportion had increased significantly

from 2006, especially among women and 55-59 year-olds. Perceived work ability was strongly connected to thoughts of continuing at work after the age of 63. People whose work ability was good were more tempted to continue. Lighter workload was an important prerequisite for those whose work ability was reduced, and meaningful, interesting and challenging work and good work community for those whose work ability was very good. Efforts to develop work ability, work and working conditions are important factors to take into account in order to increase the number of people working after the age of 63.

References

1. Finnish Centre for Pensions. Bulletin 27.1.2010. <http://www.etk.fi/>
2. *Kauppinen T, Hanhela R, Kandolin I, Karjalainen A, Kasvio A, Perkiö-Mäkelä M, Priha E, Toikkanen J, Viluksela M* (eds). *Work and Health in Finland 2009*. Helsinki: Finnish Institute of Occupational Health; 2010. (in Finnish with English summary).
3. Perkiö-Mäkelä M, Hirvonen M, Elo AL, et al. *Work and Health Survey 2009*. Helsinki: Finnish Institute of Occupational Health [network document]. Available <http://www.ttl.fi/tyojaterveys> (in Finnish).

Research on the Older Person's Ability for Touch Panel Operation

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Abstract

Personal digital assistance (PDA) and PC with touch panel are currently in widespread use in Japan. The recent touch panel operation (TPO) is low-skilled manipulation; however, the elderly's ability for TPO should be considered well. Thus, we evaluated it in an experiment. The participants were 14 elderly and 14 young individuals. Their performances of 5 tasks were compared. We found the Japanese elderly's ability for TPO varied according to their career and/or experience rather than their age. Consequently, the concept of addressing the issue of Japanese elderly's ability for utilizing information technology could be proposed.

Key terms: touch panel operation, older person's ability, personal digital assistance, tablet personal computer

Introduction

In Japan, the percentage of the population aged over 65 years is now over 22.7 %, and previous studies indicate that the elderly have an aversion to using Web browsers for personal computers (PC) to obtain information. The Japanese government (2004) pointed out that the individual situation of Japanese elderly people and their living circumstances can vary widely according to gender, state of health, financial situation, family structure, and housing. In this regard, Kobayashi and Yamamoto (1) have addressed the importance of accessibility issues for elderly Japanese.

Although the direct pointing device such as a light pen is an unfamiliar interface for Japanese elderly, Charness, Holly, Feddon and Jastrzembki (2) showed that the light pen was more suitable for older people than the computer mouse. In recent years, personal digital assistance (PDA) and PC with touch panel are in widespread use in Japan. The recent touch panel operation including intuitive manipulation such as tracing on the screen by finger is low-skilled operation for young individuals; however, the user experience of Japanese elderly people has not been explored. Therefore, a desirable way of expanding the elderly's ability for touch panel operation should be considered.

Objectives

The aim of this study is to reveal the characteristics of Japanese older person's ability for touch panel operation.

Methods

The touch panel interface is used for various machines such as automated teller machines (ATM), ticket-vending machines, and auto-receipt machines in Japan, although the most common way of touch panel

operation is touching the screen with the user's finger. However, the recent style of touch panel operation for PC or PDA includes various styles of operation such as drawing lines or patterns with the fingers. We evaluated the performance of both conventional and recent style touch panel operation by older persons.

The participants were 14 older persons, 7 males and 7 females with ages ranging from 62 to 81 years (mean = 70.6, S.D. = 6.3). All participants were volunteers. Six participants, 4 males and 2 females had experiences in using PC. None of the participants had any physical or psychomotor disabilities, and 8 participants had work experience such as salesman/saleswoman, office worker and farmer. All participants were residents of Saitama prefecture near Tokyo. Further, the young groups consisted 14 young individuals, 7 males and 7 females, ages ranging from 20 to 33 years (mean = 22.4, S.D. = 3.1), participated in the experiment in order to compare them with the performance of the aged group. The young participants were university students except for a female clerk aged 33 years and the young group included 2 left-handed participants. All of the young were daily PC users.

The participants executed tasks using a tablet PC (Lenovo Think-Pad X200 tablet) and a PDA (NTT DoCoMo T-01A). The PC was running the Microsoft Windows 7 professional Japanese edition and custom software. The custom software indicated the task to the participant and recorded the axis touched automatically. Meanwhile, the PDA was running Microsoft Windows Mobile 6.1 and custom software displaying a city map. The city map on the PDA could be moved up or down or left or right.

To reveal the elderly participants' ability for touch panel operation, we designed 5 tasks as follows and the respective participants performed the tasks in order.

Drawing star-shape. This task was tracing a star-shape on screen with a finger as well as possible. We assumed that moving a finger on the screen was a recent style of touch panel operation for PC or PDA. The participants were instructed how to draw the shape along the displayed shape as well as possible; however, we did not urge them to

hurry. Because we assumed this kind of touch panel operation was not for quick operation but for creative and subjective operation. Thus, we allowed them to have a try before the task. To evaluate the participant's performance, we recorded the touched point of the x and y-axis on screen every 10 milliseconds using custom software, and then calculated the average gap between lines drawn by the participant and the each line of the star-shape on screen.

Tapping phone number. The content of this task was to tap a Japanese phone number (10 digits) indicated on the screen using 3 different sized buttons. First, the largest sized buttons (15 millimeters square) were displayed and the participant tapped the indicated phone number and a 'Complete button' at the end quickly as possible. The distance between the numerical buttons was 5 millimeters in all cases. The 'Complete Button' was not available until the participant typed the phone number perfectly. A cancel button was also displayed to clear the numbers inputted. After the participants had typed the phone number and 'Complete Button', the smaller sized buttons (10 millimeters square) and the same phone number were displayed, and then the participants tried to tap the phone number as before. Finally, the participants tried to tap using the smallest sized buttons (7 millimeters square). This task was to estimate the appropriate button size for inexperienced elderly persons; therefore we did not allow them to try before the task but instructed them in the objective of the task and function of each button. To evaluate the participant's performance, we used the completion time as the metric.

Following and tapping an object. In order to scroll a given page on PDA or PC, flipping with a finger is used. When the page which contains a target icon scrolls, the user has to follow and tap the icon of choice quickly. However, the young users aside, the flip manipulation needs a certain level of psychomotor and cognitive ability for such quick motion of a finger, following the target icon scrolling, and quick tap. We assumed that the sequence of operations was difficult for the aged as well as the young individuals; therefore, we tried to make the task '*Following and Tapping object*' to estimate the ability. Further, we allowed

participants to have a try before executing the task. To accomplish the task, the participants followed an object moving from left to right on the tablet PC's screen and tapped the object as many times as possible. Moreover, they tried to follow and tap the object moving from right to left as before. To evaluate their performance, the number of taps was recorded using custom software.

Typing a Japanese word. Most devices without keyboard but with touch panel indicate a touchable keyboard on screen. The tablet PC also indicates a QWERTY keyboard on screen, thus we made the subjects input the Japanese word *hiragana* including 6 letters using the screen keyboard. The screen keyboard was embedded in Microsoft Windows 7 professional Japanese edition. Minimum key width was 8 millimeters and height 6 millimeters. The 'Notepad', which is application software and embedded in Windows 7 was also used by the participant to display the typed letters. The Japanese letter *hiragana* which the participants had to type was displayed on respective keys of the screen keyboard. Accordingly, the participants had to find the target key and tap the keys correctly one by one. To evaluate their task performance, we measured the task completion time.

Moving map on PDA. The map displayed on PDA was moved by rubbing a finger across the map on screen. Although this manipulation is intuitive, we assumed that it was difficult for the inexperienced elderly. Thus, we observed whether the elderly people were able to comprehend the operation and put their idea into practice or not. The participants tried to move a map on the screen of the PDA without clues in the trial.

In any task, we instructed the way of manipulation before performing the task except '*Moving map on PDA*'.

The participants' task performance was recorded using a video camera (SONY Handycam HDR-SR12) from behind. After a participant accomplished a task, the participant answered our questionnaire. The questionnaire consisted of 5 items, which was feedback about the difficulty in the task. For convenience in analyzing data, each question item used a 5-point scale of agreement.

Results

The performance is obtained from the task ‘*Drawing star-shape*’ showed that the average gap in the aged group was not so different than the young group. Especially in the case of drawing a line from upper center to lower right of the star-shape, the difference between the groups was not statistically significant. In this regard, we knew that it takes a little longer, but the performance of the aged was almost the same as that of the young people.

The task completion time for ‘*Tapping phone number*’ showed that the difference between the elderly and the young was statistically significant ($p < .01$) as shown in Figure 1. Further, Figure 1 shows that the standard deviation of the case ‘15 millimeters square’ among the elderly was smallest of all the conditions for elderly, therefore it is suggested that larger button size could reduce the personal error for older people.

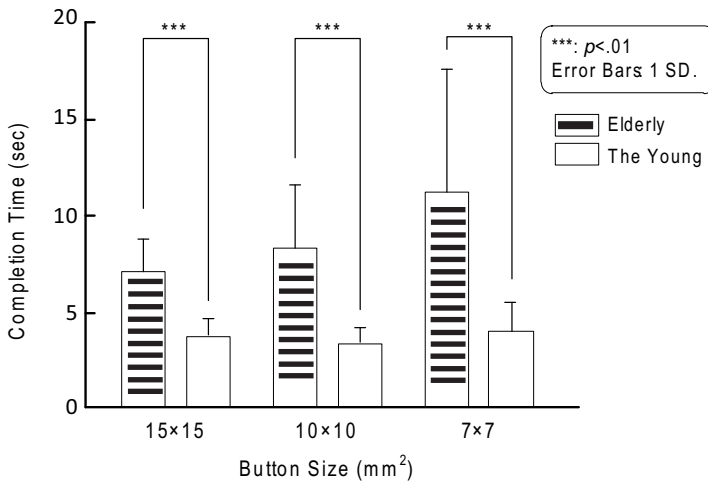


Figure 1. Comparison of completion time for ‘Tapping phone number’.

The feedback from the participants showed that the feeling about the difficulty of task did not differ between the age groups. Considering these results, it is suggested that the difficulty in performing the task did not relate to their performance.

Figure 2 shows that the task performance for ‘*Following and Tapping an object*’ differed between the age groups ($p < .01$) as well as the performance for ‘*Tapping phone number*’. Further, the feedback from the participants indicated that the aged group found this task easier than the young group. Thus, the older person’s subjective gap between performance and experience is not the same as for the young individuals.

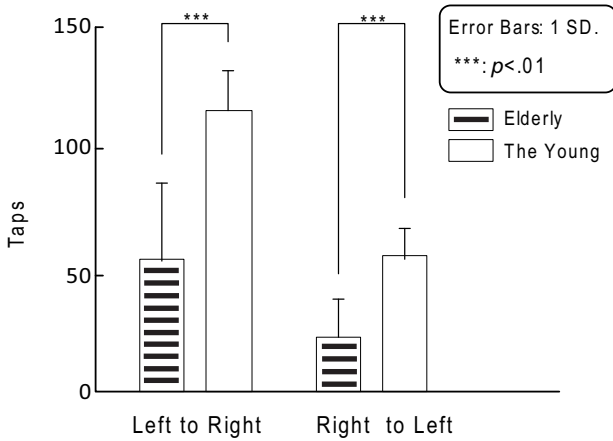


Figure 2. Comparison of the number of taps for ‘*Following and tapping an object*’.

Figure 3 indicates that the completion time for ‘*Typing Japanese word*’ differed significantly between the age groups ($p < .01$). This means that an older person takes longer than a young individual to type a word using the keyboard.

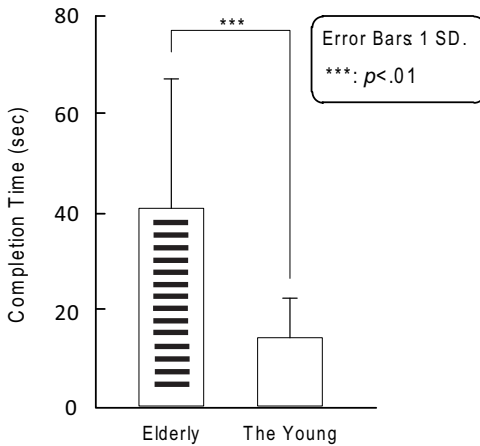


Figure 3. Comparison of completion time for ‘Typing Japanese word’.

As the results of our observing ‘*Moving map on PDA*’, all young participants succeeded in accomplishing the task. However, 4 out of 14 aged persons could not manipulate the map on screen because they could not rub a finger across the map on screen in spite of their correct intent to manipulate. Taking into account the above results, the recent style of touch panel operation for scrolling or moving the page or map on screen could be intuitive for older people; however we assume that performing the recent style of touch panel operation is not easy for them.

Discussion

The results of all tasks show that the ability of elderly for touch panel operation differed from the young participants significantly; however, the results of self-reports showed that the aged participants’ was about the same as the young’s data. Therefore, the performance metrics we

used were useful for evaluating skill in touch panel operation. Meanwhile, we observed that some aged participants performed like young ones. Thus we tried to estimate the older person's comprehensive ability for touch panel operation. The respective comprehensive ability score was a summation of the standardized performance data (*z*-scores) of the tasks except '*Moving map on PDA*'. From the ordered scores, we found that the elderly participant with high performance had a career as clerk and experience of PC use. On the other hand, the elderly participant with low performance had been a housekeeper or a farmer. Further, the elderly participants with average performance had had a career in selling, but they had experiences of using PC or devices with touch panel. From these viewpoints, it was revealed that the aged group could be categorized into 3 groups based on the level of comprehensive ability for touch operation. Further, older Japanese people's ability for touch panel operation varied according to their career or experience rather than their age. Therefore, we believe that the respective approach is required according to their characteristics in order to expand Japanese elderly's ability for operating IT devices such as PDA or tablet PC. For example, the elderly with experience of touch panel operation require more experience of recent touch panel operation in order to utilize IT and elderly people with potential ability for touch panel operation need assistive technologies.

Conclusions

The experimental results revealed the characteristics of older people's performance and clarified the difference in performance between the age groups significantly. Further, the performance of aged people varied widely, as well as their experience, career, and so on. Thus the IT experienced elderly could take advantage of their skills in touch panel operation; however the others require respective approach in order to improve their ability for touch panel operation. Consequently, we found the categorization of the older person's ability for addressing the usability issues relating to recent touch panel operation.

References

1. Kobayashi D, Yamamoto S. Usability research on the older person's ability for Web browsing. In: Kumashiro M, editor. Promotion of Work Ability towards Productive Aging; 2009. p. 227–35
2. Charness N, Holley P, Feddon J, Jastrzembki T. Light Pen Use and Practice Minimize Age and Hand Performance Differences in Pointing Tasks. Human Factors. 2004; 46(3):373–84.

Older and experienced hospital staff

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Abstract

A study of work life was carried out using questionnaires in the hospital in Estonia, where employees' average age was relatively high, 49.3 years. A total of 249 persons, all staff 45 years of age and older were studied. The results showed that the most important health problem were musculoskeletal disorders. Main pain locations were regions of the neck and shoulders. The results showed that health disorders are similar among older and younger staff. The intensity of disorders was the same. Work ability of older staff is relatively good. However older staff feel age discrimination based on stereotypes of a group limiting their employment opportunities.

Keywords: work ability, older workers, age discrimination

Introduction

People want to live in better working and living conditions in the future than today and to live longer. As a result of these aspirations and practical activities they live mostly longer. Increasing life expectancy is one part of the progress of humanity. Increasing human life expectancy and its result, population aging, poses many new questions and problems in the society.

Nowadays older people work up to the traditional pension age, 60-65 years. They retire later. This older workforce is different from the younger generation; they have many shortcomings but also benefits. These benefits have been studied much less than their shortcomings.

The health care sector employs around one tenth of all workers in the European Union. It employs a considerable share of women as more than three quarters of health care workers are women. Population aging causes the role of hospitals to increase and the number of hospitals' employees will also increase. Activities in hospitals also change. Older patients are more interested in medical services for age-related diseases than younger ones. Probably during the next tens of years the role of hospitals will change even more. In the future home will be the hub of care.

Hospitals need staff with various special skills and experience: doctors, nurses, technicians and administrative staff. That young personal is preferred by managers in most companies is a widely known fact. However, age diversity in the workplace is often a better solution. In general, the physiological capacity among the old are poorer than among the young and they have generally more health disorders. However, older staff also have some benefits: they have more tacit knowledge, they are more dedicated to work, honest, responsible, loyal, focused, and organized. These qualities come from years of work experience and make workers less alarmed when problems occur. Working for a company is much more for them than getting money. Older and experienced staff contribute their skills and experience to health care, which is very important in the case of physicians. These aspects of older workers will be more important in the future when the average life expectancy rises.

Research question

In Kuressaare, Estonia, a town of 16,000 inhabitants, there is a hospital that employs 43 physicians, 138 nurses, 102 health visitors, 96 administrative and managerial and auxiliary workers, in total 379 employees.

The average age of workers in Estonia is higher than in most European countries. The Kuressaare Hospital employees' average age was 49.3 years, and this was slightly higher, 54.0 years, among physicians. The average age of the hospital staff in the developed world is mainly 5-10 years younger, although it is on rise. For example, in the Netherlands it was 42 years (1). The Kuressaare hospital management was interested in gaining a better understanding of the problems vis-à-vis the relatively high average age of the hospital staff, to better use this workforce and to improve their working conditions.

The outcome of illness of patients and their rehabilitation depends on the working conditions of the staff in the hospital. There is a wide range of activities and environments in hospitals. The range of hazards includes biological (infections), chemical, physical (noise, needle injuries, patient handling), and psychosocial (mental stress, cleaning services, violence and shift work) in hospitals. Sometimes, e.g. in the work of nurses, there are heavy physical demands and as a result, musculoskeletal disorders. Psychological and esthetic factors are also important in hospitals. Patients heal better if they see plants, mountains, and artwork. This enables to avoid diseases and postpone aging changes in the organism. Using ergonomics in workplaces is especially effective in improving health of older people (2, 3).

Methods

Studies in the hospital were carried out using questionnaires. Questionnaires with 20 questions that had up to 19 multiple choice answer variants were given to participating staff members. The respondents were asked about their age and activity, about the work organization, working

conditions, health issues, work motives, and age discrimination. There were also open questions. The respondents could characterize positive and negative sides of their work. In all 259 persons, all staff 45 years of age and older were studied. Among them 73 were over 60 years old. In all 226 (87.3%) questionnaires were completed.

Results and discussion

Motivations

The main motivator for work in the hospital is salary. Good co-workers are in second place, good working conditions – third place, interesting and pleasant work – fourth place. The last one is the most important among doctors. It is interesting that prestigious workplace was the weakest motivator among doctors. These motivators change only little when to compare the staff that has been working during different periods in the hospital.

The staff stated that financial reward is critical for their work satisfaction. It is easy to understand the importance of salary as at present salaries are comparatively low in Estonia compared to most developed countries. The average monthly wages were about 810 Euros in Estonia in the second quarter of 2009. The salary is a little higher among hospital physicians.

Of the hospital staff 86% is interested in in-service training. This figure is especially high among nurses (97%), and doctors (94%).

Working conditions

According to the questionnaires, an important hazard was insufficient ventilation in the hospital. The next one was mental stress. However, when speaking about working conditions, people think, first of all, about temperature, noise and other parameters of the physical environment, and think less about psychological factors. They consider psychological factors to be normal components of work activity. The detailed study of these factors is more complicated than the study of other factors.

During last years more attention has been paid to limiting these factors in developed countries at European level. In October 2004, the European social partners signed an autonomous framework agreement on work-related stress.

Psychological and social factors are among the most important factors in the hospital. According to the survey, mental stress was in first place among doctors but in second place among nurses. An interesting finding was that the correlation coefficients between age and mental stress and health were very low or negative (-0.15). Probably the older staff avoid stress despite the physiological resources decrease.

Psychological and social factors in the hospital are integrated with family roles as important life roles. We did not study family problems, but generally, as demands and expectations within the family and work domains in hospitals staff are not always compatible, e.g. irregular and shift work, sometimes conflicts between family and work life are possible.

Health of the staff

Back pain was the most important health disorder and pains in the region of the neck and shoulders were in the second place. The next were flu and the common cold, visual fatigue, and sleep disorders. The intensity of disorders was the same comparing younger and older staff. According to the Estonian physicians' cohort study no health risks were observed in the cohort that could be linked to the occupational exposures of physicians (4).

Working in retirement age

In all 78% of the hospital staff were interested in continuing working beyond traditional retirement age, either full-time or part-time. There are some differences if we compare doctors, nurses, and health visitors. Wish to continue working full-time is less among doctors (26%). If we compare different age groups then the older age group 61-65 years was especially interested in continuing working full-time. Probably the benefits of retirement were earlier assessed too high. According to the

results, there were practically no people in the hospital who could not continue working because of health problems.

Age discrimination

Age discrimination of employees is prohibited under the Estonian Constitution and laws (The Law on Equal Treatment). However, some discrimination does occur. The results showed the correlation coefficient between age and age discrimination at work to be 0.36 and while searching for new employment it rose to 0.55. In searching for a new workplace age discrimination was the second most important factor among 56-60 year-olds and the most important factor among 61 year-olds and older staff.

Conclusions

Our questionnaire was useful in providing new information to improve our understanding of older hospital staff issues and improving their working conditions. The results showed that older staff are well motivated. Their health is relatively good. There is no bigger difference in health between the younger and older staff. The study shows that to use older workforce in the hospital is a good solution in utilizing their experience and accumulated knowledge.

Our study also shows that several working conditions, psychosocial conditions, ventilation – need more attention in the hospital. One possibility is to develop a specific health program.

In Estonia, according to the Estonian Constitution and laws (The Law on Equal Treatment) age discrimination is prohibited but our survey shows that age discrimination, first of all while searching for a new workplace, is an important problem for hospital staff. There is a need for state level additional measures to avoid age discrimination.

References

1. EirOnline (homepage on the internet). Grünell M. Pay increase in hospitals and special provisions for older employees (cited 2010 Apr 13). Available from: <http://www.eurofound.europa.eu/eiro/2009/05/articles/nl0905039i.htm>
2. Kristjuhan Ü. Ergonomics in slowing down the human aging rate and increasing the life expectancy. In: Johansson G. Nordiska Ergonomisällskapetets årskonferens NES'98. 1998 Sep 16-18: Lund, Sweden: Ergonomics Society of Sweden; 1998. p. 95-98.
3. Kristjuhan Ü. Youth maintenance and postponing human aging in reality. *Rejuvenation Res.* 2008;11(2):505-9.
4. Innos K, Rahu K, Baburin A, Rahu M. Cancer incidence and cause-specific mortality in male and female physicians: a cohort study in Estonia. *Scand J Pub Health.* 2002 June 2; 30: 133-40.

Masters of their own time? Working careers' visions about combining retirement and caring

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Abstract

How do working careers anticipate the timing of retirement and the weight of care commitments related to other activities when retired? This question is discussed by analysing the experiences of Finnish working careers. Most of the interviewees indicated that helping parent(s) would be part of their own retirement, but after leaving full-time work they would also like to devote time for their other personal interests, too. Working careers are willing to engage in caring when retired. However, they also have a desire to outline their caring tasks and manage their own time.

Key terms: Retirement, family care, productive aging, working careers

Background and objective

In times of political efforts to extend the working careers of adults, the research literature has also started to produce data related to the problems and possibilities of combining work and family care (1, 2) and to the factors considering longer careers (3, 4). The negative effects of caring roles for women's later-life employment and retirement incomes are well-documented (5, 6, 7). Difficulties in reconciling work and family life have been documented to be associated with intentions to take early retirement (8, 9). In contrast to extending working careers, the question of this article approaches from a different angle. The article focuses on combining retirement and caring for parents.

Retirement is often seen as a period for a person's own personal interests after duties in paid employment. On the other hand, retired people are expected to participate in so-called productive activities by continuing to work, volunteering or being involved in various caring tasks. At the same time, both the life expectancy and the number of frail older people are increasing and many aging adult children face the increasing care needs of their parent(s). How would people who are approaching their retirement and who are caring for their parent(s) like to spend time freed from full-time working?

The theoretical background of the paper is based on the discussions related to productive aging (11, 12) and third age (13). These highly gerontological concepts are surrounded by discussions of care research: the concepts of care time, work time and personal time (14). Productive aging (11) is usually defined as engagement in paid work, volunteer work or care activities after full-time employment. The concept tries to counterbalance the 'burden talk' and stresses the contributions aging people make to their kin, community and the whole of society compared to the societal costs they incur as retired, non-employed persons. Further, the aspiration towards personal fulfillment is the core dimension of the concept of the third age, initially proposed by Peter Laslett (13). The third age, the age after active working years is usually defined as time freed from both work duties and childcare.

Fiona Williams (14) writes that the ethic of work should be balanced with the ethics of care. She suggests that rather than fitting people's care needs into the requirements of work, life should be seen as consisting of three different yet tightly connected areas of life: personal time and space, care time and space, and work time and space. Accessible, affordable, flexible and good-quality social care services and support are essential to meet the needs of the second area. Meeting the needs of the third area requires, for example, paid care leaves and sabbaticals. Strikingly, Williams writes that people's needs for personal time (maintenance of body and soul, relationships and relaxation) can be met, for example, with suitable domestic services, which also provide opportunities to participate in work life. The experiences related to these areas of life may vary. For example, for some people care time is their personal time or vice versa.

Considering the situation of retired people, these concepts presented by Williams pose slightly different, but interesting questions: How do retiring or retired family careers combine their productive roles as careers and/ or workers with their other leisure activities, i.e. their personal interests? How is the interconnection of these areas of life manifest in the life situations of people out of full-time work? The research questions in this study are formulated as follows:

1. How do working careers anticipate the timing of retirement related to care commitments?
2. How do working careers anticipate the weight of care commitments related to other activities when retired?
3. How can working careers' visions of activities after full-time working be understood in terms of 'productive time' and 'personal time'?

Methods

The data consists of 20 interviews with working careers who were born in 1953 or earlier and helped or cared for their parent or both parents (i.e. were 'parental careers'). The interviews were conducted in a larger research project focusing on the work-care interplay (WoCaWo). All interviews were audio-recorded and transcribed with the permission of the respondents. Before analyzing the data more exactly, 'talk about retirement plans and future' was identified and separated from the other data. The coding was facilitated by the ATLAS.ti program. More detailed analysis was conducted by paying attention to the statements in which the interviewees assessed: 1) their desire (emphasis) to disengage from full-time working/ continue working, 2) their care commitments related to the timing of retirement and 3) their views on the relation between care and other activities during retirement (see Table 1).

The interview statements were first categorized according to interviewees' desires regarding leaving full-time work or continuing working (i). Second, the statements of the interviewees in these categories were analyzed and differences concerning timing of retirement (ii) were pinpointed: the retirement decision may be strongly or loosely connected to care commitments or there is no connection. Third, regarding the variance among these retirement decisions the statements of the interviewees' anticipated retirement activities (iii) were analyzed. Considering the differences between these statements various visions were formulated and they are seen as 'ideal types' (cf. 10). The six different visions stress certain elements common to most cases of the given vision.

Results

Table 1. Visions of parental care-giving during own retirement.

Characteristics of interviewees

- (i) Stresses the desire to **disengage** from full-time paid work
 - 1. Intended activity to replace full-time working
 - (ii) Leaving work **strongly** connected to parental care: wants to retire soon in order to get more time for parent(s) and continue caring
 - (iii) Parental care an extensive activity during retirement
 - 2. Part of the way of living opposed to work-centered life
 - (ii) Leaving work **loosely** connected to parental care: wants to retire soon in order to get more time for own hobbies, self-care and close people in general
 - (iii) Care including parental care substantial activity during retirement among other leisure activities
- (i) Stresses the desire to **continue working**
 - 3. Circumscribed activity due to problematic relationships
 - (ii) Continuing work **strongly** connected to parental care: sees work as a way to autonomy as opposed to a caring relationship
 - (iii) Setting limits to one's care tasks important when retired in order to get time for work and leisure activities
 - 4. One pastime among other work and leisure activities
 - (ii) Continuing work **loosely** connected to parental care: sees working as a meaningful activity in itself/ financially necessary
 - (iii) Setting limits to one's care tasks important when retired in order to get time for work and leisure activities

(i) Stresses neither the desire to disengage from work nor the desire to continue working

5. Squeezing and worrying activity

- (ii) Timing of retirement **not closely** related to parental care
- (iii) Worry and/ or anxiety about care duties during own retirement which is anticipated to be time for self and leisure

6. Uncertain activity

- (ii) Timing of retirement **not closely** related to parental care
- (iii) Always unpredictable future care responsibilities not a desired issue to be pondered

Although insecurity (and the vision in which caring for parents was interpreted as an uncertain activity) is always prevalent in such care and although there were a number of interviewees who indicated that they have negative or at least uneasy feelings related to their possible caring duties when retired (parental care as a squeezing and worrying activity), most of the interviewees described visions one (parental care as an intended activity to replace full-time working), two (parental care as part of the way of living opposed to work-centered life), three (parental care as a circumscribed activity due to problematic relationships) and four (parental care as one pastime among other work and leisure activities). Namely, most of the interviewees wanted to help their parents during retirement but they also stressed the possibility to help and care in manners reasonable to themselves and the possibilities to limit one's helping. They indicated that helping parent(s) was an essential part of their own lives but they also stated that when retired they would like to devote time to their other personal interests, too.

Discussion and conclusions

Applying the concepts of productive aging and the third age familiar from social gerontological research and discussions relating to the relationship of care time, work time and personal time, this study concludes that the interconnection between the visions pinpointed can be illustrated by a continuum from 'productive time' to 'personal time' and vice versa. The components of this continuum are 'work activities', 'care activities' and 'leisure activities' (Figure 1). The starting point is that care and work activities are categorized as productive time and leisure activities as personal time. However, actual situations of the interviewees were much less clearcut.

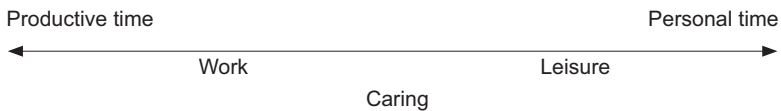


Figure 1. Interconnection of 'productive time' and 'personal time'.

In those cases in which parental care was anticipated as an intended activity to replace full-time working or part of the way of living as opposed to a work-centered life caring for parents were also anticipated as a part of life and as a part of personal time. First, the interviewees were eager to decrease their working time, i.e. hours worked. Second, helping/caring for close people and leisure activities were interconnected when the interviewees anticipated their future plans although in the latter vision parental care as such did not carry so much weight as it did in the previous vision.

By contrast, in those cases in which caring for parents was anticipated as a circumscribed activity due to problematic relationships, one pastime among other work and leisure activities or a squeezing and worrying activity helping/caring for parent(s) and leisure interests were interpreted as separate spheres of life. Devoting time to personal

interests (work or/ and leisure) was said to be interviewees' 'own time' in contrast to time devoted to other people needing care. The difference between these visions was that when parental care was interpreted as a squeezing activity the adult children's thoughts involved distress and uneasiness whereas the informants in other two visions appeared to be highly ambiguous when considering their future.

To conclude, the interviewees' views on future care responsibilities varied but they were not afraid of caring or helping during retirement if the care activities are anticipated as reasonable, i.e. they leave time for work and leisure activities. This is a significant message for policymakers. In aging societies there are pressures to stress both aging workers' and older people's productivity and societal contributions as the recent political and public debate proves in Finland, too. According to this study working careers in their late 50s or early 60s do willingly and able to spend for 'productive time' when retired. However, they also have a strong wish for 'personal time'. Older people are a resource considering the increasing care demands of their parents, but they should not be regarded only as a resource. Depending on family situation and personal valuations time freed from paid work can be used in various ways. Leaving gainful employment does not necessarily mean leaving 'productive roles' as citizens. However, pensioners' contributions as careers are both socially and personally meaningful only if they satisfy all participants of the caring relationship.

References

1. Yeandle S, Buckner L. Carers, Employment and Services: time for a new social contract? Carers, Employment and Services Report Series, Report No. 6. London: Carers UK; 2007.
2. Sand AB. Anhöriga som kombinerar förvärsarbete och anhörigomsorg. Kunskapsöversikt 2010:11. Kalmar: Nationellt kompetenscentrum Anhöriga; 2010. [In English Family members combining paid employment and care giving]
3. Loretto W, Vickerstaff S, White P. The future for older workers. New perspectives. Bristol: The Policy Press; 2009.
4. Chiva A, Manthorpe J (eds.). Older Workers in Europe. Berkshire: Open University Press; 2009.
5. Austen S, Ong, R. The employment transitions of mid-life women: health and care effects. *Ageing & Society*. 2010; 30:207–227.
6. Heitmueller A, Inglis K. The earnings of informal carers: Wage differentials and opportunity costs. *Journal of Health Economics*. 2007; 26:821–841.
7. Masuy AJ. Effect of caring for an older person on women's lifetime participation in work. *Ageing & Society*. 2009; 29:745–763.
8. Forma P. Work, family and intentions to withdraw from the workplace. *International Journal of Social Welfare*. 2009; 18:183–192.
9. Arksey H, Kemp P, Glendenning C, Kotchetkova I, Tozer R. Carers' aspirations and decisions around work and retirement. Research Report No 290. Department for Work and Pensions; 2005.
10. Higgs P, Mein G, Ferre J, Hyde M, Nazroo J. Pathways to early retirement: structure and agency in decision-making among British civil servants. *Ageing & Society*. 2003; 23:761–778.
11. Morrow-Howell N, Hinterlong J, Sherraden M (eds.). *Productive Aging. Concepts and challenges*. Baltimore & London: The Johns Hopkins University Press; 2001.
12. Leinonen A. Tuottava ikääntyminen: käsitteestä käyttömahdollisuuksiin. *Yhteiskuntapolitiikka*. 2007; 72:295–308. [In English Productive aging: from concept to implementation]
13. Laslett P. The emergence of the third age. *Ageing and Society*. 1987; 7:133–159.
14. Williams F. In and Beyond New Labour: Towards a new political ethics of care. *Critical Social Policy*. 2001; 21:467–493.

Intention to change profession and intention to stop working in younger and older workers and their relationship with work ability, need for recovery, organizational social capital and work-family conflict

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Abstract

The aim was to explore relationships between age, work ability, need for recovery (NFR), organizational social capital and work family conflict, and intentions to change profession and stop working. In a cross-sectional questionnaire study conducted on 458 employees of a public institution, the intentions to change profession and stop working, the Work Ability Index (WAI), the NFR, organizational social capital and work family conflict were assessed. Older workers thought more about stopping working than younger workers, but less about changing their profession. In older workers WAI was the most important predictor for both intent to leave parameters.

Key terms: intent to leave, work ability index, need for recovery, social capital, work family conflict, older workers

Introduction

There is an economic and political tendency to raise the retirement age. This means that workers will have to work at older ages. In this context gaining insights into the intentions of older workers to leave their profession or stop working can be of interest.

As the Work Ability Index (WAI) assesses the physical and mental demands of work, as well as the worker's health status and resources (1), it could be an important factor in the intention to leave.

The need for recovery (NFR) is an early indicator of the short-term effects of fatigue, and is a powerful predictor of long-term adverse health effects (2). Earlier research shows that older workers had a higher NFR (3). The question could be raised if this higher NFR in older workers also affects on their intentions to leave as well.

Organizational social capital is a recent concept describing quality in an organization. Good organizational social capital has been found to be positively correlated with self-rated health and psychological well-being (4). Thus it can be hypothesized that social capital could also be correlated with intention to leave.

Furthermore, it was also found that work-family conflict was positively related to withdrawal intentions of withdrawing from a profession (5).

To the best of our knowledge the relationship between intentions to leave the job and work ability, NFR, social capital and work family conflict has not so far been investigated.

Objectives

The aim of this study was to explore relationships between age, work ability, need for recovery, organizational social capital and work-family conflict, and intention to change profession and intention to stop working.

Methods

This study has been approved by the Ethics Committee Progecov-Securex (Commissie voor Medische Ethiek OG 211, Ghent, Belgium).

In total 468 subjects employed in a large public social institution were asked to participate in a cross-sectional questionnaire study. The population included social services, administrative, childcare, cleaning, cleaning at home, nursing home, nursing at home, kitchen and technical personnel.

At information sessions organized by the employer, the employees had the opportunity to fill out a standardized self-report questionnaire. A total of 458 employees filled out the questionnaire (97.9% response rate). Mean age was 40.5 years, ranging from 19 to 62 years. For the comparison of older and younger workers the subjects were divided into two age groups: older workers (45 years or older) and younger workers (younger than 45 years), according to the definition of the World Health Organization (6). Of these 199 subjects (43.4%) were 45 years or older and 259 subjects (56.6%) were younger than 45 years. Of the study population 420 were women (91.7%).

As dependent outcome variables two different intent to leave parameters were used: the proportion of employees who, in the past 12 months, had any thoughts about changing profession and the proportion of employees who, in the past 12 months, had any thoughts about stopping working. The questions used were derived from the Nurses' Early Exit Study (NEXT Study) (7).

Work ability was assessed by the short Work Ability Index (WAI) questionnaire as used in the NEXT Study (8). Scoring for the short WAI is analogous to the scoring for the long version of the WAI (1), resulting in a score ranging from 7 to 49 (the higher the score, the better the work ability; a score higher than 36 is considered to be good). The WAI score was used as a continuous variable.

The need for recovery was assessed by "The Need for Recovery Scale" questionnaire. The need for recovery scale was computed by summing up the scores of the 11 constituent dichotomous (yes/no)

items, resulting in a score ranging from 0 to 11, which was converted to a 0 to 100 scale (the higher the score, the greater the need). The NFR score was used as a continuous variable.

The Copenhagen Psychosocial Questionnaire (COPSOQ II) (9) was used to assess organizational social capital and work family conflict.

Organizational social capital was computed from the subscales “vertical trust” and “justice”, each consisting of four questions (10), each question offering five response options. The scores of the eight constituent items were added up and transformed to an “organizational social capital” scale ranging from 0 to 100 (the higher the score, the better the organizational social capital), which was used as a continuous variable.

The “work family conflict” scale was computed by summing up the scores of four questions (each offering four response options) and transforming the sum to a 0 to 100 scale (the higher the score, the higher the work family conflict). The “work family conflict” scale was used as a continuous variable.

Data analyses were performed using SPSS, version 17.0 for Windows (11). The outcome parameters were described by number and percentage for the total study population and for the younger and older workers separately. WAI, need for recovery score, work family conflict and social capital were described by mean and standard deviation for the total study population and for the younger and older workers separately. To test for differences between older and younger workers the Mann-Whitney U test and the chi-square test were used appropriately. To prevent multicollinearity, correlations between all exposure variables were checked beforehand and no high collinearity was found (12). Stepwise forward conditional multiple logistic regression analyses were used to calculate the odds ratios and their 95% confidence intervals for having thought in the past 12 months about changing profession and for having thought in the past 12 months about stopping working (dependent variables). The regression analyses were performed for the total study population and for the groups of older and younger

workers separately. The following independent variables were entered into the regression model: age group (only in the analyses of the total study population), WAI score, need for recovery score, work family conflict, social capital, gender, part time work (full-time work vs. <38 hours a week) and shift work (yes vs. no). For the stepping method criteria, the p-value for including a variable was set at .05 and the p-value for excluding a variable at .10. The final multivariate model had the smallest value for -2 Log likelihood and the highest correctly predicted percentage.

Results

Figure 1 gives the percentages of the subjects who, in the past 12 months, thought about changing profession and about stop working. The differences between the two age groups for both outcome parameters were statistically significant ($p < 0.01$).

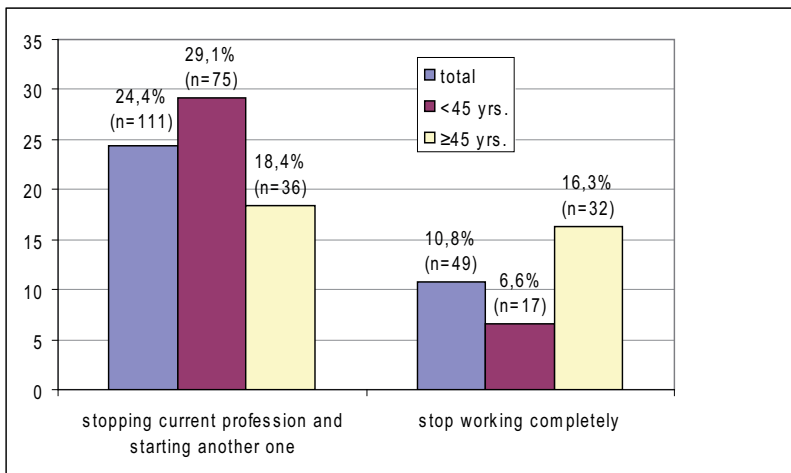


Figure 1. Intent to leave parameters for the total study population and by age group.

