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Predictors of work ability in occupations with psychological stress

Reingard Seibt · Silvia Spitzer · Matthes Blank · Klaus Scheuch

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Abstract

Aim This study aimed to detect health- and work-related predictors of poor and good work ability in teachers (TE) and office workers (OW).

Method Work ability and its influence factors were analyzed in 100 female TE and 60 female OW aged between 25 and 60 years. The work ability was evaluated with the work ability index questionnaire and the health status with the vitality measurement system®. In addition, cardiac risk factors, burnout risk, as well as the working demands and effort-reward ratio were taken into account. Predictors of work ability were analyzed by using a CHAID analysis. The number of complaints represents the best predictor to divide both occupational groups into subgroups with different work abilities (criterion variable).

Results Poor work ability is caused by many complaints and cardiovascular risk factors. By contrast, excellent work ability is associated with few complaints, the occupation “office workers,” a younger vital functional age, and the absence of burnout symptoms, which means in comparison with OW, TE have a 1.6 times higher risk for impaired work ability. Furthermore, the absence of burnout symptoms is a resource of TE, whereas OWs tend to have a younger vital functional age compared to their calendrical

age. Although this analysis is able to explain 61.2% of the influence on impaired work ability, research for further causes must be undertaken.

Conclusion The results reflect the positive effect of a high educational level and a challenging job on the preservation of good work ability. Moreover, they draw the attention to the psychological and psychosocial strains of TE. TEs are exposed more frequently to feeling overstrained; this probably effects a higher retirement rate due to illness.

Keywords Work ability · Stress · Teacher · Office worker

Introduction

Work ability is defined as the sum of factors enabling an employed person in a certain situation to manage his/her working demands successfully (Ilmarinen and Tempel 2002). That means, according to the concept of work ability by Ilmarinen and Tempel (2002), the personal ability to cope with professional demands successfully is determined by personal resources (education and competence; motivation, attitudes, values) and the requirements of the work situation (gainful employment). It can be looked at both as an individual resource according to well-being and health of the individual and also as an organizational resource, related to a higher quality of work. A high work ability is accompanied with a longer active work life and therefore with low costs for the national social system (Hasselhorn and Müller 2004). Besides qualification and motivation, the health of employees is, however, an indispensable prerequisite for good work ability and satisfaction and consequently also for capabilities and professional success. Premature retirement is one effect of decreased work ability (Tuomi et al. 2001).

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The work ability of teachers is especially alarming from an occupational medical point of view and should be examined closely. Rates of premature retirement among German school teachers due to serious health disorders are consistently higher than those of other employees in public service (Statistisches Bundesamt 2005). In 2004 only 26% of teachers reached normal retirement age, compared to 54% of other employees in public service (Statistisches Bundesamt 2005). Most of these early pensioned teachers leave their job due to health reasons, particularly psychosomatic or psychic diseases (Hillert and Schmitz 2004). Reasons for this are seen in work-related diseases, which can be traced back to the high mental stress and chronic overtraining. But this is not a specifically German problem (Brown et al. 2006; Schwarzer et al. 2000; Guglielmi and Tatrow 1998).

The occupational demands of teachers have been very well researched (Bauer et al. 2006; Dunham and Varma 1998). But the effect of work-related and personal risks and resources on the work ability of teachers has not been well examined (Ilmarinen 1999; Kyriacou 1980, 2001), and comparisons with other professions and objective data are not available. To evaluate the findings on teachers, it is necessary to compare their work ability with other occupational groups characterized by a similar level of psychological stress, but different levels of education, job specifications, and work-related demands. Office workers were chosen. But both occupational groups are characterized by mainly psychological and social communicative requirements (Huang et al. 2004).

In order to maintain and promote the work ability on a high level over working life, the identification of work-related and personal risks and resources (influence factors) is necessary. This requires a multidimensional approach that can take into account complex occupational and personality factors. Most of the former studies just worked with subjective questionnaires (Bauer et al. 2006; Clark and Thompson 1995).

The aim of this study is to examine the work ability and the work-related and personal factors ('risk factors' and 'resources'), especially health factors in grammar school teachers in comparison to office workers. Secondly, it has to be tested which of these factors are relevant predictors for poor and excellent work ability.

Method

Participants

A sample of 100 female grammar school teachers and 60 office workers were recruited in Dresden (Federal Country of Saxony, Germany) from grammar schools (response rate: 58.3%) and in public facilities (response rate: 57.1%) by telephone or personal contact. Mostly the project was

presented in a short lecture in the schools and public facilities, respectively. The participants were aged between 25 and 60 years (mean age: 44 ± 9 years).

The groups did not differ in age distribution or marital status (Table 1). The majority of women were married (teachers: 71%, office workers: 72%), and 20% of the teachers as well as 10% of the office workers were divorced. Education and professional training of the groups differed in the following ways. Without exception, all teachers had completed a university education. All of them were employed as civil servants, and 98% belonged to the permanent staff. Thirty-two percent of office workers obtained their end of school exam, whereas only 17% completed a university education, but most of them additionally had vocational training. All office workers were employed as civil servants. More than 80% are permanent workers. Their job profile ranged from pure office work (mainly administration), organizational tasks, and customer care, to advisory service. All of them worked on the computer for more than 4 h daily.