Table 1 summarizes the scores for the 4 main independent variables. Only the WAI score differed significantly between the two age groups.

Table 1. Mean scores for WAI, need for recovery, social capital and work family conflict for the total study population and by age group

| variable | total study population | | < 45 yrs. | | ≥45 yrs. | | p* |
|----------------------|------------------------|-------------|-----------|-------------|----------|-------------|-------|
| | n | mean (SD) | n | mean (SD) | n | mean (SD) | |
| WAI | 444 | 41.9 (4.3) | 252 | 42.2. (4.1) | 192 | 41.4 (4.5) | 0.019 |
| need for recovery | 456 | 30.0 (27.3) | 259 | 30.8 (27.9) | 197 | 28.8 (26.5) | 0.507 |
| work family conflict | 455 | 27.4 (20.8) | 259 | 28.8 (21.3) | 196 | 25.4 (19.9) | 0.099 |
| social capital | 457 | 68.3 (16.4) | 259 | 68.6 (15.7) | 198 | 68.0 (17.3) | 0.877 |

* p-value for the difference between the two age groups

Tables 2 and 3 show the final multivariate logistic regression models for the two intent to leave parameters, in each case for the total study population and for both age groups separately.

Table 2. Final multivariate logistic regression models for having thought in the past 12 months about changing profession; for the total study population and the two age groups (< 45 yrs. and ≥ 45 yrs.) separately; odds ratios corrected for gender, shift work and part time work

| variable | total population (n=423) OR (95% CI) | <45 yrs. (n=244) OR (95% CI) | ≥ 45 yrs. (n=179) OR (95% CI) |
|-------------------------|--|------------------------------------|-------------------------------------|
| ≥ 45 yrs. | 0.52 (0.31-0.87)* | - | - |
| WAI score | 0.92 (0.87-0.97)† | - | 0.87 (0.80-0.96)† |
| need for recovery score | 1.03 (1.02-1.04)‡ | 1.04 (1.02-1.05)‡ | 1.02 (1.00-1.04)* |
| work-family conflict | 0.98 (0.97-1.00)* | - | 0.97 (0.95-0.99)* |
| social capital | - | - | - |

* p<0.05

† p<0.01

‡ p<0.001

The intention to change profession increased with increasing work-family conflict, and decreased with increasing WAI score and increasing organizational social capital. It was significantly lower in the older workers. Work family conflict was the only predictor in younger workers, while in older workers, besides work family conflict, social capital and WAI score were also significant factors.

Table 3. Final multivariate logistic regression models for having thought in the past 12 months about stop working; for the total study population and the two age groups (< 45 yrs. and ≥ 45 yrs.) separately; odds ratios corrected for gender, shift work and part time work

| variable | total population (n=422) OR (95% CI) | <45 yrs. (n=244) OR (95% CI) | ≥ 45 yrs. (n=178) OR (95% CI) |
|-------------------------|--|------------------------------------|-------------------------------------|
| ≥ 45 yrs. | 2.82 (1.44-5.50) [†] | - | - |
| WAI score | | | 0.88 (0.81-0.96) [†] |
| need for recovery score | 1.02 (1.01-1.03) [‡] | 1.02 (1.00-1.04) [*] | |
| work-family conflict | | | 1.03 (1.00-1.05) [*] |
| social capital | | | |

* p<0.05

† p<0.01

‡ p<0.001

In the total study population the intention to stop working was associated with a high need for recovery score and was significantly higher in the older workers. The association with the need for recovery remained significant in the younger group, but in the older group, however, the WAI score was the most important predictor.

Discussion

There were significant differences between the two age groups concerning both outcome parameters. Thoughts about stopping the current profession and starting another one were significantly higher in the younger group; whereas thoughts about stop working completely were significantly higher in the older group. The direction of the difference were as might be expected.

WAI was significantly lower in the older age group. This confirmed the results of earlier studies (13).

In contrast to earlier findings (3) the older worker group did not show a greater need for recovery. However, the data in this study did not permit a multivariate analysis to explore the differences in NFR between older and younger workers, controlling for occupational exposures. This was also not within the scope of this study.

Although work family conflict revealed no statistically significant difference between older and younger workers, younger workers reported a higher level of work family conflict. This finding could be an indication of the differences in family situation in both age groups.

The fact that the scores for social capital were almost equal in both age groups could indicate that social capital is a parameter suitable for measurement on the organizational level.

The marked differences between older and younger workers concerning their intent to leave parameters were confirmed in the multivariate regression models.

The present study population consisted almost entirely of female workers employed in one large public social institution. Extrapolation to other worker groups should therefore be subject to great caution. Further studies in other occupational settings have to be carried out to confirm our results.

Conclusion

Older workers were more likely than younger workers to consider stopping working, but had less the intention to change their profession. In older workers WAI was the most important predictor both for intention to change profession and to stop working.

References

1. Tuomi K, Ilmarinen J, Jahkola A, Katajarinne L, Tulkki A. Work Ability Index 2nd ed. Helsinki: Finnish Institute of Occupational Health; 1998.
2. Sluiter JK, de Croon EM, Meijman TF, Frings-Dresen MHW. Need for recovery from work related fatigue and its role in the development and prediction of subjective health complaints. *Occup Environ Med* 2003;60(Suppl 1):i62–i70.
3. Kiss P, De Meester M, Braeckman L. Differences between younger and older workers in the need for recovery after work. *Int Arch Occup Environ Health* 2008;81:311–20.
4. Nieminen T, Martelin T, Koskinen S, Aro H, Alanen E, Hyyppä MT. Social capital as a determinant of self-rated health and psychological well-being. *Int J Public Health*. 2010 Apr 2 [Epub ahead of print].
5. Greenhaus JH, Parasuraman S, Collins KM. Career involvement and family involvement as moderators of relationships between work-family conflict and withdrawal from a profession. *J Occup Health Psychol* 2001;6(2):91–100.
6. World Health Organization (WHO). Aging and working capacity: report of a WHO study group. WHO technical report series 835. Geneva: World Health Organization; 1993.
7. Stordeur S, Kiss P, Verpraet R, De Meester M, Braeckman L, D’hoore W. Intent to leave nursing in Belgium. In: Hasselhorn H-M, Tackenberg P, Müller BH (Eds.). Working conditions and intent to leave the profession among nursing staff in Europe. Working Life Research Report 7. Stockholm: National Institute for Working Life; 2003. p. 125–35.
8. Camerino D, van der Heijden B, Estryn-Behar M, Kiss P, Pokorski J, Hasselhorn H-M. Work ability in the nursing profession. In: Hasselhorn H-M, Tackenberg P, Müller BH (Eds.). Working conditions and intent to leave the profession among nursing staff in Europe. Working Life Research Report 7. Stockholm: National Institute for Working Life; 2003. p. 88–93.
9. Pejtersen JH, Kristensen TS, Borg V, Bjorner JB. The second version of the Copenhagen Psychosocial Questionnaire. *Scand J Public Health* 2010;38(Suppl 3):8–24.
10. Kristensen TS. A questionnaire is more than a questionnaire. *Scand J Public Health* 2010;38(Suppl 3):149–55.
11. SPSS. SPSS for Windows, version 17.0. Chicago: SPSS Inc.; 2009.
12. Checkoway H, Pearce N, Kriebel D. Research methods in occupational epidemiology. New York: Oxford University Press; 2004.
13. Monteiro MS, Ilmarinen J, Corrêa Filho HR. Work ability of workers in different age groups in a public health institution in Brazil. *Int J Occup Saf Ergon*. 2006;12(4):417–27.

Employee well-being at work and early retirement intentions in medium and high-performance companies

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Abstract

This study focuses on differences in employee work ability, organizational commitment and justice, and early retirement intentions according to company performance in the metal industry and retail trade. Employees in medium-performance metal industry companies perceived their work ability poorer and experienced less organizational commitment and justice compared to employees in high-performance companies. Early retirement intentions among retail trade employees were more frequent in medium compared to high-performance companies. The findings are in line with those of earlier studies on employee attitudes and company performance, but may also indicate the existence of dual causality between employee well-being and company performance.

Key terms: Early retirement intentions, work ability, organizational commitment, organizational justice, company performance

Introduction

In years to come, human resources will be in danger of becoming scarce due to the ageing of the Western workforce. The national implications of the changing age demographics concern the possible loss of knowledge, labor shortages, and problems in short-term funding of pensions (1). Managing retirement-related decisions will become more important for the organizations in the future. Some companies and public organizations are struggling to find competent employees to replace those who are retiring (2), whereas others introduce early retirement incentives, phased retirement, and job sharing in order to downsize and restructure their human resources in times of economic recession or when faced with outsourcing needs (3).

Human resources have become an increasingly important asset for companies in the twenty-first century. According to the resource-based theory of the firm, they can provide a source of sustained competitive advantage for an organization (4–5). Studies have revealed that employee attitudes, such as affective commitment, job satisfaction, and employee engagement are at least to some extent related to company performance (6–9). These findings may also indicate that there is a dual causality between employee well-being and company performance. More specifically, the causal arrow can go from management practices and employee attitudes to organizational performance and back (10). Financially and market successful companies are likely to have resources to invest in their employees' satisfaction and well-being (8, 10).

Compared to employee attitudes, early retirement is typically seen as a form of job withdrawal (employee behavior) concerning older employees (11). It has been established that poor employee health, work ability and well-being at work contribute to early retirement intentions (12–15). Even if some older employees are more prone to retire early than their younger counterparts, it does not mean that older employees are in general less productive in organizations. Ng and Feldman (16) in their study found that by and large older employees were as motivated to contribute to their organizations as younger ones.

Objectives

The aim of this study is to explore differences in employee work ability, organizational commitment and justice, and early retirement intentions according to company performance in the metal industry and retail trade.

Methods

Data for this study were collected in 2007 from companies and their employees in the metal industry and retail trade by the Finnish Institute of Occupational Health. In the present study, a total of 506 questionnaires were sent out to the managers (typically a managing director or entrepreneur) of the randomly selected companies in various regions of Finland. Altogether 129 [n (metal industry) = 82, n (retail trade) = 47] acceptable questionnaires were returned, which yielded a response rate of 25.5 percent. This rather low response rate compares favorably to those of similar studies (17–18). A total of 54 percent of companies participating in the managerial level survey decided to participate in the employee survey. In all, we obtained 1,281 acceptable employee responses. For the purposes of this study we included 1,091 employees [n (metal industry) = 634, n (retail trade) = 457] (lower and upper management excluded).

Managers' perception of company performance was measured using a 10-item scale based on Delaney and Huselied's (19) scale of perceived organizational and market performance. Managers were asked to evaluate their current performance compared with their competitors in terms of the quality of products /services, market share, growth of sales, profitability, liquidity etc. The five-point Likert-type answers varied from 5 ("much stronger") to 1 ("much weaker"). The reliability of the scale proved to be good (Cronbach's Alpha = 0.887). For the purposes of this study companies were classified according to performance into two groups in both industries: 1= medium performance

(metal industry 45.6 % and retail trade 63.0 %), 2= high performance (metal industry 54.4 % and retail trade 37 %). None of the companies were classified as low performance.

Perceived work ability, organizational commitment and justice, and early retirement intentions were controlled for at the employee level. The Work Ability Index was used to assess perceived work ability (20). The scale indicates balance between work and personal resources from the point of view of occupational health, well-being, and coping (21). It comprises seven items, which measure employees' subjective estimation of their current work ability compared with lifetime best, work ability in relation to the physical and mental demands at work, the number of diseases diagnosed by a physician, a subjective estimation of work impairment due to disease, absence due to sickness during the past year, and own estimation of work ability and psychological resources after two years. Scores range from 7 to 49 points.

Organizational commitment was measured using a 6-item Likert-type scale (Cronbach's Alpha = 0.830) ranging from 5 = "agree totally" to 1 = "disagree totally" based on Porter et al. (22) and Steers (23). The 12-item Likert-type scale (5 = "agree totally" to 1 = "disagree totally") on organizational justice comprised distributive, procedural, and interactional justice dimensions (24). Reliability of the scale proved to be good (Cronbach's Alpha = 0.927).

Self-reported information on employee early retirement intentions was collected with the question: "Have you ever considered retiring before your full retirement age?" The respondents were classified into two categories: 1 = "no early retirement intentions" ("no, I have not considered retiring before full retirement age") and 2 = "weak or strong early retirement intentions" ("I have sometimes considered retirement before full retirement age", "I think about retirement constantly", and "I have already applied for retirement"). Information regarding employees' age was collected in 2007 from the respondents.

T-test and χ^2 -test were used to explore differences in employee work ability, age, and early retirement intentions according to company performance. All statistical analyses were performed with SPSS (15.0).

Results

Means, standard deviations, and percentages of the study variables are shown in Table 1 for the metal industry and retail trade. The mean company performance perceived by managers for the total sample was 3.7 (SD = 0.53, n = 1033, range 3.5-4.9). Mean age of employees was 42.0 (SD = 11.8, n = 1079, range 16-66 years). Metal industry employees were older than retail trade employees ($t = 4.728$, $df = 1077$, $p < .001$). The mean Work Ability Index score for the total sample was 41.5 (SD = 5.7). The work ability of retail trade employees was statistically significantly higher than in the metal industry ($t = 3.272$, $df = 1020$, $p < .001$). Overall, employees evaluated their perceptions of organizational commitment and justice to be quite high (mean = 3.5, SD = 0.9 and mean = 3.3, SD = 0.9 respectively). Both of these indicators received statistically significantly higher values among retail trade compared to metal industry employees. Finally, more than 60 % of the employees reported experiencing early retirement intentions. Early retirement intentions were especially frequent in the metal industry (68 %, $\chi^2 = 20.232$, $df = 1$, $p < .001$).

Table 1. Descriptive statistics of study sample in the metal industry and retail trade.

| Variables | Metal industry | Retail trade | χ^2 -value, t-test† |
|--|-----------------|-----------------|--------------------------|
| Company performance, mean \pm SD | 3.7 \pm 0.5 | 3.9 \pm 0.5 | 6.759*** |
| Age, mean \pm SD | 43.5 \pm 11.2 | 40.1 \pm 12.3 | 4.728*** |
| Work ability, mean \pm SD | 41.1 \pm 6.1 | 42.2 \pm 5.1 | 3.272*** |
| Organizational commitment, mean \pm SD | 3.3 \pm 0.9 | 3.6 \pm 0.9 | 4.577*** |
| Organizational justice, mean \pm SD | 3.2 \pm 0.9 | 3.4 \pm 0.9 | 3.439*** |
| Early retirement intentions, % (n) | | | 20.232*** |
| No | 32 % (187) | 46 % (189) | |
| Yes | 68 % (403) | 54 % (225) | |
| Total | 100 % (590) | 100 % (414) | |

† Categorical variables analyzed using the chi-square-test, continuous variables with t-test, *** $p < .001$

Work ability, range 7-49, organizational commitment and justice, range 1-5

Independent-samples t-test and χ^2 -test analyses were used to explore differences in employee work ability, age, and early retirement intentions according to company performance. The results are shown in Table 2. In the metal industry, statistically significant differences were found between medium and high performance companies. Employees in medium performance companies reported poorer work ability ($t = 3.121$, $df = 588$, $p = .002$), organizational commitment ($t = 6.089$, $df = 608$, $p < .001$) and organizational justice ($t = 4.566$, $df = 590$, $p < .001$) compared to employees in high-performance companies. Corresponding differences were not detected among employees in the retail trade companies. Instead, employees in medium-performance retail trade companies reported significantly more early retirement intentions than did employees in high performance companies ($\chi^2 = 9.869$, $df = 1$, $p = .002$). No differences in early retirement intentions were detected between medium and high performance metal industry companies.

Table 2. Employee work attitudes and early retirement intentions according to company performance in the metal industry and retail trade.

| Variables | Metal industry | | Retail trade | | | t-test, X ² -value |
|---|--------------------|------------------|-------------------------------|--------------------|------------------|-------------------------------|
| | Medium performance | High performance | t-test, X ² -value | Medium performance | High performance | |
| Work ability, mean ± SD | 40.4 6.3 | 41.9 5.8 | 3.121*** | 42.1 5.2 | 42.2 5.1 | 0.190 |
| Organizational commitment, mean ± SD | 3.2 0.9 | 3.6 0.8 | 6.089*** | 3.6 0.8 | 3.6 0.9 | 0.766 |
| Organizational justice, mean ± SD | 3.0 0.9 | 3.4 0.9 | 4.566*** | 3.4 1.0 | 3.3 0.9 | 1.204 |
| Early retirement intentions, % (n) [†] | | | 1.947 | | | 9.869*** |
| No | 29 % (90) | 34 % (94) | | 38 % (88) | 55 % (77) | |
| Yes | 71 % (221) | 66 % (180) | | 62 % (142) | 45 % (63) | |
| Total | 100 % (184) | 100 % (401) | | 100 % (230) | 100 % (140) | |

***p<.001

Discussion and Conclusions

This study showed that employees in medium-performance metal industry companies perceived their work ability poorer, experienced less organizational commitment and justice than employees in high-performance companies. In addition, early retirement intentions among retail trade employees were more frequent in medium than in high-performance companies. These findings offer support for earlier studies on employee attitudes and company performance (6-9), but may also indicate the existence of dual causality between employee well-being and company performance (8,10).

The differences in the well-being between metal industry and retail trade employees in terms of company performance merits further attention. This finding might indicate on a more general level that the connections between employee well-being and performance differ according to industry. In a study by Datta et al. (17), the impact of high-performance work systems on labor productivity in US-based, publicly traded manufacturing firms was influenced by industry capital density, growth, and differentiation. Becker and Huselid (25) encourage researchers to take into account the significance of a differentiated HR architecture not only across, but also within companies. A previous, tentative finding in the current study indicated similar results regarding differences according to industry (26). Possible explanations for this finding were related to the nature of the industry in the larger retail trade companies. In these companies, the volume of regular customers and store size can be crucial in terms of profitability and higher company performance.

Despite the strengths related to the fairly broad employee and organizational level self-reported data and thoroughly validated scales, this study is not without limitations.

This study is based on cross-sectional, self-reported data, which raises the question of causality. Although several cross-sectional studies on (high-performance) human resource management practices and company outcomes (27–28) have been reported, these studies have not

been able to address the issue of causal order. Studies have suggested that successful companies measured by financial and market performance would have resources to invest in their employees' satisfaction and well-being (8,10). Establishing whether a dual causality between HR practices and company performance exists would be possible by obtaining predictive data on company performance (10). Further, because this study was conducted within two industries, the question of generalizing the results to other industries arises. Collecting data from various industries, including the public sector, would increase the potential for generalization of results.

In sum, there appears to be a relationship between employee well-being in terms of work ability, organizational commitment and justice, early retirement intentions, and company performance. It indicates that investing in the development of employee health and management practices is financially beneficial for companies.

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References

1. Ilmarinen J. Towards a longer worklife – Ageing and the quality of worklife in the European Union. Helsinki: Finnish Institute of Occupational Health; 2006.
2. Hardy M. Older workers. In Birnstock HR, George LK, eds. *Aging and the Social Sciences*. London: Elsevier; 2007:201–218.
3. Wang M, Shultz KS. Employee retirement: A review and recommendations for future investigation. *J Manag.* 2010;36:172–206.
4. Barney J. Firm resources and sustained competitive advantage. *J Manag.* 1991;17:99–120.
5. Wright PM, Dunford BB, Snell SA. Human resources and the resource based view of the firm. *J Manag.* 2001;27:701–720.
6. Harter J, Schmidt F, Hayes T. Business-unit-level relationship between employee satisfaction, employee engagement, and business outcomes: A meta-analysis. *J Appl Psychol.* 2002;87:268–279.
7. Fulmer B, Gerhart B, Scott K. Are the 100 best better? An empirical investigation of the relationship between being a “great place to work” and firm performance. *Person Psychol.* 2003;56:965–993.
8. Schneider B, Hagnes PJ, Smith DB, Salvaggio AN. Which comes first: Employee attitudes or organizational financial and market performance. *J Appl Psychol.* 2003;88:836–851.
9. Vanhala S, Tuomi K. HRM, company performance and employee well-being. *Manag Revue.* 2006;17:241–255.
10. Wright PM, Gardner TM, Moynihan LM, Allen MR. The relationship between HR practices and firm performance: Examining the causal order. *Person Psychol.* 2005;58:409–446.
11. Hanisch KA, Hulin CL. Job attitudes and organizational withdrawal: An examination of retirement and other withdrawal behaviors. *J Voc Behav.* 1990;37:60–78.
12. Karpansalo M, Manninen P, Kauhanen J, Lakka TA, Salonen JT. Perceived health is a strong predictor of early retirement. *Scand J Work Environ Health.* 2004;30:287–292.
13. Elovainio M, Forma P, Kivimäki M, Sinervo T, Sutinen R, Laine M. Job demands and job control as correlates of early retirement thoughts in Finnish social and health care employees. *Work Stress.* 2005;19:84–92.
14. Siegrist J, Wahrendorf M, von dem Knesebeck O, Jürgens H, Börsch-Supan A. Quality of work, well-being, and intended early retirement of older workers – Baseline results from the SHARE Study. *Eur J Public Health.* 2007;17:62–68.

15. von Bonsdorff ME, Huuhtanen P, Tuomi K, Seitsamo J. Predictors of employees' early retirement intentions: an 11-year longitudinal study. *Occup Med.* 2009. doi:10.1093/occmed/kqp126.
16. Ng TW, Feldman DC. The relationship of age to ten dimensions of job performance. *J Appl Psychol.* 2008;93:329–423.
17. Datta DK, Guthrie JP, Wright PM. Human resource management and labor productivity: Does industry matter? *Acad Manag J.* 2005;48:135–145.
18. Gibson CB, Porath CL, Benson GS, Lawler EE. What results when firms implement practices: The differential relationships between specific practices, firm financial performance, customer service, and quality. *J Appl Psychol.* 2007;92:1467–1480.
19. Delaney JT, Huselid MA. The impact of human resource management practices on perceptions of organizational performance: Progress and prospects. *Acad Manag J.* 1996;39:949–969.
20. Tuomi K, Ilmarinen J, Jahkola A, Katajarinne L, Tulkki A. *Work Ability Index, Occupational Health Care No. 19, 2nd revised edn.* Helsinki: Finnish Institute of Occupational Health; 2002.
21. Ilmarinen J. Work ability – a comprehensive concept for occupational health research and prevention. *Scand J Work Environ Health.* 2009;35:1–5.
22. Porter L, Steers R, Mowday R, Boulian P. Organizational commitment, job satisfaction and turn over among psychiatric technicians. *J Appl Psychol.* 1974;59:603–609.
23. Steers RM. Antecedents and outcomes of organizational commitment. *Adm Sci Q.* 1977;22:46–56.
24. Colquitt J. On the dimensionality of organizational justice: A construct validation measure. *J Appl Psychol.* 2001;86:386–400.
25. Becker BE, Huselid MA. Strategic human resource management: Where do we go from here? *J Manag.* 2006;32:898–925.
26. Von Bonsdorff ME, Janhonen M, Vanhala S, Husman P, Ylöstalo P, Seitsamo J, Nykyri E. Henkilöstön työkyky ja yrityksen menestyminen vuosina 1997–2007 – tutkimus metalliteollisuudessa ja vähittäiskaupan alalla (Employee Work Ability and Company Performance in 1997–2007 – A Study of the Metal Industry and Retail Trade. (In Finnish.) Finnish Institute of Occupational Health, Report No. 36. 2009.
27. Guthrie JP. High-involvement work practices, turnover, and productivity: Evidence from New Zealand. *Acad Manag J.* 2001;44:180–190.
28. Sun L-Y, Aryee S, Law KS. High performance human resource practices, citizenship behavior, and organizational performance: A relational perspective. *Acad Manag J.* 2007;50:558–577.

IV AGE MANAGEMENT

The Vattenfall 80-90-100 working schedule as an age management tool: A four-year follow-up study

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Abstract

Increase in workers' average ages, average retirement ages dropping to 58 years in 2000, increasing pension costs and impending shortage of competence led Vattenfall Nordic AB to address retention of older workers and promotion of work ability. Workers aged 58 years and above could request 80 % of full position, 90 % of full salaries and 100 % of pension point earnings. This 80-90-100 schedule was efficient. Twenty-five percent of the workforce aged 58+ used this schedule; it did not hinder organizational effectiveness, it increased motivation and vitality, and reduced stress. It contributed to an increase in average retirement ages to 63 by the end of 2008.

Key Words: Aging workers, age management, means to promote longer careers, 80-90-100 program, leadership, Vattenfall, Sweden.

Introduction and objective

Although it is acknowledged throughout the last decade that the ongoing demographic changes will severely affect the availability of younger and increase the relative proportion of older workforce, few studies have reported on within-company age management actions that are aimed at increasing work ability and retaining older workers in the organization. Furthermore there is a wider lack of research into this topic including a leadership or a business management perspective (1). This study responds to these deficiencies by reporting a longitudinal case study that documents impacts of a unique company-based aging worker management program, still ongoing in the Swedish company Vattenfall Nordic AB. The program deals with older workforce retention and generational hand-over. Workforce retention here means the active efforts of the company to prevent early retirement of the workforce. Generation hand-over refers to the handover of competence and values from the experienced generations to the newly recruited and younger workers. A special work schedule, called 80-90-100, was adopted to support this effort. The research questions driving this study were: 1) what was the actual content and form of the 80-90-100 schedule; 2) how did it fit into the broader Ageing Workforce Management Program in the company; 3) how was the schedule received by the participants and their manager; 4) what were the impacts of the schedule; and 5) to what extent can this schedule be recommended as a means to prolong work careers for older workers?

Vattenfall has expanded its production and deliveries of electric energy produced in hydro-electric power plants and nuclear power plants especially throughout the 1960's to 1980's, and the number of employees increased in step with sales growth, reaching about 8,000 today. The company has been a highly respected and popular employer and enjoyed low workforce turnover. Consequently, the average age of employees and managers has been high and is increasing (mean = 46 years; one third of the employees being between 50 and 60 years of age, see Figure 1), reflecting the history of the company as well as

the general demographic changes in the Nordic region today. About six percent of staff, however, was older than 60, and the average pension age was dropping and reached 58 years of age by the year 2000, its lowest level ever. Altogether 2,014 employees would be eligible to retire from 1998 to 2014, among whom 1,510 would retire between the years 2007 and 2014 (Figure 2). Most of them would be difficult to replace and the company found it increasingly difficult to recruit young and competent workers, especially to fill outdoor maintenance and construction jobs and to work in remote and sparsely populated areas, which is the location of some of their plants.

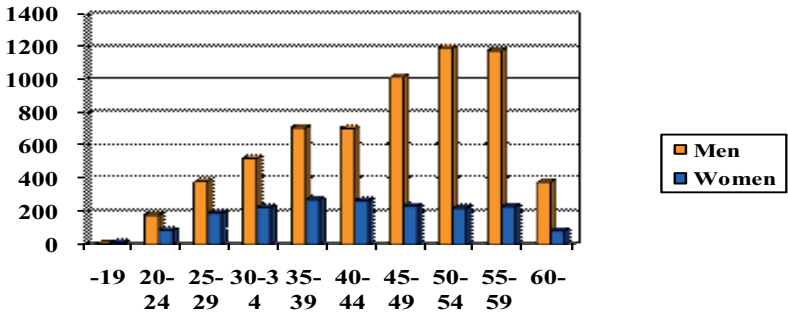


Figure 1. Vattenfall Nordic AB employee age distribution 2008.

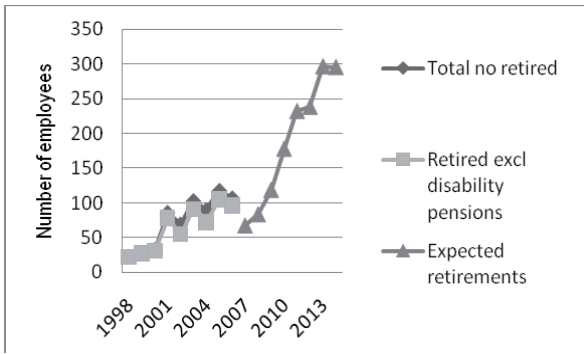


Figure 2. Observed (1998 – 2007) and expected (2008 – 2014) retirement in Vattenfall Nordic AB.

Facing these threats to the company's future performance, retention of the older workforce, promotion of work ability in older workers, and transferring competence to facilitate the generational hand-over became central organizational assets. On April 24, 2001, Vattenfall's CEO announced that the standard retirement age with full company pension would now be 65 years of age, compared to 58–60 years which were the norm at that point in time. The only exceptions would be for cases of illness and disability, and some workforce on special contracts. This announcement gave rise to the Aging Workforce Management Program, which contained several internal processes and structures along with external networking and media attention. It constituted a radical change away from early retirement practices which have been conceived of as a form of ageism (2, 3, 4), and the turn also required changes in attitudes of all involved (5). The process that followed was to some extent inspired by the "Age Management Model" launched by Ilmarinen (6, 7). By applying the expression "Age Management" the model points to remedies and solutions from the perspective of three levels: the individual, the organization, and society (7). For the individual, the benefits will be improved working ability, health and well-being, meaning and structure, social relationships and the feeling of making a valuable contributions to the company. The company will benefit from the retention of critical competence and labor, reduced expenditures on training and pensions, and less need for supervision. For society, the advantages will be the improved health and well-being of employees, higher income, and reduced costs of pension, health and welfare systems. However, although inspired by Ilmarinen's work, the Vattenfall program constituted a unique approach to the aging workforce challenges. The most innovative means in the program were the 80-90-100 working schedule, which was introduced through seminars for the workforce aged 57 years and above and in the organizational communication in general.

Method

The study adopted a longitudinal case study design, starting in 2005 and observing the processes and outcomes to June 2009. The research methodology used document studies, interviews, observation and participation in internal and external meetings and presentations, questionnaires and company internal statistics, thus applying a multi-method approach (8): 1) The interviews relied on semi-structured interview guidelines. For evaluating the 80-90-100 schedule, 29 participants and 19 managers were interviewed, with the focus on functional aspects along with individual and group outcomes. 2) The leaders of the four unions organizing workforce and managers in this company were interviewed in a two-hour focus group session, which were recorded and analyzed. 3) Observations were made at meetings with managers, union representatives and co-workers, and notes were made after the observations were finished, and mainly used to verify the outcomes of the interviews. 4) In November 2008, an electronic questionnaire was e-mailed to 700 randomly selected managers in the company and a response rate of 40 percent was realized. 5) A questionnaire study to 303 participants on the 80-90-100 schedule (response rate 77 percent) was applied in 2009. Finally, Company statistics on sick leaves for 2004 - 2007 (Figure 3) and average retirement ages for 1998–2008 were added to the measurements.

Results

The rationale for the Ageing Workforce Management Program and its purpose was communicated to employees in pamphlets like “Myths and Facts about Older Workers (50+)”, and its core messages contained expressions like:

“Early retirements a waste of resources... Vattenfall’s goal is to offer our employees such attractive working conditions that more can and

will want to remain longer in the company... For it to succeed, what is required ... is that we all ... are well informed about the connection between age and working ability... It is important to declare that there is no conflict of interests between younger and older workers in the workplace... The coming generation shift, on the contrary, presumes that we develop a way of working that makes young as well as older workers experience Vattenfall as an attractive employer... We must to a greater degree see to it that our younger people work together with more experienced employees”.

Furthermore, the pamphlet aspired to replace myths about older workers with facts in areas like declining physical strength being met with compensating skills, lack of relationship between age and work performance, and flexibility and receptivity to change as a lifelong personal capability. It also highlighted facts about older workers’ self-sufficiency, their need for less supervision, their development of loyalty and social skills, and their retention of learning capacities.

In 2005–2006, the Human Resource department (HR) invited all employees aged 57+, via their line managers, to participate in one-day information and motivation seminars, where the 80-90-100 schedule was launched. A pilot program had been tested in two business units since 2003. The 80-90-100 schedule allowed the individual employees involved in the program to work 80 percent of full-time while receiving 90 percent of their full-time salary and earning 100 percent of pension points. At the outset, it was also argued that the vacancies created in the teams in the absence of older workers should be used to integrate younger workers and give them gradual access to the tacit knowledge and skills possessed by the team members. The schedule was offered to workers aged 58+ and could be initiated on their own request, independent of their health status. However, it was not a right given to all workers like rights to a vacation; instead it was a management tool. The line managers were empowered to accept or reject such applications, and the decisive argument was the actual demands for labour at the local level. The agreement was to be made between the individual

applicant and the manager, and would be evaluated and renegotiated after six months with another six-month extension possible. The team itself would make up for the loss of man-hours if work priorities dictated, or the work would be slowed down, as no economic or man-power compensation would be provided to the team from the central organization to replace the losses of man-hours at team level.

About 25 percent of the workforce aged 58+ was enrolled in the schedule at any time since it was formally introduced. As of 2008, about 325 workers from about 1,200 potential candidates participate in this schedule. Some are in the schedule for one period only, and most for several periods or the rest of their careers. No complete records are kept showing the “careers paths” of each employee in the schedule, however. All participating employees were satisfied with the 80-90-100 schedule and gave several reasons for this. For one, it facilitated continued work with chronic health problems, and it allowed them to prepare for retirement practically, socially and emotionally. All interviewees felt more motivated and energized and alert at work, and would continue working to 65 provided there was a continuation of the schedule. It gave one day less per week on the road for long-distance commuters and gave people with chronic health problems more time for recovery. It was perceived as a form of recognition of the value of their seniority and unique competence in the workplace. Some felt uncertain, however, about their extended continuation in the schedule because of the requirement to re-negotiate every six months. The sick-leave rates for the group enrolled in the 80-90-100 schedule were lower than or equal to the average sick-leave rates for Vattenfall in total for the years 2004 and 2007 (Figure 3).

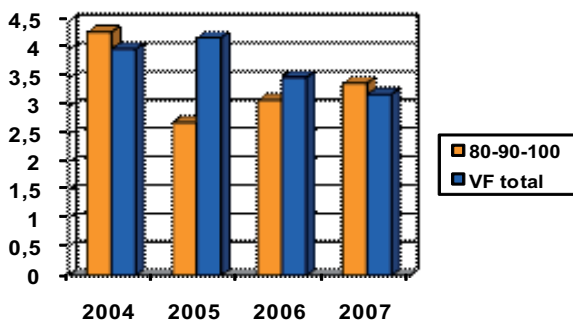


Figure 3. Sick leave rates for participants in the 80-90-100 Vattenfall Aging Workforce Management program compared to sick leave rates for Vattenfall in total (percent of working hours).

According to the 2009 survey of the 80-90-100 participants, 94 % reported satisfaction with their work, 53 % reported higher motivation, 53 % stated that they did the same amount of work in a shorter time, and 58 % reported improved performances. Moreover, 85 % reported improved health, 32 % reported decreased sick leave rates, and 88 % reported willingness to work up to 65 years of age. Competence transfer happened most 1) by being asked about how to / why / where / with whom (53 %); 2) as discussions (37 %), and 3) as organized teaching or mentoring (5 %). Only 5 % reported *not being involved* in any competence transfer.

According to the manager survey, 93 % of the managers found the 80-90-100 schedule to be an important or very important measure for prolonging the careers of older workers and ranked it third in importance after “new and exciting work tasks” and “increased decision latitudes in own work”(Table 1). The interviews showed that managers generally appreciated the schedule as it also led to more highly motivated and engaged workers who had more ideas for problem solving and more capacity to pursue their assigned tasks. No loss of productivity was reported. In most of this work, productivity was not a linear function of working hours as tasks and conditions are diverse across time, contexts, and places.

Moreover, the energizing effect of the schedule increased the productivity of some workers, and “...most workers want to make a serious contribution to the company” (union leaders’ interview). The latter was a concern, however: “Work demands may be flexible but do not disappear, and there might be a need for greater efforts in the time left for work to keep up the productivity of the system” (union leaders’ interview). This greater effort was most often from the person with reduced weekly working hours, but could also be shared by other team members, which only in some very few instances was not well taken: “Of course, the Jante Law exists, but generally this is not a matter of conflict” (union leaders’ interview). Managers complained, however, about more administrative work, lack of organizational support for replacing the lost man-hours, difficulties on teams due to reduced manning and increased workload on colleagues, and some instances of unintended use of the benefits had been observed. In the questionnaire study 43 % of the managers complained about lack of training in managing older workers. Also, the schedule was not implemented in all units, as some managers claimed it was incompatible with the work demands and available resources, but the union leaders objected strongly to this argument. Moreover, when adapted by the managers, it was practised with different criteria by different managers as some “sub-interpreted” the rules. Some managers felt uneasy about making these decisions, and some felt it added to their administrative burden. In some cases it was observed that managers signed the re-negotiated deal without any comments written on the form, while others stated the reason why they had refused or accepted the application. These differences do not document lack of consideration or injustice. The union leaders, however, were concerned with inequalities found in the decision-making processes. They stated that lack of training for the managers on how to apply this schedule was one relevant explanation for the problems observed: “Some line and middle managers have not reached an adequate understanding of these issues. For instance, one regional manager stated that we shall be maximally restrictive with these agreements... Another issue is the difficulties that some older workers have met when applying

for the 80-90-100 schedule in shift-work positions. It does not need to be difficult, and these cases are not in harmony with the signals from headquarters in Stockholm... A third issue is the original intention of using the schedule to open up opportunities in the work teams for younger workers to constitute double manning and thus learn some of the tacit tricks of the trade – that just did not happen” (union leaders’ interview). Moreover, they pointed to a lack of managerial control parameters to be applied in this part of the management process: “Control parameters decide priorities” (union leaders’ interview). They also asked for a formalized procedure for appeal from those refused entry to the schedule. In sum, the unions clearly stated that the schedule should have been part of an agreement and available as an option for all aged 58+; more in line with the regulations for the annual vacation.

Table 1. Managers’ evaluations of the extent to which various means would be important to extend employees careers and delay retirement. Only the five items receiving highest ratings were included (n=280).

| Means to extend working careers | Not important | Some importance | Important | Very important | Mean value |
|--|---------------|-----------------|-----------|----------------|------------|
| New and exciting work tasks | 0 | 2 | 23 | 75 | 3.7 |
| Increased decision latitude at work | 0 | 2 | 31 | 67 | 3.7 |
| Reduced working hours (80-90-100) | 3 | 4 | 25 | 68 | 3.6 |
| Become a mentor for colleagues | 1 | 7 | 41 | 51 | 3.4 |
| More feedback and encouragement from own manager | 1 | 14 | 42 | 44 | 3.3 |

From 2000 to 2008 the average retirement ages increased by 5.5 years, from 58.2 to 63. The above findings signify contributions of the 80-90-100 schedule as a part of the Aging Workforce Management Program

in line with its goal of 65 years of age as the ordinary retirement age. The program gained external media support as it was an innovation in Swedish working life. Due to this program and its success, Vattenfall was elected “*The 2006 Employer of the Year*”. This media attention and the innovativeness of the Aging Workforce Management Program led to visits from other companies and politicians from elsewhere in Norway and abroad, and this external attention enhanced the effect of the actual program itself within Vattenfall.

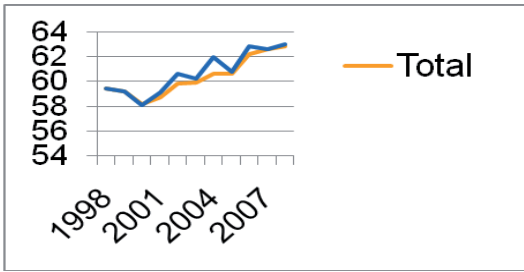


Figure 4. Development of average retirement ages in Vattenfall 1998 – 2008.

Discussion and conclusions

Based upon an instruction from the CEO to increase the actual retirement ages from 58 to 65 years, the Ageing Workforce Management Program was motivated by organizational needs to retain the workforce and their critical competence, consequently its underlying objective was to ensure the future long-term economic performance for the company. The 80-90-100 schedule is a central component of this program, offering a 20 % reduction of the workload to a smaller portion (about 25 %) of workers aged 58 years and above, on their own request, while reducing their salary by 10 %, but without any change in their pension earning agreements. The individual worker must request to be part of this schedule, and it is flexible as it is settled for six months at the time; however, most of the agreements, once settled, were prolonged

until retirement. The schedule was successful according to employees, managers and the union leaders, and contributed significantly to the increase in retirement ages from an average of 58 years in 2000 to 63 years in 2008. However, the exact contribution of this schedule to the total outcome is impossible to assess, as other processes were running parallel to the 80-90-100 schedule. As a conservative estimate it may be claimed that the 80-90-100 schedule prolonged the working careers of about 25 % of the workers aged 58 and above, but as the schedule signified that the company valued the contribution of the older workers, the total impact may be much higher.

The 80-90-100 schedule was well integrated as a measure in the broader Aging Workforce Management Program of Vattenfall. It was pretested and launched in the 57+ seminars; however, it was not supported by sufficient training of and instructions to managers, and consequently practised differently throughout the organisation, which was a subject of criticism from the union leaders. Hence its efficiency might have been improved by leadership training and more efficient organizational communication. The fact that managers were partly uncomfortable with the implementation of the schedule also indicates that efficient organizational communication is mandatory for a seamless outcome of this kind of innovation. On the positive side the findings indicate that the organization was not hampered by the schedule, that stress was reduced and individual motivation, satisfaction and work effectiveness were enhanced through the application of this measure to an extent that the company found it uninteresting to conduct any detailed cost-benefit analyses of the schedule. Hence, the solution chosen by Vattenfall could be recommended as a means for other organizations provided their workers are not involved in tasks where productivity may be predicted as a linear function of the actual hours they put into their work.

Finally it is noticeable that the managers rated three growth-oriented means (“increased decision latitudes”, “becoming a mentor for younger colleagues” and “new and exciting work tasks”), and two reward means (“feedback and encouragement from leader” and “pro-

gressive increase in age pensions”) as almost of equal importance as the 80-90-100 schedule for prolonging workers’ careers. One important implication of this finding may be that managers found it appropriate to reduce the workload for about a fourth of the older workers while the remaining and larger group gain more from growth and reward strategies as their work ability is sufficient for full-time employment and increased responsibilities. Consequently means to prolong older workers careers should at least be tailored to adopt 1) strategies for individual growth; 2) tangible and intangible rewards of workers; and 3) reduction of workload to fit the variability in older workers capacities. However, only the third alternative has been documented here. A limitation of the study is its lack of a control group; hence future research should replicate the study applying an experimental approach.

References

1. Streb C K, Voelpel S C, Leibold M. Managing the Aging Workforce: Status Quo and Implications for the Advancement of Theory and Practice. *European Management Journal*. 2008; 26: 1–10.
2. Butler R N. Age-ism: Another form of bigotry. *The Gerontologist*. 1969; 9: 243–246.
3. Bytheway B. *Ageism*. Buckingham: Open University Press; 1995.
4. Townsend P. Ageism and social policy. In: Walker C P A, editor. *Ageing and Social Policy. A Critical Assessment*. Aldershot: Gower; 1986.
5. Taylor P, Walker A. Employers and older workers: Attitudes and employment practices. *Ageing and Society*. 1998; 18: 641–658.
6. Ilmarinen J. Aging workers. *Occupational & Environmental Medicine*. 2001; 58: 546–552.
7. Ilmarinen J. Promotion of work ability during aging. In: Kumashiro M, editor. *Ageing and Work*. London: Taylor and Francis; 2003: 23–35.
8. Creswell J W. *Research Design: Qualitative, Quantitative and Mixed Methods Approaches*. (2nd ed). Thousand Oaks: Sages Publications; 2003.

“Fit for the Future” – the Austrian Program to Maintain Work Ability

Kloimüller I

Austrian Social Insurance for Occupational Risks (AUVA) and the Social Security Administration (PVA)

Abstract

In 2008 the Austrian Social Insurance for Occupational Risks and the Social Security Administration jointly started to develop a prevention program to reduce illness-related early retirement and maintain work ability. In total, 20 companies in highly demanding industries with about 12,500 employees are participating. By using standardized processes and methods, the employees' work ability status is analyzed. The analysis is primarily based on the Work Ability Index Plus™, an extended version and further development of the Work Ability Index and approved by Prof. Juhani Ilmarinen.

Key terms: maintaining work ability; analysis with the *Work Ability Index Plus™*

Introduction

Maintaining work ability and reducing illness-related early retirement are goals we need to achieve quickly in Austria as in many other European countries. Even more so, given the demographic changes taking place in Austria and the country's ensuing efforts to raise economic performance and finance social and health services.

Economic objectives might have given rise to this program but increasing work ability itself is a win-win situation for everyone involved, as economic interests go hand in hand with the workers' interest in their health and quality of life. Maintaining work ability also means better health and well-being, positive challenges and good quality of life and thus has a direct influence on work and private life. Each additional year that people are able to work is both a personal and a macroeconomic gain.

Since the "FinnAge" program, carried out by the Finnish Institute of Occupational Health in Finland in the 90's we have learned that work ability can be improved by a set of carefully targeted measures and that most people can stay productive until an advanced age. All this provided that the working conditions are designed such that they meet the varying requirements and reflect the varying strengths of the worker at the different stages of his life.

At the beginning of 2008 the Austrian Social Insurance for Occupational Risks (AUVA), , and the Social Security Administration (PVA), were instructed by the Austrian state to jointly develop and sponsor a prevention program that focused on the reduction of disability retirements and the maintenance and promotion of work ability and have it implemented nationwide by 2012.

A steering committee was set up consisting of representatives of the AUVA, PVA, the Chamber of Labour, the Federal Economic Chamber, the Federation of Austrian Industries and the Austrian Trade Union Federation as well as the project leaders. This committee takes the most important decisions regarding implementation of the program.

Objectives

The “Fit for the Future – Maintaining Work Ability” program is meant to support the maintenance and promotion of work ability of workers and employees in industries where demands on health are high.

The program’s targets are to:

- prove that work ability can be maintained or even enhanced
- prove that disability can be reduced
- develop a tool kit with successful measures and methods
- publish the results as encouragement to other companies.

Material and methods

Twenty companies from highly demanding industries agreed to participate in the program, they are as follows:

1. Construction: Strabag, Habau including Held & Francke, Hentschläger, Staudinger (the latter two are part of the Austria Bau Group)
2. Trade: H&M
3. Iron and metal industry: Schinnerl, Liebherr, ABO, Julius Blum GmbH
4. Hotels and restaurants: Sana GmbH
5. Cleaning and waste disposal: Saubermacher
6. Transport: Blaguss Reise GmbH
7. Health: Premiamed Group, Haus der Barmherzigkeit Group, Krankenhaus der Barmherzigen Schwestern (Vinzenz Group, hospital), UKH Salzburg (accident hospital), Rehabzentrum Großgmain (rehabilitation centre), Caritas Socialis, LKH Hartberg/KAGES Stmk
8. Österreichische Post AG / Paketlogistik Österreich (PLÖ) Eastern Region (Austria Post, parcels & logistics)

These companies have committed to participate in the program for four and a half years. They have widely differing staff numbers and structures (e.g., H&M has a staff of 2,500 and shops all over Austria, whereas Schinnerl GmbH has a staff of 100 and one site in the small town of Tulln).

The process in the companies:

- August to November 2008: the analysis was started after an intensive awareness-building phase had taken place, in which for example the concept of work ability was discussed so as to agree and settle on one common concept of the term throughout the company.
- November 2008 up to March 2009: By using standardized processes and analysis tools like the WAI Plus the basic work ability status of the companies was analyzed and assessed how much work ability is hampered or promoted.
- From April 2009 on first measures were and are still being implemented to improve work ability aiming at corporate culture, structures and process as well as staff behavior.
- From October 2010 to February 2011 the companies will evaluate the status of work ability with the WAI Plus and enter the second phase of the interventions. Measures are adjusted according to the results.
- From January to March 2012 a third and final evaluation with the WAI Plus will take place.

The support and consulting process adheres to the following two principles:

Involving staff as experts on their world of work, and creating a learning organization, i.e., binding know-how to the company and spreading it throughout the company via multipliers.

The following analysis methods are used in the analysis/evaluation phases:

- semi-structured interviews discussing aspects of work ability and ageing
- workshops with managers, workers' representatives and multipliers
- focus groups with staff members
- analysis of the companies' age structure – status-quo and forecasts for five and ten years to come
- collection of further structural data of the companies
- analyses of workplaces and work processes and their ergonomic design
- survey among the entire staff with the Work Ability Index Plus™, an extended version of the Work Ability Index. The core of the analysis is this Work Ability Index Plus™ (WAI Plus).

The key part of the questionnaire is the original WAI (2nd edition; Tuomi K, Ilmarinen J, Jahkola A, et al: 1998) (1), the Freiburg Complaints List (Fahrenberg; 1975) and additional tested questions covering various new dimensions of work ability according to the model “House of Work Ability”. The questions are designed to cover the various dimensions of the work ability house along the same guidelines as for the WAI (people subjectively assess how they cope with demands). Specific aspects or items were chosen that had been tested in practice for many years, for which we had benchmark figures from the WAI and where therefore retest reliability was high (evaluation by IBG, 2008).

With the existing data from the first analysis scales for the dimensions health, competences, values, interest in work, co-operation, work conditions, management role are being developed.

After the final data evaluation in 2012 the WAI Plus questionnaire will be finalized.

Covering all work areas, the companies are fully evaluated three times with the WAI Plus; a maximum of 12,500 data points can be collected per run. In order to guarantee the anonymity of the questionnaire, the staff member will be asked to create a unique code according

to instructions provided. Only he will know his code and he will have to use it again for the second and third surveys. This will allow us to compare data and thus ascertain how work ability has developed.

Results

The workers evaluated in the first analysis showed on the whole fairly good average WAI scores of 40.8 (f: 40.5; m: 41.2). WAI scores decreased with age, low qualification, amount of night work, length of working hours, lack of support from superiors and negative social relationships.

Roughly eight of the employees had critical WAI Scores. In many companies, especially in the health sector, emotional and psychical stressors influenced work ability more negatively than physical impacts.

Of the sample, including also people under 30 years of age, 8% had decided to quit their current job. Of workers between 55 and 59 years of age, 20% and of those aged 50–54 years 8 % decided to retire in the next few years.

Lifelong learning and perspectives to develop until retirement have not been achieved so far.

Based on the first analysis, work ability experts and the project managers jointly developed measures to recover, maintain and promote work ability.

The intervention and support measures taken within companies are targeted at work culture, structures, processes and behaviors. They are well tailored to the specific situation and needs of companies and employees.

All in all, the aims are the maintenance and promotion of work ability through active and holistic health and work ability management. This implies, above all, that health, healthy ageing and work ability become strategic management tasks.

The following measures were in the first intervention phase standard, thus obligatory, for all companies:

- awareness building throughout the personnel
- training for managers and leaders in age management and work ability (especially considering appreciation at work)
- training for occupational health experts, i.e., the company doctor and work psychologist in particular, in work ability (work ability coaching)
- work ability coaching or ergonomic training for workers and employees to make them learn how they themselves can contribute to maintaining or improving their health and work ability.

All other modules are optional and also depend on the findings of the ongoing analyses; they range from the development of healthy work-time schedules that take account of the varying needs of the different age groups to the ergonomic redesign of the workplace, night shift training, and concepts for regeneration and so on. Two thirds of the measures are aimed at working conditions and one third, at most, at behavior.

After the second analysis with the WAI Plus (October 2010-February 2011) a second round of interventions and measures will take place.

Discussion

The program was introduced in the companies by the end of 2008. Final results, including the Work Ability Index Plus™, will be published in 2012 and incorporated into a program that will eventually become standard.

The 20 pilot companies serve as models of good practice for other companies in their industry sectors. They are intended to encourage others and demonstrate that investing in the maintenance of work

ability pays off. Beginning in autumn 2009, regular industry-specific events to publicize and present the results and findings have been organized in co-operation with the ÖPWZ (Österreichisches Produktivitäts- und Wirtschaftlichkeits-Zentrum, the Austrian Centre for the Improvement of Productivity). Yearly a large-scale conference on this topic takes place in Vienna.

The Work Ability Index Plus Model was also presented at the European Forum Alpbach in 2009.

Reference

1. Tuomi K, Ilmarinen J, Jahkola A, et al; Work Ability Index. 2nd edition. 1998.

Work Ability Coaching – a new tool encouraging individuals, businesses and industries to handle the demographic change process

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Abstract

Because of today's urgent workforce problems, the new Work Ability Coaching consulting tool is currently attracting a considerable amount of attention. Its use in practice is increasing. The initial evaluation report, which has now become available, indicates that Work Ability Coaching is suitable for motivating both individuals and company executives to develop and implement work ability promotion measures. The scope of the measures currently focuses strongly on personal and corporate factors influencing work ability. These results rely on providing consultants with good quality training in the use of the tool and ensuring that its use is quality-assured.

Key terms: occupational work ability promotion, empowerment, consulting tool

Introduction

Background: Demographic change – the challenge for workers and managers

Demographic change is becoming increasingly evident in many countries. More and more managers are beginning to realize that their workers and the pool of labor available to them are on average growing older. Because of the drop in the number of career entrants and the increase in the number of people reaching retirement age, businesses are employing people in all age groups. How can we meet the economic challenges with an ageing workforce? How can a business attract career entrants and career changers, and how can it develop a sense of loyalty among its new people? How will workers manage to continue working for longer, given the large numbers of people already being forced to take early retirement for health reasons?

If workers are in future expected not only to “keep going” until retirement age but to actually contribute to their employer’s success effectively, willingly and in good health until they retire, it will be necessary to encourage the promotion of work ability and to put appropriate promotion measures in place at an early stage and on an ongoing basis.

The theory of work ability

Good work ability has as little to do with chance as has bad fate. Both are the result of numerous factors that can be influenced. This knowledge can fundamentally change the way businesses look after their employees.

The concept of work ability is based on studies and promotion programs initiated by the Finnish Institute of Occupational Health in the 1980s (1). The key elements of the concept, which lays down standards below which regular human resources work and employee care, occupational safety and health promotion should not fall, are as follows:

1. Work ability is not exclusively about personal behavior but is an interplay between worker and work.
2. Because of the physical, mental and social changes people undergo in the course of their 40–45 years of working life and the ongoing technological, organizational and social changes in the working environment, work ability is not a stable factor in any employment situation. In order to prevent crises in work ability, it is necessary to regularly balance out the two factors.
3. According to the current state of research (2), the constituent parts or decisive factors of work ability are:
 - a) the person's functional capacity (particularly their physical and mental constitution)
 - b) the person's professional competence (abilities, skills and knowledge gained through experience)
 - c) the values and attitudes the person develops towards their work and their employer
 - d) the work demands
 - e) the compatibility between work and private wishes and commitments (work-life balance)
 - f) the general social conditions in which the person finds themselves.
4. As our experience in consulting has taught us, these elements of work ability can be influenced by interventions on the part of both the person themselves and their employer:

| Elements of work ability | Intervention by the employer | Intervention by the person |
|---------------------------------|--|--|
| Functional capacity | Occupational health and safety, health-related offers at work | Personal health promotion |
| Competence | Human resources development and career opportunities | Personal education and training, career planning |
| Values and attitudes | Social climate and corporate culture; management organization | Social behavior, communication |
| Demands of work | Work organization and design | Working healthily |
| Work-life balance | Facilitating a work-life balance | Demand for and uptake of offerings, options |
| General social conditions | PR work for business and profession; corporate social responsibility | Active, self-assured citizens and workers |

5. Promoting work ability successfully and sustainably is much more likely to succeed if intervention takes place on all levels and if both employers and workers play an active role in it.
6. The status and development of work ability are not simply a question of a person's calendar age but depend much rather on the quality of the various elements and in particular on the organization of the person's work and that of their company. This also means that there will be greater differences in work ability between individuals than between age groups.
7. The development of work ability can be visualized with the Work Ability Index. This tool visualises the fit or lack of fit between the two factors of individual capacity and work, established in a confidential, personal setting for the worker and as an anonymised workforce indicator for the employer.

However, we believe that the widespread use of the Work Ability Index as an evaluation tool in many European businesses has regrettably pushed the intervention potential of the concept of work ability for workers and employers into the background, or at least has not helped

it to gain the necessary acceptance. The (sometimes contradictory) critical examination of the exclusive use of the Work Ability Index was what prompted us to develop the *Arbeitsbewältigungs-Coaching*® (Work Ability Coaching) consulting tool (4, 5).

Methods

Development and use of the consulting tool

The development and testing of the Work Ability Coaching tool as a combination of the Work Ability Index and a coaching module based on the concept of promoting work ability took place within a research project entitled “*Partizipation und interaktive Interdisziplinarität für eine zukunftsfähige Arbeitsforschung – PIZA*” (Participation and an interactive interdisciplinary approach for sustainable work research) funded by the German Federal Ministry of Education and Research (2002–2005) (6).

The consulting and research team asked how the concept of promoting work ability could be used more efficiently to master the demographic challenges and how it could be presented in a way that empowers both workers and managers. The prototype of a process consulting tool with the following features was developed:

- It is based on scientific knowledge.
- It places the work ability promotion model at the center of the consulting activities and uses the measurement tool purely as a visualization tool to support workers and employers in what they are doing themselves.
- It initiates a development process in the company concerned, where both the individual worker and the human resources and company managers are encouraged and enabled to put concrete promotion measures in place to maintain or support the worker's work ability and that of the workforce as a whole.

- It is a quality-assured consulting process which is based on the success factors of the European Network for Workplace Health Promotion (systematic, participative, goal-oriented, feasibility-tested and integral).

The Work Ability Index is used to analyze and visualize the current work ability situation. The presentation of the results is intended to raise awareness and to facilitate self-monitoring. This is followed by an individual coaching interview based on the promotion model, in which workers are shown how to formulate their own action plans and express their needs to their employer and to plan the first steps in implementing them. This results in an individual, needs-based work ability promotion plan, drawn up by the workers themselves to achieve their own work ability promotion and protection goals. Thus Work Ability Coaching entails empowerment, or expressed in another way: encouragement to self-regulate. It can be understood as a radically participative approach, since the process consulting work starts with the individual but does not stop with them. Work Ability Coaching is a multistage process consisting of two core modules which follow on from one another:

- a) Personal Confidential Work Ability Coaching for workers (approx. 60 minutes per person)
- b) Corporate Work Ability Workshop for decision-makers (approx. 4 hours)

In the corporate workshop, the anonymous summary of work ability values and the promotion themes raised by the participants in the Personal Confidential Work Ability Coaching session are presented and explained to the corporate decision-makers. This is followed by a moderated discussion intended to result in the agreement and implementation of at least one goal-oriented promotion measure that is feasible for the company (ideally on all action levels see elements of work ability).

Work Ability Coaching is carried out by a team of highly qualified confidential consultants . There are currently about 350 trained experts in Austria, Germany and Switzerland. The Work Ability Index questionnaires and the coaching documents are evaluated confidentially outside the companies by external consultants in accordance with the data protection provisions.

Results and Discussion

Output and outcome evaluation of the consulting tool

The Work Ability Coaching consulting tool was developed, tested and evaluated in a longitudinal study from 2003 to 2009 in collaboration with homecare organizations and their workers in Rhineland-Palatinate (Germany). As a result, knowledge is now available on the development and influencing of work ability in homecare over a period of seven years.

In the initial promotion phase (2003 to 2005), various studies were performed to evaluate work ability in eight care services with a total of 224 workers (7), albeit without specific interventions, as part of the PIZA project funded by the German Federal Ministry of Education and Research (BMBF).

As a result of the ongoing topicality of the subject and the activities of the Rhineland-Palatinate Ministry of Labour, Social Welfare, Health, Family and Women (MASGFF), the decision was taken to continue the project. In 2007 the MASGFF decided to support the development of the work ability of its care workers and the sustainability of its homecare services for a further three years, subject it to a longitudinal study and support it with interventions. As far as the choice of methods was concerned, the tools used in 2003 and 2005 were to be used for data comparability purposes, while the enhanced Work Ability Coaching intervention method was to be used for individuals and businesses for the first time. Five homecare organizations from the initial group took part in the continuation study from 2007 onwards. At the time of the

effectiveness evaluation in mid-2009, 248 employees were involved. Workforce sizes ranged between 8 and 121 people. In 2009 the average age was 47.9. The biggest age group, representing 34%, was 45 to 54-year-olds: more than half of all workers were aged over 44, and just 16% were below the age of 34.

The remarks below explain the results of the output and outcome evaluation of the consulting tool (8).

The complete Work Ability Coaching program was implemented twice among the care services in the second promotion phase (2007 and 2009). Forty-one percent of the workers, managers (including directors, executive managers and care service managers) and workers' representatives took part.

To ascertain what output in relation to work ability promotion activities for workers and in the care services could be triggered for the workforce by Work Ability Coaching, the workers who participated on both survey dates were asked how many promotional needs they had formulated in 2007 and to what extent these needs had been met either by themselves or by their employer. The repetition in 2009 reached a total of 63 workers from the five cooperating organisations who had participated in 2007. On average, these people had made 1.7 work ability promotion plans of their own. They reported that two thirds of these individual promotion measures had been implemented. The respondents' reviews also showed that a relatively high proportion (65%) of the average of 2.8 promotion themes per person that had been addressed to their employer had also been achieved. Implementation levels differ between the participating organisations.

The second evaluation question focused on the outcome of the promotion process on the evaluation of operational changes in terms of promoting work ability and the health of those involved.

Positive developments can be identified in the areas of occupational training, changes in the organization of work and the work atmosphere. Clear negative trends were described in terms of working conditions at clients'/patients' homes and cooperation with other professions.

The intensification of communication within the company and the discussion of joint promotion measures and individual promotion plans seem in general to have led to an improvement in working conditions. Work Ability Coaching did not reach decisive factors outside the company, however.

Based on the frequency of current medical diagnoses, health problems increased over the two intervention years. However, this did not lead to a reduction in the work ability of those involved. We ascribe this circumstance to the promotion activities undertaken. Overall, the work ability of the 24 workers who took part on all four study and intervention dates developed as follows: Their work ability increased on average between 2003 and 2005, it fell significantly between 2005 and 2007, and this downward trend continued to a lesser extent between 2007 and 2009.

Table 1. Overall development of the Work Ability Index of participants in 2003, 2005, 2007 and 2009.

| | 2003 | 2005 | 2007 | 2009 |
|---|------|------|------|------|
| Work Ability Index (WAI) (range; 7 – 49 points, good work ability; 37 – 43 points) (n=24) | 40.1 | 41.3 | 39.1 | 38.5 |
| SD | 3.9 | 4.7 | 6.0 | 5.1 |

Conclusions

Because of today’s urgent workforce problems, the new Work Ability Coaching consulting tool is currently attracting a considerable amount of attention. Its use in practice is increasing, thus permitting further evaluation to be made. The initial evaluation report which has now become available indicates that Work Ability Coaching is suitable for motivating both individuals and company executives to develop and implement work ability promotion measures. The scope of the measures currently focuses strongly on personal and corporate factors influencing work ability. External factors have not as yet been explored sufficiently.

These results rely on providing consultants with good quality training in the use of the tool and ensuring that its use is quality-assured.

Further evaluation projects and ongoing quality assurance are necessary in order to enable the expectations to be met.

References

1. Ilmarinen J. Towards a Longer Worklife. Ageing and the quality of worklife in the European Union. Helsinki: FIOH Bookstore; 2005.
2. Gould R, Ilmarinen J, Järvisalo J, Koskinen S. Dimensions of Work Ability. Results of the Health 2000 Survey. Vaasa: Waasa Graphics Oy, 2008.
3. Tuomi K, Ilmarinen J, Jahkola A, Katajarinne L, Tulkki A. Work Ability Index. (*Arbeitsbewältigungsindex*) Dortmund/Berlin, 2001.
4. Federal Institute for Occupational Safety and Health. Strengthen the Individual, Save the Company. Work Ability Coaching: An Answer to New Challenges. (*Das Individuum stärken, die betriebliche Zukunft sichern! Arbeitsbewältigungs-Coaching® als Antwort auf neue Herausforderungen.*) Dortmund, 2009.
5. Gruber B, Frevel A. Work Ability Coaching. New Tool for New Challenges. Manual. (*Arbeitsbewältigungs-Coaching®. Neue Herausforderungen erfordern neue Beratungswerkzeuge. Handlungsanleitung.*) Dortmund: Report 38, published by the Federal Institute for Occupational Safety and Health, 2009.
6. Arbeit und Zukunft e.V. (pub.): Changing Dialogues. Participative Work Design – Preconditions, Methods and Experiences for a Sustainable Work Research. (*Dialoge verändern. Partizipative Arbeitsgestaltung – Voraussetzungen, Methoden und Erfahrungen für eine zukunftsfähige Arbeitsforschung*) Cologne (Wissenschaftsverlag) 2006
7. Ministry of Labour, Social Welfare, Health, Family and Women (MAS-GFF) of the German State of Rhineland-Palatinate (pub.) / Arbeit und Zukunft e.V.: Healthy Workers and Good Quality of Service in Homecare Services. (*Gesunde Beschäftigte und gute Servicequalität in der ambulanten Pflege.*) Mainz: *Reports from care*, No. 4, 2005.
8. Ministry of Labour, Social Welfare, Health, Family and Women (MASGFF) of the German State of Rhineland-Palatinate (pub.) / Arbeitsleben KG: Coping with working conditions in Homecare Services. PIZA-Longitudinal Study 2003-2005-2007-2009. (*Arbeitsbewältigung in der ambulanten Pflege. PIZA-Längsschnittstudie 2003-2005-2007-2009.* Mainz, 2009. Download 15 May 2010: http://www.arbeitsleben.at/cms/images/stories/endbericht_piza_ii_2009_endfassung.pdf.

A German program to promote cognitive capacities of aging workers in the car industry

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Abstract

PFIFF is a program for promoting cognitive capacities of aging employees. The first step (PFIFF I) was focused on (a) development of a workshop concept, (b) preparation of workshop material for trainers and trainees and (c) development of a cognitive training program, (d) accompanying research (literature review and neurophysiological/ neuropsychological studies). The second step (PFIFF II) is focused on cognitive training and evaluation. The effectiveness of the training will be evaluated as well as the whole process of implementation (motivation to participate, reasons for non participation, satisfaction with the training program).

Key terms: Cognitive training, aging employees, evaluation

Introduction

This project PFIFF is focused on the cognitive capacities of aging employees. There is no doubt that cognitive capacities are an important part of work ability, which is the key issue of this conference. PFIFF stands for the German words “Programm zur Förderung der Intellektuellen Fähigkeiten für ältere Arbeitnehmer” (“Program for promoting intellectual capacity of aging workers”). This project was promoted and managed by the Federal Institute for Occupational Medicine (BAuA) and the Initiative of New Quality of Work (INQA) – an Initiative of the German Ministry of Labour and Social Affairs. It was lead by IfADo- the Leibnitz Research Centre for Working Environment and Human Factors in cooperation with our institution.

Project partners are the University of Bochum, the Society of Brain Training and the OPEL car company.

PFIFF was initiated because (1) cognitive demands are becoming more and more important in our information and communication society. Multitasking demands, flexible work, problem solving and learning require good cognitive capabilities of employees, (2) cognitive capacities change with increasing age, particularly the so-called fluid intelligence. Fluid intelligence refers e.g. to the ability to react quickly to stimuli from the environment or to react flexibly to changing work demands. By contrast, crystalline intelligence (e.g. experiential knowledge) may improve with increasing age and (3) age-related decline can be influenced and counteracted using protective factors or cognitive training. The efficiency of cognitive training for improving cognitive capacities will be evaluated in this project.

Objectives

This project is implemented in two phases: PFIFF I and PFIFF II (Figure 1). The main purpose of PFIFF I was to develop a scientifically based program for improving the cognitive capacities of aging

employees. PFIFF I lasted from May 2007 to December 2008. PFIFF II is focused on the implementation and evaluation of the program developed in PFIFF I. PFIFF II is still in progress and will last until March 2011.

Methods

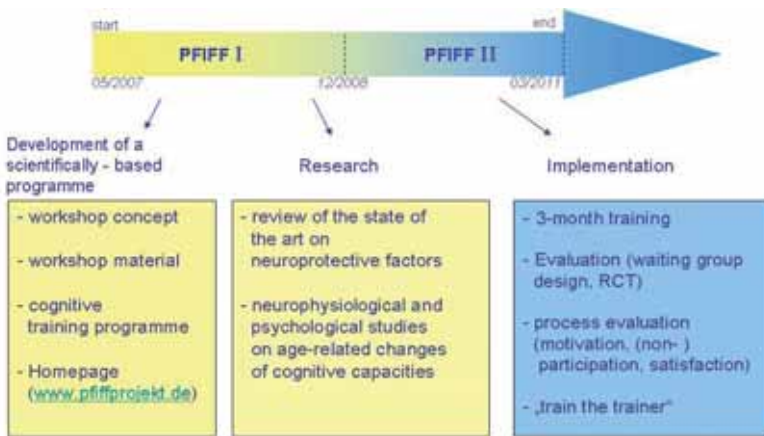


Figure 1. PFIFF work packages

PFIFF I consisted of the following work packages: (a) development of a scientifically-based workshop concept, (b) preparation of workshop material for trainers and trainees and (c) development of a cognitive training program, (d) accompanying research. Additionally, the homepage www.pfiffprojekt.de and the brochure “Geistig fit im Beruf” were prepared (available only in German).

Accompanying research was focused on a review of the state of the art regarding neuroprotective factors which may prevent cognitive decline with increasing age and on neurophysiological/neuropsychological

studies. The literature review provided the basis for the development of a scientifically-based workshop concept.

The neurophysiological/ neuropsychological studies were carried out in the OPEL car company. We wanted to know whether workers of different occupations differ in their cognitive capacities and in their ability to process information from the environment. We compared OPEL workers with monotonous work demands and workers with flexible work demands, particularly workers from assembly lines versus workers from quality assurance, maintenance or services. Altogether 91 male subjects were involved in these studies.

PFIFF II, which is still in progress, is focused on implementation and evaluation. The most important part of implementation is the cognitive training which lasts altogether 3 months. The effectiveness of the training will be evaluated, likewise the whole process of implementation. We will obtain information about the motivation of the OPEL workers to participate in the cognitive training program, the reasons for non-participation and the workers' satisfaction with the training program.

Another step during the PFIFF II period is to train facilitators to introduce the PFIFF concepts in other companies.

Results

The *workshop concept* was developed on the basis of the results of the literature review of neuroprotective factors of cognitive aging. The individual workshop modules focus on factors influencing age-related changes in cognitive functions. E.g., it is known that stress (esp. chronic stress) influences the development of cognitive capacity. The scientific findings on the relation between stress and cognitive capacities are summarized in the workshop module "Stress and stress coping" and will be disseminated during the workshops.

Another workshop module is focused on the role of nutrition and sport in cognitive functions. The workshop module "Cognitive capaci-

ties and working conditions” provides information about protective and inhibiting factors at work (e.g. work design, qualification, monotonous working conditions) for cognitive capacities. The workshop module “Cognitive training” provides knowledge about the role cognitive training and cognitive training strategies for improving cognitive capacity. The workshop modules and the workshop material can be found on our PFIFF website www.pfiffproject.de.

The *cognitive training program* consists of different training modules (Fresh-Minder 2, brain-jogging 1-3, USM Brain Trainer, Ahano PEDS 3, Happy Neuron CD 1 – CD 5) which focus on training of different cognitive domains. E.g., the Fresh minder 2 program is for improving short and long term memory, concentration, and divided attention. The USM Brain Trainer was focused on the velocity of information processing, memory, reaction time, and special attention. The Happy Neuron program is focused on memory, concentration and vocabulary.

Neurophysiological research was focused on whether workers in different occupations differ in their cognitive capacities and the underlying processes of information processing. Specifically we wanted to know whether monotonous repetitive work affects information processing in comparison to flexible work. Bioelectrical brain activity, particularly the so-called Event Related Brain Potentials (ERPs) were analyzed because cognitive processes are accompanied by measurable changes in bioelectrical brain activity. ERPs give information about the stage of information processing. They reflect brain functions, like attention, working memory, inhibition of reactions, flexibility, or error processing, which are important for our everyday work.

We investigated four groups of subjects: younger and older assembly line workers (monotonous work) as well as younger and older workers with flexible work demands (quality assurance, maintenance or services).

Figure 2 shows one example of the results (Gajewski et. al. 2010) obtained in a task switching paradigm. These tasks require good working memory and the ability to react flexibly to changing task demands. The

left figure shows the so-called P3 component, which reflects working memory capacity. This component is lowest in older assembly line workers (black curve). This means that working memory is impaired in comparison to younger subjects from the flexible working group (blue curve). The right figure shows the so-called error-related negativity. This component reflects the capability to detect errors a subject has made previously. This function, too, is impaired in the older assembly line workers (black line).

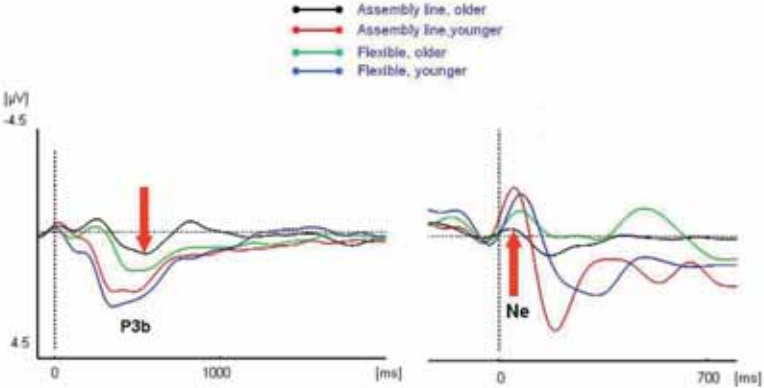


Figure 2. ERP data (description in the text).

The *evaluation of the effectiveness of the cognitive training* will be conducted on 126 volunteers who were randomly allocated to a treatment and a waiting-list-control group. The study design is illustrated in Figure 3. The intervention group performed neuropsychological tests at the beginning (T 1) of the training period. Then the treatment, e.g. the cognitive training, will start. Furthermore, subjects must complete a questionnaire for process evaluation to evaluate motivation and satisfaction with the training.

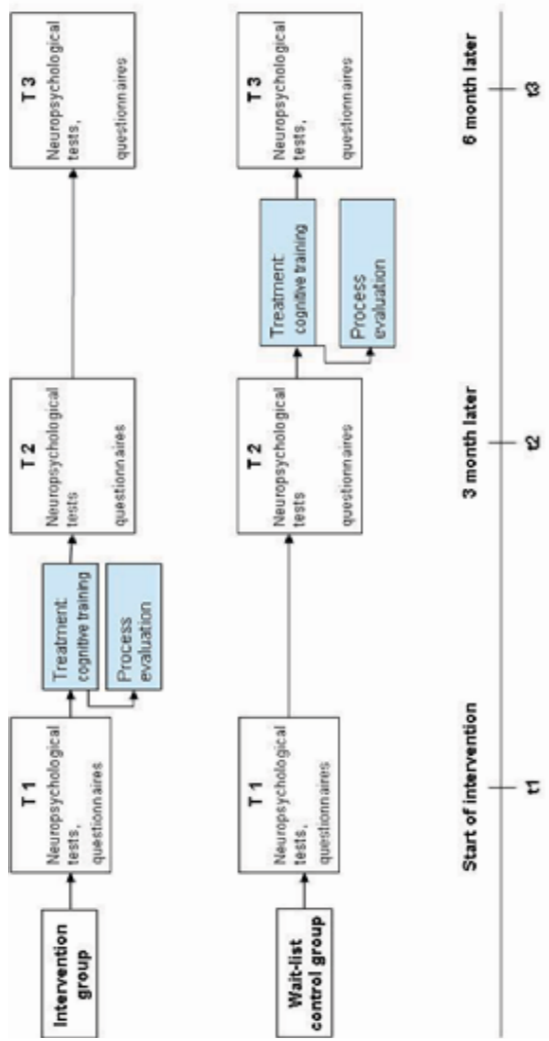


Figure 3. Study design

After training, subjects again perform neuropsychological tests (T 2) to evaluate the effects of the training. The repetition of neuropsychological tests at T 3 is necessary to test the sustainability of the training effect.

The waiting-list group has also to perform the neuropsychological tests at T1. They have to wait until T 2, where subjects have to perform the neuropsychological tests again to analyze the effect of time (without treatment). Then they go through the cognitive training and at time T 3 subjects do the neuropsychological tests a third time.

Conclusions

There is a great need to implement measures to improve the cognitive capacities of aging employees. The combination of research and implementation of scientific-based measures for cognitive improvement is a successful approach in increasing the commitment for participation in the companies.

References

1. Gajewski, P.D.; Wild-Wall, N.; Schapkin, S.A.; Erdmann, U., Freude, G.; Falkenstein, M.: ERP correlates of working memory and error monitoring in young and middle aged workers assessed by task switching. *Biological Psychology* 2010, in press.

New engineers are needed – how a consulting business gained the experience to activate retired engineers

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The issue

Age Management has recently been discussed in Sweden. Research and follow-up studies have been carried out. A number of companies have applied different programs to deal with elderly employees. The companies have been aware of the coming situation regarding lack of competence because of the number of forthcoming retirements and the smaller generations coming in to the labor market. Many young people are currently entering the job market in their thirties while the dependency ratios are rising, meaning that fewer people have to provide for more people. There is consequently a risk of a shortage of competence in the coming years and in the availability of skilled workforce. On the other hand, the average life expectancy is increasing and more people want to prolong their working life beyond the normal retirement age. In many companies and in society there is a consensus about the need for a greater participant ratio among the elderly on the labor market.

To get a grip on the issue among our organizations thoroughly prepared measures are needed in order to achieve age management.

Background

Epsilon in Sweden is a consulting business in technology and system development supplying a large part of Swedish industry. The Epsilon staff consists of about 1,000 employed consultants.

The subsidiary company, Epsilon Arena AB, has its main operation in two areas. One is futures, i.e. the young generations arriving on the job market and searching for their first job. The other area is the retired work force – or in Epsilon’s terminology, the “Emeritus”.

The business idea is to market Emeritus consultants to the existing customer base. A competence data base which contains skills, competencies and employment history as well as interests and which form of work is preferred, is central in the business. Epsilon can match the enterprises’ competence with their customers’ demands and needs and bring about new working commissions.

Epsilon has now accumulated the experience to convert the research findings into a practical system operating on market conditions. This is a kind of bridging project for retired engineers and can give them a new career where they can contribute with their knowledge and experience to their own individual benefit but also for Epsilon as well as society as a whole.

When in 2007 Epsilon looked into the demographics of its own employees this also triggered an interest in the larger demographic picture, especially for engineers and system developers in Sweden. In 2008, a study of attitudes related to work, experience and age was initiated as a panel study (1). Three different groups were defined in the study:

1. Students (Active students in engineering and IT/system development)
2. Active Engineers (Age < 55 with working life experience in engineering or IT)
3. Senior Engineers (Age 55–67 with working life experience in engineering or IT)

Some of the findings from this study had an impact on how Epsilon proceeded. These were:

- The interest in continuing work after retirement was great among the senior engineers; 63% in the group were very interested in continuing working.
- Interesting work content, flexible hours, the possibility to keep up social networks and the ability to contribute with experience were the most important factors for a job opportunity to be of interest.
- The persons who expressed a willingness to continue working after retirement gave a mean time of 20 h/week as a measure of how much they wanted to work.
- Interest in work was lowest during the summer months of the year.

Being a consultancy company with customers in a wide range of industries, Epsilon identified a high potential to fulfill many of the factors identified by the senior engineers to make work after retirement interesting for them.

By attracting senior engineers interested in work when their respective competencies are sought after by Epsilon's customers, Epsilon also increased its ability to deliver competencies into new areas and could also meet part-time assignment requests in new ways. The ability to find the competence that the customers want in the right "time-slot" as well as the ability to cost effectively deliver less than full-time assignments was seen as critical business abilities for Epsilon and are therefore highly desirable.

In a separate work, the differences in motivation and driving forces between different age groups were studied on Epsilon's assignment by Kairos Future (2). Flexible working hours and the option to work part time are also listed in this work as the most important factors for being interested in continuing work after retirement together with factors such as lower tax and less demanding work assignments.

Epsilon Arena and career partner networks

With the findings from a panel survey confirmation of the interest to continue working after retirement among retired engineers in Sweden was seen and a decision was taken to act on these signals. Epsilon Arena AB was formed as a subsidiary company within Epsilon with the assignment to develop and manage a network of retired and soon to be retired engineers with an ambition and willingness to continue to act in Swedish industry after their formal retirement. The network named “Epsilon Emeritus” is one of the components in Epsilon’s ambition to become an attractive “career partner” for Swedish engineers.

The term networking is used for people who are not permanently employed by Epsilon but who have expressed interest in assignments as technical consultants in the field of personal technical expertise.

Beside the network for retired engineers “Epsilon Emeritus”, a network for engineering students and recently qualified engineers was also formed under the name “Epsilon Future”. “Epsilon Partner” is a network for self-employed consultants acting in their own company and having an interest in finding assignments through Epsilon. Finally, Epsilon Arena AB is also responsible for building up a network of former employees, “Epsilon Alumni”.