Study design and inventories

Work ability is a result of interaction between occupational (e.g., intensity of work, effort-reward imbalance) and personal (e.g., coping, social competence, behavior under stress), and especially health factors (e.g., vitality, complaints, burnout risk). Therefore, an integrated occupational medical and psychological research method was used to determine predictors of poor and excellent work ability in both groups. This multidimensional method consists of objective (physiological measures) and subjective (questionnaires, structured interview) instruments for the assessment of the work ability and the personal and work-related factors-including the health status (vitality).

Table 1 Anamnestic characteristics of teachers and office workers

Anamnestic characteristics	Teachers (n=100)	Office workers (n=60)	Significance p-value
Age [years]	44.6±7.7	42.6±8.8	0.124
Marital status [%]			
- Single	8	13	0.123
- Married	71	72	
- Divorced	20	10	
- Widowed	1	5	
Vocational education [%]			
- No vocational education	0	0	0.001***
- Vocational training	0	73	
- Polytechnic	0	10	
- University	100	17	

***p<0.001

(Means and standard deviations; frequencies [%])

In order to find predictors of the work ability, CHAID analyses were carried out. CHAID (chi-squared automatic interaction detector) analysis was used to find predictors of poor and excellent work ability. This method divides a population into distinct groups based on the category of the “best” predictor of a dependent variable. Each of these groups is split into smaller subgroups based on other predictor variables. The process continues until no further statistically significant predictors can be found (Magidson 1994).

Work Ability Index (WAI)

The WAI is based on a self-assessment of work ability and gives information about the individual health state, the physical and mental demands in the occupation and the capacity of performance (Tuomi et al. 1998). The WAI describes how well an employee is capable of doing his/her job (Tuomi et al. 2001). It is recommended as a diagnostic instrument for the development of measures for the health support and the identification of employees who require medical care. The aim is to prevent the premature reduction of work ability. The WAI measures the following seven aspects of work ability:

- current work ability compared with lifetime best (WAI 1);
- work ability in relation to the physical and mental demands in the present work (WAI 2);
- current number of diseases or injuries diagnosed by a doctor (WAI 3 - 51 diseases that are assigned to 14 illness groups afterwards);
- subjective estimation of work ability impairment due to diseases (WAI 4);
- sick leave taken in the last 12 months (WAI 5);
- personal prediction of work ability in the next 2 years (WAI 6) and
- psychological attitudes and resources to do the job (WAI 7).

The cumulative index of WAI ranges from 7 to 49 points and is divided into the following categories: poor (7 - 27 points), moderate (28 - 36 points), good (37 - 43 points), and excellent work ability (44 - 49 points).

Health status

In this study health status includes *vitality* and *burnout* risk.

Vitality *Vitality* is defined as the age- and gender-corrected functional state and the well-being of the whole organism based on the troika of physical, mental, and socio-emotional capabilities of a person (Meißner-Pöthig 1997). The Vitality Measurement Station (Vitalitätsmessplatz®: Meißner-Pöthig 1997) is an inventory for the assessment of the health status in accordance with the WHO definition as physical, emotional, and social well being. This diagnostic method is used to identify individual risks and resources,

which frequently are in relation to personal habits (e.g., lack of exercise, bad nutritional habits, sensitivity to stress, and stress management). The measuring system is a multidimensional test battery comprising 45 vitality indicators to assess the following functions:

- *cardiopulmonary system* (e.g., blood pressure, pulse at rest and work load, vital capacity, arterial oxygen partial pressure, cardiovascular index after submaximal strain);
- *musculoskeletal system* (e.g., muscular strength, speed, coordination capabilities);
- *sense organs* (e.g., visual/auditory acuity, visual/auditory reaction capabilities);
- *body composition* (e.g., body fat, active cell mass, water ratio, waist hip ratio);
- *psychological and mental dimensions* (e.g., verbal/cognitive response, reorientation capabilities, concentration, flexibility, strategy building, memory capacity);
- *physical and psychological complaints* measured by the BFB questionnaire (Höck and Hess 1975) and
- *social factors* (obligations and leisure time, behavior under stress, social competence).

The age-related changes of the individual vitality indicators are condensed in a functional age index (FAI)-an indication of the *vital age*. The calculations of the FAI are based on age- and gender-related reference values for a defined reference population in which the calendrical and biological functional age correspond in normally aging persons (Meißner-Pöthig 1997). The vital (biological) aging speed can differ considerably.

Maslach Burnout Inventory-General Survey Finally, as an indicator of health status the *burnout risk* was measured with the questionnaire Maslach Burnout Inventory-General Survey (MBI-GS: Schaufeli et al. 1996) developed for use with all occupations other than the human services and education. The MBI-GS subscales *emotional exhaustion*, *cynicism* and *professional efficiency* ranged in a codomain from 0 to 6. A high degree of burnout is reflected in high scores on *emotional exhaustion* and *cynicism* and low scores in *professional efficiency*. To evaluate the burnout risk the instruction from Kalimo et al. (2003) is used (“no burnout”: 0 - 1.49 points, “some burnout symptoms”: 1.5 - 3.49 points, “burnout risk”: 3.5 - 6 points).

Factors of personality

Sociodemographic factors and habits Determined anamnestic factors and habits (e.g., age, marital status, current complaints, smoking, consumption of alcohol, unfavorable

nutritional behavior, and behavior at leisure time) were assessed by means of a self-made structured interview.

Relaxation inability The *inability to relax* was examined by using the corresponding subscale of the standardized questionnaire FABa (Richter et al. 1996). This subscale gives information for risk assessment of inefficient coping with demands and disturbed relaxation. The codomain of the score for relaxation inability ranges from 6 to 24. The general cut off for ‘noticeable’ values is 19 and for “very noticeable” values 21.

Work-related factors

Some *occupational factors* were assessed by means of a professional case history (self-made structured interview). The participants were asked, for example, about their working conditions and occupational career.

Working demands For measuring the range of *job demands* (JD) and *decision latitude* (DL), the FIT questionnaire (Richter et al. 2000) was used. It is a screening instrument for the assessment of the coherence between the working situation and the consequences of work. In the result of the questionnaire an occupation can be classified as *active* (high JD and DL), *low strain* (low JD and high DL), *passive* (low JD and DL), or *high strain job* (high JD and low DL). *High strain jobs* are connected with an increased risk for cardiovascular diseases, according to Kivimäki et al. (2002).

Effort-reward imbalance The *effort-reward imbalance* at work was measured by the short version of ERI questionnaire with 23 items (Siegrist et al. 2004; Siegrist 1996). It is applied to identify chronic effects of psycho-mental and socio-emotional stress and to estimate associated health hazards. The subscale *occupational reward* measures satisfaction with a three-factorial structure: financial and status-related aspects (1), esteem rewards (2), and gratification of job security (3). If the ratio between effort and reward at work is higher than 1 (high effort and low gratification) a healthy risk can be expected.

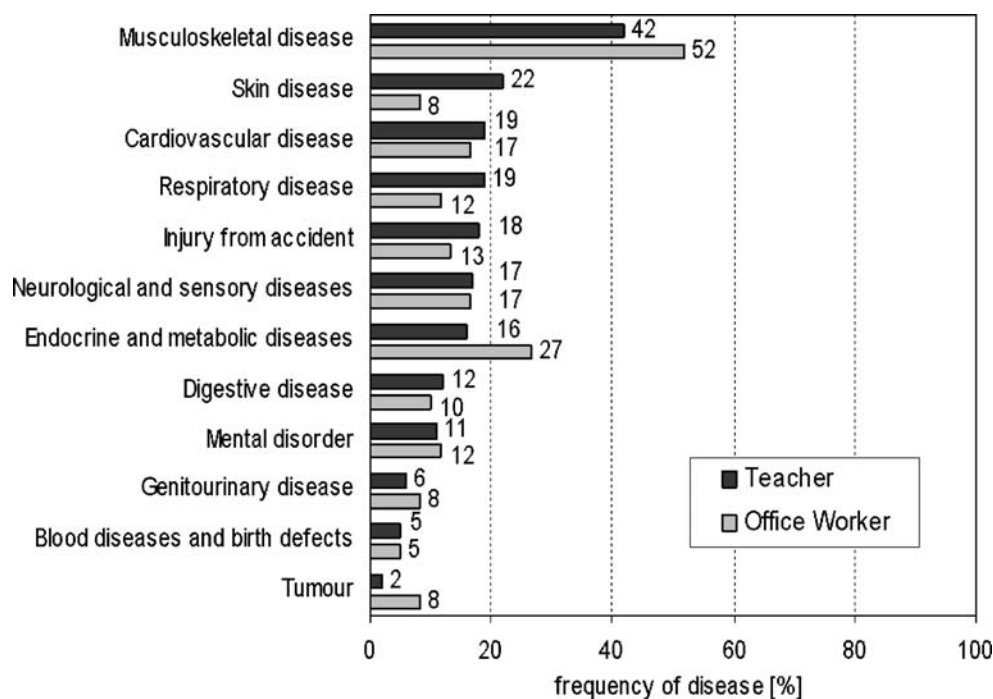
Results

Comparison among occupational groups

The *work ability* of teachers with an average of 39 ± 6 points is significantly lower than the work ability of office workers with an average of 41 ± 5 points ($p = 0.001$). More teachers than office workers show a poor or moderate (37 vs. 18%) work ability. Good work ability is almost evenly distributed in both occupational groups (50 vs. 53%), but excellent work ability can be found twice as often among office workers than in teachers (13 vs. 28%).

Health risk factors and **resources** of work ability included in the analysis were diagnosed diseases (Fig. 1), current complaints, relaxing capacities, burnout risk and the ratio of effort and reward at work, but also cardiovascular

Fig. 1 Frequencies of diseases [%] (WAI 3) for teachers (n=100) and office workers (n=60)



risk factors (e.g., body mass index-BMI, waist hip ratio-WHR, pulse performance index-PPI), physical and mental ‘fitness,’ and vital age.

The occupational groups do not differ regarding the number of *physical and psychic complaints*. That means that teachers do not have more complaints than office workers. However, 68% of the teachers and 60% of the office workers report exhaustion as their most frequent complaint. On average, six physical complaints are reported in both groups (teachers: 6.3 ± 4.6 ; office workers: 6.4 ± 4.7 ; $p = 0.901$). In the psychological field two complaints are stated in both occupational groups ($p = 0.513$).