Membership of a network is based on active registration in the network, which is done through Epsilon’s Internet homepage. After the first step of registration, login information and descriptions of Epsilon’s intranet and competence database are mailed to the network member and access to Epsilon’s systems is granted. This access means that the member of a network can see news published in the network, use the forum channels for the network, search and see contact information for other network members and provide data on his or her professional profile regarding competence and experience for the competence database. The network member can see all open assignments where the salesperson responsible has not yet found a suitable and available consultant profile through searches in the competence database. Indication of interest in

an open assignment can be registered by the network member through contact with the salesperson by phone or e-mail.

Combining future and emeritus consultants

With the two networks handled within the same company, we see a unique opportunity to connect engineers at both ends of their respective careers in fruitful collaboration that we see as interesting both for members of the Future and the Emeritus network.

From a previous study we also see that the interest in finding a mentor with sound experience of Swedish industry from the Emeritus network is large. Seventy-three percent of students expressed high or very high interest in the opportunity to find a mentor with relevant work life experience.

Occupational pension and social system

A common obstacle when considering employment of an older person in the engineering field in Sweden is that the pension cost in the collectively bargained additional pension in the occupational pension system may in some situations be high. Also, to be able to find out what pension costs an employment will have, a quotation from the organization that handles the occupational pension is needed. This means that there are some obstacles that have to be addressed when considering employing an older engineer. If nothing else is agreed, employees born after 1979 fall under the rules of the occupational pension agreement, which is a foreseeable cost for the employer.

Therefore, the company Epsilon Arena AB was formed as a company, where the occupational pension costs are based only on salary regardless of the age of the employees. This removes the obstacles when employing under the ITP2 systems. This is seen as necessary to be able to handle temporary employments of people who qualify for collectively bargained additional pension under the occupational pension system.

Occupational pension supporting systems and quality assurance

The ability to host networking consultants within Epsilon is based on the system support that has been built up around the traditional consulting business. The scalability of the systems and the ability to handle large networks with little additional overhead cost is crucial.

Through an intranet which is the same as that used for employees in Epsilon's other subsidiaries with different access for different user types and groups, web based communication can be maintained with a large number of network members. Communication between the members can be supported and informal networks based, for example, on geography, competencies, general interests etc. can be formed. The "heart" of the supporting systems is the Competence database. It has several thousands of special competencies where each networking is graded and searchable in combination with industry experiences. The content of the competence database is used in all searches for competence that are performed by Epsilon salespersons and managers.

The intranet also provides access to an E-learning platform (LMS), access to e-mail, time reporting system and payroll information. The access level to these systems all depends on whether or not a person is currently working for Epsilon's customers.

When expanding with networks there is a challenge to personal relations and knowledge of "softer" factors for the networking members. To be qualified to take on assignments as a networking consultant a quality assurance process is linked to each networking consultant.

The first step in the quality assurance process is that all mandatory parts of the competence database have been filled with data. This gives the network member the status named "*Interested*" which is visualized by one of three stars being lit. The status can be seen both by the consultants themselves and also by all Epsilon managers and salespersons.

The second step of the quality assurance process is the status named "*Qualified*". This status implies that the network member has been interviewed by an Epsilon manager and this manager has entered

a comment in the Competence Database that can be seen by fellow managers. Usually this is performed for a specific assignment but can in some cases be performed without a specific lead if the competence profile is seemed highly interesting. The status is visualized by two of three stars being lit.

The third and final step in the quality assurance process is the status named “*Verified*”. This status implies that the consultant has performed a consultant assignment through Epsilon with good results and a satisfied customer. The status is visualized by three of three stars being lit.

It was found out that the retired engineers have seldom or never written a CV during their career it may be quite a challenge to know the exact years in different employments and assignments. Creating a good CV to market them in the role as a consultant can therefore be both time consuming and difficult for these people. Although they may have an excellent delivery capacity and be very attractive to organizations where they are well known, this challenge requires some attention when attempting to market senior engineers to new customers as consultants.

Research findings into business

The timing for the start of Epsilon’s Career Partner network has meant both challenges and opportunities. During 2009 the consulting business in Sweden turned down dramatically which meant that the market demand for all categories of technical consultants dropped significantly. This time has been used to recruit into networks and we now see that we have an unsurpassed delivery capacity with more than 4,500 networking consultants to complement our permanently employed staff.

References

1. Epsilon AB Arbetsliv (Epsilon Ltd worklife), Zapera, April 2008
2. Generations, kompetens och värderingsväxling (Generations, competency and changes in values), Kairos Future, 2008

Effects of a 55+ program on sickness absence in the food industry

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Abstract

The aim of the 6-year follow-up study was to analyze the effects of the senior program on sickness absence. In all 129 employees aged 55 years and above participated in the program and 229 employees of the same age in the control group. Sickness absence days and short (≤ 7 days) and long (> 7 days) spells were calculated. After the program the odds ratio for days was 0.834 (0.67–1.04) in the intervention group vs. control group. The OR for short spells was 1.200 (1.11–1.30) and for long spells 0.799 (0.70–0.91). The study suggests that the intervention decreased the risk for long sickness spells.

Key terms: sickness absence, ageing/senior worker, intervention

Introduction

The association between sickness absence and age is a quite widely studied subject. We already know that younger workers have more short sickness absence spells than older ones and, on the contrary, that older workers have more long spells than younger ones. (1–4) Increased sickness absence rates predict worker's early retirement (5). Due to the aging of the population and due to the decrease in the number of younger in relation to older employees it is essential to keep people longer in working life.

In companies many kinds of pilot programs related to health and work ability promotion have been addressed to the older workers, but scientific publications about them are rare. One of the few interventions related to age management is the Vattenfall Age Management Program in Sweden focused on both individual and organizational attributes. At the core of the program was the age management leadership 80-90-100 schedule offered to the employee. The program allowed the participants to work 80 % of his/her working hours while receiving 90 % salary and earning 100 % pension points. This program increased the average retirement age in the company from 58 to 62.5 years over six years. In addition sick leave rates were lower among workers in the 80-90-100 program compared to the company on average. (6) In Finland Abloy Age Master program aimed at extending the working life of the personnel, reducing sickness absence and increasing the appreciation of senior workers and transferring tacit knowledge. The program included supervisory work, work conditions and content, functional capacity, rehabilitation age master holidays, functional events and communication. The aims were achieved; the retirement age increased by three years, sickness absence decreased evenly (especially due to musculoskeletal diseases) and appreciation of aging workers increased. (7)

Objective

Prompted by the outcomes of earlier studies on age management the aim of this study was to examine the effects of a senior program (meant for employees 55 years of age or above) on sickness absence among blue-collar workers in a food industry company.

Methods

The study was based on the data from a sickness absence register in a large Finnish food industry company (total personnel over 2,000) from 2003 to 2008. The information about the workers who participated in the senior program was obtained from the human resources management of the company. The subjects of the study were production personnel (blue-collar workers) 55 years of age or above. These blue-collar workers' work in the food factory is physically demanding including lifting and carrying, repetitive and monotonous movements, complicated working positions, heat, coldness, noisiness, etc. In all 129 employees participated in the program (intervention) and 229 employees of the same age in the control group. About 80 % (n=103) were women in the intervention group and respectively 68 % (n=155) in the control group. The mean age of the study subjects at the beginning of follow-up was 57 years in both groups. The mean of the follow-up was almost 3 years in both groups. The study was approved by the ethics committee of the Pirkanmaa University Hospital District.

Sickness absence was expressed as days and spells with different duration (1–7 days or more than 7 days) in relation to person-years. They were calculated individually one year before joining the program (baseline) and for the time in the program (follow-up). The same factors for the same time were calculated for the control group. The comparison inside the groups was made by comparing sickness absence rates during the follow-up time to baseline absence rates in the year before joining the program (see Figure 1).

| Joining year and number of participants in the groups | | Year of baseline and follow-up years | | | | | | |
|---|------------------|--------------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|
| | | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | |
| Intervention N=129 | Control N=229 | | | | | | | |
| 2004 | n=35 | n=129 | base- line | follow-up | | | | |
| 2005 | n=17 | n=21 | ----- | base- line | follow-up | | | |
| 2006 | n=27 | n=27 | ----- | ---- --- | base- line | follow-up | | |
| 2007 | n=30 | n=28 | ----- | ---- --- | ----- | base- line | follow-up | |
| 2008 | n=20 | n=24 | ----- | ---- --- | ----- | ---- --- | base- line | follow- up |

Figure 1. Study design

Baseline consisted of the sickness absence rate from one year before joining the program, and the follow-up years range from 1 to 5 (mean was 3 years).

Senior program

The senior program was implemented in part of the company in the year 2004 and was meant for employees 55 years of age or above. Other criteria were voluntary participation and working at least five years in the company. If the criteria were fulfilled, the employee had an appraisal with her/his supervisor and the manager of the unit. The decision of approval was made by the production manager or managing director. The program was part of an internal function and was not organized outside the concern by outside consultants.

The program aimed to pay attention to the specific needs of the worker. Also, it included some special benefits (e.g. extra holidays, discussion with a supervisor about work demands and work ability and options to change the content of work and need for rehabilitation or education). There was also wage security, which meant that the wage does not fall lower even if the demands of the work decreased. The

participants of the senior program were also relieved of three-shift work and their circulating in different work posts was minimized. In addition the participants of the program were able to change their holiday pay or extra pay based on a year in service to days off. The option for free or partially free physical therapy with the company doctor's certificate was also one of the benefits included in the senior program.

Statistical analysis

Sickness absence rates of the individual follow-up time were calculated together in both the intervention and the control group. Person-years were also summed up for each individual. From the summed sickness absence rates and person-years we calculated indicators of sickness absence rates by person-year. These variables were used to describe the frequencies and to examine the changes inside the groups (Wilcoxon's test). Sickness absence rates were described by medians and ranges. The investigation of sickness absence between the groups was made using Poisson regression (generalized linear model). Sickness absence days were studied with negative binomial distribution. All the statistical analyses were performed by SPSS for Windows version 15.0.

Results

Basic factors

The study subjects in the intervention group (N=129) had higher sickness absence rates already before the follow-up. In all 19 % (n=25) of the intervention group had no sickness absence days before the follow-up. In the control group (N=229) the proportion was 31% (n=70). During the follow-up these zero values decreased in both groups being 8 % (n=10) and 15 % (n=35) respectively.

Changes in sickness absence inside the groups

The sickness absence days and the short spells increased statistically significantly during the follow-up in the intervention group (N=129).

Differences in sickness absence between the groups

The results indicate that the intervention group had a statistically significant decreased risk (OR 0.80 [0.70–0.91]) in over 7 days’ sickness absence spells compared to the control group (Table 2). On the contrary in short spells (1–7 days) the susceptibility to risk was increased in the intervention group, in which it was 1.20-fold (OR 1.20 [1.11–1.30]) compared to the control group. There was no statistically significant difference between the groups in sickness absence days.

Table 2. Baseline sickness absence spells¹ adjusted associations with sickness absence spells between the intervention group and the control group during follow-up (presented as OR and confidence intervals) analyzed by Poisson regression model. A person-year is in the model as an offset variable.

| Variable of sickness absence | Workers not in the senior program / Control group N=229 | | Workers in the senior program / Intervention group N=129 | |
|---|--|----------|---|-------------|
| | OR | [95 %CI] | OR | [95 %CI] |
| Different lengths of sickness absence spells | | | | |
| 1-7 days | 1 | | 1.200 | [1.11-1.30] |
| >7 days | 1 | | 0.799 | [0.70-0.91] |
| Sickness absence days* | 1 | | 0.834 | [0.67-1.04] |
| ¹ baseline meant sickness absence spells in the year before joining the program *studied using negative binomial distribution | | | | |

Discussion

The main result was that workers in the senior group had lower risk for long sickness absence spells (>7 days) than those in the control group. On the contrary they had higher risk for short sickness absence spells (1–7 days).

The senior workers in the intervention group had higher sickness absence rates before the intervention than those in the control group.

Also, their rates increased more than in the control group. It is possible that workers in the intervention group had more impaired health or work ability which means a healthy worker effect in the control group. On the other hand it is positive that the workers with impaired health or work ability were willing to promote their work ability. It is also evident that if these workers had not joined the program their sickness absence rates would have increased even more. It seems that that the workers in the intervention group did not need so many long sickness absence spells if they had enough short spells. On the other hand in the control group short spells also increased and despite that their risk for long sickness absence spells was higher than in the intervention group. However, it could be positive if increased short spells reduced the need for long sickness absence spells.

Criticism has been leveled at wide-ranging age discrimination in practice, which our studied senior program also partly represents. The criticism points out differences between age groups (in terms of health, well-being, overall performance, personal initiative etc.) are usually much smaller than differences between individuals belonging to the age groups concerned. (8) Programs like the senior program at hand may also yield social identity as an “older worker”, which is found to be related to negative attitudes towards work and on the contrary the organizations which not use age as a criterion for distinguishing between workers enhance positive attitudes towards work. (9) On the other hand, programs directed at older workers may increase positive attitudes towards aging workers, which was also an aim of the human resources management of the company.

The weakness of this study can be found in the inaccuracy in point of time of the year when a worker joined the intervention. We checked that most of the workers joined the program in the early months of the year. Also, the baseline sickness absence adjusted in the statistical model may be skewed by exceptional sickness absence rates. This is quite marginal, but possible if a worker had much more or less sickness absence days than normally in the baseline year. Actually, the strength of the present study was the study design including a control group, which is rarely available in studies based on workplace programs.

Conclusion

The study suggests that long sickness absence spells could be reduced by taking into account individual needs of aging workers.

References

1. Arola H, Pitkänen M, Nygård CH, Huhtala H, Manka ML. The connection between age, job control and sickness absences among Finnish food workers. *Occup.Med.(Lond)* 2003 May;53(3):229–230.
2. Blank N, Diderichsen F. Short-term and long-term sick-leave in Sweden: relationships with social circumstances, working conditions and gender. *Scand J Soc Med.* 1995 Dec;23(4):265–272.
3. Knutsson A, Goine H. Occupation and unemployment rates as predictors of long term sickness absence in two Swedish counties. *Soc.Sci. Med.* 1998 Jul;47(1):25–31.
4. Thomson L, Griffiths A, Davison S. Employee absence, age and tenure: a study of nonlinear effects and trivariate models. *Work & Stress* 2000 01;14(1):16–34.
5. Szubert Z, Sobala W. Current determinants of early retirement among blue collar workers in Poland. *Int. J.Occup. Med.EnvIRON. Health* 2005;18(2):177–184.
6. Mykletun RJ, Furunes T. Promoting health and work ability in Vattenfall AB Nordic, Sweden. In: Kumashiro M editor. *Promotion of Work Ability towards Productive Aging – Selected papers of the 3rd International Symposium on Work Ability, Hanoi, Vietnam, 22–24 October 2007, 2009.* p. 169–175.
7. Ilmarinen J. Towards a longer worklife! Ageing and the quality of worklife in the European Union; 2006.
8. Schalk R, van Veldhoven M, de Lange AH, De Witte H, Kraus K, Stamov-Rossnagel C, et al. Moving European research on work and ageing forward: Overview and agenda. *European Journal of Work & Organizational Psychology* 2010 02;19(1):76–101.
9. Desmette D, Gaillard M. When a “worker” becomes an “older worker” – The effects of age-related social identity on attitudes towards retirement and work. *Career Development International* 2008;13(2):168–185.

National Forum for Well-being at Work

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Introduction

Prolonging work careers is one of the most important and widely accepted societal goals of Finland's policy to meet demographic challenges. The goal is to raise the real retirement age by at least three years by the year 2025 and make people start the work career one year earlier.

Well-being at work means safe, healthy and productive work in a well-led organization performed by competent workers and work communities who find their jobs meaningful and rewarding. Work is seen as a factor that supports people's life management. Well-being includes physical, mental and social well-being at work. (1)

Well-being at work forms a prerequisite for a person to have a real opportunity to choose whether to continue working or leave the life of work. The person should be healthy enough and physically and mentally capable of working. Besides, one has to be motivated to work and stay in the labor market. If a person is not capable of working, it is hardly possible to influence his or her real retirement age by retirement age legislation.

Well-being is also an essential element in improving productivity and the success of organizations. In fact, well-being and productivity and customer satisfaction can be improved simultaneously. Well-being at work also has an effect on individuals, families and larger communities and organizations.

Examples of work life programs conducted in Finland

A series of national work life programs has been a significant Finnish success factor. Finland has a long history of conducting work life programs. They have approached the issue from different angles depending on the circumstances within society. As regards the methods, the programs represented the program policies adopted in the past couple of decades. (2) Alongside management by norms and management by resources, the role of management by information has been recently emphasized, and that is what the different programs particularly aim to do. All programs have been carried out in cooperation with stakeholders.

Programs are an effective way of disseminating national policies into practice. On the other hand, the innovations and analyses concerning new trends as part of programs have contributed to detecting new and emerging areas where action is needed. The concrete objectives of the programs have been utilized widely in setting objectives for public authorities and other organizations, such as research institutes.

The National aging workers program 1998–2001 was the first major work life program. Its goal was to increase the average retirement age and employment rates of over 55-year-olds. The program was successful and attitudes related to ageing workers actually became more positive.

The Well-being at work program 2001–2003 concentrated on the dissemination of techniques and changing of attitudes at the workplace level. Emphasis was put on the prevention of exclusion and burn-out. National accident prevention program 2001–2005 aimed at reducing the number and severity of accidents and occupational diseases.

The Work attraction program 2004–2007 (Veto program) aimed at ensuring citizens' full participation in working life, affecting the extension of working life, improving the reconciliation of work and other areas of life, improving equality, and increasing the attractiveness of work as an option in different situations. Good safety culture was emphasized. (3)

The Finnish Workplace Development Program has been reorganized recently and is part of TEKES, The Finnish Funding Agency for Technology and Innovation. Its goal is to promote operation of enterprises and other work organizations with an eye on simultaneous enhancement of productivity and the quality of working life. Development activities are based on cooperation between the management and staff of the workplaces.

The National Forum for well-being at work as a new concept

The Ministry of Social Affairs and Health, Finland has started a national Forum for well-being at work in order to intensify network cooperation and partnerships aimed at improving well-being at work. The Forum operations are aided by other organizations such as research institutes. The Forum provides a natural and reliable foundation for extensive cooperation by all actors.

The Forum for well-being at work is a component of the Government's Policy Programme for Employment, Entrepreneurship and Worklife. Furthermore, it promotes in particular the development of occupational health care and rehabilitation together with the Policy Programme for Health Promotion. The Forum also creates synergy with the Policy Programme for the Well-being of Children, Youth and Families.

The Forum builds on the heritage of preceding working life programs and makes use of achievements and good practices created during these. The Forum provides a sound platform for broad participation and improves interaction between workplaces and experts. The forum

principle is a flexible approach that enables flexible reactions to major changes on the world scene. The forum comprises a directing council, which includes all the major interest groups. The viewpoint is compatible with the new WHO concept of workers' health. There is also space for contributions from individuals and professionals interested in improving the various aspects of well-being at work. (4)

The objective of the Forum is to boost network cooperation and partnerships so as to make the actions more effective and to achieve common goals. All the people at a given workplace including experts in management and planning of work, supervisors responsible for well-being at work, occupational safety and health managers, occupational safety and health representatives as well as the occupational health care system and other stakeholders are important in promoting well-being at work.

A steering group consisting of representatives of relevant organizations guides the activities of the Forum for well-being at work. Its work groups organize national, regional and local events and projects. The themes dealt with are based on the needs of working life and stakeholders. Typical activities include fairs, seminars, expert meetings, joint open settings for learning, publications, articles, brochures, web service, guidance of research and development, and relevant projects.

Main themes of the Forum

The actual work is organized around four major themes which deal with good practices, combating occupational accidents, managing and alleviating job strain and development of occupational health care services. All individuals and organizations interested in these issues and well-being at work in general are thus welcome to participate in the activities of the Forum.

Theme 1: Activities related to occupational safety are a part of the successful management of a workplace observing corporate social responsibility. The genuine will to improve safety and the aim to dis-

seminate the idea of “zero accident principle” provide a good basis for promoting occupational safety. Interaction with other workplaces enhances occupational safety skills.

Theme 2: Controlling for strain and stress at work is a part of good management and fair leadership. These aspects should be discussed on an everyday basis at the workplace. Excessive strain reduces well-being at work and impairs the results of work. Too little strain may also be harmful and may increase risks of exclusion. Suitable challenges encourage and motivate the staff and increase productivity. Decisions and measures taken in the workplace as well as individuals’ own choices and initiatives contribute to control over strain and to occupational health.

Theme 3: Occupational health care has an important task. Health is essential to well-being at work. Health is monitored and promoted by methods that are efficient and up-to-date. In the Forum the theme group on occupational health care represents various stakeholders. It contributes to the development of work and disseminates information to its reference groups about efficient methods. The feedback received by the members of the theme group is important since it makes it possible to influence the circumstances that need to be improved by means of appropriate surveys and projects.

Theme 4: Everyone can spread good practices and contribute to the dissemination of good practices related to occupational health and safety. A good practice may be an example based on experience that can be applied in different operating environments. Even simple good practices are worth disseminating so that others can use them or at least learn from them. Learning and a general exchange of information and practices promote health and safety at work.

Conclusions

The Forum provides an innovative platform for broad participation and improves interaction between workplaces and experts. The fo-

rum principle is a flexible approach that enables flexible reactions to major changes in the working life and in economic and societal circumstances.

Programs with limited time frame are effective in tackling the challenges defined. There is a risk that good organizational practices formed during the program are lost once the program period is over. The Finnish experience concerning the Forum for well-being at work highlights the need to integrate new innovative practices into the permanent work practices of organizations. Effective practices will remain while the less successful disappear.

Work and working life are changing due to changes in society and in production and service concepts. The continuous change constitutes a challenge for all organizations and interest groups to modify their work practices. Effective management of numerous networks will be one of the key success factors in the years to come.

References

1. Well-being at Work - New Innovations and Good Practices. Finnish Institute of Occupational Health. 2008: p. 28. ISBN 978-951-802-884-3
2. Hurmalainen, Mikko, Savolainen, Heikki & Yrjänheikki, Erkki. Occupational health care in Finland. The Parliament Politics, Policy and People Magazine. 2007:253. p.13.
3. Veto Programme. 2009. Final report of the Veto Programme 2003–2007 (Veto-ohjelman loppuraportti). Reports of Ministry of Social Affairs and Health. 2008:53. ISBN 978-952-00-2748-3; ISBN 978-952-00-2749-0 (PDF)
4. Suomaa, Leo, Yrjänheikki, Erkki, Jokiluoma, Hannu & Savolainen, Heikki. Regional Europe's Regions and Cities Review. The Parliament Magazine 2009:15. p. 58.

Continuous vocational training and its effects on work ability

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Abstract

Total Productive Maintenance (TPM) programs may improve workers' health and safety. We studied 14 food industry workers undergoing a TPM program, and 40 health care workers with comparable work schedules not undergoing such a program. The median Work Ability Index (WAI) score was 43 (interquartile range, IQ 42 - 45) among food industry workers, and 44 (IQ 41 - 45) among healthcare workers ($p = 0.86$). However, the sickness leave score was significantly lower in food industry workers ($p = 0.03$). Our results support the efficacy of TPM programs in reducing sickness leave indicators and ability to countermeasure aging effects among workers.

Key terms: vocational training, WAI, TPM.

Introduction

Prolonging working life in an aging working population is a major challenge for Western economies, as the associated increase in welfare costs has led to a reduction in early retirement benefits, delay of the mandatory retirement age, and promotion of voluntary delayed retirement (1). Within this context, strategies to improve work quality and the creation of indicators measuring it have become crucial (2). Such indicators should comprehensively consider the various aspects of work quality, including health, safety, physical and mental work demands, skills and career development, and job satisfaction. Job satisfaction, in turn, results from work organization schemes promoting involvement and motivation among workers. Total Productive Maintenance (TPM) (3) programs of work organization, based upon the *kaizen* (change for the better) principle, promoting workers' involvement through continuous education and vocational training, may improve all the aspects of work quality, thus leading to a more comfortable prolonging of working life (4).

Objectives

Continuing education and vocational training are flexible tools of lifelong learning, crucial in rapidly meeting the new demands of a changing labor market. Continuous Vocational Training (CVT) it is therefore instrumental in modernizing work organizations, facilitating innovation, and improving productivity. We monitored the effectiveness of a TPM program, including CVT applications, *versus* subjective coping with work demands and health status using the Work Ability Index (WAI) (5, 6) and sickness leave score as indicators.

Methods

We examined 40 healthcare workers, 14 from surgical departments, and 26 from internal medicine departments, and a random sample of 14 workers employed in 10 different production jobs at a food manufacturing plant. An 8-hour rotating work shift schedule applied for all subjects in both groups. A *kaizen*-inspired TPM intervention program was conducted in the food manufacturing plant in collaboration with the local occupational health physician. Ten percent of the total male workforce (N =14) randomly selected among those employed in 10 different production jobs were monitored.

Improvement in the work organization on the production line was achieved by eliminating awkward and long-term standing postures, reducing the work energy expenditure of heavy tasks (by Progressive Low Cost Automation) and following CVT educated workers' suggestions based on their experience in the front line. No such intervention was conducted in the health care departments. During periodical health surveillance exams, both the food industry workers and the health care workers were asked to complete the WAI questionnaire, and to score their health status and their ability to cope with work demands. Days of annual sickness leave were abstracted from the company and categorized as follows: 0 = 61 days or more; 1 = 46 – 60 days; 2 = 26-45 days; 3 = 11-25 days; 4 = 1-10 days; 5 = none.

We calculated median and range for WAI and sickness leave score. Spearman's correlation test was applied to explore the relationship between age and WAI. The Mann Whitney test was used to test differences across the study groups. Under the null hypothesis, the Mann Whitney statistics followed a standard normal deviate z distribution. The threshold to reject the null hypothesis was set for a test value $\leq z_{0.975}^*$.

Results

Overall, the median WAI values were 44 (range 28–49), just above the upper cut-off point between the good and excellent range of score values, and it was not affected by age (Spearman’s correlation coefficient = 0.082, $p = 0.55$), or by gender (men: 44, range 35–49; women: 44, range 28–48; $p = 0.66$), or, among health care workers, by type of department (surgical departments: median 44.5, range 28–49; internal medicine departments: median 44, range 31–47; $p = 0.34$). Table 1 shows that the median WAI among food workers was 43 (range 35–49) and it was 44 (IQ range 28–49) among health workers, very similar among the two groups ($p = 0.86$).

Table 1. Work ability index and sickness leave score by branch

| | food industry workers | | Health care workers | | Mann Whitney statistics | |
|----------------------|-----------------------|---------|---------------------|---------|-------------------------|------|
| | median | range | median | range | z | p |
| Work ability index | 43 | 42 - 45 | 44 | 35 - 49 | 0,18 | 0,86 |
| Sickness leave score | 5 | 4 - 5 | 5 | 2 - 5 | 2,16 | 0,03 |

Sickness leave was significantly more frequent among health care workers than food industry workers ($p = 0.03$). Among health workers, neither type of department ($p = 0.35$) nor gender ($p = 0.54$) affected frequency of sickness leave.

Discussion and Conclusions

Our results suggest that the benefits to the work organization resulting from a *kaizen*-driven TPM intervention positively affect the individual perception of health status, which translates into less annual sickness leave. In the present study population, WAI was not affected. How-

ever, although the same 8-hour rotating work shifts applied in both groups, the healthcare workers may have had a higher education level than food workers. Therefore, their work ability perception might have already been satisfactory, while the food industry workers achieved the same level thanks to the continuing education and vocational training introduced with the TPM intervention, as we previously reported (7). Therefore, WAI still appears to be a good indicator of job satisfaction and to be sensitive to changes in the work organization.

Sickness leave was apparently reduced among food industry workers undergoing a *kaizen* intervention programme. Workers whose tasks are very demanding, and entail a heavy workload with low level of opportunity for proposing alternative better coping options, as is the case for food industry workers compared with health workers, have been shown to be at greater risk of suffering injuries and developing adverse health outcomes, such as stress, psychological strain, and cardiovascular diseases (8). From the industrial management perspective, low quality products and a greater rate of waste frequently occur under such circumstances. Our results show that, following a TPM intervention, food industry workers had an annual sickness leave frequency lower than that of the healthcare workers. Actually, since the food industry workers started the TPM program they have had a continuous trend towards a reduction of lost time accident frequency rate (minus 18%) and a decrease of 43% in absenteeism.

Work organization deals with the way work is managed, including job design, new technologies, automation, pace of production, work/rest schedules, shift work, working hours, and working overtime. In its turn, job design includes work pace, skill and strain required, as well as the degree of worker's control over his job. Teamwork and a participatory approach influence work organization. There is growing consensus about workplace hazards resulting from not pursuing the continuous improvement of workers' education and knowledge.

References

1. Ilmarinen J, The ageing workforce challenges for occupational health. *Occupational Medicine*. 2006; 56 (6): 362-364
2. Ilmarinen J., Tuomi K, Klockars M. Changes in the work ability of active employees over an 11 year period. *Scan J Work, Environ Health*, 1997; 23: Suppl 1, 49-57
3. Ohno T. *Toyota Production System: Beyond Large-Scale Production*. Portland, Or: Productivity Press. 1988.
4. Ilmarinen J Towards a Longer Worklife! – Ageing and the quality of worklife in the European Union. FIOH; 2005
5. Ilmarinen J. and Rantanen J., Promotion of Work Ability during Ageing. *Am J Ind Med*. 1999; Supplement 1: 21-23
6. Tuomi K., Huuhtanen P, Nykyri E. and Ilmarinen J., (2001). Promotion of Work Ability, the quality of work and retirement. *Occup. Med*. 2001; 51 (5): 318-324
7. Meloni M., Cocco P, Costa G. Work ability and work quality as indicators for a longer and more productive working life. In: *Promotion of Work Ability towards Productive Aging*. Kumashiro (ed). Taylor & Francis Group, London; 2009
8. Schnall P L, Belkic K L, Landsbergis P A, Baker D The Workplace and Cardiovascular Disease. *Occupational Medicine* 2000; State of the Art Reviews: 15 (1)

Influence of Three Worksite Conditions on the Work Ability of Canadian Elderly Workers

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Abstract

The aim of the present study was to associate Canadian elderly workers' work conditions with their Work Ability Index (WAI) score. Correlation coefficient and multiple regression analyses were used to analyze the relationships between age, WAI, and worksite conditions. From the results, it is possible to hypothesize that work conditions (physical demand, work environment, and work organization) has a significant relationship with the Canadian aging workers' WAI score and they are mostly related to WAI dimension 1, 2, 3, and 6: "current work ability", "work ability related to job demands", "number of current diseases", and "own prognosis of work ability two years from now" respectively.

Key terms: Work Ability Index (WAI), Canadian elderly worker, physical demand, work environment, work organization

Introduction

Canada's aging population is increasing at a fast pace and serious concerns have been raised as to whether or not there will be enough workers to ensure continued economic growth. The Government of Canada has reported that the size of the work force will begin to decrease, relative to the total population, starting in 2010. The importance of delaying the retirement age to meet economic demands as a result of fewer people in the labour force is well recognized (1).

Tsai *et al.* showed that early retirement was not beneficial but rather detrimental to mortality (2). Individuals who retired early (at age 55) showed a higher mortality rate compared to those who retired later.

There are also individuals who wish to continue work beyond retirement age but are forced to retire due to company policies, or personal disabilities.

Faced with such rapidly aging populations, increasing numbers of aging workers, and increasing need for people to continue working longer, the challenges for occupational health services call for innovation in health promotion, prevention of work-related diseases, and maintenance of work ability.

To date, little research has been done on the work ability of older workers, how to accommodate those who want to continue working, and the possible predictors for maintaining functionality. Research is necessary to better comprehend the work ability of old workers, and to identify the occupational health programs that will help workers to continue to work into retirement age, if they choose to do so.

Ilmarinen and his colleagues categorized work content (physical demand), work environment, and work organization as the three main groups of risk factors that influence work ability (3). Each of these three factors was found to predict with some accuracy the decline in work ability.

From these facts, the authors formulated the study questions of the present study as: how physical demand, work environment, and work organization is associated with the work ability index (WAI) score

of the Canadian elderly workers? If they do, what specific dimension of WAI do they affect?

Methods

Participants whose age was 55 and over were recruited for the study through a company and through website invitations. They were all volunteers.

The Work Ability Index (WAI) and work conditions were assessed by questionnaire. The WAI is a questionnaire to measure work ability. It has seven dimensions which are described in Table 1. Three questions were added that inquired about work conditions: “How do you consider your work’s physical demand”, “How do you consider your work environment?”, and “How do you consider your work organization?”. Four choices were offered for each question. The questionnaire was mailed to the participants.

Correlation coefficient and multiple regression analyses were used to analyze the relationships between age, WAI, and worksite conditions.

Results

The subjects comprised 62 volunteers, 31 men and 31 women, and their average age (SD) was 59.0 (5.0).

Table 1 shows the difference between male and female for age, total WAI score, and the seven dimension of WAI.

Table 1. Age, total WAI score, and WAI dimension scores (dimension 1 to 7) for male and female participants, median and range.

| | Male median (min-max) | Female median (min-max) |
|--|-----------------------|-------------------------|
| Age | 59 (53-66) | 57.5 (54-87) |
| total WAI score | 42 (17.5-49) | 37.5 (20-49) |
| dimension 1 (current work ability compared with life-time best) | 9 (0-10) | 8 (5-10) |
| dimension 2 (work ability in relation to the demands of the job) | 10 (2.5-10) | 9 (4-10) |
| dimension 3 (number of current disease diagnosed by a physician) | 5 (1-7) | 2 (0-7) |
| dimension 4 (estimated work impairment due to disease) | 6 (1-6) | 5 (1-6) |
| dimension 5 (sick leave during the year) | 4 (1-5) | 4 (1-5) |
| dimension 6 (own prognosis of work ability two years from now) | 7 (1-7) | 7 (1-7) |
| dimension 7 (mental resources) | 4 (2-4) | 4 (2-4) |

The differences between male and female were observed at the median of total WAI score and WAI dimension 3.

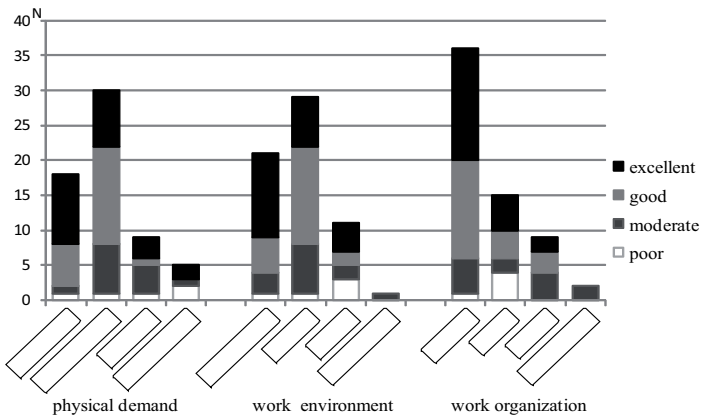


Figure 1. Number of participants in each three work conditions: physical demand, work environment, and work organization.

The numbers of participants in each three work conditions are presented in Figure 1. All the three work conditions show a similar trend. The participants who reported that their work conditions were very good or good had the highest scores on the WAI questionnaire.

Table 2. Correlation coefficient between the work conditions and participants' age and WAI scores (dimension 1 to 7).

| | physical demand | work environment | work organization |
|-------------------|-----------------|------------------|-------------------|
| age | -0.1 | 0.09 | 0.10 |
| total WAI score | -0.37** | -0.32* | -0.35** |
| dimension 1 | -0.27* | -0.20 | -0.26* |
| dimension 2 | -0.18 | -0.26* | -0.31* |
| dimension 3 | -0.29* | -0.34** | -0.26* |
| dimension 4 | -0.35** | -0.22 | -0.32 |
| dimension 5 | -0.24 | -0.24 | -0.23 |
| dimension 6 | -0.39** | -0.18 | -0.25 |
| dimension 7 | -0.24 | -0.17 | -0.21 |
| *p>0.05, **p>0.01 | | | |

Significant correlation coefficients were observed between the three work conditions and total WAI score and dimension 3. In addition, physical demand had significant correlation coefficients with dimensions 1, 3, 4, and 6. Work environment had a significant correlation coefficients with dimension 2, and work organization had significant correlation coefficients with dimensions 2 and 3.

The results of the multiple regression analyses are shown in Table 3. There were no significant associations between age and total WAI score. Significant associations were observed between total WAI scores and each of the three work conditions adjusted for age, gender, and work primary.

Table 3. Multiple regression analyses between total WAI score and age and three work conditions.

| | beta | t | p | R ² |
|--------------------------------|-------|-------|------|----------------|
| age [#] | 0.1 | 0.08 | 0.94 | 0.12 |
| physical demand [†] | -0.34 | -2.56 | * | 0.21 |
| work environment [†] | -0.31 | -2.44 | * | 0.2 |
| work organization [†] | -0.33 | -2.7 | ** | 0.22 |

#; Adjusted for gender and work primary.
†; Each analysis was adjusted for age, gender, and work primary, respectively.
*;p<0.05, **;p<0.01

For multiple regression analysis between the three work conditions and each WAI dimension, significant betas were observed between all the work conditions and WAI dimension 1 and dimension 3. In addition, physical demand had significant beta with dimension 6, and both work environment and work organization had significant betas with dimension 3 (Table 4).

Table 4. Multiple regression analyses between WAI dimensions and work conditions.

| | dimension 1 | | dimension 2 | | dimension 3 | | dimension 4 | | dimension 5 | | dimension 6 | | dimension 7 | |
|-------------------|-------------|-------|-------------|-------|-------------|-------|-------------|-------|-------------|-------|-------------|-------|-------------|-------|
| | beta | t | beta | t | beta | t | beta | t | beta | t | beta | t | beta | t |
| physical demand | -0.29 * | -2.09 | -0.16 | -1.12 | -0.29 * | -2.17 | -0.3 | -2.00 | -0.23 | -1.62 | -0.30 * | -2.31 | -0.1 | -0.95 |
| R ² | 0.11 | | 0.10 | | 0.19 | | 0.16 | | 0.10 | | 0.22 | | 0.08 | |
| work environment | -0.30 * | -2.29 | -0.32 * | -2.54 | -0.31 * | -2.46 | -0.13 | -0.94 | -0.23 | -1.70 | -0.08 | -0.61 | -0.20 | -1.49 |
| R ² | 0.12 | | 0.18 | | 0.20 | | 0.11 | | 0.11 | | 0.15 | | 0.10 | |
| work organization | -0.28 * | -2.13 | -0.28 * | -2.17 | -0.28 * | -2.26 | -0.24 | -1.83 | -0.17 | -1.26 | -0.23 | -1.88 | -0.17 | -1.24 |
| R ² | 0.11 | | 0.16 | | 0.19 | | 0.15 | | 0.08 | | 0.20 | | 0.09 | |

The analyses were done by each WAI dimension as a dependent variable and work condition as an independent variable. Each analysis was adjusted for age, gender, and work primary.

*; p<0.05

Discussion and Conclusion

The multiple regression analysis in the present study showed no relationship between age and work ability, but significant relationships were observed between total WAI score and the three work conditions measured.

There are four limitations in the present study. First, it has a cross-sectional design, and no cause-and-effect relationship among variables can be claimed. Second, the numbers of participants were small. Third, there were only two participants whose primary work was physical work. And last, all the participants were volunteers. This may have introduced selection biases.

Several studies have reported significant relationships between WAI scores and workers' age (4). The reason why the present study had conflicting results could be the small number of participants and the narrow range of their age.

The results of the multiple regression analysis between total WAI scores and the three work conditions are in agreement with previous study results (3). However, due to a high correlation coefficient between the three work conditions, the authors failed to find which work condition is most associated with total WAI score.

Since all three work conditions had a significant relationship to total WAI score, the authors did multiple regression analyses between each work condition and each WAI dimension. From these results, it can be hypothesized that work conditions (physical demand, work environment, and work organization) have a significant relationship with the Canadian aging workers' Work Ability Index and they mostly related to WAI dimension 1, 2, 3, and 6.

The present study was done as a pilot study with the aim of identifying occupational health reforms needed to meet employees' needs and to promote the continuation of work after retirement age. In a further study, a larger numbers of Canadian aging workers will be recruited, and comparison will be made with other countries.

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References

1. Policy Research Initiative. Encouraging Choice: Aging, Labour Supply, and Older Workers. http://policyresearch.gc.ca/doclib/R5_BN_Encour_Choice_e.pdf [cited 2010 July 28]
2. Tsai SP, Wendt JK, Donnelly RP, de Jong G, Ahmed FS. Age at retirement and long term survival of an industrial population: prospective cohort study. *BMJ*. 2005; 331(7523):995.
3. Ilmarinen J. Aging, work and health. In: Snel J, Cremer R, editors. *Work and aging: a European perspective*. London: Taylor and Francis Ltd; 1994. p.47–63.
4. Pohjonen T. Perceived work ability of home care workers in relation to individual and work-related factors in different age groups. *Occup Med (Lond)*. 2001; 51:209–17.