Moreover, the *frequency of risk factors for cardiovascular diseases* of teachers is lower compared with that of office workers (Table 2). High blood pressure is analyzed in almost every second office worker (OW: 47%; TE: 25%; $p = 0.033$), but only approximately 12 percent of them are treated with antihypertensive medication (Table 2). More than a third of office workers (37%) are overweight, but there is no significant effect ($p = 0.199$) on teachers (27%). This is reflected in a high proportion of fat in the body composition. In the group of office workers, the proportion of body fat is 23 ± 7 kg on average and thus about 3 kg higher than the fat proportion in the group of teachers (normal range: 10 – 17 kg). There is a health risk by the waist hip ratio (WHR: unfavorable fat distribution pattern) for 12% of teachers and 18% of office workers. For the

fitness index, the average values of the groups are above the value of 2, which corresponds to a good fitness. The similar composition of the active body cell mass (e.g., muscle mass) indicates a comparable fitness as well.

The *functional age index* (a construction of the measured vitality indicators), which mirrors the vital age, shows that teachers (40.6 ± 8.0 years) compared with their calendrical age (44.6 ± 7.7 years) have a younger vital age, whereas in office workers the vital age (44.5 ± 5.3 years) corresponds to their calendrical age (42.6 ± 8.7 years). This indicates an obviously better vitality status in teachers than in office workers. The vital functional age of teachers is strongly affected by their *excellent mental capacities* (e.g., flexibility, concentration, strategy building, memory capacities), a better physical fitness (pulse performance index), and in this way a good training status of their cardiovascular system (resources). Despite the fact that teachers are generally marked by more job-related and everyday job demands and a lower proportion of leisure time than can be assessed for office workers, they use their leisure time actively to keep up their physical fitness and well-being.

For the total value of the *burnout risk*, significant differences result from the occupation. Teachers (1.7 ± 0.7 points) have significantly ($p = 0.000$) higher values in burnout risk in comparison to office workers (1.2 ± 0.8 points). A distinctive burnout risk (3.5 points) is available merely in 3% of office workers, but more than 50% of

Table 2 Selected risk factors for cardiovascular diseases in teachers and office workers

Analyzed risk factors for cardiovascular diseases	Teachers (n=100)	Office workers (n=60)	Significance p-value
Blood pressure			
Systolic blood pressure [mmHg]	125.0 \pm 15.3	129.8 \pm 13.6	0.048*
Diastolic blood pressure [mmHg]	80.6 \pm 8.6	84.8 \pm 9.1	0.005**
- Hypertension (>140/90 mmHg) ¹ [%]	25.0	46.7	0.033*
- Antihypertensive medication [%]	12.0	11.7	0.950
Fitness			
Fitness index (PPI) ^a	2.1 \pm 0.8	2.1 \pm 0.6	0.994
- PPI<1 (poor) [%]	7	2	0.414
- PPI>2 (good) [%]	50	57	
Body measures			
Body fat mass [%]	20.4 \pm 7.3	22.7 \pm 7.2	0.086
Active body cell mass [%]	25.2 \pm 2.6	25.4 \pm 3.1	0.195
Body mass index (BMI) [kg/m ²]	23.7 \pm 3.3	24.3 \pm 3.8	0.299
- Overweight (BMI \geq 25 kg/m ²) ² [%]	27.0	36.6	0.199
Waist hip ratio (WHR)	0.79 \pm 0.6	0.80 \pm 0.5	0.440
- Metabolic risk (WHR>0.85) ² [%]	12.0	18.3	0.272

^a PPI = Pulse performance index: ratio of pulse frequency difference (pulse at work load minus pulse at rest) to duration of work load

* $p < 0.05$; ** $p < 0.01$

¹ The sixth report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (1997). *Archives of Internal Medicine*, 157: 2413–46

² Deutsche Adipositas-Gesellschaft, Deutsche Diabetes-Gesellschaft, Deutsche Gesellschaft für Ernährung. (2005). Evidenz basierte Leitlinie-Prävention und Therapie der Adipositas (German Adiposity Association, German Diabetes Association, German Association for Nutrition. Evidence-based guideline-prevention and therapy of adiposity)

(Means and standard deviations; frequencies [%])

teachers. Only approximately a fourth of office workers show burnout symptoms (Table 3). In teachers there is a proportion of emotional exhaustion that is twice as high as in office workers (34% vs. 17%; $p = 0.000$).

Unlike office workers, teachers achieve the significantly highest values for *relaxation inability* (17.1 vs. 13.5 points; $p = 0.000$); 31% have a ‘noticeable’ or ‘very noticeable’ relaxation inability (Table 3), while in office workers high values are found for only 7% ($p = 0.000$).

Furthermore, significant differences between the occupations in range of *job demands* and *decision latitude* could be determined. Teachers differ from office workers by a bigger range of job demands (teachers: 3.3 ± 0.3 ; office workers: 3.1 ± 0.5 ; $p = 0.010$) and a higher decision latitude (teachers: 3.1 ± 0.5 ; office workers: 2.8 ± 0.6 ; $p = 0.001$). According to the classification of Karasek (Karasek 1979; Karasek and Theorell 1990), 90% of teachers can be found in an *active job* and 10% in a *low strain job*. The distribution of the office workers varies more strongly. The office workers can be classified to all categories except the *passive job* (active job: 65%, low strain job: 27%, high strain job: 8%).