Benefits of workplace surveys for promoting occupational health and safety in enterprises

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Abstract

Workplace surveys create the basis for occupational health service activities in client enterprises. The aim of this study was to ascertain their benefits. A total of 548 occupational health professionals and occupational safety and health representatives answered our questionnaire. Enterprise representatives felt that the neutral observations of outsiders encourage enterprises to improve work conditions more actively. Occupational health professionals felt that workplace surveys contribute to safer work and better attitudes towards safety. The most important factors for promoting occupational health and safety at workplaces were the commitment of management, and its attitude to occupational health and safety.

Key terms: Workplace survey, occupational health, occupational safety, benefit.

Introduction

Finnish employers are obligated by law to organize occupational health services (OHS) for their employees. The employer is partly reimbursed for OHS costs by the Social Insurance Institution. OHS must include preventive services which promote work ability, and recognize and assess the harmful risks and exposures of work which affect occupational health and safety. Curative services are voluntary for employers. There are four different OHS providers: municipal health care centers, enterprises' OH units, private medical centers, and a mixed model of OH units. The aims of OHS are a healthy and safe work environment, a well-functioning work community, the prevention of work-related diseases, and the maintenance and promotion of employees' work ability (1).

A workplace survey is a process which consists of justification, planning, implementation, analysis and assessment, reporting, and linkage to follow-up mechanisms (2). It creates a basis for OHS activities for client enterprises, enables the identification and assessment of health risks and problems caused by work, and provides suggestions for the continuous improvement of the work environment and the workplace community, in order to prevent and combat known health risks, and to maintain and promote work ability and functional capacity (3).

This study is part of a larger study on the various processes of occupational health services in Finland.

Objectives

The aim of this study was to ascertain the benefits of workplace surveys for improving the occupational health and safety of enterprises.

Methods

A structured questionnaire was sent to 2,535 randomly selected respondents from the member association registers of occupational health professionals and occupational health and safety representatives. A total of 367 occupational health professionals and 691 occupational health and safety representatives, of whom 53% (n=561) were women and 47% were men (n=497), completed the workplace survey questionnaire. The response rate was 43.1%. The mean age of the respondents was 48.7 (range 25-79 years). The benefits of the workplace survey were elicited using the open question: “What issues could be affected by a workplace survey carried out by OHS in your organization/in a client enterprise?” Over half of the respondents of the questionnaire responded (n=558). The data was analyzed with qualitative content analysis.

Results

The respondents reported that workplace surveys had many different kinds of benefits concerning e.g. ergonomics, various risks, loading and hazard factors at work, improving knowledge, leadership actions and management, workers’ work ability and well-being at work and co-operation between enterprise and OHS. Many respondents mentioned several benefits of the workplace survey. Here we report only a summary, not the number of times each of the items was mentioned. The most commonly mentioned benefits dealt with ergonomics and identifying different load and risk factors.

The ergonomic benefits included investing in equipment and furniture, furniture adjustment and settings, eyesight at work, and training in moving and lifting. It was possible to decrease exposure to different loading and risk factors through planning and solving technical problems. The workplace survey also made it possible to recognize physically and mentally loading factors at work. In addition, knowledge of how to prevent overloading and repetitive strain inju-

ries increased in enterprises. If management was aware of employees' mental pressure it was easier to define work and divide it more equally among employees.

The workplace surveys also highlighted physical risk factors, which helped to advance e.g. renovations, and implement local exhaust ventilation. Knowledge about chemical factors helped identify which chemicals essential for work are healthier for employees. In addition, safety datasheets were usually noted in workplace surveys, so enterprises invested and exploited them more actively.

A workplace survey might be the starting point for a risk assessment or for forming an occupational safety committee in an enterprise. Occupational health professionals felt that workplace surveys resulted in employees working more safely with liquids, in accident prevention, the use of personal protective equipment, and in improved attitudes towards safety performance. The representatives of the enterprises felt that the main benefit of the workplace surveys was the neutral observations of outsiders, which encouraged enterprises to put more effort into improving working conditions.

If the workplace survey was carried out well, it helped organize and plan OHS actions more precisely (e.g. content of health screening), prioritize the issues which need attention in enterprises, and to clarify the roles and distribution of work between the enterprise and OHS. In addition, the co-operation between the enterprise and OHS became more active due to the workplace surveys. When representatives of the enterprise and OHS trusted each other, it was easier for OH professionals to propose actions based on workplace surveys.

Close co-operation between occupational safety, OH professionals and the line organization facilitated the realization of proposed actions in an enterprise. Continuous co-operation made it possible to have shared targets to make work safer and healthier. Furthermore, barriers preventing workers from contacting OHS were lowered, and the attitude towards OHS was more positive if OH professionals were seen at workplaces. Overall, the most important issues for promoting occupational health and safety at workplaces were the commitment of management and its attitude to occupational health and safety.

Discussion

The workplace survey is a challenging process for both OHS and enterprises. It is essential that the people responsible for designing a workplace or work method can participate in these surveys, or at least make use of the information presented in the survey reports. It is also crucial that employers, workers, occupational safety committees and other stakeholders are fully informed of the findings and recommendations. It is advisable to arrange an open information meeting at which the findings and recommendations can be discussed with the stakeholder group. (2) Information gained from workplace surveys can also be used in occupational safety programs and vice versa (4).

Occupational health services are a functional and comprehensive service system in the field of occupational health and safety in Finland. The efficiency and benefits of OHS depend heavily on relations and communication between the OHS's and their clients. (5) If co-operation between the enterprise and OH professionals works well, the implementation and follow-up of proposed actions can be efficient. It is important to know who is in charge of the process. The stakeholder groups, especially managers, who have the power to allocate the required resources for corrective actions, must be involved in the discussion of the conclusions and recommendations of the workplace survey. (2) The prerequisites for an effective workplace survey are continuous co-operation and regular follow-ups of activities after the recommendations of the workplace survey.

Conclusions

According to our results, it seems that the workplace surveys considered in this study had both direct and indirect benefits for occupational health and safety in the enterprises. Basically, teamwork among occupational health service units, occupational health and safety representatives, management, and employees is vital to solving today's complex problems at workplaces (6).

References

1. Rantanen J. Development of occupational health services. In Taskinen H. (editor). *Good Occupational Health Practice. A guide for planning and follow-up of occupational health services*. Ministry of Social Affairs and Health, Finnish Institute of Occupational Health Helsinki: Edita Prima Oy; 2004. p. 6–10.
2. Kurppa K, Riala R. The workplace survey as part of workplace risk assessment. *Asian-Pacific Newsletter on Occupational Health and safety* 2001; 8: 4–7.
3. Finland's Government Decree on the principles of good occupational health care practice, the content of occupational health care, and the qualifications of professionals and experts, no 1484, section 6, Definition and aims of a workplace investigation.
4. Riala R. Workplace surveys. In Taskinen H, (ed.) *Good occupational health practice. A guide for planning and follow-up of occupational health services*. Helsinki: Ministry of Social Affairs and Health: Finnish Institute of Occupational Health. Helsinki: Edita Prima Oy; 2004. p. 86–106.
5. Peltomäki P, Husman K. Networking between occupational health services, client enterprises and other experts: difficulties, supporting factors and benefits. *International Journal of Occupational Medicine and Environmental Health* 2002; 15: 139–145.
6. Wachs J. Building the occupational health team: keys to successful interdisciplinary collaboration. *AAOHN Journal* 2005; 53: 166–171.

Aging, health and lifestyle as predictors of fitness for work: a new perspective for occupational physicians?

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Abstract

We checked fit to work certifications in 2,334 workers (1,951 males and 383 females). Seven percent of male workers and 8.1% of females had limited fitness for work. The higher incidence of limitations were in workers over 55 years old in males and between 45 and 54 years old in females, in workers with a body mass index over 30 and in workers that smoke more than 20 cigarettes a day. We can conclude that aging workers have a higher rate of limitation; obesity and smoking is a prognostic factor for fitness to work limitations.

Key terms: aging, health promotions, fit to work limitations, body mass index.

Introductions

It is mandatory for the Italian legislation that a occupational doctor issue a fitness to work certification for each worker. The physician establishes a medical surveillance program on the basis of the occupational risk which the workers are exposed to. A worker can be considered fit to work, unfit to work or fit to work with some limitations or restrictions in his/her job.

In recent decades the retirement age has risen due to economic decisions of governments. This situation has also raised the average age of the workers exposed to occupational risk.

The international labor organization estimates that the number of economically active persons aged 65 years and above will increase from 83.2 million in the world in 2000 to 136 million by 2020 (1, 2). Elsewhere the proportion of 50 to 60 years old in the workforce will be double compared to workers younger than 25 years in the EU15 (first 15 European countries to join the Union) by the year 2025 (3).

Objectives

The aim of our study is to evaluate the incidence of various factors in the group of workers that have fitness to work certificates with limitations. We would also like to identify which workers' individual characteristics are more likely to result in a fitness to work with limits.

Methods

To achieve our aim we analyzed 2,324 fitness to work certifications in workers exposed mostly to physical risks (noise and vibration), manual lifting, repetitive movements, and working at heights (more than 2 meters). The analysis was made through an occupational medicine management software (Achille®).

Results

The workers are 1,978 males and 379 females, of whom 282 are non-Italians (207 males and 75 females).

The average age was 42.8 ± 11.8 in males and 39.6 ± 6.6 in females and 38.3 ± 10.7 in non-Italians (37.9 ± 11.9 in males, 39.4 ± 6.0 in females).

The workers with restrictions on fitness to work were 7.2% (7.4% Italian workers, 5.0% non-Italians), the percentage of fitness with limitation in females is higher than in males (7.7% vs. 7.0%); especially among Italians (9.2% vs. 7.2%).

Average body mass index (BMI) was 25.4 ± 4.2 kg/m² (25.9 ± 3.9 in males and 23.8 ± 4.6 in females). Non-Italians had a lower BMI than Italian workers both in males (26.1 ± 3.9 vs. 24.9 ± 4.6) and in females (24.1 ± 4.4 vs. 22.9 ± 4.6).

Table 1. presents the distribution of workers in the groups of underweight (BMI under 18.5), normal weight (BMI between 18.5 and 24.9), overweight (BMI between 25 and 29.9) and obese (BMI over 30).

The increase of limitations or restrictions in groups of older workers was evident in all subcategories (male, Italians and non-Italians) except that of females in which the group with higher incidence of limitations was the one with workers between 46 and 55, but there were only 3 workers in the group of over 55 years (Table 2).

Table 1. Distribution of studied population (%) in weight categories and number of people.

| | All workers | | | Italian workers | | | non-Italian workers | | |
|---------------|-------------|------------|-------------|-----------------|------------|------------|---------------------|-----------|------------|
| | Male | Female | Total | Male | Female | Total | Male | Female | Total |
| Underweight | 1.5 (29) | 4.0 (15) | 2.1 (44) | 1.3 (23) | 3.0 (9) | 1.7 (32) | 3.0 (6) | 8.0 (6) | 4.3 (12) |
| Normal weight | 41.5 (813) | 64.5 (245) | 46.5 (1058) | 40.1 (710) | 63.7 (194) | 45.0 (904) | 49.7 (103) | 67.6 (51) | 54.5 (154) |
| Overweight | 42.1 (839) | 21.2 (80) | 37.6 (919) | 43.0 (762) | 22.5 (68) | 38.8 (830) | 36.9 (77) | 16.2 (12) | 31.4 (89) |
| Obese | 14.1 (283) | 10.2 (39) | 13.3 (322) | 14.8 (262) | 10.7 (33) | 13.9 (295) | 10.3 (21) | 8.1 (6) | 9.7 (27) |

The average age of workers with limitations or restrictions was 46.3 ± 10.1 vs. 38.8 ± 9.0 of workers fit to work without limitations or restrictions.

Table 2. Distribution of limitations in various age (% and n).

| Percentage of workers with limitations or restrictions | All workers | | | Italian workers | | | non-Italian workers | | |
|--|-------------|----------|-----------|-----------------|----------|-----------|---------------------|---------|---------|
| | Male | Female | Total | Male | Female | Total | Male | Female | Total |
| Under25 | 4.1 (8) | 0.0 | 3.7 (8) | 4.0 (7) | 0.0 | 3.6 (7) | 5.3 (1) | 0.0 | 4.8 (1) |
| 26-35 | 3.7 (13) | 5.5 (4) | 4.0 (17) | 3.7 (10) | 7.0 (4) | 4.3 (14) | 3.6 (3) | 0.0 | 3.0 (3) |
| 36-45 | 5.6 (28) | 7.1 (13) | 6.2 (41) | 5.0 (22) | 8.3 (12) | 6.1 (34) | 9.4 (6) | 2.0 (1) | 6.1 (7) |
| 46-55 | 9.5 (65) | 23.3 (7) | 10.2 (72) | 9.6 (64) | 29.2 (7) | 10.3 (71) | 5.3 (1) | 0.0 | 4.0 (1) |
| Over 55 | 10.3 (25) | 0.0 | 10.2 (25) | 10.5 (23) | 0.0 | 10.4 (23) | 9.1 (2) | 0.0 | 8.7 (2) |

Regarding BMI, we can see that it is 26.6 ± 5.1 in workers with limitations or restrictions in their fitness to work and 25.3 ± 4.1 in those fit to work without limitations. The differences in BMI between workers with and without limitations were more evident in Italian workers, especially males; however, only in foreign male workers did the group without limitations or restrictions have a higher BMI than those with limitations.

The incidence of limitations was higher in obese workers and lower in those of normal weight. The usual behavior of limitations in all groups examined except for foreigners was a decrease in limitations between underweight and normal weight; then there was an increase in overweight and another one in the group of obese workers. In foreign workers we had a higher prevalence of fitness to work limitations in normal weight subjects and a decrease in the other groups. Table 3 summarizes these data.

The limitations on fitness to work on the basis of smoking habits did not show big differences in the various groups; the only exception was the group of workers that smoke more than 20 cigarettes per day, in which there was the highest percentage of workers with limitations on fitness to work (17.5%).

Alcohol consumption seemed to have no effect on fitness to work limitations.

Workers who habitually take drugs had more limitations (15%) than those who did not take drugs (5.3%).

We grouped the limitations into 9 categories (hand lifting, working at heights, night shifts, use of personal protective equipment, driving means of transportation, postures, working rhythms, high injury jobs and exposure to hand and arm vibrations); afterwards we divided them into age categories and the data obtained are summarized in Table 4.

We grouped the limitations into 9 categories (hand lifting, working at heights, night shifts, use of personal protective equipment, driving means of transportation, postures, working rhythms, high injury jobs and exposure to hand and arm vibrations); afterwards we divided them into age categories and the data obtained are summarized in Table 4.

Table 3. Distribution of limitations in various BMI groups (% and n).

| Percentage of workers with limitations or restrictions | All workers | | | Italian workers | | | non-Italian workers | | |
|--|-------------|----------|-----------|-----------------|----------|-----------|---------------------|---------|---------|
| | Male | Female | Total | Male | Female | Total | Male | Female | Total |
| | Underweight | 9.5 (2) | 6.7 (1) | 8.3 (3) | 13.3 (2) | 11.1 (1) | 12.5 (3) | 0.0 | 0.0 |
| Normal weight | 6.2 (35) | 6.3 (15) | 6.2 (50) | 6.3 (29) | 7.4 (14) | 6.6 (43) | 5.9 (6) | 2.0 (1) | 4.6 (7) |
| Overweight | 9.8 (56) | 6.3 (5) | 9.4 (61) | 10.5 (52) | 7.5 (5) | 10.1 (57) | 5.3 (4) | 0.0 | 4.6 (4) |
| Obese | 12.0 (23) | 7.9 (3) | 11.4 (26) | 12.9 (22) | 9.4 (3) | 12.4 (25) | 4.8 (1) | 0.0 | 3.7 (1) |

Table 4. Characteristic of job limitations in the populations (% and n).

| | Weight hand lift | Height works | Night works | Use of PPE | Means driving | Postures | Working rhythms | High injury jobs | Hand and arm vibrations |
|----------|------------------|--------------|-------------|------------|---------------|----------|-----------------|------------------|-------------------------|
| UNDER 30 | 2.6 (4) | 1.1 (2) | 0.0 | 1.5 (2) | 0.7 (1) | 0.0 | 0.4 (1) | 0.4 (1) | 0.0 |
| 31-40 | 2.3 (4) | 0.0 | 0.5 (1) | 2.0 (3) | 0.5 (1) | 0.0 | 0.3 (1) | 0.0 | 0.0 |
| 41-50 | 4.2 (7) | 1.3 (2) | 0.8 (1) | 0.5 (1) | 0.5 (1) | 0.5 (1) | 0.0 | 0.2 (1) | 0.0 |
| OVER 50 | 5.9 (9) | 1.2 (2) | 1.2 (2) | 1.2 (2) | 0.0 | 0.0 | 0.0 | 0.8 (1) | 1.2 (2) |

Discussion and conclusions

From the analyses of our data we concluded that both in Italian and non-Italian workers the prevalence of limitations is higher in older workers. Agreeing with Chan (4) who reports an increase in working limitations in weight lifting in older groups of workers we also found that workers with limitations or restrictions on fitness to work – in particular for weight hand lifting, working at heights and night work – are older compared to the ones without limitations.

The prevalence of limitations is also higher in workers with a BMI higher than 30 kg/m² and in those who smoke more than 20 cigarettes per day.

Our analysis confirms the importance of company health promotion programs, especially in smoking reduction and increasing knowledge about correct nutrition.

Regarding the increase of limitations among older workers, it seems very important to underline the importance of company occupational physicians in identifying the right job task for aging workers; the literature reports a possible increase in “relative workload” in workers over 55 years old (5).

Considering that in 2025 one third of workers will be over 50 (3), it also seems important to underline the lack of a specific legislation that can help occupational physicians in managing them, as is the case with young workers, especially for job tasks with higher physical demand as described by Costa (6).

References

1. G.C. Koh, D. Koh. Occupational health for an ageing workforce: do we need a geriatric perspective? *J Occup Med Toxicol* 2006 May 23;1:8
2. Available from : International Labour Organisation [<http://laborsta.ilo.org/>]
3. Ilmarinen J. The ageing workforce—challenges for occupational health. *Occup Med* 2006 56(6):362–364.
4. Chan G., Tan V., Koh D. Ageing and fitness to work *Occup Med* 2000;50:483–491
5. Costa G. Work and Ageing *Med Lav* 2010; 101 (Suppl 2):57–62
6. Costa G., Sartori S. Ageing, working hours and workability. *Ergonomics* 2007;50: 1–17

Investigating modifiable organizational factors relating to workability: a focus on gendered culture

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Abstract

This study aimed to investigate the relationships between workability, organizational factors and psychosocial factors related to worker health and wellbeing. The cross sectional study involved participants from a general worker population (N = 305). Surveys were distributed through participants' organizations and completed online. Findings of this study suggest that many of the factors that predict workability are in fact modifiable organizational factors. Findings suggested whilst individual factors remained important predictors of work ability, organizational nurturance values, leadership effectiveness, occupational stress and job satisfaction were significant organizational factors.

Key Terms: gendered culture, work ability, organizational factors, intention to remain

Introduction

Due to falling mortality and fertility rates, Australia has one of the world's most rapidly ageing workforce populations (1). Early retirement stands to lose the Australian labour force over 1 million person years of potential working life (2). Prolonging work life by increasing the retirement age will address large budget and skilled labour deficits as the population ages. Research suggests that prolonging work life can be achieved through increased health, quality of life *and* work ability (3, 4, 5). Work ability is an individual's perceptions about how able they are to complete work required given specific work demands, health and mental resources (5). There is evidence that improving work ability in older workers can help to keep workers in the workplace and reduce levels of early retirement (4). Preliminary research in Australia is consistent with the findings from Finland that suggest that self-rated work ability, rather than age or job satisfaction, is the best predictor of employees plans to retire (6, 11).

Work ability is influenced by both individual and organizational factors. A number of individual level factors that appear to be related to work ability include socio-economic status (8), health related factors such as chronic health issues (4), and workers' health and functional capacity (including physical, mental and social capacity (9, 10, 22)). In an Australian study of public sector workers (11) individual factors such as self-efficacy and physical health impacted on work ability for all workers. However, there were significant differences found in older and younger workers on the causes related to intention to remain in the organization. These differences related to work demands and an organizational level factor: attitudes towards older workers. Organizational culture was an important factor with high value congruence (between individuals and the organizational culture) being a significant predictor of work ability.

Other organization (work environment) factors that have been found to influence work ability include type of work, work satisfaction, work conditions, work-life balance (4). These factors are linked

to effective leadership and strong organizational cultures within organizations. Therefore, it appears that both individual and workplace factors may influence the work ability of employees in both positive and negative ways.

Gendered organizational culture

Many women report lower work ability scores than men across a number of studies (7, 12). This may be due to the fact that women experience a double work burden: a combination of paid and unpaid employment requiring multiple roles, and that multiple roles can have adverse effects on health and occupational stress (12). In addition, because women face issues such as lack of career progression opportunities and workplace bullying more frequently than men, they may also be more likely to experience increased incidences of sick leave, fatigue and reduced work ability (13). The social expectations that are placed on men and women in society are replicated in workplaces and the workplace culture (14). These social expectations however are so deeply engrained in the workplace culture that they are difficult to detect (14). Organizational culture is defined as gendered when descriptive of the set of beliefs about men and women and the nature of relationships between men and women (15). Therefore, gender identity, when applied to organizational culture, is descriptive of the predominant beliefs or ideologies about sex-roles and their relationships that are inherent within cultural values, mores and processes. Organizational cultures in industries dominated by males are predominantly gendered towards favoring masculinity and replicate hierarchies of male dominance and female subordination (16, 17). The 'gendered organization' therefore positions women at a disadvantage within their organization with adverse effects on health and wellbeing.

Research has found that employees who perceive exclusionary practices, sexual harassment and discrimination against women in organizations are more likely to be less satisfied with work, and express greater intention to leave (18). Importantly, both men and women similarly report higher psychological distress and lower job satisfac-

tion as a result of working in gender segregated environments and/or observing hostility towards women (19, 20). In addition, organizational cultures that reinforce sex-role stereotypes about leadership in particular may lead women worker to experience incongruity between their own gender identity and that of being a leader (21).

The study aimed to investigate the organizational and individual factors that are predictive of workability and intention to remain in the organization. Specifically the study aimed to identify whether:

- Organizational level factors (leadership style, gendered culture, job satisfaction and occupational stress) would be significant predictors of work ability before explaining the variance attributable to individual level factors (psycho-social factors).

Method

Total 305 participants comprised 216 (70.8%) females and 82 (26.9%) males with the sex of 7 (2.3%) participants unknown. Participants' age ranged from 18 to 65 years. 63.6% of participants worked full time, 16.7% part-time, and 16.7% temporary roles across a range of job roles in diverse industries.

Materials

Current ability was measured using a single self-report item from the Work ability Index: one's subjective current ability to work on an 11-point Likert scale. *Intention to Remain* was also measured using a single item which asked respondents to state in years, approximately when they planned to leave their current organization. With regard to *Gender Identity*, individual and organizational gender was measured as either Autonomous (masculine) or Nurturing (feminine), using standard gender scales (23). Perceptions of *Leadership effectiveness* were

measured using the Multifactor Leadership Questionnaire short form (MLQ 5x Short; 24). The *Vocational Strain* subscale consisting of ten items from the Occupational Stress Inventory- Revised (OSI-R; 25) was used. The Job Descriptive Index (JDI; 26) was used as a measure of *job satisfaction*. In the current study, the JDI uses a 7-point Likert scale ranging from (1) to (7). With regard to *General Emotionality*, the Negative Emotionality (NEM) and Positive Emotionality (PEM) scales from Tellegen's Multidimensional Personality Questionnaire (MPQ; 27) were used to measure individual's general emotionality. The General Self-efficacy Scale (GSE-12; 28) was used to measure individual *self-efficacy*. Finally, *Health and Coping* were both measured using single self-report items. A 10-point Likert scale was used with responses ranging from 1 to 10.

Procedure

Participants were recruited via experimenter networks and organizational liaisons. Organizations targeted were those that were likely to be male-dominated such as factories and finance & accounting firms, where women are in non-traditional roles. Surveys were distributed both in hard copy and online format yielding an overall response rate of 22%.

Results

Descriptive statistics that compared means for participants under 45 years and those 45 years and over revealed that there were significant differences between groups for only some of the variables of interest in the study. The results in Table 1 suggest that participants in the older group were more like to report that they: would remain in the organization for a longer period of time; had higher coping ability; less negative affect; and higher work satisfaction scores than younger workers.

Table 1. Significant mean differences between older and younger participants on variables of interest.

| | under 45 years: Mean | 45 yrs and over: Mean | Mean Square | F |
|-------------------------|-------------------------|--------------------------|----------------|-------|
| Intention to Remain | 1.61 | 2.36 | 29.84 | 27.03 |
| Current Ability to Cope | 6.75 | 7.33 | 17.84 | 5.10* |
| Negative Affect | 1.61 | 1.53 | .40 | 6.20* |
| Work Satisfaction | 4.69 | 5.10 | 9.04 | 9.71* |

Note: * p<.05

To assess the associations between variables of interests Pearson’s correlation coefficients were calculated for the total sample, and separately for older and younger workers. Results suggested that there were significantly different patterns of relationships between variable for older and younger groups. For the 45 years and over group, work satisfaction ($r = .39$) and pay and promotion satisfaction ($r = .30$) as well as organizational nurturance ($r = .32$) were significantly correlated with work ability. These same variables were significantly correlated for younger workers, however there were additional associations evident as well. For younger workers, health ($r = .50$) and leadership culture ($r = .24$) also significantly correlated with work ability into the future. Due to these variations all proceeding analyses were conducted for older and younger groups separately.

Predictors of workability

Two hierarchical regression analyses were conducted: one for younger and one for older groups. For younger workers, gender variables were entered in the first step followed by work satisfaction measures, leadership variables, and vocational strain in subsequent steps. The psychosocial variables with intention to leave were entered in the final steps of the model. Due to the smaller sample size in the older worker group, criterion variables were limited to those variables that had shown a significant correlation with work ability for older workers. Therefore

only organizational nurturance, work satisfaction, intention to remain, vocational strain and the psycho-social variables were entered into the hierarchical regression. Table 2 shows the results of the regression for the younger and older samples.

Table 2. Coefficients for Hierarchical Regression Model for Predictors of Workability

| Predictors – Standard Betas | U45yrs | sr2 | t | 45+yrs | sr2 | t |
|--------------------------------|------------|------|--------|--------|------|-------|
| 1 Organizational Nurturance | 0.21 | .21 | 3.29* | .21* | .21 | 3.31 |
| 2 Organizational Nurturance | 0.13 | .11 | 1.81 | .12 | .11 | 1.83 |
| Work Satisfaction | 0.25 | .23 | 3.80* | .26* | .23 | 3.85 |
| Pay / Promotion Satisfaction | -0.17 | -.14 | -2.30* | | | |
| Intention to Remain | | | | -.03 | -.03 | -.64 |
| 3 Leadership Effectiveness | 0.15 | .13 | 2.1*3 | | | |
| Work Satisfaction | 0.31 | .26 | 4.34* | .01 | .01 | .19 |
| Pay / Promotion Satisfaction | -0.19 | -.15 | -2.56* | | | |
| 4 Vocational Strain | -0.42 | -.31 | -5.40* | -.44* | -.34 | -5.91 |
| Pay / Promotion Satisfaction | -0.16 | -.13 | -2.15* | | | |
| Leadership Effectiveness | 0.05 | .03 | .80 | | | |
| 5 Vocational Strain | -0.44 | -.20 | -3.64* | -.31* | -.22 | -4.03 |
| Pay / Promotion Satisfaction | -0.17 | -.14 | -2.48* | | | |
| Negative Affect | -0.14 | -.13 | -2.30* | -.13* | -.12 | -2.11 |
| Self Efficacy | 0.21 | .19 | 3.40* | .21* | .18 | 3.36 |
| 6 Organizational Nurturance | 0.09 | .07 | 1.44 | 0.07 | .06 | 1.20 |
| Work Satisfaction Scale | 0.03 | .02 | .43 | 0.01 | .01 | -.13 |
| Pay and Promotion Satisfaction | -0.15 | -.11 | -2.14* | | | |
| Intention to Remain | | | | | | -1.21 |
| Leadership Effectiveness | 0.03 | .03 | .60 | | | |
| Vocational Strain | -0.22 | -.15 | -2.99* | -0.24* | -.17 | -3.36 |
| Negative Affect | 0.01 | .01 | .20 | -0.03 | .02 | .42 |
| Self Efficacy | 0.18 | .16 | 3.14* | 0.18* | .16 | 3.09 |
| Current Ability to Cope | 0.16 | .12 | 4.68* | 0.17* | .13 | 2.51 |
| Current State of Health | 0.29 | .24 | 2.36* | 0.30* | .24 | 4.78 |
| R2 (adjusted) | .38 | | | .38 | | |

Note: models were significant at every step. Analysis of variance statistics are available on request.

The regression results for younger workers showed that of the gender scales only organizational nurturance was a unique significant predictor of workability. However, this was totally mediated by the inclusion of work satisfaction and pay and promotion satisfaction which were positive and negative predictors of work ability respectively. Leadership

effectiveness was a significant positive predictor of work ability, with its effects and that of work satisfaction being totally mediated by the inclusion of vocational strain which was a significant negative unique predictor. Of the psycho-social variables, negative affect and self-efficacy appeared to be significant predictors of workability with their inclusion in the model partially mediating the effects of vocational strain. In the final step of the model coping and health measures totally mediated the effects of negative affect with pay and promotion satisfaction, vocational strain and self-efficacy remaining significant unique predictors of workability. The final model suggested that decreases in satisfaction with pay and promotion and vocational strain, and increases in self-efficacy, coping and health were likely to lead to increased work ability scores for younger workers.

Regression results for older workers showed that like the younger group, organizational nurturance was a significant positive predictor of work ability, however its effect was totally mediated by the inclusion of work satisfaction which was a positive unique predictor. In step 3, work satisfaction ceased to be a significant predictor with the inclusion of vocational strain, with step 4 showing a partial mediation of the effects of vocational strain with the inclusion of self efficacy and negative effect. The explanatory power of negative affect was totally mediated by the inclusion of coping and health measures in step 5. The final regression model suggested that as vocational strain decreased and self efficacy, coping and health increased so to would there be a likely increase in work ability scores.

Discussion

This study aimed to investigate the organizational and individual factors that are predictive of work ability and intention to remain in the organization. Specifically it aimed to identify whether organizational level factors would be significant predictors of work ability alongside the variance attributable to individual level factors. Whilst results for younger and

older aged participants differed, there were some distinct similarities between the groups. For both groups, organizational nurturance over other gender identity scales appeared to be a significant positive predictor of workability. This suggests that organizations that espouse and enact values related to caring and compassion for others, empathy, warmth, nurturance etc are more likely to promote increased work ability scores in both younger and older workers. These findings may confirm other studies that have found that organizational cultures that are not nurturing also tend to result in lower wellbeing, lower job satisfaction and higher organizational withdrawal behaviours for staff overall (19, 20).

While work satisfaction appeared to be a significant unique predictor of work ability for both younger and older workers, satisfaction with pay and promotion and leadership effectiveness were only significant unique predictors for the younger group. This may suggest that leadership effectiveness and issues related to pay and promotion are more important for younger workers than for older workers in their assessment of their current work ability.

Surprisingly, satisfaction with pay and promotion was a negative predictor of work ability while work satisfaction and leadership effectiveness were positive predictors. The direction of the association between work ability and satisfaction with pay and promotion for the younger group may suggest that as satisfaction increases work ability decreases. This may reflect an attitude from the younger cohort that suggests that their ability to do their current role is somehow compromised with the promise of increased remuneration and better career opportunities. This may reflect a temporal attitude about one's current ability as opposed to increased ability afforded in a hypothetically new role into the future. More research is required to untangle the perceptions of younger workers.

Vocational strain appeared to be an important organizational factor for both younger and older workers explaining 15 and 17 percent of the variance in work ability in both final models. It was the second most important predictor of work ability following health. This confirms past research (3) that found chronic disease, stress symptoms and work abil-

ity were strongly correlated and, in another study, found occupational stress to be a significant and unique predictor of work ability (11). The findings in this study also confirmed past research that suggests that an individual's psychological well-being, high self-esteem and good personal coping mechanisms positively impact on increasing work ability and prolongation of work for ageing workers (3, 6, 29). Self-efficacy in particular proved to be an important unique positive predictor of work ability for both samples, whilst coping resources and health actually mediated the effects of negative affect on work ability.

Findings should be interpreted in the context of limitations of the current study. Although the sample size was adequate, the majority of the participants were female. Furthermore, the majority of participants were aged between 18-25 years. In order to extend the generalisability of results future research should target a wider range of ages and sex groups. In addition, only a single item measure was used for work ability, coping resources and health. The use of scaled measures such as the Workability Index (WAI) (30) may have increased the power in the regression models achieved due to the use of a more reliable measure.

Conclusions

Overall the results showed the importance of organizational culture, leadership effectiveness, job satisfaction and vocational strain on work ability. While individual factors of self-efficacy, coping resources and health appear to be important predictors of work ability, these organizational factors can help organizational health practitioners target primary level interventions more appropriately to system wide issues. The findings of this study suggest that individual interventions targeting resilience and health could be coupled with interventions that address organizational nurturance values; leadership effectiveness, occupational stress and job satisfaction as effective strategies for increasing work ability in the workforce over its whole life course, not just for those workers that are already in the ageing category.

References

1. Australian Bureau of Statistics. Population projections (No. 3222.0) Retrieved March 1, 2008, from AusStats database
2. Jackson, N & Walter, M., Retirement intentions of Australia's Baby Boomers. An occupational overview, Research Projects No 4, Demographic Analytic Services Unit, University of Tasmania, 2009.
3. Salonen, P, Arola, H, Nygård, C.H, Huhtala, H., & Koivisto, M. Factors associated with premature departure from working life among ageing food industry employees. *Occupational Medicine-Oxford*, 2003; 53 (1), 65–68.
4. de Boer, A.G.E.M., van Beek, J.C., Durinck, J., Verbeek, J.H.A.M., & van Dijk, F.J.H. An occupational health intervention programme for workers at risk for early retirement; a randomised controlled trial. *Occupational and Environmental Medicine*, 2004; 61 (11), 924–929.
5. Ilmarinen, J. Towards a longer worklife: Aging and the quality of worklife in the European Union. Helsinki: Finnish Institute of Occupational Health; 2001.
6. Webber, L., Smith, K., & Scott, K. Age, work ability and plans to leave work. Proceedings of the Joint Conference of the Australian Psychological Society and the New Zealand Psychological Society, Auckland, N.Z. (pp. 479–483) Australian Psychological Society: Melbourne; September 2006.
7. Camerino, D., Conway, P. M., van der Heijden, B. I. J. M., Pokorski, J., Estry-Behar, M., & Hasslehorn, H. M. The role of job alienation in work ability deterioration and unhealthy aging. *International Congress Series*, 2005; 1280, 61–66.
8. Aittomäki, A., Lahelma, E., & Roos, E. Working conditions and socio-economic inequalities in work ability. *European Journal of Public Health*, 2002; 12 (4), 35.
9. Chan, G, Tan, V, & Koh, D., Ageing and fitness to work. *Occupational Medicine-Oxford*, 2000; 50 (7): 483–491
10. Seitsamo, J. and Ilmarinen, J. Life-style, aging and work ability among active Finnish workers in 1981–1992. *Scandinavian Journal of Work Environment & Health*, 1997; 23 (1), 20–26.
11. Palermo, J., Webber, L., Smith, K., Khor, A. Factors that predict work ability: Incorporating a measure of organizational values towards ageing, Ilmarinen, J (Ed). *Promotion of Work Ability Towards a Productive Ageing*, Japan: International Committee on Occupational Health; 2009.

12. Rotenberg, L., Portela, L.F., Banks, B., Griep, R.H., Fischer, F. M., & Landsbergis, P. A gender approach to work ability and its relationship to professional and domestic work hours among nursing personnel. *Applied Ergonomics*, 2008; 39, 646–652.
13. Pranjić, N., Males-Bilić, L., Beganlić, A., & Mustajbegović, J. Mobbing, stress and work ability index among physicians in Bosnia and Herzegovina: survey study. *Croatian Medical Journal*, 2006; 47 (5), 750–758.
14. Palermo, J. Breaking the cultural mould: The key to women's career success. The Hudson 20:20 Series, Hudson Global Resources & Human Capital Solutions; 2004.
15. Probert, B. „Clair Burton Memorial Lecture: 'Grateful slaves' or 'self-made women': A matter of choice of policy.“ *Australian Feminist Studies*, 2002; 17(37): 7–17.
16. Rosenberg, J., H. Perlstadt, et al. „Now that we are here: Discrimination, disparagement and harassment at work and the experiences of women lawyers.“ *Gender & Society*, 1993; 7(3): 415–433.
17. Still, L. V. Women in Management: how are they faring? Nedlands, Western Australia, Centre for Women and Business, Graduate School of Management, University of Western Australia; 2002.
18. Carr, P. L., Szalacha, L., Barnett, R., Caswell, C., & Inui, T. A “ton of feathers”: Gender discrimination in academic medical careers and how to manage it. *Journal of Women's Health*, 2003; 12, 1009–1018.
19. Bond, M. A., Punnett, L., Pyle, J. L., Cazeca, D., & Cooperman, M. Gendered work conditions, health, and work outcomes. *Journal of Occupational Health Psychology*, 2004; 9(1), 28–45.
20. Miner-Rubino, K., & Cortina, L. M. Beyond targets: Consequences of vicarious exposure to misogyny at work. *Journal of Applied Psychology*, 2007; 92, 1254–1269.
21. Schmitt, M. T., Branscombe, N. R., & Postmes, T. Women's emotional responses to the pervasiveness of gender discrimination. *European Journal of Social Psychology*, 2003; 33, 297–312.
22. Tuomi, K., Ilmarinen, J., Klockars, M., Nygård, C.H., Seitsamo, J., Huuhtanen, P., & Martikainen, R. Finnish research project on aging workers in 1981–1992. *Scandinavian Journal of Work Environment & Health*, 1997; 23 (1), 7–11.
23. Palermo, G. Gender and organizational culture: Relationships between marginality and women's career success. Germany: Lap Lambert Academic Publishing; 2010.
24. Bass, B. M., & Avolio, B. J. Transformational Leadership: A response to critics. In M. M. Chemers & R. Ayman (Eds.), *Leadership theory and research: Perspectives and directions*. Sydney: Academic Press Inc.; 1993.

25. Osipow, S. H. and A. R. Spokane Manual for the Occupational Stress Inventory. Odessa, FL, Psychological Assessment Resources; 1987.
26. Balzer, W.K., Khim, J.A., Smith, P.C., Irwin, J.L., Bachiochi, P.D., Robie, C., Sinar, E. F., & Parra, L. F. Users manual for the job descriptive index and job in general scales. Bowling Green, OH: Bowling Green State University; 1997.
27. Tellegen, A., Ed. Structures of mood and personality and their relevance to assessing anxiety, with an emphasis on self report. Anxiety and the anxiety disorders. Hillsdale NJ, Erlbaum; 1985.
28. Bosscher, R.J. & Smit, J.H. Confirmatory factor analysis of the general self-efficacy scale. Behavior Research and Therapy, 1998; 36, 339–343.
29. Martimo, K., Varonen, H., Husman, K., & Viikari-Juntura, E. Factors associated with self-assessed work ability. Occupational Medicine, 2007; 57, 380.
30. Finish Institute of Occupational Health, Work Ability Index. (2nd ed.); 1998.

Development of an initial model for the medical management of an older work force

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Abstract

Occupational gerontology studies the effect of occupational exposures on age-associated changes in the work ability (i.e. functional capacity) and health of employees. Our aim was to develop a model that explains the role of the work environment on age related morbidity with advancing age. Employees may develop diseases resulting from exposures to adverse working conditions (e.g. high work stress). In the present study 283 employees were examined using the Work Ability Index (WAI). The results indicate that work ability decreases with advancing age while the variability in work ability increases over the life course. The model developed indicated that a portion of the variance could be attributed to the effects of extant diseases at the time of the examination.

Conclusion: The development of diseases during the working life affects work ability. Our model suggests that monitoring work ability can reduce health care costs and aid in the management of the older work force.