Despite inferior difference, teachers (0.7) report a significantly ($p = 0.008$) stronger *effort-reward imbalance* than office workers (0.6). This more unfavorable *effort-reward imbalance* in the group of teachers results from the effect that teachers tend to overexert more strongly in their occupation than office workers, but teachers get a comparable recognition from the occupational field (Table 3). However, the ERI mean values classified are quite safe. There is a health risk for only 7% of teachers (office workers: 0%; $p = 0.036$).

Predictors of work ability

At first, correlation and regression analyses were carried out in order to test the association between personal factors, work-related factors and the work ability of teachers and office workers (Table 4). Significant low rise to middle correlations (Bühl and Zöfel 2005) was determined between work ability and current complaints ($r = -0.54$), burnout risk ($r = -0.54$), relaxation inability ($r = -0.41$), as well as the

effort-reward imbalance ($r = -0.33$) and the physical fitness index ($r = 0.21$); significant very low correlations are still found for memory performance ($r = 0.18$), fat mass ($r = -0.16$), BMI ($r = -0.16$), and WHR ($r = -0.15$).

Due to their meaningfulness these variables were included in the CHAID analyses (Magidson 1994) for determining relevant predictors for work ability: current complaints, relaxation capacities, burnout risk, and the effort-reward ratio at work, but also cardiovascular risk factors (BMI, WHR, PPI), physical and mental ‘fitness,’ and the vital functional age. The result of this analysis is represented for the complete sample of the teachers and the office workers as a classification tree (tree diagram) that shows how major “types” formed from the independent variables differentially predict the criterion variable (Fig. 2). The best predictor is the one with the lowest significance value.

According to this analysis, the significant *factors* on work ability are the following: physical and mental complaints (BFB questionnaire: $p=0.000$), fitness index (PPI: $p=0.000$), occupational group ($p=0.003$), waist hip ratio (WHR: $p=0.001$), classified burnout risk ($p=0.001$ and $p=0.013$), and vital functional age (FAI: $p=0.042$). In this model 61.2% of the complete variance is explained with the work ability (WAI score) in occupational groups with psychological stress. Based on significant predictors, future work ability is forecast (Fig. 2).

Impaired (poor) *work ability* is mainly associated with an increased number of physical and mental complaints (BFB questionnaire), a moderate fitness status of the cardiovascular system, and an unfavorable classification of the waist hip ratio. By contrast, *excellent work ability* is associated with few physical and mental complaints (BFB questionnaire), the occupation “office workers,” a younger vital functional age, and the absence of burnout symptoms. The number of *current* complaints seems to be the strongest factor in both groups for impaired work ability. In comparison to office workers, teacher have a 1.6 times higher risk for impaired work ability.

Additionally, the same CHAID analysis was tested without the variable *current complaints*; the variable *burnout risk* became the predictor that is associated the

Table 3 Burnout risk in teachers and office workers

Burnout risk (0 – 6 points)	Teachers (n=100)	Office workers (n=60)	Significance p-values
Total score (weighted) [points]	1.7 ± 0.7	1.2 ± 0.8	0.001***
- Single symptoms (1.50 – 3.49 points) [%] ^a	58	22	0.001***
- Total burnout (≥ 3.50 points) [%] ^a	0	3	

^a Assessment rule and classification of the burnout risk from Kalimo et al. (2003)

*** $p < 0.01$

(Means and standard deviations; frequencies [%])

Table 4 Selected personal and work-related risk factors in teachers and office workers

Analyzed parameters	Teachers (n=100)	Office workers (n=60)	Significance p-values
Relaxation inability (6 – 24 points)			
Total sum [points]	17.1±3.7	13.5±3.8	0.001***
- Noticeable sum (19 – 24 points) [%] ^a	31	7	0.001***
Working demands ^b			
Job demands (JD: 1 - 4 points)	3.3±0.3	3.1±0.5	0.010**
Decision latitude (DL: 1 - 4 points)	3.1±0.5	2.8±0.6	0.010**
- Passive job (JD: <2.5, DL: <2.5) [%]	0	0	0.029*
- Low strain job (JD: ≥2.5, DL: <2.5) [%]	10	27	
- Active job (JD: ≥2.5, DL: ≥2.5) [%]	90	65	
- High strain job (JD: <2.5, DL: ≥2.5) [%]	0	8	
Work-related effort-reward ratio ^c			
Effort (6 - 30 points) ^c	17.1±4.3	14.7±3.6	0.001***
Reward (11 - 55 points) ^c	48.6±5.1	47.5±6.3	0.378
Effort-reward imbalance (ERI)	0.65±0.2	0.56±0.2	0.008**
- Health risk (≥1) [%] ^c	7	0	0.036*

^a Classification of the recuperation incompetence from Richter et al. (1996)

^b Classification of the job demands and decision latitude from Richter et al. (2000)

^c Classification of the effort-reward imbalance from Siegrist (1996)

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

(Means and standard deviations; frequencies [%])

most with the work ability. If the WAI score was calculated without the subscale WAI 3 (current number of diseases or injuries diagnosed by a doctor), the results in the tree diagram hardly changed. Here, the number of *current complaints* was identified again as the main predictor for impaired and high work ability, respectively.

Summarizing these findings, *poor work ability* can be found in both occupational groups. It is especially related to physical risk factors. *Excellent work ability* can be found among teachers with high mental resources and among office workers with young vital functional age. After all, 43% of office workers show excellent work ability (WAI:

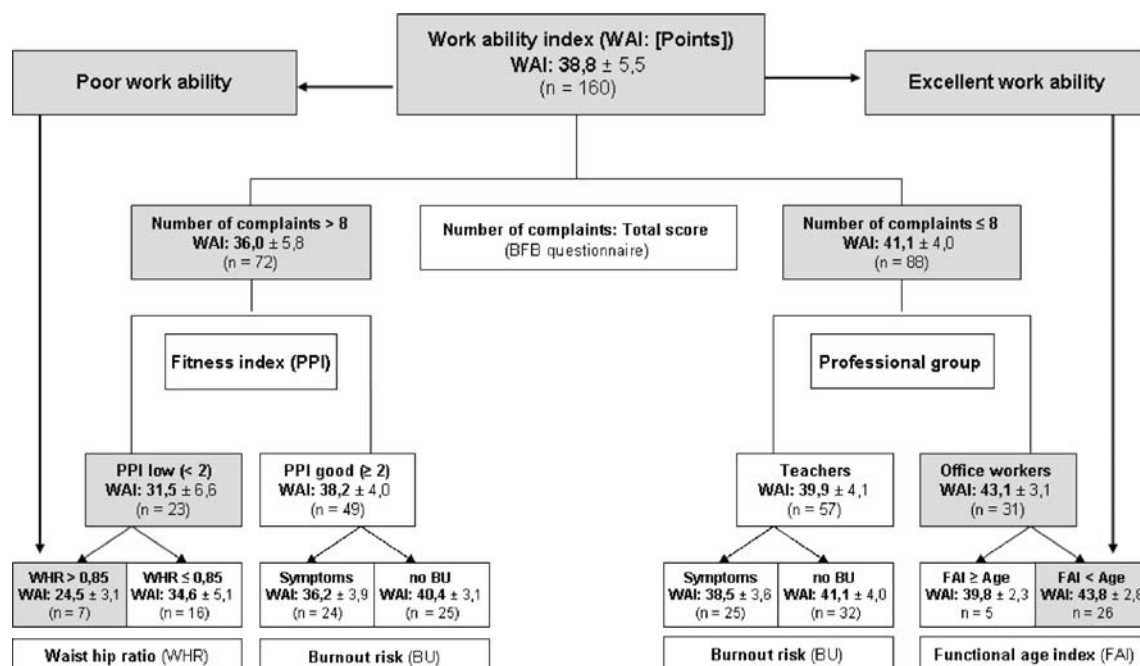


Fig. 2 CHAID analysis (SPSS Answer Tree)-predictors of poor or excellent work ability for teachers (n=100) and office workers (n=60)

44±3 points). According to these predictors, teachers do only achieve good work ability. However, this is true for more than half of the assessed teachers (57%). Calendrical age does not prove to be a predictor of work ability in both groups. Women who work in psychologically demanding occupations show poor work ability, especially if a variety of complaints is combined with an unfavorable waist hip ratio (WAI: 24±3 points). This CHAID analysis is able to explain 61.2% of the variance of work ability.

Discussion

In general, teachers differ from office workers in terms of more unfavorable *effort-reward imbalance* (ERI) and a higher proportion of emotional exhaustion and cynicism (MBI-GS). More than 58% of teachers, but only 25% of office workers show burnout symptoms as a result of job-related strain ($p=0.000$). However, in no case a full burnout syndrome could be found. In addition, teachers have higher relaxing capacities than office workers (FABA: sum score >17 points). Especially the combination of high exhaustion and a higher level of relaxation inability are threatening to people's health as their free time does not offer enough recreation after a working day.

Some of the teachers and office workers have physical impairments. Cardiovascular risk factors and the burnout components, which can express themselves in a considerable restriction of the work ability and in emotional illnesses, are of special relevance. Only 14% of the teachers take part in a general work preventive medical checkup, and only 5% of them use psychotherapeutic counseling.

The permanent state of imbalance between efforts made at work and reward gained can lead to stress reactions (e.g., stress or activations of the central nervous system), which have to be considered as health risks. This *effort-reward imbalance* has to be regarded as an additional health risk in 7% of teachers. Admittedly, there is a discrepancy between teachers' subjective estimation of work ability and their vitality status. A significantly lower work ability among teachers than among office workers can be assessed, although their vital functional age index is much younger compared to office workers. This indicates a different speed of aging among teachers and office workers, but also a connection to education and occupational demands. This range illustrates once more that the speed of aging—independent of the occupational group—can vary considerably in each individual case (different '*vitality patterns*').

The results of health status (vitality) reflect the effects of work-related demands and an unhealthy lifestyle. But they also indicate resources for the preservation of the work ability. The vital functional age of teachers, for instance, is strongly influenced by mental performance capabilities and

physical fitness. These factors promote the ability to cope with occupational demands.