Key words: occupational gerontology, prevention, life-span model, variance, age, diseases

Introduction

The Concept of Occupational Gerontology

Human gerontology is usually associated with the study of elderly subjects (1) with study populations are often older than 65 years, the usual border between active employment and retirement. Because of the breadth of studies in human gerontology, occupational gerontology is closely associated with geriatrics, the study of the medical problems of the aged. For example, after age 65 many individuals become less active and also become more susceptible to the development of chronic illnesses. Studies of individuals in the post-65 age cohort often focus on the increasing need for care as well as on the biological and psychosocial consequences of the chronic diseases from which they suffer (e.g., diabetes mellitus, cardiovascular diseases, arthritis, etc.). Human gerontology not only involves the study of the medical aspects of diseases but also the handling of work-related impairments resulting from those diseases, including the loss of independent functioning among older patients.

Individuals younger than 65, who are still active in the workforce, are not often the subjects of studies on aging. Except for the occasional longitudinal study, e.g. (2) younger cohorts are often used as comparison groups for cross-sectional studies focusing on age related differences. This has the effect of using the findings from a younger cohort as a baseline against which an older cohort of workers is compared without assessing changes that may have occurred in the functional capacity of either the young or older subjects. This points out one of the major problems of using a cross sectional design: it compares the aggregated performance of two separate age cohorts. That is, the researcher is concerned with age differences and not age related changes. To assess age related changes across either the life-span or work-span requires the use of a longitudinal design. A case can be made that we should not limit studies in occupational gerontology to those over 65 years but rather should assess the incremental changes that occur throughout the working life. More than a decade ago, Winn pointed out the

knowledge gap that has derived from not taking a life-course approach to the study of occupation on post retirement morbidity (3). From a life-course perspective prevention should be viewed as integral to health promotion, and interventions should be initiated early in life and should include attention to the effect of the individual's work environment. The beneficial aspects of a good work environment include a reduction in chronic diseases and an increase in the length of time that an individual can maintain the independent activities of daily living.

To call attention to the impact of the work environment on long term functioning, Goedhard made the case that 'occupational gerontology' should be differentiated from the other branches of gerontology (4). When first introduced in 2001, the objective was to bridge the gap between occupational health and gerontology, aiming to maintain or improve the work ability of employees while enhancing the prospects for their successful aging. Based on the argument presented by Goedhard, we can regard occupational gerontology as a separate branch of gerontology that targets the actively working population. Goedhard suggested that this area of scientific inquiry should include various studies of employee work ability, the effects of employee work environment on the individual, the effects of the work organization, and the effects of adverse work exposures, as well as other occupationally related risk factors that can adversely affect successful aging, i.e. factors that prevent the worker from arriving at a level of physical, social, and psychological well-being in old age (5).

Outcomes of studies in the areas of diet, exercise, personal habits, and psychosocial factors may help workers to improve their potential in the work environment and help to prevent disability. Furthermore, such studies would also be useful in enhancing disease prevention, maintaining health, and maintaining or enhancing work ability.

Any study of an active worker entails complexity since the effects of the work environment, psychosocial variables, and genetics – as well as the effects from a myriad of other variables can singly or in combination affect the health and well-being of the individual. Adding the dimension of 'age related changes', or 'aging', to the effects that these

other variables have on the individual increases the complexity of the scientific research needed to address questions related to occupational health problems. The development of models, however, that adequately explain results from studies conducted in this area will prove useful in demonstrating the importance of the work environment on both morbidity and mortality (6). The aim of the study reported below was to develop a model that provides a better understanding of the possible effects of the work environment on age-associated changes in work ability. Models developed from these efforts can promote a better understanding of the complex relationships between work demands and the biological and psychosocial changes that occur both within and among workers as they age.

Work ability and employability are key concepts in studies in the field of occupational gerontology. Work ability, a measure of functional capacity, is itself a very complex concept composed of such elements as an individual's physical and mental health, physical capacity, and stress perception, plus the ergonomic integrity of the work environment

Materials and Methods

We examined work ability using WAI in 283 workers who were participating in a periodic occupational health survey (POHS). The subjects were blue-collar workers employed in the metal industry (N=90, age-range 20-60 yrs) and in an electro-technical industry (N=193; blue-collar and white-collar workers; age-range 19-60 yrs).

WAI is a useful instrument that serves as a foundation for studies on workers' functional capacity and relates those quantitative outcomes to other measures. Work ability is expressed by the composite score calculated from the several questions that make up WAI. This score, which ranges between 7 and 49, is helpful in developing both practical and theoretical models that can aid in understanding the relationships between overall work ability and other variables. It can be assumed that variables such as endurance capacity, calendar age and work stress can

affect work ability either positively or negatively. For example, in a study of work ability and physical endurance capacity (VO₂max) the following regression model was derived:

$$\text{WAI} = 37.6 + 0.19x \text{ VO}_2\text{max} - 0.05 x \text{ age}; (r=0.46; \text{ explained variance: } 22\%; p<.01)$$

The conclusion was that age affects work ability negatively whereas physical capacity is positively related to work ability (7).

The reported amount of shared variance between work ability rate and age was relatively small in this study by Goedhard and colleagues, explaining approximately 5 to 10% of the variance of the WAI scores. Endurance capacity, however, explained considerably more of the variance in the work ability rate than did calendar age. A useful recommendation from this work was that stimulating older employees to engage in regular physical exercise was probably beneficial in compensating for the age-associated decline in work ability. Without this finding, the only reasonable explanation for the decrease in functional capacity would be to accept that age-associated declines in work ability are inevitable since chronological age cannot be modified.

Variability of aging workers and presentation of the model:

There are many theories of aging and much is known about age-associated changes in the human organism, but no available theory provides an overall explanation of the aging process. It is generally accepted that aging of the organism is caused by a combination of genetic and environmental factors (8). Each person (employee) has a unique combination of genetic and environmental influences affecting any particular phenotype (9). Many biological, psychological, and social functions will change with advancing age and do so at different rates both within and across individuals. The variability within an individual changes over the life course. Therefore, inter-individual differences

can also be expected to increase with age, as does the variability of the phenotype. From an occupational health perspective, it is important to gain knowledge about the role of the work exposures on the variability of the phenotype because it may provide insight into the expression of differences in the rate of age-related changes between people. This variability can be expressed as follows:

Equation (1) $V_e + V_g = V_p$ [V_e = environmental component; V_g = genetic component; V_p = phenotypic variance] where

Equation (2) $(V_e/V_p) + (V_g/V_p) = 1$; and (V_e/V_p) = environmentality; and (V_g/V_p) = heritability

Results

WAI scores and age

A statistically significant decrease of the observed WAI scores across age was noted. presented in Figure 1. The calculated linear regression model was:

$WAI = 48.36 - 0.155 \times \text{age}$ (standard regression) [$p < .01$; explained variance: 8.5 %; $R^2 = 0.085$].

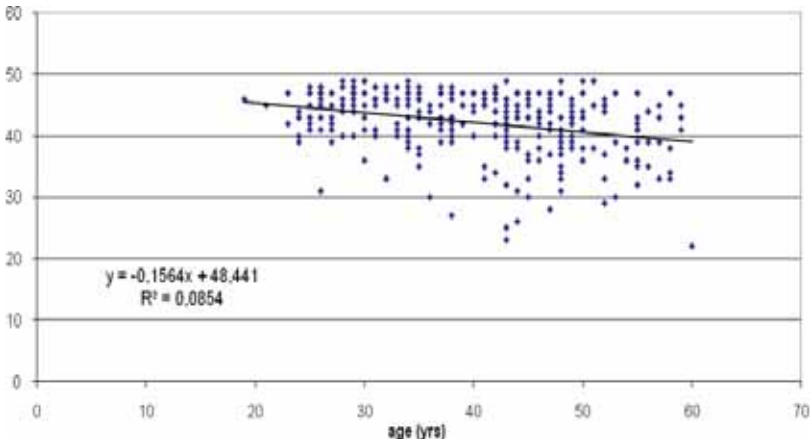


Figure 1. WAI scores of 283 industrial workers; the calculated regression line is statistically significant.

The wide scatter observed in the WAI scores in Figure 1 is indicative of the variability observed both within and across age cohorts. These findings are consistent with the results reported from longitudinal studies conducted in Finland, where it has been noted that work ability decreases with advancing age. However, the age related decrease noted in our study only accounted for 8.5% of the total explained variance, suggesting that other factors besides age were significant contributors to the work ability rate and to the variability of the WAI scores. The 91.5% of unexplained variance in this analysis might be accounted for by either genetic or environmental factors, a combination of the two, or perhaps some yet to be explained causative agent. Table 1 presents the WAI scores obtained from different age-cohorts. The reader will note, from the data provided in Table 1, that the variance of the observed WAI scores increases with age, which is indicated by the increased scatter of scores with advancing age. The calculated regression line of the variances shows a significant increase with age:

$$\text{Variance} = 5.46 + 0.73 \times \text{Age} \quad (r = 0.85; p < .01)$$

Table 1. WAI scores, standard deviation and variance for different age-groups.

| Age-group | Number of workers | WAI score (mean) | WAI score (standard deviation) | variance |
|-----------|-------------------|------------------|--------------------------------|----------|
| 19-24 | 8 | 43.25 | 2.63 | 7.92 |
| 25-29 | 38 | 44.7 | 3.60 | 12.99 |
| 30-34 | 44 | 43.34 | 1.17 | 18.83 |
| 35-39 | 39 | 42.64 | 2.12 | 21.32 |
| 40-44 | 50 | 41.8 | 4.96 | 36.98 |
| 45-49 | 51 | 40.78 | 2.12 | 22.65 |
| 50-54 | 28 | 41.25 | 3.54 | 32.71 |
| 55-60 | 25 | 39.32 | 13.44 | 34.06 |
| All | 283 | 42.09 | 5.10 | 26.14 |

Diseases and work ability

Diseases, especially chronic diseases may have a strong negative effect both on the functional aging process and on work ability. A measure of this construct is provided in the WAI section eliciting the number of diseases that have been reportedly diagnosed. WAI item number 3 consists of 13 categories of diseases or conditions with approximately fifty separate maladies spread across the categories.

These separate maladies represent the diseases diagnosed by a physician. The score on this item accounts for between 1 and 7 of the total 49 possible points that make up the WAI score; (i.e. 1 represents the existence of 5 or more diseases; 7 represents no disease). For the group of 283 workers addressed in this study, it was found that the score on item number 3 in Table 2 decreased with age. This decrease implies that the number of diagnosed diseases, on the average, increased over time. It also can be suggested that since the number of reported diseases increased with age, then the length of exposure to condition(s) resulting in the disease(s) should also have increased with increasing age. This relationship is demonstrated by the following regression line that was obtained from the analyses of item number 3 i.e. the reported number of diagnosed diseases:

$$\text{WAI score (item 3)} = 7.0 - 0.05 \times \text{Age} \quad (r = -0.25; p < .01)$$

The significance of this relationship suggests the need for a further analysis of the influence of various disease states on the age-associated variance of work ability. In this effort, we examined the influence of various disease states by comparing the data from the following two subgroups of workers:

1. A group of workers (n=102) without reported diseases on the WAI questionnaire (i.e., a score on item number 3 = 7)
2. A group of workers (n=181) with one or more reported diseases on the WAI questionnaire (i.e. score on item number 3 = 1 to 5)

After recoding the data from item number 3 of Table 2, and adjusting each participant's WAI scores accordingly (i.e. WAI score minus data obtained from item number 3 Table 2), the composite WAI scores presented in Table 2 were obtained.

Table 2. Variance of WAI scores for two subgroups (a) without disease) and (b) with 1 or more diseases)

| | WAI – item 3 (no disease) | WAI – item 3 (1 or more diseases) |
|--------------------|------------------------------|--------------------------------------|
| Number of workers | 103 | 180 |
| Age (mean) | 37.8 | 42.0 |
| Mean | 38.8 | 36.0 |
| Standard deviation | 2.38 | 4.43 |
| Variance | 5.67 | 19.67 |
| Range | 32-42 | 18-42 |

By recoding the data, the conclusion that can be drawn is that the variance in the composite Work Ability Index Score is considerably larger when an employee reports one or more existing diseases than when there is an absence of reported diseases. This finding strongly suggests that diagnosed medical condition(s) are a detriment to an employee's

occupational functional capacity. Additional studies examining the influence of disease states on the age-associated variance associated with work ability would appear to be both a productive as well as an important field of investigation for the occupational gerontologist.

This analysis makes it obvious that the relationship between work ability and age is strongly affected by the presence of diagnosed disease states. In case of no diseases, the corrected work ability decreases only slightly with age.

Thirty-six percent of the studied population reported that they did not suffer from a diagnosed disease (n = 102 employees; see Table 2). The calculated regression model for those employees with no reported diseases on the WAI questionnaire was

$WAI = 40.3 - 0.04 \times \text{age}$ (N=102, $r = 0.16$; $p > 0.05$; explained variance: 2.5%).

When WAI scores are depicted in relation to age in the case of reported diseases on the WAI questionnaire. The calculated regression model is as follows:

$WAI = 45.5 - 0.13 \times \text{age}$ [N= 180, $r = 0.244$; $p < .01$, explained variance: 6%]

Compared to the results provided in case of AI scores in the absence of diseases, there appears to be a wide scatter of data and the average decline in scores that occurs with increasing age. This decline in functional capacity is obviously greater with than without reported diseases.

The present findings allow us to raise the question of a possible relationship between work – environmentality (i.e., environmental factors) and the variance noted in scores on the Work Ability Index (i.e., a measure of the employees functional capacity).

Discussion

One of the goals of the field of occupational gerontology should be to determine what factors account for the increased variability in a worker's functional capacity that occurs over time. Both genetic and environmental influences are important factors that impact on the aging process. According to the available literature a strong genetic influence on the aging process is not only probable but likely (10). An individual's genetic structure not only appears to protect the organism against damage or infections but has a central role in the maintenance of homeostasis (10).

Absence of disease is considered the norm in which the aging process of the organism is primarily subjected to purely genetic influences. The decline in functional capacity that is observed in case of absence of disease noted may thus be considered the norm for work ability over time or for work ability studied across an age-range. Although we would certainly need to have more details, given the data and arguments above, we feel comfortable in making the following assumption: Heritability is expressed by the ratio of the variance of WAI in the absence of disease over the total WAI variance. This relationship can be expressed by the following formula:

Heritability: $(V_g/V_p) = \text{variance provided by WAI minus WAI score of item 3 of Table 2} / \text{total WAI variance}$

Using the data provided in Table 2 (column A: no disease and column B: 1 one or more diseases) we can substitute the following values into the equation:

$$\text{Heritability} = (V_g/V_p) = 5.85 / 19.67 = 0.29$$

Then from Equation (2) it should follow that:

$$\text{Environmentality: } (V_e/V_p) = 1 - (V_g/V_p) = 0.71$$

If our assumptions are correct, then the following preliminary conclusions can be reached from the values obtained: Prevention of disease

is important to the maintenance of work ability and hence functional capacity. The phenotypic variance of work ability appears to be affected more by environmental factors than by genetic factors.

Moreover, environment (i.e., work) is an important factor in determining the work ability rate. These findings will have to be extended with more data from similar studies using other groups of workers in order to develop models that can successfully be applied in occupational health settings targeted for an aging work force.

Prevention of diseases and work ability:

An important inference from this study is the decline in work ability, as measured by the decline in the WAI scores, as a function of disease states in workers. We consider this model useful for occupational health physicians. Development of one or more chronic diseases (e.g., those mentioned in Table 1) may adversely affect work ability. Therefore, it is deemed useful to monitor the possible development and the effect of such diseases by annual checks of work ability through administration of WAI, especially for those workers in the age range of 51 through 60 where the risks of decreasing work ability are significant. Close monitoring of work ability is not only in the best interests of employees but also of management. The aging worker may benefit from such a testing regime since maintenance of work ability can positively affect productivity as well as reduce health care costs including those indirect costs associated with absences. The end result is that the employee's value to the company can be increased until retirement and result in decreased health care costs thereafter. Another consequence of the periodic evaluation of work ability would be a decrease in variance of work ability over time.

Furthermore, we believe, from the model developed in this report, that the following conclusion can be drawn: The field of occupational gerontology can provide a useable framework for addressing the practical problems encountered by, and questions concerning the management of, older workers and can aid workers in the transition from the working life into the third age (i.e., post-retirement) period.

References

1. Grundy E. The epidemiology of aging. In: Brockehurst J.C., Tallis R.C. and Fillit H.M. (eds): Textbook of Geriatrics and Gerontology. 4th ed. Churchill Livingstone, Edinburgh, 1992: 3–20
2. Ilmarinen J, Tuomi K, Klockars M. 1997. Changes in the work ability of active employees over an 11-year period. *Scand. J. Work, Environm and Health* 23 suppl.1:49–57.
3. Winn F. 1991. Preface for special issue on ergonomics and the older worker. *Exp. Aging Research*. 17(3):139-141
4. Goedhard WJA. 2004. Occupational gerontology: the science aimed at older employees. In: Kumashiro M, editor. *Aging and work*. London: Taylor and Francis. p 9–19.
5. Gibson RC. 1995. Promoting successful and productive aging in minority populations. In Bond LA, Cutler SJ, Grams, A. editors. *Promoting successful and productive aging*. Thousand Oaks, CA: Sage, p. 279–288.
6. Ilmarinen J. 1999. Work Ability and its indicators among ageing workers. In: Ilmarinen J (ed.). *Ageing workers in the European Union*. Helsinki: FIOH. chap 8. p 46–47.
7. Goedhard WJA, Rijnstra TSHW, Puttiger PHJ. 1997. Work ability and its relationship with age and maximal oxygen uptake. In: Kilbom Å, Westerholm P, Hallsten L, Furaker B, editors, *Work after 45?* Stockholm: Arbetslivsinstitutet, Arbete och Hälsa 29:106-111.
8. Bergeman CS. 1997. Aging – Genetic and Environmental Influences., Thousand Oaks, CA: Sage. (p. 1-25)
9. McClearn GE, 1997. Biogerontologic theories. *Exp. Gerontology* 32:3–10.
10. Brouwer A. 1990. The nature of aging. In: Horan MA and Brouwer A. editors,
11. *Gerontology – Approaches to biomedical and clinical research*. London: Edward Arnold. P. 1–11.

Work ability and later-life health: A 28-year longitudinal study among Finnish municipal workers

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Abstract

We examined longitudinally the associations between the work ability of middle-aged employees and their health over the retirement years. The study sample came from a follow-up questionnaire to Finnish municipal workers. General linear models with repeated measures were used to assess the effects of the Work Ability Index and other variables on health. The results showed that the Work Ability Index was a strong predictor of later-life health. If work ability was excellent, the odds of good health were over 3 times higher than for a person with poor work ability. Maintenance of good work ability throughout the occupationally active years has a strong impact on later-life health.

Key terms: work ability index, longitudinal study, health

Introduction

Work ability, measured by the Work Ability Index (WAI) has proved to be a reliable predictor of morbidity, early retirement, and disability in studies concerning ageing workers (1-3). Good work ability also predicts well-being and functional status far beyond the retirement transition (4). There is also some evidence that work ability may predict mortality (5-6). Even though there is evidence that work ability is associated with a person's own evaluations of his/her health (7-8) more studies are still needed to obtain information from the long-term effects of work ability on later-life health and well-being. The main objective of this study was to examine longitudinally the associations between work ability in midlife among occupationally active employees and their health in their retirement years.

The specific study questions were:

1. Does the level of Work Ability Index (WAI) with the categories excellent, good, moderate, and poor have an impact on self-assessed health and morbidity 28 years later?
2. Is WAI associated with health even if other factors are taken into account?

Material and methods

The study sample

The study sample came from a follow-up questionnaire study of Finnish municipal workers which was conducted at the Finnish Institute of Occupational Health from 1981 to 2009 (6). In 1981, a questionnaire was mailed to 7,344 municipal workers in different areas of Finland. The respondents were born between 1923 and 1937 and the mean age was 50.5. A total of 6,257 persons responded to the first questionnaire (the response rate was 85.2%). In 2009, a total of 3,093 persons responded

to the final questionnaire (the response rate was 74% of the surviving participants who responded to the first questionnaire). In 2009, the vital status and dates of death were added to the data. By then, 2,079 respondents had died.

Study variables

The measure of perceived health was constructed from two questionnaire items: “Compared to your friends of the same age, is your health much better, slightly better, the same, slightly worse, or much worse?” and “To what extent do diseases hamper your everyday life: not at all, relatively little, to some extent, rather much, or very much?” The responses to these questions were combined into four groups (good, moderate, poor, and very poor health). The construction of these groups has been reported elsewhere (9-10). The independent variables were work ability, measured by the Work Ability Index (WAI), categorized into excellent, good, moderate, and poor (11), physical function (coping with mainly physically demanding daily activities, for instance heavy cleaning work, lifting and carrying heavy weights, climbing three flights of stairs without needing to rest, walking about 2 km without a rest, running a short distance without a rest, sitting still for about 2 h, squatting down on one’s heels and getting up, bending over, bending down, lifting hands above the head, detailed movements of the arms and fingers), and lifestyle, including health behavior (i.e. alcohol consumption, smoking, physical exercise) and involvement in various activities (reading, studying, attending clubs and associations, and needlework, handicrafts). For physical function and activity items, summary scores were created. Gender, marital status (unmarried, married, unmarried but co-habiting, separated, divorced, widow/widower), socio-economic group (blue-collar, lower-level white-collar, upper-level white-collar workers), age, and gender were also included in all analyses.

Statistical analysis

The associations between health, physical function, lifestyle, and other background variables were assessed by general linear models with re-

peated measurements. These likelihood based methods are valid under missing at random assumption when missing data might depend on observed data (12). With this method it was possible to use all available data from each time point and there was no need to be restricted to the follow-up data only. Statistical analyses were performed with the SAS statistical package (13).

Results

At the baseline, there were some differences between the study participants and those who had died during the 28-year follow-up or those who did not respond to all questionnaires (Table 1). Compared to non-respondents, the study participants belonged more often to the upper white-collar group; they were also younger, more active and had better physical function. About 60 per cent of the deceased were men or used to work in blue-collar occupations. In addition, work ability was better among the participants; the proportion of excellent work ability was 20% compared to 11% among non-respondents and 14% among the deceased.

Table 1. Baseline characteristics of participants in the follow-up, deceased and other dropouts.

| Baseline characteristics (range) | Participants in the follow-up (n=3093) | Deceased (n=2079) | Non-respondents (n=1085) |
|---------------------------------------|--|-------------------|--------------------------|
| | % or Mean (Std) | % or Mean (Std) | % or Mean (Std) |
| Gender | | | |
| Men | 37% | 61% | 35% |
| Women | 63% | 39% | 65% |
| Socio-economic status | | | |
| Upper white-collar work | 25% | 16% | 14% |
| Lower white-collar work | 38% | 24% | 36% |
| Blue-collar work | 37% | 60% | 49% |
| Activity level (0–5) | 1.35 (1.1) | 1.09 (1.0) | 1.16 (1.1) |
| Age (45–58 years) | 49.7 (3.4) | 51.7 (3.6) | 50.4 (3.6) |
| Physical function (0–33) ^a | 26.2 (5.9) | 23.4 (7.2) | 25.0 (6.5) |
| Morbidity (0–24 diseases) | 1.69 (2.0) | 2.26 (2.5) | 1.82 (2.2) |
| Health | | | |
| Good | 9% | 7% | 7% |
| Average | 28% | 23% | 25% |
| Poor | 49% | 47% | 51% |
| Very poor | 14% | 23% | 17% |
| Work Ability Index | | | |
| Excellent | 20% | 14% | 11% |
| Good | 39% | 38% | 31% |
| Moderate | 31% | 34% | 37% |
| Poor | 10% | 14% | 21% |

^a from 1985

The Work Ability Index was a strong predictor of later-life health (Table 2). When all the other independent factors were included in the analysis, the level of Work Ability Index was still a highly significant predictor of health. Besides good work ability, involvement in activities and good physical functioning further improved health at follow-up. Women reported better perceived health than men. Socio-economic status based on occupation was also a strong modifier of health. Upper white-collar work especially promoted health compared to blue-collar work.

The adjusted odds ratios in Table 3 describe the relative differences between work ability groups. For instance, if a person had excellent-

work ability in midlife the odds of having good health was 3.6 times compared to the odds of a person with poor work ability having good health during the retirement years. Even an increase from poor work ability to moderate almost doubled the odds of good health.

Table 2. General linear model of health 1981-2009. Estimates and 95% confidence intervals (CI). N=3093

| Parameter | Estimate | StdE | 95% CI | | Z | Pr > Z |
|------------------------------|----------|------|--------|-------|-------|---------|
| Time | | | | | | |
| 1981 | -0.45 | 0.04 | -0.53 | -0.37 | -10.9 | <.0001 |
| 1992 | -0.29 | 0.04 | -0.36 | -0.22 | -8.13 | <.0001 |
| 1997 | -0.12 | 0.03 | -0.18 | -0.07 | -4.58 | <.0001 |
| 2009 | 0 | | | | | . |
| Gender | | | | | | |
| Women | 0.35 | 0.05 | 0.25 | 0.44 | 7.22 | <.0001 |
| Men | 0 | | | | | |
| Age | | | | | | |
| | 0.04 | 0.01 | 0.02 | 0.05 | 6.14 | <.0001 |
| Socio-economic status | | | | | | |
| Upper white-collar | 0.17 | 0.06 | 0.06 | 0.28 | 3.05 | < .01 |
| Lower white-collar | -0.02 | 0.05 | -0.12 | 0.09 | -0.30 | n.s. |
| Blue-collar work | 0 | | | | | |
| Activity | | | | | | |
| | 0.09 | 0.02 | 0.05 | 0.12 | 4.97 | <.0001 |
| Physical function | | | | | | |
| | 0.16 | 0.0 | 0.16 | 0.17 | 41.8 | <.0001 |
| Work Ability Index | | | | | | |
| Excellent | 1.27 | 0.09 | 1.10 | 1.46 | 13.5 | <.0001 |
| Good | 1.11 | 0.06 | 0.98 | 1.23 | 17.1 | <.0001 |
| Moderate | 0.61 | 0.06 | 0.50 | 0.72 | 10.9 | <.0001 |
| Poor | 0 | | | | | |
| Alcohol consumption | | | | | | |
| None | -0.34 | 0.04 | -0.42 | -0.25 | -7.97 | <.0001 |
| Some | 0 | | | | | |
| Smoking | | | | | | |
| Does not smoke | 0.13 | 0.06 | 0.02 | 0.25 | 2.25 | < .05 |
| Smokes | 0 | | | | | |

Table 3. Relative differences between Work Ability Index groups explaining good health. Odds ratios (OR) and 95% confidence intervals (CL)

| Label | Estimate | SE | CL | | Chi-sq | Pr |
|-------------------------------|----------|------|------|------|--------|--------|
| Excellent vs. poor | 3.58 | 0.34 | 2.97 | 4.30 | 182.78 | <.0001 |
| Excellent vs. moderate | 1.98 | 0.16 | 1.66 | 2.29 | 64.83 | <.0001 |
| Excellent vs. good | 1.18 | 0.10 | 1.00 | 1.39 | 3.91 | 0.0480 |
| Good vs. poor | 3.08 | 0.20 | 2.67 | 3.44 | 293.12 | <.0001 |
| Good vs. moderate | 1.65 | 0.08 | 1.50 | 1.82 | 105.20 | <.0001 |
| Moderate vs. poor | 1.83 | 0.10 | 1.64 | 2.05 | 118.55 | <.0001 |

Discussion

Our study suggests that promotion of good work ability over the occupationally active years has a strong impact on later-life self-assessed health. It has also been shown that self-rated health predicts morbidity (14, 15), and consequently, if an aging employee could maintain his or her work ability over the occupationally active years it would enforce a healthier and disability-free third age. This may have strong implications for social policy as populations in most industrialized countries are aging rapidly and the economic costs of this aging are expected to rise in the future.

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References

1. Ilmarinen J, Tuomi K. Past, present and future of work ability. *People and Work Research Reports* 2004; 65: 1–25.
2. Tuomi K, Ilmarinen J, Seitsamo J, Huuhtanen P, Martikainen R, Nygård C-H, Klockars M. Summary of the Finnish research project (1981–1992) to promote the health and work ability of aging workers. *Scand J Work Environ Health* 1997; 23 suppl. 1: 66–71.
3. Alavinia S, de Boer A, van Duivenbooden J, Frings-Dresen M, Burdorf A. Determinants of work ability and its predictive value for disability among Dutch construction workers. *Occupational Medicine* 2009; 59(1): 32–37.
4. Tuomi K, Huuhtanen P. Promotion of work ability, the quality of work and retirement. *Occupational Medicine* 2001; 51: 318–324.
5. Seitsamo J, Martikainen R. Work ability and all cause mortality: A 25-year longitudinal study among Finnish municipal workers. In M Kumashiro (ed.): *Promotion of Work Ability towards Productive Ageing*, Taylor & Francis, London 2009. p. 101–104.
6. Tuomi K, Ilmarinen J, Klockars M, Nygård C-H, Seitsamo J, Huuhtanen P et al. Finnish research project on aging workers in 1981–1992. *Scand J Work Environ Health* 1997; 23 suppl 1: 7–11.
7. Saarni SI, Saarni ES, Saarni H. Quality of life, work ability, and self employment: a population survey of entrepreneurs, farmers, and salary earners. *Occupational and Environmental Medicine* 2008; 65: 98–103.
8. Sørensen L, Pekkonen M, Männikkö K, Louhevaara V, Smolander J, Alèn M. Associations between work ability, health-related quality of life, physical activity and fitness among middle-aged men.” *Applied Ergonomics* 2008; 39: 786–791.
9. Seitsamo J. Retirement transition and well-being – A 16-year longitudinal study. *People and Work Research Reports* 76, Helsinki 2007.
10. Seitsamo J, Klockars M. Aging and changes in health. *Scand J Work Environ Health* 1997; 23 suppl 1: 27–35.
11. Tuomi K, Ilmarinen J, Jahkola A, Katajarinne L, Tulkki A. *Work Ability Index*. Finnish Institute of Occupational Health. Helsinki 1998.
12. Little R, Rubin D. *Statistical analysis with missing data*. Wiley, New York 1987.
13. Littell R, Milliken G, Stroup W, Wolfinger R. *SAS system for mixed models*. SAS Institute. Cary, NC 1996.
14. Molarius A, Janson S. Self-rated health, chronic diseases, and symptoms among middle-aged men and women. *Journal of Clinical Epidemiology* 2002; 55: 364–370.
15. Vuorisalmi M, Lintonen T, Jylhä M. Global self-rated health data from a longitudinal study predicted mortality better than comparative self-rated health in old age. *J Clin Epidemiol* 2005; 58: 680–687.

Changes in work ability according to type of pension benefit – A 28-year prospective study

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Abstract

This study focuses on changes in work ability according to old-age, individual early, and disability pensions over a 28-year time period. This prospective follow-up study showed significant differences in the development of work ability according to different pension benefits pre and post-retirement. Individuals who exited the workforce due to old age showed a steady decline in their self-rated work ability during follow-up. For those who exited the workforce due to individual early retirement or disability pension, a U-shaped curve, with a distinctive post-retirement recovery was detected. In addition to aging, the changes may be due to several situational factors.

Key terms: Work ability, pension benefit, prospective study, resource based theory

Introduction

Individuals' well-being and ability to adapt to life changes is dependent on numerous resources. The resource perspective (1) can be used to understand retirement transition and adjustment processes (2). According to Hobfoll's (3) conservation of resources (COR) theory, individuals build, protect, and retain their resources. In the retirement context, resources may be physical, cognitive, motivational, financial, social, and emotional (2). The theory further postulates that when faced with loss of resources, an individual will experience distress and may consequently develop mental and physical health problems (4). The prevalence of adverse outcomes such as mobility limitations, disability in everyday tasks and related service use increases with older age (5, 6). To avoid, retard or reverse the normal age-related process of decline in functioning (7), physical as well as mental resources are needed for compensation of decline and optimizing the remaining resources that are needed for leading an independent and socially active life in old age (8, 9).

Building upon the resource perspective, we use the Work Ability Index (10) to explore individual physical and mental resources with respect to work and/or every-day-life demands. Work ability has been conceptually defined as the measure of how good the worker is at present and will be in the near future, and how able s/he is to do his or her job with respect to the demands of the job and their health and mental resources (11). An imbalance between employee resources and work demands may have detrimental effects on their work status, health, and well-being over time (12, 13). Work ability can be promoted by managerial means. This includes taking work demands, the environment, work organization, and employees' health, functional capacity, and competences into consideration (14). The work ability of ageing employees, especially in the age group 52-58 years, tends to decline dramatically (12). However, whether the associations of adult working life extend well into old age is not clear (15). There are indications that work has far-reaching effects on individuals' ability to function in

old age. Using data stretching from midlife to old age, we found in a recent study that midlife work ability correlated with old age disability for women and with mortality for men (16).

The mandatory retirement age in the Finnish municipal sector before 2004 was 63-65, with the exception of some occupation-specific lower retirement ages (e.g. nurses, bus drivers). However, in the 1980's and 1990's several employees exited working life before their official retirement age into disability or individual early retirement. In case of disability retirement, clinically diagnosed illness or injuries serve as evident reasons, push factors (17). Alternatively, employees could apply for an individual early retirement pension at the age of 58. In order to receive individual early retirement, employees had to have a permanently reduced working capacity, a long work history, and a reduced capacity to cope with work demands. Work ability is a strong predictor of employee early retirement (14). Hence, type of pension benefit (old age, individual early and disability retirement pension) can reflect the balance between employees' resources and his or her work demands.

Objectives

This study adapts a resource based theory perspective in investigating changes in employee work ability from active mid-working life to old age according to the pension benefit they qualified for. In exploring both within and between group-variation, we use a large scale population-based 28-year longitudinal study.

Methods

This study is based on the Finnish Institute of Occupational Health co-ordinated Finnish Longitudinal Study on Municipal Employees (FLAME), which focused on health, work, lifestyle, and retirement among employees in the municipal sector (18). Altogether 7,344 em-

ployees were chosen randomly from all municipal professions in different parts of Finland aged 44-58 years at baseline in 1981. With a response rate of 85.2 percent, the baseline cohort consisted of 6,257 employees (44.7 % men). Since the 1981 baseline, four consecutive follow-up data collections took place in 1985 (respondents 5,556, non-respondents [NR] 600, deceased 101), 1992 (respondents 4,534, NR 1,329, deceased 394), 1997 (respondents 3,817, NR 1,695, deceased 745) and 2009 (participants 3,093, NR 1,085, deceased 2,078). Baseline characteristics are shown according to pension benefit group in Table 1.

Work ability was elicited as a subjective assessment of present work ability in relation to lifetime best, which is the first item on the Work Ability Index (WAI). WAI has been validated against clinical data (19) and the first item on the scale has been shown to capture most of the variability of the entire scale (12). The work ability score ranged from 0 to 10, with higher scores implying better work ability. Work ability was measured in all five study waves (in 2009 for 1,669, 40 % of the survivors). Record-based data regarding the different types of pension benefits (old-age, disability and individual early retirement) were required from the Finnish Centre of Pensions. Mortality data was obtained from the Population Register Centre of Finland. Repeated measures ANOVA was used to explore within and between group variance changes in work ability from active mid-working life to old age according to different types of pension benefits. All statistical analyses were performed with SPSS (15.0). Repeated measures ANOVA were used to explore within and between group variance in work ability according to pension benefit groups. The sphericity assumption was not met (Mauchly's test of sphericity, Greenhouse-Geisser $p=.899$, Huynh-Feldt $p=.902$), which indicated that the variance between the measures was not homogeneous. Hence, we used the Greenhouse-Geisser estimate as a correction factor. It was applied to the degrees of freedom used to calculate the p -value for the observed value of F .

Table 1. Baseline characteristics according to subsequent type of pension benefit

| Variables | Old age retirement (n=3666) | Individual early retirement (n=808) | Disability retirement (n=1293) | p-value of χ^2 or F-test† |
|--|-----------------------------|-------------------------------------|--------------------------------|--------------------------------|
| Age, mean \pm SD | 51.5 \pm 3.6 | 48.5 \pm 2.2 | 50.8 \pm 3.4 | <.001 |
| Gender, % (n) | | | | <.001 |
| men | 40% (1459) | 46% (373) | 50% (648) | |
| women | 60% (2207) | 54% (435) | 50% (645) | |
| Type of work, % (n) | | | | <.001 |
| upper white collar | 23% (833) | 22% (176) | 13% (170) | |
| lower white collar | 38% (1400) | 30% (239) | 26% (330) | |
| blue collar | 39% (1433) | 49% (393) | 61% (793) | |
| Work ability, mean \pm SD | 7.7 \pm 1.6 | 7.5 \pm 1.6 | 6.4 \pm 2.2 | <.001 |
| Deceased during the follow-up, % (n) | 26% (957) | 20% (180) | 44% (566) | - |
| Participated in all data collection waves, % (n) | 44% (1611) | 45% (360) | 27% (351) | - |

† Categorical variables analyzed using the chi-square-test, continuous variables with ANOVA

Results

The findings of the repeated measures ANOVA analysis are presented in Table 2. Tests of within-subjects effects indicated that work ability declined during the 28-year follow-up period ($F=665.320$, $df=3.596$, $p<0.001$). The between-subject effect showed a statistically significant difference between the three pension benefit groups ($F=379.385$, $df=2$, $p<0.001$). Finally, a statistically significant group-by-time interaction in work ability for all three pension benefit groups during 28-year follow-up was detected, suggesting that the change patterns differed between the pension benefit groups ($F=102.122$, $df=7.193$, $p<0.001$) (Figure 1). The decline was non-linear for those who had exited into disability and individual early retirement with a post-retirement recovery in work ability. Those who had retired due to old age showed a linear decline, but at a higher level than other groups.

Discussion and Conclusions

Work ability declines as individuals approach the third age. Data extending from active mid-working life well into old age allowed us to explore work ability patterns throughout the adult life span. This 28-year prospective follow-up study revealed significant differences in work ability according to different pension benefits. The findings support earlier studies in that individuals who retire due to old age reported a steady decline in their work ability during follow-up (12). For those who entered into individual early retirement or disability pension, a U-shaped curve with a post-retirement recovery was detected. These individuals were granted their retirement predominantly between 1985 and 1997. The work ability of these two groups was at its lowest around the data collection in 1992.

Table 2. Changes in work ability according to type of pension benefit, Repeated measures ANOVA.

| Variables | Old age retirement (n=1155) | Individual early retirement (n=263) | Disability retirement (n=251) |
|--|--------------------------------|---|-------------------------------------|
| Work ability, 1981 mean ± SD | 7.96 ±1.50 | 7.72 ±1.46 | 6.66 ±2.01 |
| Work ability, 1985 mean ± SD) | 7.45 ±1.54 | 7.01 ±1.51 | 4.74 ±3.02 |
| Work ability, 1992 mean ± SD | 6.73 ±1.97 | 3.83 ±2.65 | 2.32 ±2.53 |
| Work ability, 1997 mean ± SD | 6.42 ±1.88 | 4.38 ±2.49 | 3.56 ±2.60 |
| Work ability, 2009 mean ± SD | 5.86 ±2.24 | 5.31 ±2.10 | 4.30 ±2.50 |
| F (work ability), within- subject effect† | F=665.320, df=3.596, p<0.001 | | |
| F (pension benefit group), between- subject effect | F=379.385, df=2, p<0.001 | | |
| F (work ability x pen- sion benefit group), within-subject effect† | F=102.122, df=7.193, p<0.001 | | |

† With Greenhouse-Geisser correction of degrees of freedom

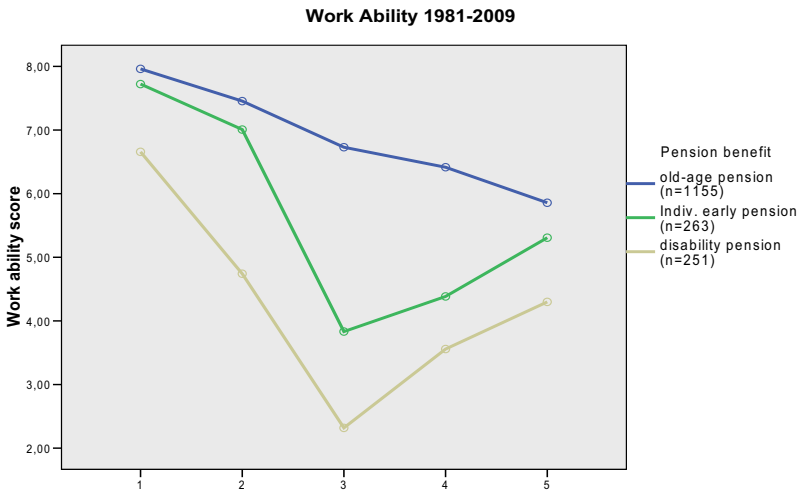


Figure 1. Within and between group changes in work ability during 1981 and 2009 according to pension benefit.