'High' education has positive effects on preservation of nearly all performance features. In addition to the high education level, the continuous training of mental capacities, as is characteristic for grammar school teachers, is beneficial to the preservation of the high mental performance capacities. This is because functions that are frequently used remain at a high level for a long time ("use hypothesis"). This is not only true for the training of physical capacities, but also for mental and social capabilities. There is an occupational transfer effect assumed. The high level of work-related mental demands in teachers allows the transfer of these effects to other non-occupational abilities (Welford 1976). According to Stauder (1992), teachers are more sensitive to changes (e.g., weakness of memory) than other occupational groups.

In both groups impaired work ability is closely related to a high number of physical and mental complaints and physical risk factors (PPI, WHR). Excellent work ability among teachers is mainly marked by mental resources (no burnout risk), whereas it is characterized by a young vital functional age (FAI) among office workers. In comparison with office workers, the teachers have a 1.6 times higher risk for impaired work ability (WAI <37 points).

Teachers more frequently than other occupational groups suffer from diseases that develop from mental and emotional stress. Therefore, teachers show a high risk of psychosomatic and psychic diseases. As reasons for it, primarily work-related chronic overload is discussed. As a rule, office workers have a considerably lower mental and emotional stress, and thus also a lower risk for reduced work ability.

In order to identify relevant risk factors and resources in both occupational groups, an integrated occupational medical and psychological research method has proved useful as health risks and resources at work are multidimensional. However, it is only one sphere of influence of work ability. In order to find other reasons for impaired work ability, more factors have to be taken into account—especially vitality, but also individual habits (diet, fitness, leisure time) and personal coping capabilities, such as recreational capacities, burnout risk, stress management, as well as effort and reward on the job (Mearns and Cain 2003; Gaziel 1993). The assessment of different vitality functions in particular allows a focused intervention that considers the individual lifestyle. If the prognostic significance of WAI for the occurrence of occupational disabilities is taken into account, it can be concluded—considering the described risk factors—that teachers are more likely to retire early from their job due to health reasons.

Summarizing, it can be said that long-lasting work ability requires long health. Preventive measures are necessary to

protect and promote employees' health. According to the *German Labor Protection Law* (Arbeitsschutzgesetz 1996), the health of the teachers has to be supported and preventatively protected. However, the realization of such a support varies strongly in the different federal states. Preventative measures for the receipt and support of work ability should include both personal and work-related factors. The *professional specific* of teachers is not taken into account sufficiently in work medical prevention and in diagnostics or therapy until now. For this occupational group, there are no generally accepted methods to analyze medical risks. There are still no methodical and structural prerequisites for an effective and efficient employees' medical support.

The integrated occupational medical and psychological research method is able to identify *work* and *person-related risk factors* and *resources* of occupations with psychological stress because both health risks and resources vary at work. To sustain and promote work ability, not only work-related risks, but also lifestyle, health behavior (e.g., diet, stress prevention), and individual resources should be the focus. Depending on the individual diagnosis, it is possible to recommend certain training methods and programs of sports medicine, and instructions for stress and life problem management.

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References

- Arbeitsschutzgesetz 1996 (German Labor Protection Law 1996). www.gesetze-im-internet.de/arbbschg/BJNR124610996.html
- Bauer J, Stamm A, Virnich K, Wissing K, Müller U, Wirsching M, Schaarschmidt U (2006) Correlation between burnout syndrome and psychological and psychosomatic symptoms among teachers. *Int Arch Occup Environ Health* 79:199–204
- Brown J, Gilmour WH, Macdonald EB (2006) Ill health retirement in scottish teachers: process, outcomes and re-employment. *Int Arch Occup Environ Health* 79:433–440
- Bühl A, Zöfel P (2005) SPSS Version 12. Einführung in die moderne Datenanalyse unter Windows (SPSS Version 12. Introduction to the modern data analysis under Windows). 9. rev. and enlarged edition, Pearson Studium, München
- Clark CB, Thompson JA (1995) Job burnout and job leaving in public school teachers: implications for stress management. *Int J Stress Manag* 2:15–29
- Deutsche Adipositas-Gesellschaft, Deutsche Diabetes-Gesellschaft, Deutsche Gesellschaft für Ernährung. (2005) Evidenz basierte Leitlinie - Prävention und Therapie der Adipositas (German Adiposity Association, German Diabetes Association, German Association for Nutrition. Evidence based Guideline - Prevention and Therapy of Adiposity). www.deutsche-diabetes-gesellschaft/Evidenzbasierte-Leitlinien/Adipositas.de
- Dunham J, Varma V (1998) Stress in teachers: Past, present and future. Whurr, London
- Gaziel HH (1993) Coping with occupational stress among teachers: a cross-cultural study. *Comp Educ* 29:67–79
- Guglielmi R, Tatrow K (1998) Occupational stress, burnout, and health in teachers: A methodological and theoretical analysis. *Rev Educ Res* 68:61–99
- Hasselhorn HM, Mueller BH (2004) Premature departure from the nursing profession in Europe-the NEXT-Study. *Ergonomia* 26:261–263
- Hillert A, Schmitz E (2004) Psychosomatische Erkrankungen bei Lehrerinnen und Lehrern. Ursachen - Folgen - Lösungen (Psychosomatic diseases in female and male teachers. Causes-consequences-solutions). Schattauer, Stuttgart
- Höck K, Hess H (1975) Der Beschwerdenfragebogen (BFB) (The questionnaire for complaints (BFB)). Deutscher Verlag der Wissenschaften, Berlin
- Huang YH, Robertson MM, Chang KI (2004) The role of environmental control on environmental satisfaction, communication, and psychological stress. Effects of office ergonomics training. *Environ Behav* 36:617–637
- Ilmarinen J (1999) 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, Ministry of Labour, Helsinki
- Ilmarinen J, Tempel J (2002) Arbeitsfähigkeit 2010. Was können wir tun, damit Sie gesund bleiben (Work ability 2010. What can we do so that you remain well)? VSA, Hamburg
- Kalimo R, Pakkin K, Mutanen P, Toppinen-Tanner S (2003) Staying well or burning out at work: work characteristics and personal resources as long-term predictors. *Work Stress* 17:109–122
- Karasek RA (1979) Job demands, job decision latitude and mental strain: Implications for job redesign. *Adm Sci Q* 24:285–308
- Karasek RA, Theorell T (1990) Healthy work. stress, productivity and the reconstruction of working life. Basic Books, New York
- Kivimäki M, Leino-Arjas AP, Luukkonen R, Riihimäki H, Vahtera J, Kirjonen J (2002) Work stress and risk of cardiovascular mortality: Prospective cohort study of industrial employees. *Br Med J* 325:857–860
- Kyriacou C (1980) Stress, health, and school-teachers: A comparison with other professions. *Camb J Educ* 10:154–159
- Kyriacou C (2001) Teacher Stress: directions for future research. *Educ Rev* 53:27–35
- Magidson J (1994) The CHAID Approach to Segmentation Modeling: CHI-squared Automatic Interaction Protection. In: Bagozzi RP (ed) *Advanced Methods of Marketing Research*. Blackwell, Cambridge, MA
- Mearns J, Cain JE (2003) Relationship between teachers' occupational stress and their burnout and distress: roles of coping and negative mood regulation expectancies. *Anxiety Stress Coping* 16:71–82
- Meißner-Pöthig D (1997) Referenzstudie zur Vitalitätsdiagnostik. In: Meißner-Pöthig D, Michalak U (Eds) *Vitalität und ärztliche Intervention: Vitalitätsdiagnostik: Grundlagen-Angebote-Konsequenzen* (Reference study to the vitality diagnostics. Vitality and medical intervention: Vitality diagnostic: Basics-offers-consequences). Hippokrates, Stuttgart
- Richter P, Rudolf M, Schmidt CF (1996) Fragebogen zur Analyse belastungsrelevanter Anforderungsbewältigungen (Health-related coping with job demands). Hans Huber, Göttingen
- Richter P, Hemmann E, Merboth H, Fritz S, Häsger C, Rudolph M (2000) Das Erleben von Arbeitsintensität und Tätigkeitsspielraum – Entwicklungen und Validierung eines Fragebogens zur orientierenden Analyse (FIT) (Perceived work intensity and activity latitude: Development and validation of a questionnaire (FIT)). *Zeitschrift für Arbeits- und Organisationspsychologie* 44:129–139

- Schaufeli WB, Leiter MP, Maslach C, Jackson SE (1996) Maslach Burnout Inventory - General Survey (MBI-GS). In: Maslach C, Jackson SE, Leiter MP (eds) MBI-Manual. 3rd edn. Consulting Psychologists Press, Palo Alto, CA
- Schwarzer R, Schmitz GS, Tang C (2000) Teacher burnout in Hong Kong and Germany: A cross-cultural validation of the maslach burnout inventory. *Anxiety Stress Coping* 13:309–326
- Siegrist J (1996) Adverse health effects of high effort/low reward conditions at work. *J Occup Health Psychol* 1:27–43
- Siegrist J, Starke D, Chandola T, Godin I, Marmot M, Niedhammer I, Peter R (2004) The measurement of effort-reward imbalance at work: European comparisons. *Soc Sci Med* 58:1483–1499
- Statistisches Bundesamt (2005) Pressemitteilung vom 05.11.2005 (Federal Statistical Office (2005) Press release from 05.11.2005) Available from URL: www.destatis.de
- Stauffer M (1992) Ältere Beschäftigte und technischer Wandel. Computereinsatz im Büro–Maßnahmen betrieblicher Unterstützung (Older employees and technical change. Use of computers in the office, measures of operational support). Hogrefe, Göttingen
- The Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation and treatment of high blood pressure (1997) *Arch Intern Med* 157:2413–2446
- Tuomi K, Huuhtanen P, Nykyri E, Ilmarinen J (2001) Promotion of work ability, the quality of work and retirement. *Occup Med* 51:318–324
- Tuomi K, Ilmarinen J, Jahkola A, Katajarinne L, Tulkki A (1998) Work ability index. *Occupational Health Care* 19. Finnish Institute of Occupational Health, Helsinki
- Welford AT (1976) Thirty years of psychological research on age and work. *J Occup Psychol* 49:129–138