Additional sub-group analyses (not shown here) revealed that similar patterns of changes in work ability according to pension benefit group were found in men and women, as well as in upper and lower white-collar, and blue-collar employees. Several possible explanations for the differences in the work ability patterns over time need to be considered. First, the linear decline in work ability in individuals who retired due to old age was probably due to higher age compared to the two other pension benefit groups. Second, it is possible that those who retired because of disability were sicker and suffered from higher post-retirement mortality (selective survival). Survivors with higher post-retirement work ability represent a selected group of people with improved health. These changes may also mark regression to the mean. Third, Finland faced a deep recession in the 1990's, which may have affected the work ability of individuals with declining physical and mental resources. A severe national economic crisis is likely to be reflected in employees' perceptions of their jobs. According to the resource based

theory, when faced with loss of resources, an individual will experience distress and may consequently develop mental and physical health problems (4).

The strengths of this study include the large scale prospective data covering a broad set of municipal occupations. In addition, work ability is a validated measure, which has been described as activity that is the result of the balance between work demands and strain and the individual resources and ability to meet these demands (11). A potential limitation in the analyses is the selective dropout from the study, which is inevitable in long-term prospective studies. The 'healthy worker survivor effect' is an ongoing process where those who stay in a specific profession tend to be healthier than those who leave employment (20). However, we do not believe that this would effectively explain our results as our analyses are based on prospective data of a fixed cohort. Our result may be an underestimation of the predictive value of work ability. Caution is needed when generalizing the results on population level, because occupational groups tend to be healthier than the general population that includes people outside the workforce. It can be argued that work ability measured in old age is not a valid measure for the employee resource and job demand equilibrium. However, participants were asked to evaluate their current work ability against their lifetime best. All the respondents had been part of working life and were assumed to be familiar with the requirements working entails.

In sum, the post-retirement recovery pattern among those who exited working life due to early individual and disability retirement suggests a regain in vital resources for functioning in later life (8, 9). Work ability can be promoted by managerial means. This includes taking work demands, the environment, work organization, and an employee's health, functional capacity, and competences into consideration (14). It is essential to focus on maintaining the work ability of older employees because of its effects on managing everyday tasks, which in turn is important for independence and need for care in old age (16).

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References

1. Hobfoll SE. Social and psychological resources and adaptation. *Rev Gen Psychol.* 2002; 6:307–24.
2. Wang M, Shultz KS. Employee retirement: A review and recommendations for future investigation. *J Manag.* 2010;36:172–206.
3. Hobfoll SE. Conservation of resources: A new attempt at conceptualizing stress. *Am Psychologist.* 1989;44:514–24.
4. Hobfoll SE, Johnson RJ, Ennis N, Jackson AP. Resource loss, resources gain, and emotional outcomes among inner city women. *J Pers Soc Psychol.* 2003;3:632–43.
5. Spillman BC, Lubitz J. The effect of longevity on spending for acute and long-term care. *NEJM.* 2000;342:1409–1415.
6. LaCroix AZ, Guralnik JM, Berkman LF, Wallace RB, Satterfield S. Maintaining mobility in later life. II. Smoking, alcohol consumption, physical activity, and body mass index. *Am J Epidemiol.* 1993;137:858–869.
7. Verbrugge LM, Jette AM. The disablement process. *Soc Sci Med.* 1994;38:1–14.
8. Freund AM, Baltes PB. Selection, optimization, and compensation as strategies of life management: Correlations with subjective indicators of successful aging. *Psychol Aging.* 1998;13:531–43.
9. Joop D, Smith J. Resources and life management strategies as determinants of successful aging: On the protective effect of selection, optimization, and compensation. *Psychol Aging.* 2006;21:253–65.
10. Tuomi K, Ilmarinen J, Eskelinen L, et al. Prevalence and incidence rates of diseases and work ability in different work categories of municipal occupations *Scand J Work Environ Health* 1991;17 (Suppl 1):67–74.

11. Ilmarinen J. Work ability – a comprehensive concept for occupational health research and prevention. *Scand J Work Environ Health*. 2009;35:1–5.
12. Ilmarinen J, Tuomi K. Past, present and future of work ability. Helsinki: Finnish Institute of Occupational Health. 2004;65:1–25.
13. von Bonsdorff ME, Huuhtanen P, Tuomi K, Seitsamo J. Predictors of employees' early retirement intentions: an 11-year longitudinal study. *Occup Med*. 2009.doi:10.1093/occmed/kqp126.
14. Tuomi K, Huuhtanen P, Nykyri E, Ilmarinen J. Promotion of work ability, the quality of work and retirement. *Occup Med*. 2001;51:318–324.
15. Feldt T, Hyvönen K, Makikangas A, Kinnunen U, Kokko K. Development trajectories of Finnish managers' work ability over a 10-year follow-up period. *Scand J Work Environ Health*. 2009;35:37–47.
16. von Bonsdorff MB, Seitsamo J, Ilmarinen J, et al. Midlife work ability as a predictor of mortality and late-life disability: A 28-year prospective study. *CMAJ*, in press.
17. Harkonmäki K. Predictors of disability retirement: from early intentions to retirement. University of Helsinki. Helsinki: The Local Government Pensions Institution; 2007. [dissertation].
18. Ilmarinen J, Tuomi K, Eskelinen L, Nygård CH, Huuhtanen P, Klockars M. Background and objectives of the Finnish research project on aging workers in municipal occupations. *Scand J Work Environ Health*. 1991;17 Suppl 1:7–11.
19. Eskelinen L, Kohvakka A, Merisalo T, Hurri H, Wagar G. Relationship between the self-assessment and clinical assessment of health status and work ability. *Scand J Work Environ Health*. 1991;17 Suppl 1:40–47.
20. Wunsch G, Duchene J, Thiltges E, Salhi M. Socio-economic differences in mortality. A life course approach. *Eur J Popul*. 1996;12:167–185.

VII UNEMPLOYMENT AND EMPLOYABILITY

Work Ability Score as an Indicator of Employability in the Course of Unemployment. An International Study

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Abstract

The aim of this study was to investigate the work ability of long and short-term unemployed persons and compare it with a representative sample of Finnish adults using the Work Ability Score. The results show that the long-term unemployed evaluate their work ability lower than the short-term unemployed. Furthermore, the work ability among the unemployed people studied is significantly lower than that of the Finnish adult population and also of the Finnish unemployed. The results are discussed in light of the relevant literature, as well as the social changes in Finland. Also, suggestions for maintaining and stabilizing subjective work ability are presented.

Keywords: Work Ability Score, long-term unemployment, short-term unemployment work ability.

Introduction

Unemployment is undeniably harmful to the health of the people concerned, e.g. through significant abuse of alcohol and cigarettes, and a lack of physical activity (1). The unemployed become socially excluded after exclusion from social life, e.g. because of a shortage of money and fear of ridicule. At the same time, they are even held responsible for their situation, while economic and political parameters are ignored. The unemployed suffer from social segregation, since society defines itself as a community of working citizens (2). Therefore, long-term unemployment will also have a negative effect on people's employability (cf. 3, 4, 5, 6).

This study was concerned with the measurement of work ability and focused on the utility of the questionnaire-based Work Ability Index (WAI) in order to evaluate the work ability of the unemployed. The WAI was developed by a group of experts at the Finnish Institute of Occupational Health (FIOH) Helsinki as an assessment instrument of work ability of the working population (8, 9, 10). Despite theoretical assumptions, the theory of work ability is increasingly being used outside the labor market context to assess the work ability of the unemployed e.g. during health and labor market programs at Werkstatt Frankfurt e.V. (11, 12, 13). However, there is an essential methodological problem with using WAI in order to measure the work ability of people outside the employment. The reference framework of self-evaluation of one's work ability, namely the current work setting, does not exist among the unemployed.

Objectives/Methods

The aim of this study was to investigate the work ability of short and long-term unemployed people. Additionally, the whole study sample (N= 644) was compared to the representative sample of Finnish adult population (N=5, 178, 493 unemployed people included). As an instru-

ment we used the Work Ability Score (WAS) – 1st dimension, derived from the WAI. The participants were asked to compare their current work ability to their best lifetime work ability. A score of 0 represents full work disability, and a score of 10 indicates work ability at its best ever. Additionally, socio-demographic characteristics were examined. Statistical analyses were made using SPSS 17.

Description of the study sample

The participants were recruited in three European cities: Frankfurt/Main (n=305), Warsaw (n=125) and Graz (n=214). All participants came from comparable cultural and economic backgrounds. The average length of unemployment for the entire research sample amounted to 3.69 years (SD=4.2). The sample analyzed included 311 women and 333 men. The average age of the interviewees was 43.29 years (SD=9.81) and almost half (48.3%) of them had completed an apprenticeship. The mean of the Work Ability Score within the whole study sample amounted to 7.04 (SD=2.58). The question on marital status was not answered by all participants. At the time of the survey, the participants were engaged either in some form of labor market training, temporary work well-being program, in an apprenticeship or a health promotion program.

Table 1. Description of the study sample

| | Work Ability Score | | Age | | Length of unemployment (years) | | Completed apprenticeship | Marital status (marriage, partnership) | Immigrants |
|--|--------------------|------|---|-------|--------------------------------|------|--------------------------|--|------------|
| | M | SD | M | SD | M | SD | | | |
| The whole study sample | | | | | | | | | |
| N=644 | 7.04 | 2.58 | 43.29 | 9.81 | 3.69 | 4.2 | 48.3 | n.a. | 12.6 |
| women N=311 | 6.92 | 2.63 | 43.29 | 8.89 | 3.65 | 4.29 | 49.8 | n.a. | 9 |
| men N=333 | 7.16 | 2.53 | 43.29 | 10.61 | 3.73 | 4.05 | 46.8 | n.a. | 15.9 |
| Frankfurt/M | | | | | | | | | |
| N=305 | 6.96 | 2.84 | 39.57 | 9.95 | 4.72 | 4.62 | 31.1 | n.a. | 26.6 |
| women N=129 | 6.64 | 2.94 | 40.12 | 9.36 | 5.28 | 4.97 | 37.2 | n.a. | 21.7 |
| men N=176 | 7.19 | 2.75 | 39.16 | 10.37 | 4.31 | 4.31 | 26.7 | n.a. | 30.1 |
| Warsaw | | | | | | | | | |
| N=125 | 7.14 | 2.23 | 43.05 | 9.17 | 4.11 | 3.39 | 59.2 | 25.6 | 0 |
| women N=52 | 7.17 | 2.48 | 40.73 | 9.5 | 3.84 | 2.79 | 55.8 | 28.8 | 0 |
| men N=73 | 7.12 | 2.05 | 44.7 | 8.62 | 4.3 | 3.76 | 61.6 | 23.3 | 0 |
| Graz | | | | | | | | | |
| N=214 | 7.10 | 2.38 | 48.74 | 7.11 | 1.97 | 3.26 | 66.4 | 45.8 | 0 |
| women N=130 | 7.1 | 2.35 | 47.46 | 6.1 | 1.96 | 3.33 | 60 | 42.3 | 0 |
| men N=84 | 7.11 | 2.45 | 50.73 | 8.08 | 2 | 3.16 | 76.2 | 51.2 | 0 |
| The Finnish unemployed | | | | | | | | | |
| N=493 | 7.5*** | | WAS means scores compared with the WAS mean scores of the whole study | | | | | | |
| women N=269 | 7.8*** | | | | | | | | |
| men N=224 | 7.2 | | | | | | | | |
| The representative sample of the Finnish adult population | | | | | | | | | |
| N=5.178 | 8.1*** | | WAS means scores compared with the WAS mean scores of the whole study | | | | | | |
| women N=2.692 | 8.2*** | | | | | | | | |
| men N=2.486 | 8.0*** | | | | | | | | |
| ***p<0.001 n.a. not applicable | | | | | | | | | |

The participants of the Frankfurt group took part in three promotion programs. The first program, “Frankfurt Method to Professional Qualifications” (FWB) targets especially people between the ages of 25 to 45 years who have not completed their vocational education offering them an opportunity to gain an apprenticeship. The second program, “Social Work” or “Integration Measure” (AGH), is a labor market program for those predominantly without health impairments. The third program, “Train to Job” (TTJ), is a health promotion measure for people with diagnosed health impairments.

The Warsaw group was interviewed in five centers for social care, in which people seeking work can get socio-pedagogical and psychological counseling. They can also search for job offers and find help to train themselves for job interviews. Courses for additional qualifications are also offered.

The participants of the Graz group took part in two promotion projects. The “ESF” project was developed for the long-term unemployed, especially people with certain problems such as being released from prison, being addicted or homeless, i.e. people who could not be integrated into the labor market because of their mental or social problems as well as possible physical impairments. The “stop & go” project suits people threatened by long-term unemployment and those with integration deficits who are registered as work seeking at their job agencies. These are people who have been unemployed for a short period of time, but show obstacles to integration. The detailed information on the subgroups are presented in Table 2.

The Work Ability Score of the Finnish population was derived from an elaborative health survey, the “Health 2000 Survey” (7). The data were gathered between September 2000 and July 2009 in 80 regions of Finland. A three-level self evaluation of work ability (Work Ability Estimate), the Work Ability Index (WAI) and the Work Ability Score were used as indicators for work ability.

Table 2. Description of the subgroups within the study sample.

| Subgroups | Work Ability Score | | Age | | Length of unemployment (in years) | | Completed apprenticeship | Relationship status (marriage, partnership) | Immigrants |
|---|--------------------|------|--------------------------|----|-----------------------------------|----|--------------------------|---|------------|
| | M | SD | M | SD | M | SD | | | |
| FWB N = 113 (m=68; w=45) | 8,74 | 1,71 | (25 - 50) 32,35 6,29 | | (1 - 15) 2,73 3,51 | | 20,4 | n.a. | 28,3 |
| AGH N = 107 (m=71; w=36) | 7,20 | 2,63 | (25 - 60) 43,32 10,45 | | (1 - 20) 5,60 4,25 | | 34,6 | 42,1 | 21,5 |
| MG N = 85 (m=37; w=48) | 4,29 | 2,26 | (23 - 58) 44,46 7,45 | | (1 - 25) 6,27 5,41 | | 41,2 | 51,8 | 30,6 |
| Warsaw N = 125 (m=73; w=52) | 7,14 | 2,22 | (26 - 59) 43,05 9,17 | | (1 - 18) 4,11 3,38 | | 59,2 | 25,6 | 0,0 |
| ESF-Project N = 88 (m=35; w=53) | 6,43 | 2,55 | (24 - 63) 45,68 8,15 | | (1 - 19) 4,50 3,87 | | 56,8 | 33,0 | 0,0 |
| Stop & Go N = 126 (m=49; w=77) | 7,57* | 2,14 | (24 - 64) 50,88 5,34 | | (0,05 - 1,00) 0,21 0,23 | | 73,0 | 54,8 | 0,0 |

Long-term unemployed: N=518
Work ability score among the long-term unemployed is significantly lower than among the short-term unemployed
* p < 0,05

Results

The results of the study show that the unemployed as a whole group as well as the study samples from three European cities all show moderate work ability; therefore, there are no significant differences between them (Kruskal-Wallis test). The Mann-Whitney test indicated that the work ability of people unemployed less than one year is significantly higher than the work ability of the long-term unemployed ($p < 0.05$).

Furthermore, the t-tests reveal that there are significant differences between the whole study sample of the unemployed ($n=644$, $M=7.04$) and the Finnish unemployed ($n=493$, $M=7.5$). There were no differences between the unemployed male participants in the two samples analyzed ($n=333$, $M=7.16$ and $n=224$, $M=7.2$). Surprisingly, the mean WAS of the Finnish unemployed females ($n=269$, $M=7.8$) was significantly higher than the mean score on WAS among unemployed female participants in this study ($n=311$, $M=6.92$).

The results of t-tests also indicate that the Finnish adult population ($n=5\ 178$, $M=8.1$) has significantly higher mean WAS than the whole study sample ($n=644$, $M=7.04$). Furthermore, the Finnish males ($n=2\ 486$, $M=8.0$) compared to the males in this study ($n=333$, $M=7.16$) as well as the Finnish females ($n=2\ 692$, $M=8.2$) compared to the females in this study ($n=311$, $M=6.92$) had significantly higher mean WAS.

Table 3. Pearson's correlation coefficients for the relationship between the WAS and the length of unemployment and age.

| | Length of unemployment | | | Age | |
|-------------------------------|------------------------|--------|------|-------|------|
| | n | r | p | r | p |
| the whole study sample | 644 | -0,266 | *** | -0,25 | *** |
| women | 311 | -0,303 | *** | -0,18 | ** |
| men | 333 | -0,229 | *** | -0,31 | *** |
| long-term unemployed | 518 | -0,265 | *** | -0,35 | *** |
| short-term unemployed | 126 | -0,085 | n.s. | -0,02 | n.s. |

*** $p < 0,001$

** $p < 0,01$

n.s. $p > \alpha$ (5 %)

Pearson's correlation coefficients reveal highly significant relationships between the length of unemployment and the experienced work ability as well as between the age and the perceived work ability in the whole study sample and the group of long-term unemployed people. In the group of short-term unemployed people (less than one year) in both cases the associations were not statistically significant. Presumably, older long-term unemployed perceive their work ability to be lower (see Table 3 and Figure 1).

Discussion and Conclusions

This study confirmed that the interviewees from three European cities were not significantly different regarding their experience and evaluation of their subjective work ability. In comparison to the long-term unemployed, short-term unemployed people, i.e. less than one year, experience and evaluate their subjective work ability higher. For the long-term unemployed, the results also show that the duration of their unemployment, and older age, have a negative effect on how they perceive and validate their work ability.

In addition, it was proved that perception and evaluation of work ability among the unemployed participants of the study, men as much as women, distinctively differ from the results of the Finnish adult population. According to Gould et al. (7), work ability of the unemployed, and especially the long-term unemployed is poorer than that of the working population.

The findings concerning the evaluation of subjective work ability of the Finnish adult population should be interpreted in light of the rating by the World Economy Forum 2005, in which Finland was evaluated as the most competitive of 117 evaluated countries (cf. 15). Another explanation may be that Finland, compared to other European countries, is in the lead concerning health promotion and improvement of employability, especially where the elderly population is concerned (15).

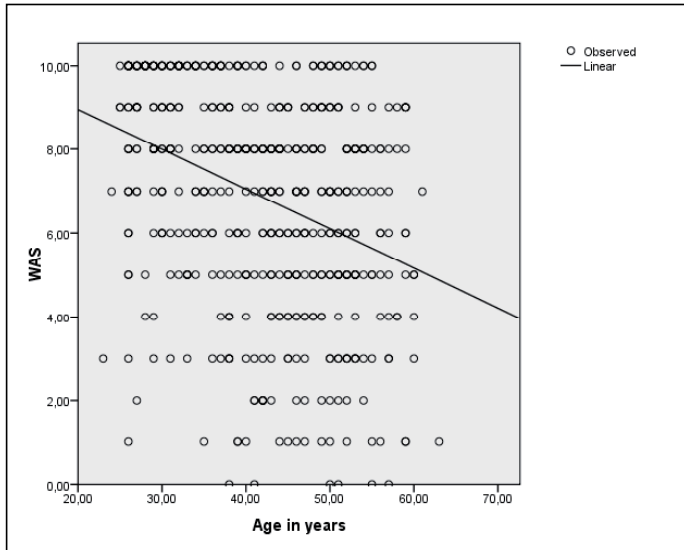
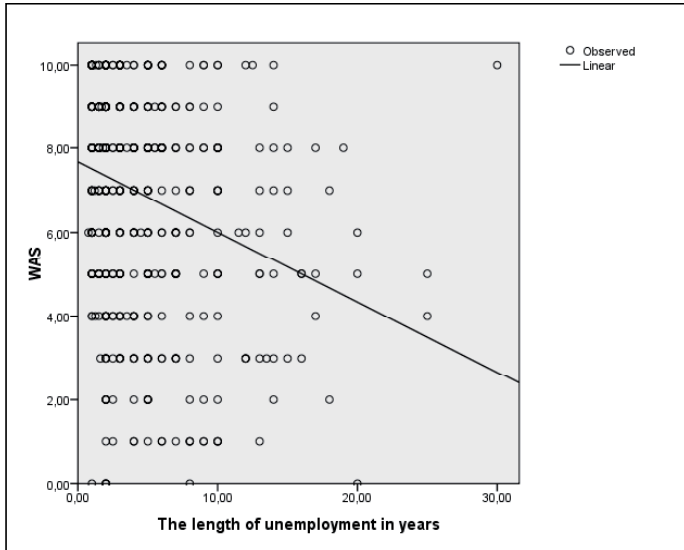


Figure 1. The relationship between the Work Ability Score (WAS) and the duration of unemployment and age in the group of the long-term unemployed (n= 518.)

Thus, Wilkinson and Pickett (16) report that Scandinavian women's employment status is significantly above average compared to German or Austrian women. These findings lead to the conclusion that Finnish women evaluate their subjective work ability significantly higher than women in the whole study sample because they experience more trust and less inequality. Consequently, Finnish unemployed people may not feel as marginalized and integrate themselves better into society.

Furthermore, the long-term unemployed who are engaged in an apprenticeship program or temporary workfare program perceive their work ability between moderate and good. These forms of labor market trainings enable access to the latent functions of employment (cf. 17), and in this way the available work ability could be sustained. However, note also that these people do need support in order to sustain, and if necessary, enhance their work ability. Their well-being can be partly improved by occupational training measures, but fully achieved only by shortening the duration of unemployment. Regarding the long-term unemployed who experience multiple health impairments and poor work ability it is, however, highly advisable to conceptualize health promotion and labor market programs in order to enhance their well-being and work ability, and promote their active and equal participation in society.

References

1. Elkeles T, Kirschner W. Arbeitslosigkeit und Gesundheit. Interventionen durch Gesundheitsförderung und Gesundheitsmanagement– Befunde und Strategien [Unemployment and Health. Interventions through Health Promotion and Health Management]. Bremerhaven: Wirtschaftsverlag NW; 2004.
2. Arbeitskammer des Saarlandes, editors. Schwerpunktthema: Soziale Ungleichheit und Ausgrenzung nehmen zu [The Increase of Social Inequality and Social Exclusion]. Saarbrücken; 2006.
3. Kieselbach T, Beelmann G, Jeske D. Sozialer Konvoi in beruflichen Transitionen: Ein Beitrag zu einem neuen europäischen Sozialmodell für die Begleitung in beruflichen Umbrüchen [Social Convoy in Occupational Transitions: Recommendations for a European Framework in the Context of Enterprise Restructuring] In: Hollederer A, Brand H, editors. Arbeitslosigkeit, Gesundheit und Krankheit [Unemployment, Health and Illness]. Bern: Verlag Hans Huber; 2006. p. 137–156.
4. Kirschner W, Elkeles T. Eine aktuelle Bestandsaufnahme von deutschen Projekten zur Gesundheitsförderung von Arbeitslosen-Probleme, Forschungs- und Entwicklungsbedarfe . [An Actual Review of German Health Promotion Projects for the Unemployed', Problems', Study's and Developments' Demands]. In: Hollederer A, Brand H, editors. Arbeitslosigkeit, Gesundheit und Krankheit [Unemployment, Health and Illness]. Bern: Verlag Hans Huber; 2006. p. 97–112.
5. Kuhnert P. Work Life Balance trotz Arbeitslosigkeit und instabiler Beschäftigung? Paradoxie oder neue Chance? [Work Life Balance Despite Unemployment and Instable Employment. Paradox or a New Chance?]. In: Kastner M, editor. Die Zukunft der Work Life Balance [The Future of Work Life Balance]. Heidelberg: Asanger; 2004. p. 141–177.
6. Kuhnert P. & Kastner M. Chancen und Grenzen arbeitsmarktintegrativer Gesundheitsförderung am Beispiel der Job-Fit-Evaluationsstudie [Chances and Constraints for Labour Market Integrating Health Promotion Using the Example of Job-Fit-Evaluation Study]. In: Hollederer A, Brand H, editors. Arbeitslosigkeit, Gesundheit und Krankheit [Unemployment, Health and Illness]. Bern: Verlag Hans Huber; 2006, p. 123–135.
7. Gould R, Illmarinen J, Järvisalo J, Koskinen S. Dimensions of Work Ability – Summary and Conclusions. In: Gould R, Ilmarinen J, Järvisalo J, Koskinen S, editors. Dimensions of Work Ability. Results of the Health 2000 Survey. Vaasa: Waasa Graphics Oy; 2008. p. 165–175.

8. Ilmarinen J, Tempel J. In: Giesert M, editor. *Arbeitsfähigkeit 2010 – Was können wir tun, damit Sie gesund bleiben?* [Work Ability 2010–What Can We Do to Stay Healthy?]. Im Auftrag des DGB-Bildungswerks e.V. Hamburg: VSA Verlag; 2002.
9. Ilmarinen J. *Towards a Longer Worklife – Ageing and the quality of worklife in the European Union*. Finnish Institute of Occupational Health; 2006. p. 132–148.
10. Ilmarinen, J, Gould R, Järivikoski A, Järvisalo J. Diversity of Work Ability. In: Gould R, Ilmarinen J, Järvisalo J, Koskinen S, editors. *Dimensions of Work Ability. Results of the Health 2000 Survey*. Vaasa: Waasa Graphics Oy; 2008, p. 13–24.
11. Beck D, Gawlik–Chmiel B. Förderung von Gesundheit und Beschäftigungsfähigkeit von arbeitslosen Menschen – Erfahrungen aus einem Modellversuch zur arbeitsmarktintegrativen Gesundheitsförderung [Promoting of Health and Employability among the Unemployed – Experiences from a Pilot Project of Labour Market Health Promotion]. *Prävention*, 2008; 31(3): 86–89.
12. Gawlik–Chmiel B, Beck D. Gesundheit für Arbeitslose als Integrationsziel: Das Kommunale Netzwerk für Arbeitsmarktintegration und Gesundheitsförderung in Frankfurt am Main [Health for the Unemployed as Integration Target: the Communal Network for Labour Market Integration and Health Promotion in Frankfurt on the Main]. In: Holleederer A, editor. *Gesundheit von Arbeitslosen fördern! Ein Handbuch für Wissenschaft und Praxis [Promoting Health of the Unemployed! A Handbook for Science and Practice]*. Band 22. Frankfurt am Main: Fachhochschulverlag; 2009. p. 449–461.
13. Gawlik-Chmiel B, Szlachta E, Rauscher M, Hooshmandi-Robia B. Work Ability Score as Indicator of Employability of the Unemployed. Engaged in Social Welfare Programs. An International Study. International Conference Towards Better Work and Well-being, Poster plenary II: The workplace as an arena for health and safety promotion. Helsinki; 2010 February 10–12.
14. Hasselhorn HM, Ebener M, Galatsch MLJ, Mueller BH: „Predictive value of single items of the work ability index“. 4th Symposium on Work Ability – Age Management during the Life Course, Session 1: oral presentation, Tampere; 2010 June 6–9.
15. Richenhagen G. Demografischer Wandel in der Arbeitswelt – Ein internationaler Vergleich aus Sicht von Arbeits- und Beschäftigungsfähigkeit [Demographic Change in the Labour Market – a Comparison in Context of Work and Employability]. In: Schott T, Hornberg, C, Kuntz B, editors. *20 Jahre Public Health in Deutschland. Bilanz und Ausblick [20 years of Public Health in Germany. Balance and Outlook]*. (in print).

16. Wilkinson R, Pickett K. Community Life and Social Relations. In: Wilkinson R, Pickett K, editors. *The Spirit Level. Why Equality is Better for Everyone*. London: Penguin; 2010. p. 49–62.
17. Jahoda M. *Wieviel Arbeit braucht der Mensch? Arbeit und Arbeitslosigkeit im 20. Jahrhundert* [How Much Work Men Need? Work and Unemployment in 20th Century]. Weinheim und Basel: Beltz Verlag; 1983.

Employability in the Course of Unemployment – A Participative Approach

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Abstract

In the context of health promotion and labor market integration training measures, the Finnish Theory of Work Ability (FIOH) was applied to unemployed life. This participative approach involves insights from team working with exemplary groups. During the intervention “Professional Competence and Success Strategy”, combined with Antonovsky’s Concept of the Sense of Coherence and Frankl’s Existential Analysis, the “House of Work Ability” was directly applied on the target group, especially the long-term unemployed. It was modified according to the needs and with the help of these affected individuals. Furthermore, in consideration of the WAI dimensions, a questionnaire will be developed and validated in order to measure employ potential during certain stages of unemployment. The approach to advance and measure potential employability in the course of unemployment was developed with the help of “Affected Persons as Experts”. All insights were compared and complemented with recent scientific findings. With the derivation of preventive health promoting and labour market integrating recommendations, the findings will support counseling and prevention efforts focusing on the target group.

Keywords: employability, work ability, long-term unemployment, health promotion

Introduction

In addition to its direct and indirect economic impacts, unemployment is strongly linked to substantial risks for the unemployed individual concerning both mental and physical health. Therefore, measures of prevention and health improvement focus in particular on improving the health status and strengthening psychosocial potentials in order to increase the probability of re-employment. Effectiveness and economic efficiency of the programs are essential.

The preliminary findings of national studies are not sufficient to account for an adequate evaluation of the actual effectiveness of health promoting and labor market integration measures (1). Therefore, the development and validation of an adequate means to evaluate individual employability and employ potentials of the long-term unemployed is a major goal. In addition, such a means should enable the evaluation of health promoting and labor market integration training measures, support the identification of factors influencing individual employment potential, and allow the derivation of preventive health promotion and labor market integration recommendations for decision-makers.

Regarding a clear terminological definition concerning the target group of long-term unemployed in the context of labor market and social policies, Elkeles, Kieselbach, Kuhnert and Kastner use the term “employability” (cf. 1, 2, 3).

State of Research

Work ability / employability and its indicators

In the literature describing employability, generalized terms lack a detailed definition. Further studies refer to parts of professional activities, so that the results and findings cannot be translated into the context of the long-term-unemployed and their employability (cf. 4, 5).

Apel & Fertig (6) present results of their study on methods concerning the development of a concept as part of the evaluation research

targeted at the basic social security for work-seekers (German Social Code II). In this study employability is understood as individual ability to find a new job and to maintain or extend an existing job.

Kriegesmann et al. (7) highlight aspects of employability from a health care perspective. They state that employability can be improved by own and self-competent action, by the interlinkage of security and health protection and the individual competence advancements, as well as by developing a health oriented life-style.

Deeke & Kruppe (5) use the term “interactive employability”, to refer to employability as the individual level of personal skills (including orientations and behavior) linked with market processes such as the law of supply and demand.

Müggenburg (8) defines employability as the ability of a person seeking employment on the basis of their professional and personal qualifications such as problem-solving and decision-making skills and the ability to act. If someone is unable to seize his chances, or misses the right connections, if a person is unable to react adequately and quickly to any change of requirements, for the most part, according to Müggenburg, this person must take responsibility for his own failure.

Blancke et al. (4) describe the concept of employability as a dynamic labor market strategy. In this context the concept of employability is based on the assumption that employees possess marketable and high qualifications, that they are productive and able to add value to a company or business. The authors follow the opinion of Hillage und Pollard that employability is an “asset” such as professional qualifications and problem-solving and decision-making skills.

Zempel & Frese (9) state that personal initiative, self-efficacy, motivation and a supporting environment are crucial for improving employability. Individual problems will increase with increasing length of unemployment. This will lead to mental and psychosomatic disorders and a lack of initiative. The chances for re-employment will be reduced, and the negative consequences for mental health and personal status will increase.

Relevant Scientific Assumptions for a Participative Approach
Ilmarinen's "House of Work Ability" and Work Ability Index

Ilmarinen (10, 11) defines "work ability" as the sum of those factors that enable a person in a certain situation to master a certain task successfully. The four pillars of the "House of Work Ability" are health (i.e. physical and mental health and social resources), education and competence (including special skills and professional experience), values and attitudes (including motivation as well as job satisfaction) and work (physical, mental and social work requirements as well as work design). This implies that work ability is not determined by the individual alone but by interaction in a work environment. Contrary to all expectations, the studies prove that work ability is not age-related; it is possible, even in old age, to sustain, restore or enhance work ability. At the moment there is no generally accepted and adequate means to evaluate the employability of an unemployed person. The Work Ability Index (WAI) is an adequate means to describe the ability to deal with work regarding a certain age and a certain work requirement. (12). Hence, WAI as a whole is not suitable for the evaluation of the employability of the unemployed. Yet, two dimensions are suitable, since they do not describe work ability on the basis of certain work requirements. One of them is WAI I, which elicits a self-assessment of the current work ability compared to the best work ability ever achieved. The other suitable dimension is WAI 7 eliciting mental resources such as enjoying activities, one's activity level as such, and feeling confident about the future.

The “Health - Dis-ease” Continuum by Aaron Antonovsky

According to Aaron Antonovsky (13), the Sense of Coherence (SOC) is a disposition, a human perception or evaluation pattern. People evaluate their own lives and their own activities to very different degrees, as understandable, manageable, and meaningful. The Sense of Coherence is developed to the extent that all primary human experience is affected by consistency, the ability to work under pressure and the participation in the shaping of results. People with a high Sense of Coherence – to put it in simpler terms – get by very easily. They feel up to challenge and lead meaningful lives. With his questionnaire about life orientation (SOC scale), which is scientifically validated, the Sense of Coherence can be measured and evaluated. In that way, SOC is an indicator for health and decision-making, and therefore a suitable means for the evaluation of employability (cf. 14).

Logotherapy and Existential Analysis by Viktor Emil Frankl

According to Viktor E. Frankl, man always needs a purpose as the center of his life (15). If a person does not find “something to live for”, he or she will experience a feeling of futility; Frankl called it “existential vacuum”. This vacuum manifests itself through apathy, lethargy, depression, as well as anxiety and self-doubt or a feeling of boredom. Among the many sources of possible meaningfulness, Frankl differentiates between three basic categories of value, in other words, three “high streets” leading to meaning: values of experience, of creativity, and internal attitude.

A Heuristic Model of Employability by Fugate, Kinicki & Ashforth

Fugate et al. (16) propose a heuristic model of employability combining three dimensions of human capacities, the proactive personal capacity calling for initiative, i.e. personal adaptability, for career identity and social and human capital, influencing active adaptability in various work situations. It is worth considering if developing new means or instruments, how far the findings of Fugate et al. concerning employability can be applied to the target group of long-term unemployed.

A Participative Approach

The labour market integrating and health promoting measure “Train to Job”

This approach was developed in 2005 for the long-term unemployed with health impairments. Since then, under the same conditions such as content, course of action, training personnel, rooms, but at a different time, a measure with seven exemplary groups was implemented. For the development of this measure, the scientific findings of Ilmarinen, Antonovsky, Frankl, Böckmann as well as Kuhnert and Kastner and insights gained from practical experience with the target group by the current author were taken into consideration.

The aim of working with the exemplary groups was to optimize the strategies handling daily routine (3) by activating their health (13, 17) in order to contribute to the stabilization and improvement of employability (cf. 10, 18). At the beginning of the measure, all participants shared the opinion that because of diagnosed somatic and mental diseases, they were hardly able to work under pressure. In other words, they could not imagine taking up a regular job. In order to evaluate experienced employability this approach makes use of dimensions one and seven of the Work Ability Index (WAI) as well as the short version of Antonovsky’s Orientation to Life Questionnaire (13).

The Sense of Coherence (SOC) defines a pattern of perception and evaluation of the world and the individual’s own day-to-day reality in all ranks, such as comprehensibility, manageability and meaningfulness. SOC expresses how well someone can face challenges and deal with urgent problems. The questionnaire was conducted at the beginning of the measure, after three months, and, if applicable, at the end of the measure. All participants were given the opportunity to verify their objectively experienced abilities in a real work situation. With a “target/actual-comparison” of their concrete work situation the participants could be enabled to evaluate their abilities and limits (cf. 14, 19).

The whole measure took 12 months and included two phases. In Phase One, a twelve-week measure, all strategies handling daily

routines were optimized. In this phase, the participants worked five times a week in workshops and seminars on the following topics: activity, stress relaxation, nutrition, health management, as well as time management and decision-making and responsibility. Therefore, Phase One favors the analysis of one's own situation in the course of unemployment experiencing and realising health competence and employment potential.

The capacities and resources acquired in this way could be made use of in Phase Two, a nine-month phase, when the participants are employed in a work opportunity with Werkstatt Frankfurt (matters falling under section 16 SGB II). Here, the participants were given the opportunity of practical experience and the evaluation of their own decision-making and responsibility in a working situation. Within the work process, the participants had the opportunity to evaluate and correct their ideas of the desired work's requirements with their experiences in the actual work situation. In this phase, weekly feedback rounds were conducted.

This way, the participants had the opportunity to monitor and control their health status at work, as well as the influence of their work on their personal and family situation. If necessary, individual psychological counseling was offered. Each participant was allowed to change his or her work situation as often as necessary in order to reach a balance between health and employability aims. It was confirmed that this approach of improvement of employability is sufficient for this target group.

For example, 72 % of the participants (of six exemplary groups, n=69) accessed various forms of employment or qualification. The other participants (28 %) benefited from further health improvement measures. In this context it is important that even though all participants suffered from serious health impairment the majority were able to improve their employability and stabilize it during the program.

Employability in the course of unemployment

In the course of the program “Train to Job“ with each exemplary group an attempt was made to adapt Ilmarinen’s “House of Work Ability“ and implement it on the situation of long-term unemployment, and to conclude its modification (see Figure 1). The present author noticed that those concerned defined their subjectively experienced work ability (WAS) by their subjectively experienced health (“base of the house“).

In order to illustrate the connection between these subjective experiences Antonovsky’s “health - dis-ease” continuum and Ilmarinen’s subjective Work Ability Score (WAS) were compared in the context of the “consumer response” of the group members. Consequently, as expected, most participants of the target group described themselves as “too ill“ and consistently as “unable to work”. These observations were indirectly confirmed by Hasselhorn et al. (20). They showed a significant correlation between WAS and health ($r=.70$).

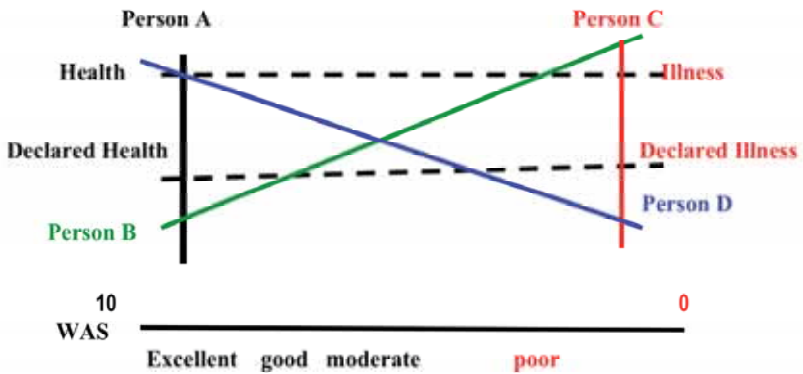


Figure 2. Antonovsky's "Health - Dis-ease" Continuum and Ilmarinen's subjective Work Ability Score (WAS) adapted by Gawlik-Chmiel

In this context it is necessary to point out that the person concerned will express his or her subjectively perceived health and work ability to other people the way he or she shapes and experiences it in regard to the goals pursued, the values determining his or her life and to the social networks he or she is engaged in.

Furthermore, each exemplary group described a fully employable person (Affected Persons as Experts). On the basis of these findings, single dimensions of employability were established and the scientific findings were added to this subject on the basis of literature research (see Figure 3).

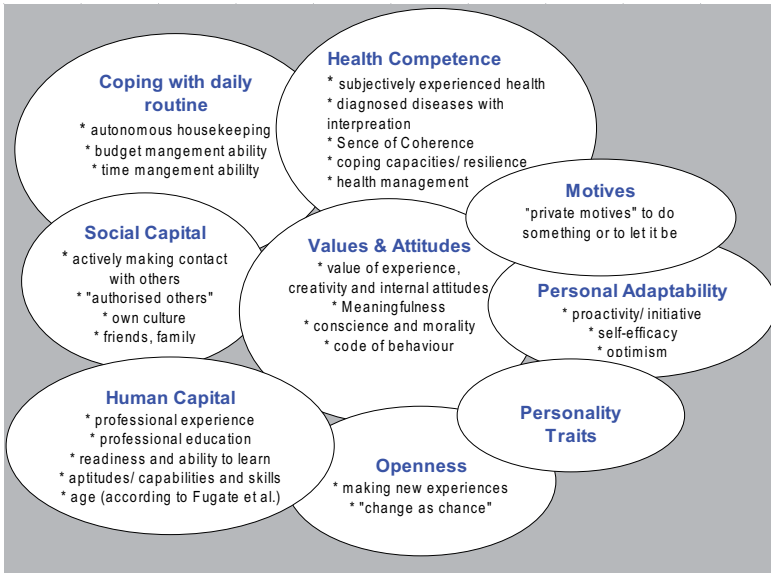


Figure 3. Dimensions of Employability in the Course of Unemployment

Time management and time structuring in the course of long-term unemployment were analysed and worked out in the view of those affected. The dimension “Health Competence“ could include the following scales: subjectively experienced health, medically diagnosed diseases as well as personal interpretation of participants (being long-term unemployed), Sense of Coherence, resilience or coping capacities and health surveillance.

The dimension “Human Capital” (according to Fugate and colleagues) includes the following influencing variables and characteristics: professional experience, professional education, readiness and ability to learn, aptitudes and capabilities as well as skills. Thus the values of experience, creativity, internal attitudes and meaningfulness have a major impact on human behavior, aims in life and the way we deal with other people, whether we treat them with respect and appreciation or

with disdain. Those values give us a reason; they give us motives to do something or to let it be, to act or to remain passive. Even conscience and moral attitude are part of this dimension, because they are our Code of Behavior, our “unwritten law”. According to Schwarz (21), especially in complex decisive moments, values are important landmarks. Schwarz calls these values “Beacons of Action”, providing orientation, if a situation is ambiguous and we have to face certain problems. Therefore and in a complex way, values are a motor for human development. All exemplary groups agreed that this dimension, having such an impact on the others, is the most important of all. In this context, the scientific findings of Frankl (15), Böckmann (18), Antonovsky (13) and the latest results of Schnell (22) concerning “Meaningfulness” were taken into consideration. The dimension “Social Capital” includes the following influencing variables and characteristics: actively making contact with others, “authorized others”, own culture, friends and family. All dimensions introduced have a huge impact on coping with daily routines in the course of unemployment. Handling and coping with daily routines depends on a number of factors: living as a single person or with a family; to be willing to take or even already taking care of oneself and others; looking after one’s health and staying well and fit; dealing differently with life in the course of unemployment; changing or not changing the diurnal rhythm in a negative way; trying or not trying to escape reality by turning to drugs or alcohol and relationship status.

The so-called experienced relationship status is very important as Antonovsky, Frankl, Fugate et al. and also the people concerned have already stated. There is also another problem: in order to cope with their situation, some long-term unemployed have built up a life of their own, a different lifestyle, with different preferences.

In this regard, it is important to mention the “legitimate others”, i.e. family, friends, authorities, a teacher, a rabbi or priest, or God Himself, who, according to Antonovsky, play a decisive role in the life of each individual by strongly affecting our behavior, our values, our decision-making and our perception of life. And again our motives are

in question whether or not we do something or let it be. Therefore, the next dimension is called “Motives” instead of “Motivation”, since people will only be willing to do something and act, if they have a motive for action (or motive for movement). The last three dimensions are Personal Adaptability, Openness and Personality Traits.

Next to the findings from working with the representative groups, these dimensions are mainly based on the extensive scientific research and findings on employability by Fugate, Kinicki and Ashforth. The most important points hereby are “openness to change”, “proactivity”, as well as the necessary optimism (16).

Outlook

The next step will be the construction of questionnaire items and their evaluation, such as expert rating, factor analysis, construct validity and retest reliability (cf. 23). The starting points of the item construction are the dimensions of employability presented in the course of unemployment and the characterization of “a fully employable person” from the work with all seven exemplary groups (Affected Persons as Experts).

In addition to the measurement of potential employability, establishing a new instrument for unemployed people will enable the evaluation of health promotion and labor market integration training measures by regarding and reviewing influencing factors.

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References

1. Elkeles T, Kirschner W. Arbeitslosigkeit und Gesundheit. Interventionen durch Gesundheitsförderung und Gesundheitsmanagement– Befunde und Strategien [Unemployment and Health. Interventions through Health Promotion and Health Management]. Bremerhaven: Wirtschaftsverlag NW; 2004.
2. Kieselbach T, Winefield AH, Boyd C, Anderson S, editors. Unemployment and Health. Bowen Hills Qld: Australian Academic Press; 2006.
3. Kuhnert P, Kastner M. Chancen und Grenzen arbeitsmarktintegrativer Gesundheitsförderung am Beispiel der Job-Fit-Evaluationsstudie [Chances and Constraints for Labour Market Integrating Health Promotion Using the Example of Job-Fit-Evaluation Study]. In: Hollederer A, Brand H, editors. Arbeitslosigkeit, Gesundheit und Krankheit [Unemployment, Health and Illness]. Bern: Verlag Hans Huber; 2006. p. 123–135.
4. Blancke S, Roth Ch, Schmidt J. Employability (“Beschäftigungsfähigkeit”) als Herausforderung für den Arbeitsmarkt. Auf dem Weg zur flexiblen Erwerbsgesellschaft [Employability as a Challenge for the Labour Market. The Way to the Flexible Working Society]. In: Arbeitsberichte der Akademie für Technikfolgenabschätzung [Work Reports of the Academy for Technology Assessment] Nr. 157. Stuttgart; 2000.
5. Deeke A, Kruppe T. Beschäftigungsfähigkeit als Evaluationsmaßstab? Inhaltliche und methodische Aspekte der Wirkungsanalyse beruflicher Weiterbildung im Rahmen des ESF-BA-Programms [Employability as Evaluation Criterion? Content and Methodological Aspects of the Analysis of Effects of Professional Training of the ESF-BA-Programms]. IAB Werkstattbericht Nr. 1, Nürnberg; 2003, 1.
6. Apel H, Fertig M. Operationalisierung von “Beschäftigungsfähigkeit” – Ein methodischer Beitrag zur Entwicklung eines Messkonzepts [Operationalisation of “Employability” – a Methodological Contribution to the Development of a Measure Concept]. Köln: ISG; 2008.
7. Kriegesmann B, Kottmann M, Masurek L, Nowak U. Kompetenz für eine nachhaltige Beschäftigungsfähigkeit [A Competence for a Sustainable Employability]. Fb 1038. Schriftenreihe der Bundesanstalt für Arbeitsschutz und Arbeitsmedizin. Dortmund, Berlin, Dresden; 2005.
8. Müggenburg H. Employability (Beschäftigungsfähigkeit). “Der aktuelle Begriff” [Employability. The Current Term], Berlin: Wissenschaftliche Dienste des Deutschen Bundestages, lfd; 2002. p. 41.

9. Zempel J, Frese M. Prädiktoren der Erwerbslosigkeit und Wiederbeschäftigung [The Predictors of Employability and Re-Employment]. *Verhaltenstherapie und Psychosoziale Praxis*. 2000; 32:379–390.
10. Ilmarinen J, Tempel J. In: Giesert M, editor. *Arbeitsfähigkeit 2010 – Was können wir tun, damit Sie gesund bleiben?* [Work Ability 2010–What can we do to stay healthy?]. Im Auftrag des DGB-Bildungswerks e.V. Hamburg: VSA Verlag; 2002.
11. Ilmarinen J. Towards a Longer Worklife – Ageing and the quality of worklife in the European Union. *Finnish Institute of Occupational Health*; 2006. p. 132–148.
12. Hasselhorn H M, Freude G. *Der Work Ability Index – ein Leitfaden* [The Work Ability Index – the Manual]. Bremerhaven: Wirtschaftsverlag NW. Schriftenreihe der Bundesanstalt für Arbeitsschutz und Arbeitsmedizin: Sonderschrift S 87; 2007.
13. Antonovsky A. *Salutogenese – Zur Entmystifizierung der Gesundheit*. Deutsche erweiterte Herausgabe von Alexa Franke [Unraveling the mystery of health. The German Extended Edition by Alexa Franke]. Tübingen: dgvt-Verlag; 1997.
14. Beck D, Gawlik-Chmiel B. Förderung von Gesundheit und Beschäftigungsfähigkeit von arbeitslosen Menschen – Erfahrungen aus einem Modellversuch zur arbeitsmarktintegrativen Gesundheitsförderung [Promoting of Health and Employability among the Unemployed – Experiences from a Pilot Project of Labour Market Health Promotion]. *Prävention*. 2008; 31(3):86–89.
15. Frankl VE. *Ärztliche Seelsorge, Grundlagen der Logotherapie und Existenzanalyse* [The Doctor and the Soul: Principles of Logotherapy and Existential Analysis]. Frankfurt/M.: Fischer Taschenbuch; 1994.
16. Fugate M, Kinicki A, Ashforth BE. Employability: A psycho-social construct, its dimensions, and applications. *Journal of Vocational Behavior*. 2004; 65:14–38.
17. Karazman R, Kloimüller I, Karazman-Morawetz I, Geißler H. Existenz-Typologie und Effekt-Typologie. Sinnfindung und zwischen-menschliche Entwicklung als Evaluationskriterien betrieblicher Gesundheitsförderung [Existence Typology and Effect Typology. The Finding of the Meaning and Interpersonal Development as Evaluation Criteria of Occupational Health Promotion], 1996 [cited 2010 August 21]. Available from: http://www.ibg.co.at/HWL_pub.htm
18. Böckmann W. *Lebenserfolg. Der Weg zu Selbsterkenntnis und Sinn-Erfüllung* [Life Success. The Way to Self-Awareness and Meaningfulness]. Düsseldorf: ECON Taschenbuch Verlag, 1990.
19. Gawlik-Chmiel B, Beck D. *Gesundheit für Arbeitslose als Integrationsziel: Das Kommunale Netzwerk für Arbeitsmarktintegration und Gesundheitsförderung in Frankfurt am Main* [Health for the Unemployed

- as Integration Target: the Communal Network for Labour Market Integration and Health Promotion in Frankfurt on the Main]. In: Holleder A, editor. *Gesundheit von Arbeitslosen fördern! Ein Handbuch für Wissenschaft und Praxis [Promoting Health of the Unemployed! A Handbook for Science and Practice]*. Band 22. Frankfurt am Main: Fachhochschulverlag; 2009. p. 449–461.
20. Hasselhorn HM, Ebener M, Galatsch MLJ, Mueller BH: “Predictive value of single items of the work ability index”. 4th Symposium on Work Ability – Age Management during the Life Course, Session 1: oral presentation, Tampere; 2010 June 6–9.
 21. Schwarz SH. Universals in the content and structure of values: Theoretical advances and empirical tests in 20 countries. *Advances in experimental social psychology*. 1992; 25:1–65.
 22. Schnell T. The Sources of Meaning and Meaning in Life Questionnaire (SoMe): Terlations to demographics and well-being. *The Journal of Positive Psychology*. 2009; 4 (6):483–499.
 23. Kallus KW. Erstellung von Fragebogen [The Construction of Questionnaires]. UTB 3277. Wien: facultas. wuv; 2010.

Functional capacity and its associations with age, education and health among unemployed people

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Abstract

The purpose of the study was to describe the various components of functional capacity and associations of functional capacity with age, education and health among long-term unemployed people. The study group consisted of 114 unemployed people (59 men and 55 women) aged 23 – 62 years. Physical functional capacity was measured by many various tests. Background variables were age, marital status, education and self-rated health. Of the variables describing physical functional capacity, muscle strength and reaction time, as well as the 6-minute walk in women, correlated most with age. Education was connected with many variables of functional capacity among women, but education did not correlate with functional capacity among men. The results showed that about 50 % of the unemployed had a long-term illness and 20 % had difficulties in coping with worklife because of deteriorated health.

Key terms: functional capacity, long-term unemployment, health, socio-economic status, ageing

Introduction

The poor health status of unemployed people is manifest in increased mortality and morbidity when compared to the average population (1, 2). With prolonged unemployment, health problems increase and difficulties accumulate in all areas of well-being. Even though the health of the unemployed people has been studied in many forms, the factors of functional capacity have not attracted much attention. Physical functional capacity is one of the most important factors in enhancing the health of the unemployed.

The first purpose of this study was to describe the various components of functional capacity and associations of functional capacity with age, education and self-rated health among long-term unemployed people. The second purpose was to describe the living habits of long-term unemployed and their connection to functional capacity. The study was carried out in the municipality of Hämeenkyrö with 10,000 inhabitants. It was a part of the Development Partnership Project on Health Care for the Unemployed coordinated by the National Institute for Health and Welfare.

Materials and methods

The study group consisted of 114 unemployed people (59 men and 55 women) aged 23–62, with a mean age of 46.5 years among men and 48.1 years among women. Physical functional capacity was measured by many various tests. These included

- chair stand
- arm curl
- chair sit-and-reach
- back scratch
- hand grip
- reaction time
- vital capacity
- peak expiratory flow
- 6-min walk

Background variables were age, marital status and education (Table 1).

Table 1. Distributions of sociodemographic factors among long-term unemployed people (%)

| | Men (n=59) | Women (n=55) |
|-------------------------|------------|--------------|
| <u>Age (yrs)</u> | | |
| 20 – 29 | 7 | 2 |
| 30 – 39 | 16 | 18 |
| 40 – 49 | 38 | 26 |
| 50 – 59 | 34 | 47 |
| 60 - | 5 | 7 |
| <u>Marital status</u> | | |
| Married or cohabitating | 31 | 51 |
| Unmarried | 60 | 22 |
| Divorced | 7 | 27 |
| Widowed | 2 | 0 |
| <u>Education</u> | | |
| Elementary school | 63 | 51 |
| High school | 7 | 7 |
| Secondary school | 30 | 42 |

Results

Health and functional capacity

The unemployed participants rated their health as fairly good. 40 % of men and 33 % of women reported at least good health, while 15 % of men and 26 % of women reported poor or very poor health. According to the work ability index, 19 % of men and 22 % of women had poor work ability.

In physical functional capacity, the greatest differences between men and women could be found in muscle strength, respiratory functions and endurance (Table 2). There were no differences between the genders in reaction times, flexibility or joint mobility.

Table 2. Means of measurements of functional capacity among men and women

| | Men (n=54) | Women (n=54) | Statistical significance |
|----------------------------|------------|--------------|--------------------------|
| <u>Measurements</u> | | | |
| Chair stand (number) | 13.4 | 12.2 | NS |
| Arm curl (number) | 20.9 | 17.0 | p= .001 |
| Chair sit-and-reach (cm) | 0.5 | 3.5 | NS |
| Back scratch (cm) | - 9.1 | -5.3 | NS |
| Hand grip (kg) | 57.2 | 35.5 | p= .000 |
| Choice reaction time (ms) | 447 | 443 | NS |
| Choice movement time (ms) | 273 | 259 | NS |
| Vital capacity (l) | 5.1 | 3.7 | p= .000 |
| Peak expiratory flow (l/s) | 10.5 | 7.6 | p= .000 |
| 6-min walk (m) | 555.0 | 492.7 | p= .006 |

Age correlated with more variables of functional capacity among women than men. Of the variables describing physical functional capacity, muscle strength and reaction time, as well as the 6-minute walk in women, correlated most with age.

Education was connected with many variables of functional capacity among women, but education did not correlate with functional capacity among men. In almost all tests of functional capacity, women with more education received better results than women with less education. Among men education correlated only with vital capacity: men with less education had a greater vital capacity.

Tests describing muscle strength in the extremities (arm curl and chair stand), flexibility (chair sit-and- reach) and endurance (6-minute walk) were most of all connected with self-rated health in both genders. In men, reaction times correlated with self-rated health more clearly than in women.

Living habits

About two thirds of men and women were smokers. However, men smoked larger quantities than women. Among the long-term unemployed, about the same share of people (84 % of men and 64 % of

women) consumed alcohol as in the general population. In quantity, the long-term unemployed consumed more alcohol than the general population. About 25 % of men and one third of women reported daily physical exercise. About 60 % of men and women reported they took physical exercise at least twice a week. Unhealthy living habits (smoking, heavy drinking, lack of exercise, poor nutrition) seemed to accumulate in the same individuals. The risk group consisted of 19 % of men and 14 % of women (the same person had 3 – 4 unhealthy living habits).

The associations of functional capacity with living habits was examined by means of a linear regression method. Of the various functional tests the 6-minute walk test and chair sit-and-reach test were used in the analysis, because these tests were most strongly associated with physical activity. Both self-reported and objectively measured functional capacity associated significantly with physical activity. Those with a better capacity had higher frequency of physical activity. Smoking and abundant alcohol consumption were significantly associated with lower physical activity.

Discussion

The results showed that about 50 % of the unemployed people had a long-term illness and 20 % had difficulties in coping with work life because of deteriorated health. The long-term unemployed reported poorer self-rated health and physical functional capacity than people of the same age on average. Also, Working Ability Index was lower in the long-term unemployed than in the general Finnish population of the same age. Age was related to almost all variables of functional capacity. This showed that in the long-term unemployed, age affected physical functional capacity and, in this way, working ability.

Many of the measurements of physical functional capacity were connected with self-rated health. Education was connected with functional capacity especially among women. These results show that the

evaluation of functional capacity is important when implementing programs which aim to enhance working ability and general health among unemployed people.

In this study smoking was more common and drinking heavier among the long-term unemployed than in general population. Several earlier studies have shown that unemployed people have more unhealthy living habits than those who are employed (3, 4, 5). On the other hand, there are studies showing that poor health and unhealthy living habits may increase the risk of unemployment (4, 6).

The long-term unemployed are concerned about their own health and they think that health examinations are important. It is therefore important to develop health services and health promotion programs especially designed for unemployed people. The evaluation of functional capacity is a key factor in these programs.

References

1. Morris J, Cook D, Shaper A. Loss of employment and mortality. *BMJ* 1994; 308:1135-9.
2. Martikainen P, Valkonen T. Excess mortality of unemployed men and women during period of rapidly increasing unemployment. *Lancet* 1996;348:909-12.
3. Morris J, Cook D, Shaper A. Non-employment and changes in smoking, drinking, and body weight. *BMJ* 1992;304:536-41.
4. Montgomery S, Cook D, Bartley M, Wadsworth M. Unemployment, cigarette smoking, alcohol consumption and body weight in young British men. *Eur J Public Health* 1998;8:21-7.
5. Khlat M, Sermet C, Le Pape A. Increased prevalence of depression, smoking, heavy drinking and use of psycho-active drugs among unemployed men in France. *Eur J Epidemiol* 2004;19:445-51.
6. Virtanen P, Vahtera J, Broms U, Sillanmäki L, Kivimäki M, Koskenvuo M. Employment trajectory as determinant of change in health-related lifestyle: the prospective HeSSup study. *Eur J Public Health* 2008;18:504-8.

The impact of appreciation on health promotion for older long-term unemployed and nursing staff threatened by unemployment

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Abstract

Research projects with older long-term unemployed people (2005-2008) and older nursing staff (2009-2011) at the Technical University of Dortmund found similarities concerning limitations in mental and physical health and health behavior. Long-term unemployed as well as older employees in hospitals often experience a depreciation of their career and identity. The findings of the project ProWert (producer's pride due to appreciation) show that nursing staff (psychiatry, somatic & geriatric medicine) benefits from appreciative leadership, social support from colleagues and healthy working conditions.

Key Terms: Unemployment, Health, Older Unemployed, Nursing Staff, Appreciation, Health Promotion

Introduction

This paper deals with the impact of appreciation on health. It points out similarities and differences between the situation of long-term unemployed people and nursing staff threatened by unemployment.

First of all, the devaluation and missing appreciation for older nursing staff on the one hand and unemployed people on the other hand will be described. Secondly, bad health conditions and exclusions will be discussed as possible factors that render appreciation impossible. Thirdly, the importance of appreciation and coping strategies in the working environment will be pointed out. As a fourth step, the lack of appreciation in working routine will be demonstrated by several quotations from our project ProWert. The fifth aspect to be mentioned in this paper is the need for appreciative leadership. Finally, an overview of the development in psychological health and appreciation will be given.

Method

Problem-oriented interviews with 30 older employees in hospitals (aged 50-63) and 30 long-term unemployed people were conducted. The interviews were evaluated by means of qualitative content analysis with special attention to aspects such as appreciation, the impact of missing appreciation, social recognition and trust.

Results

1. Devaluation and missing appreciation of older nursing staff and unemployed

Interviews from ProWert show that absence of appreciation for all the efforts as well as missing regard for medical condition may result in

an adverse and critical course of the last period of employment up to retirement in both groups. Both long-term unemployed people and older employees in hospitals often experience a devaluation of their career and identity (1). ProWert shows that nursing staff (psychiatry, somatic & geriatric medicine) benefits from appreciative leadership, social support from colleagues and healthy working conditions. Due to demographic changes, more nursing staff will be needed in the future. Employees can be won over and also retained in their jobs for a longer time with the help of appreciation.

For long-term unemployed, losing trust seems to correspond with failing appreciation. In a study by Kuhnert, Ayan and Kastner (2), half of the unemployed participants claimed to be disappointed by people they trusted. Older long-term unemployed people's faith in others seemed to be shattered. This again has a negative impact in establishing trustful relations as a precondition for appreciative behavior. More than two thirds of the unemployed people (68%) were dissatisfied with their living conditions (3).

In general, one can say that the long-term unemployed (>24 months of unemployment) show poorer scores compared to the short-term unemployed (<12 months) on all psycho-social scales (2).

Currently, there is only little analytical comparison between older long-term unemployed people and nursing staff explaining why both lack of work and work overload result in similar negative outcomes. Many participants of ProWert expressed a great need for appreciation. One example is given in the following quotation:

“Appreciation is very important to me. We have to work hard for many years – we need acknowledgement and appreciation in order to fulfil the expectations which are connected to this job. (...) It doesn't need to be a lot, but it needs to be authentic”. (Member of nursing staff in ProWert)

2. Bad health condition and/or exclusion – no appreciation possible?

As a next step, possible connections between bad health condition as well as exclusion and impossibility of appreciation will be discussed. The devaluation of the long-term unemployed is mainly to be seen in societal exclusion and absence of social support. The following figure shows the great amount of societal exclusion in comparison to other societal groups:

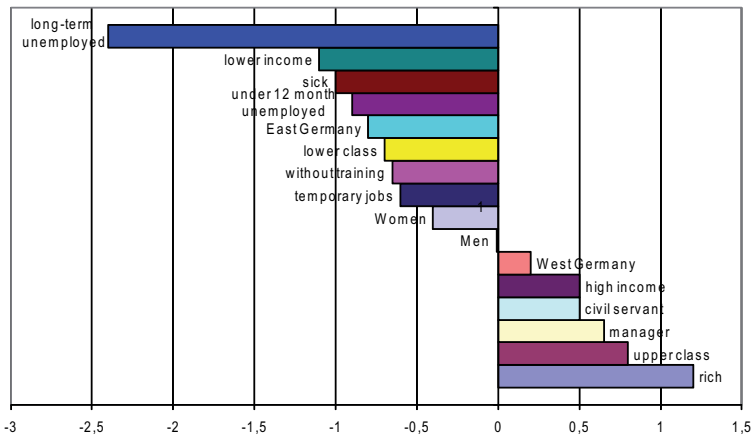


Figure 1. Opportunities of personal inclusion, deviation from the average (4)

As Keuler (5) found out, only half of the German companies employ older people (meaning people aged 50 or older). Eurostat (2010) states that the employment quota of older people amounts to 56.2% in Germany and 55.5% in Finland whereas in Sweden and Norway, 70% and respectively 68.7% of the older population are employed. Further studies have detected a discrepancy between the official “elderly-friendly” positions and the exclusion strategy within companies (6). This is important, as job insecurity especially intensifies the risk of fear and depression (7).

Between 2005 and 2008, the University of Dortmund conducted a pilot project to show how lack of appreciation, acceptance, respect and esteem affect the everyday lives of many long-term unemployed people. The following quotations are taken from this project:

“If there is not enough appreciation, everything stops working”. (Group leader, 30 years of age)

“At the employment agency or in your personal environment, you often experience disrespectful treatment”. (Female pedagogue, 45 years of age)

Support for these statements can be found in the research of Olejniczak (8, p. 249), who writes that the German Hartz-IV-Reform causes immediate mental pressure as well as a feeling of stigmatization and devaluation.

3. Positive Effects of Appreciation in the Working Environment

The aspects pointed out above gain importance when considering the positive effects of appreciation in the working environment. Appreciation causes positive social structures (good working climate, good social relations, and organizational justice), satisfied and efficient employees and a lower risk of bullying (9). In addition, appreciation by executives and management is the strongest motivational factor for employees throughout Europe. Furthermore, producer's pride as a possible consequence of appreciation enhances motivation, ability to cooperation, politeness and improvement as well as better service (10). Also, appreciation at work over several years leads to an increase in job satisfaction, quality of services, health conditions and levels of trust within a company.

As well as appreciation, coping strategies can lead to better health. The Dortmund study on long-term unemployed persons (11) reported that almost two thirds (62%) of the subjects wished to have more social contacts but 14.2% were totally isolated without any support even in

critical situations or illness, and only 32.6% felt pride or appreciation from their contacts (12). Since they have lost their job, most of the long-term unemployed (59.7%) received less affection from other people and 71.2% less respect from their families (12, p. 358-359). Almost one fourth (23%) of the unemployed participants stated that they did not receive any social support (2).

4. Lack of appreciation in working routine

At least in Germany, there is a lack of appreciation in the working routine. Organizational cultures with low health care and little appreciation are dominant. In the area of public health, nursing staff and doctors are especially affected: Distinct symptoms of burnout were found among 26% of nursing staff (13) and 31% of doctors in hospitals. This can be directly compared to the long-term unemployed: 41% of these show distinct symptoms of burnout, whereas the quota among employees in public service amounts to 6.5% (14). Nursing staff aged 50 and above are especially threatened by burnout. This is crucially important due to the fact that nursing staff with high values of burnout has a 2.5-fold risk of belonging to the group of job dropouts (15). This data may be connected with the personal coping strategies of the persons concerned: 59% of the employees in hospitals show unhealthy coping strategies (13).

Especially among older nursing staff, there are significant health complaints due to shift-work. An utterance of a nursing assistant in one of the interviews supports this:

“There are a couple of elderly nurses on my ward. I myself am 57 and I am sporty. But a lot of the nurses, putting it carefully, cannot be told apart from the patients” (Nursing assistant in ProWert).

Of the nursing staff 67% feel bad about their opportunities to influence their work arrangements and 80% feel they have too little time for their partners and relatives (16). A culture of appreciation would need appreciative work conditions:

“Our safety is not taken care of. The equipment on the ward is pretty run-down. So I don’t really enjoy it here. If the team didn’t exist, almost no one would work here anymore” (Caregiver in psychiatry in ProWert).

Many nursing staff members in hospitals are by now afraid of “not getting their work done”. Their haste is even expressed in their body postures (Reports in ProWert).

5. Appreciative leadership – urgently needed, but hardly existent

Everything that has been mentioned before shows that appreciative leadership is urgently needed. Ironically, it is hardly existent: There is a low quality of leadership in hospitals (17), especially among supervisors of functional (non medical) employees and doctors (Interviews ProWert). Furthermore, business management is more important to many executives than an (appreciative) focus on their employees (18). Also, strongly career-oriented executives have only a limited interest in the long-term health and work ability retention of their employees (19). Therefore, a controlling bureaucracy that encompasses mistrust must be prevented, strongly disciplining leaderships must be restored and sensitivity for employees’ mental state has to be developed (19). This has to happen practically, not theoretically – ProWert interviews show a great difference between concepts of leadership in hospitals and actual routine on the wards.

6. Development in psychological health and appreciation

Older nursing staff can be seen as starting point for the development of an appreciating work culture on the wards – they should be the “key persons” (1):

“I think that finishing their working life with dignity is a huge problem for older nurses and nursing assistants. Retirement at the age of 67, or the fact that the policy for partial retirement expires are a catastrophe” (older nurse in ProWert).

The health situation of older nursing staff is “precarious to catastrophic” – the share of those who go into early retirement due to their health condition is nowadays 40%. This is one of the highest existing quotas in Germany (20). Employees in other countries retire at a higher age and there is a higher level of societal appreciation of older employees (e.g. in Denmark, Sweden). There is a “House of Working Ability” (21), where working factors, values, competences and health have the same importance. The same approach is used in ProWert (2).

Central elements of appreciation in stabilizing groups with long-term unemployed (6) are: Intermediation of lost appreciation (acceptance, esteem and respect are often missing), communication of appreciation an attitude and empathy, recognition of “the Power of the Weak” and offering space in group-oriented empowerment (GE).

In short: *“Appreciate experience and experience appreciation”*. (U-turn, project from Austria)

Discussion

On the basis of the qualitative study presented and a forthcoming survey with questionnaires in summer 2010, contents for an intervention program concerning appreciative leadership promoting health will be developed. Future prospects are an important determinant of health:

“My illness is the lack of perspective”. (Long-term unemployed, 50+)

Future programs should focus in particular on elderly jobseekers. In comparison to younger participants they suffer more health impairments than the younger ones (cf. 22). In Germany, a growing number of unemployed people are more than 50 years old (IAB-Studie 2010). Taking health impairments into account, this group basically has no chances on the job market. In our study the 40-50 year-old participants did not anticipate any positive prospects. Useful interventions for elderly jobseekers could be empowerment and appreciation modules

for coming to terms with the past, since these people often display regressive behaviour (cf. 23).

Many participants of the program had multiple problems. In general, it is difficult to find work for any unemployed person with some disadvantage. There has to be more preventive work at an individual level as well as condition oriented prevention in different areas of life. Therefore, cooperation with German job centers and their external services is essential. Vocational counseling and health promotion need to be more interlinked (24).

The pilot project *Job-Fit* indicates that short-term counseling which integrates appreciation programs helps unemployed people with slight or average health impairments to improve their coping strategies. Unemployed people with multiple problems and chronic diseases are in need of long-term support, which is not yet provided in Germany. An analysis by the IAB indicates that structural unemployment will continue until 2015 (25). Especially for people with multiple problems and dysfunctional coping strategies, the “Hartz IV”¹¹ reform results in additional pressure (e.g. financial restrictions). Older long-term unemployed people are obliged to go into early retirement and have to accept reduced pensions (26, p. 11). The pensions in Germany are clearly lower than the OECD average (27). German workers experience a higher risk of becoming unemployed and report more complex and demanding working conditions, more working hours and less job stability (26, p.11).

These aggravated circumstances might lead to increased stress for unemployed people, thus increasing the risk of illness in the long run. On the other hand, the results reported by Gash et al. (28) suggest that transitions from unemployment into employment have a significant and positive effect on the health status of German men.

1. Hartz IV reform: i.e. long-term unemployed (>12 months) receive an allowance of 352 € (plus money for rent). Unemployed people with savings, private fortune or living together with an employed partner are excluded from receiving allowance (Kuhnert, 2005b).

Conclusion

In interactions with younger employees and especially with leaders great potential was found concerning a development of change processes. On the basis of the qualitative study presented, contents for an intervention program for appreciative leadership promoting health will be developed. Health promotion for senior unemployed and nursing staff has to consider various concepts of life and depleted resources in order to achieve sustainable effects.

References

1. Kuhnert, P., Akca, S. & Kastner, M. (in Print). „Gesund pflegen unter Zeitnot und fehlender Anerkennung? – Wertschätzungsaspekte des Gesundheitsmanagements in der Krankenpflege. [Healthy Nursing Between Time Pressure and Missing Appreciation? – Aspects of Appreciating Health Management in Nursing.] In: M. Kastner. Leistungs- und Gesundheitsmanagement“. Pabst Science Publishers. Lengerich.
2. Kuhnert, P., Ayan, T. & Kastner, M. (2010). Differentiated results of a health orientated Self-Management-Counselling for short and long-term unemployed as well as unsteady employed persons. Kieselbach, T. & Mannila, S. (eds.). Persistent unemployment and precarious work: Research and policy issues (Psychologie sozialer Ungleichheit, vol. 14). Wiesbaden: VS (forthcoming).
3. Kuhnert, P. (2005). „Wie ein Motor ohne Treibstoff...“ – Männergesundheit in der Arbeitslosigkeit. In: M. Kastner, T. Hagemann & G. Kliesch (Hrsg.), *Arbeitslosigkeit und Gesundheit – Arbeitsmarktintegrative Gesundheitsförderung* (S. 273–293). [“Like an Engine without Fuel...” – Men’s Health during Unemployment. In: Unemployment and Health-Labour Market-integrative Health Promotion] Lengerich: Pabst.
4. Böhnke, P. (2005). Mittendrin und trotzdem draußen? Soziale Ungleichheit in Deutschland. [Right in the middle but nonetheless on the outside? Social diversity in Germany.] *WZB-Mitteilungen*, Dezember, 34–37.

5. Keuler, M. (2005). "Ältere werden nur von jedem zweiten Betrieb bei der Einstellung berücksichtigt". [Only ever other Business takes the Elderly into account when they hire someone.], In: G.I.B.-VIP-News No. 8, 2005
6. Kuhnert, P. et al. (2008). Handbuch Stabilisierende Gruppen. Ein Praxisratgeber für die Einzel- und Gruppenberatung mit ALG-II-Empfängern. Bundesministerium für Arbeit und Soziales. [Handbook: Stabilizing Groups. A Guidebook for both Individual and Group Counseling of long term Unemployed (*unemployment benefit II-recipients*). German Federal Ministry of Labor and Social Affairs.] Bonn. Druck Mannheim: ISBN 3-9809417-0-1.
7. Southwick S, Vythilingam M, Charney D. The psychobiology of depression and resilience to stress: implications for prevention and treatment. *Annual Review of Clinical Psychology 2006: (2) 255-291.*
8. Olejniczak, Michael (2010). Aktive Leistungen nach dem SGB II als Dienstleistungsprozess – Eine qualitative Analyse der Hartz-IV-Reform auf Basis von Interviews mit Betroffenen. [Active Benefit according to the SGB II (*German Social Welfare Code*) as a Process of Service – a Qualitative Analysis of the Reform of Hartz-IV (*social welfare/unemployment benefit*) based on Interviews with People Concerned.] Rainer Hampp Verlag. München, 2010.
9. Gunkel, L. & Szpilok, M. (2010). Betriebliche Intervention und Prävention bei Konflikten und Mobbing. In B. Badura, H. Schröder, J. Klose u. K. Macco (Hrsg.), Fehlzeiten-Report 2009. Zahlen, Daten, Analysen aus allen Branchen der Wirtschaft (S. 215–226). [Company-lead Intervention and Prevention with regards to Conflicts and Mobbing. In: Absenteeism report 2009. Numbers, Data and Analyses from all Economic Branches] Berlin: Springer.
10. Gouthier, M. H. J. (2006): Produzentenstolz von Dienstleistern als positive Arbeitsemotion. In: Ringlstetter, M. Kaiser, S. Müller-Seitz, G. (Hrsg.), Positives Management. Zentrale Konzepte und Ideen des Positive Organizational Scholarship [Producer's Pride of Service Providers as Positive Working Emotion. In: Positive management. Central Concepts and Ideas of Positive Organizational Scholarship], Wiesbaden, S. 91–113.
11. Kuhnert, P. & Kastner, M. (2002). Neue Wege in Beschäftigung. Gesundheitsförderung bei Arbeitslosigkeit (373–406). In: B. Röhrle (Hrsg.), Prävention und Gesundheitsförderung Band 2. [New Ways into Occupation. Health Promotion for Unemployed. In: B. Röhrle (Hrsg.), Prevention and Health Promotion Vol. 2. Tübingen: dgvt-Verlag] Tübingen: dgvt-Verlag.

12. Kuhnert, P. (2007). Arbeitslosigkeit bewältigen und Lebensmut erhalten – Beratung von Langzeitarbeitslosen. [Overcoming Unemployment and Keeping up the Will to Live – Advising long-term unemployed.] VDM Verlag Dr. Müller, Saarbrücken.
13. Metz, A–M., Neuhaus, K. & Kunze, D. (2006). Gesund pflegen im Krankenhaus. (Nachhaltige Reduzierung psychischer Fehlbelastung von Krankenpflegekräften durch Gesundheitsförderung). [Healthy Nursing in Hospital. (Sustained Reduction of Psychic Stress among care-takers by means of Health Promotion.)] INQA-Bericht 12. Dortmund.
14. Wüstner, K. (2005). Burnout bei Arbeitslosen. [Burnout among Unemployed.] Arbeit, Heft 2 (2005). S. 131–146.
15. Simon, M. (2008). Pflegepersonalmangel im Krankenhaus. Eine Multilevelanalyse von Berufsausstiegs- und Einrichtungswechselabsicht. [Lack of Nursing staff in the Hospital. A Multi-level analysis of intentions to quit or change to another institution], Dissertation. Bergische Universität Wuppertal.
16. Teusch & Schmitz (2009). Gefährliche Pflege in unserer Region. [Dangerous Nursing in our Region.] <http://www.menschenwuerdigepflege.de/Umfrage-Ergebniss-gefaehrliche-pflege.pdf> (Download vom 08.12.2009).
17. Stordeur, S. et al. (2005). Führungsqualität, Arbeitszufriedenheit und berufliche Bindung von Pflegekräften. In H.-M. Hasselhorn, B. H. Müller, P. Tackenberg, A. Kümmerling u. M. Simon (Hrsg.), Berufsausstieg bei Pflegepersonal (S. 30–48). [Leadership quality, job satisfaction and occupational Commitment among Nursing Staff. In: Quitting amongst Nursing Staff.] Schriftenreihe der Bundesanstalt für Arbeitsschutz und Arbeitsmedizin. Dortmund/Berlin/Dresden 2005.
18. Schlechtriemen–Koß, A. (2009). Jetzt wird wieder in die Hände gespuckt.... Reorganisation einer Station. [Reorganisation of a ward.] Dr. Med. Mabase Nr. 182, November/Dezember 2009, S. 35–38.
19. Wilde, B., Dunkel, W., Hinrichs & S., Menz, W. (2010). Gesundheit als Führungsaufgabe in ergebnisorientiert gesteuerten Arbeitssystemen. In B. Badura, H. Schröder, J. Klose u. K. Macco (Hrsg.), Fehlzeiten–Report 2009. Zahlen, Daten, Analysen aus allen Branchen der Wirtschaft (S. 147–153). [Health as Executive Function in goal-oriented working systems. In: Absenteeism report 2009. Numbers, Data and Analyses from all Economic Branches] Berlin: Springer.

20. Hien, W. (2009). Pflegen bis 67: Älter werden und Gesundheit im Pflegeberuf. Gute Arbeit, Zeitschrift für Gesundheitsschutz und Arbeitsgestaltung [Nursing up to the Age of 67: Ageing and good Health in Nursing. Good Work, Journal for Health Protection and Job Design.], S. 36–39.
21. Ilmarinen, J. (2007). The Work Ability Index (WAI). In *Occupational Medicine* 2007 57:160.
22. Holleeder, A. (2009). Gesundheit von Arbeitslosen fördern. Ein Handbuch für Wissenschaft und Praxis. Fachhochschulverlag. Der Verlag für Angewandte Wissenschaften. [Encourage unemployed's Health. Manual for Science and Practise.], Frankfurt a. M.
23. Creed, P. & Watson, T. (2003). Age, Gender, Psychological Wellbeing and the Impact of Losing the Latent and Manifest Benefits of Employment in Unemployed People. *Australian Journal of Psychology*, 55 (2), 95–103.
24. Kuhnert, P. & Kastner, M. (2009). Gesundheits- und beschäftigungsorientierte Beratung bei Arbeitslosigkeit – Das Konzept der Stabilisierenden Gruppen. In A. Holleeder (Hrsg.). *Gesundheit von Arbeitslosen fördern. Ein Handbuch für Wissenschaft und Praxis.* (S. 203–229). Fachhochschulverlag. Der Verlag für Angewandte Wissenschaften. [Health- and employee- centred Consulting related to Unemployment – the concept of stabilising groups. In: Encourage unemployed's Health. Manual for Science and Practise.] Frankfurt a. M.
25. Lutz, C., Meyer, B., Schnur, P. & Zika, G. (2002). Projektion des Arbeitskräftebedarfs bis 2015. Modellrechnungen auf Basis des IAB/INFORGE-Modells [Projection of the employee demands until 2015. Model calculations based on IAB/INFORGE models]. *Mitteilungen aus der Arbeitsmarkt- und Berufsforschung*, 35 (3), 305–326.
26. Schneider, J. & Beblo, M. (2010). Health at work – Indicators and Determinants. (A Revised Literature and Data Review for Germany). IAB Discussion Paper 17/2010. Institute for Employment Research. Nürnberg.
27. OECD (2009). *Pensions at a Glance: Retirement-Income Systems in OECD Countries.* OECD Paris.
28. Gash, V., Mertens, A., & Romeu Gordo, L. (2006). Are Fixed-Term Jobs Bad for Your Health? A comparison between Western Germany and Spain, FHW Discussion Paper 27.

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