



WORK ABILITY AND PSYCHOSOCIAL WORK STRESS – PREDICTORS OF RETIREMENT INTENTION AMONG OLDER TEACHERS

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Abstract

Objectives: Many teachers worldwide retire early for health or personal reasons. Predictors could help to identify teachers at risk in order to counteract this development. The study therefore investigates whether the intention to retire can be predicted by work ability, psychosocial work stress and work behaviour. **Material and Methods:** The data came from a representative cross-sectional study of German secondary school teachers (N = 18 971). The analyses included 1496 full-time teachers aged ≥ 50 years (58% female). Teachers were assigned to 1 of 2 groups based on their intention to take early or regular retirement. A binomial regression model was used to analyze the predictive power of the intention to retire for the following factors: work ability index (WAI) – factor 1, effort-reward ratio (ER ratio), overcommitment (OC), age and gender. In addition, a qualitative analysis of the teachers' suggestions was carried out regarding which measures would make the regular retirement age attainable. **Results:** Half (49%) of the teachers intended to retire early, with the proportion of women being around twice as high (67%) as men (33%) ($d = 0.37$). The analyzed predictors explained a total of 22% of the variance. The WAI factor 1 proved to be the most important predictor (variance explanation: 14%). Effort-reward ratio and OC each contributed around 10% to the variance explanation of the retirement intention. The probability of taking early retirement increased with decreasing work ability, increasing ER ratio and a high tendency to overcommit; age and gender were of secondary importance. Teachers suggested a reduction in compulsory hours (46%), relief from extracurricular tasks (45%) and smaller classes (29%) as decisive measures for achieving regular retirement. **Conclusions:** Work ability index factor 1, ER ratio and OC could be used as part of occupational health prevention programmes to identify and advise older teachers at risk who need support. *Int J Occup Med Environ Health.* 2024;37(5):508–23

Key words:

work ability, effort-reward imbalance, overcommitment, secondary school teachers, retirement intention, health promotion measures

INTRODUCTION

The teaching profession is characterised by high mental, emotional and psychosocial work stress [1] but also by a high degree of autonomy. In addition to a fixed number of lessons and extracurricular appointments, teachers can organise more than half of their working hours freely [2]. Professional time management is therefore an important prerequisite for successfully managing the wide range of

work tasks. If this competence is lacking, their quality expectations of their work and the expectations of pupils, parents and society can be an obstacle to receiving adequate rest [3]. Long weekly working hours, regular work at weekends and high levels of professional exertion can favour self-endangerment in terms of health [4].

Compared to other occupational groups, teachers are characterised by a high proportion of early retirements [5],

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which is one of the many causes of the global shortage of teachers [6]. In Germany, only around 1 in 4 teachers reaches the statutory retirement age [7], although the reasons for this are not systematically recorded. Older teachers leave the profession prematurely, primarily due to the high demands of the job [8]. In addition, the ability to work in the teaching profession decreases as the number of working years increases [9].

In order to counteract the early retirement of teachers, 2 concepts are becoming increasingly important in research – that of work ability [10] and that of effort-reward imbalance [11]. Both concepts are independently recognised as correlates and predictors of intentional early retirement [12]. On the other hand, several studies have found reciprocal relationships between the 2 constructs and that the association between effort-reward imbalance and intended disability pension claims is mediated via work ability [13].

In a study by Alavinia et al. [14], moderate work ability was associated with an 8-fold higher risk of receiving a reduced earning capacity pension within the next 2 years compared to good or very good work ability. With low work ability, the risk increased 34-fold. Several studies have confirmed the link between low work ability and the intention to retire early [10,15].

In addition to excessive work demands, teachers' ability to work is negatively influenced by a lack of discipline from pupils. In the qualitative study of teachers by Hlad'ó and Harvánkóvá [16], older teachers found new professional demands and difficult interactions with pupils challenging primarily because they were less able to cope with them efficiently due to a decline in adaptability. In this context, work ability is described as a dynamic construct that requires constant further development, e.g., by acquiring new skills [10]. A favourable working atmosphere, good collegial relationships, support and positive feedback from superiors are positively related to work ability [1].

Originally, individual work ability was determined using the work ability index (WAI) questionnaire based on information on coping with mental and physical work demands, health status and existing resources [10]. Although the WAI is regarded as an internationally established questionnaire with high practical relevance in organisational contexts, studies on its factor structure have produced varying results. In more recent research, the majority of studies identified 2 factors [17–19] that call into question the 1-dimensionality of the originally unweighted WAI sum index [10]. Most recently, the 2-dimensionality was confirmed in a representative study by Freyer et al. [20], according to which WAI factor 1 depicts the subjective ability to work and resources, while WAI factor 2 depicts the health conditions in a weighted manner.

The effort-reward (ER) model [11] is also an established concept that links psychosocial work stress with health. According to this model, high effort with low material or immaterial reward leads to an effort-reward imbalance (ERI). This results in psychosocial work stress, which increases the risk of stress-related illnesses in the medium and long term [21].

In addition to the extrinsic factors, the ER model also includes the intrinsic factor of overcommitment (OC). This describes an individual coping style with a tendency to over-extend oneself without regard to one's own resources [22]. Overcommitment reinforces or mediates the effect of an ERI on mental health [23,24]. For teachers, it is assumed that the simultaneous occurrence of a high ERI and OC represents an increased risk to health and well-being [11,22,24]. While earlier research often focused on the independent effects of health on the date of retirement [25], current research emphasises the complex interplay between health, working and living conditions and the legal framework [26]. It is assumed that health does not directly influence the time of retirement, but rather that this effect is moderated by factors such as ability to work and motivation to work [26]. Other studies have identified work abil-

ity and work opportunities as mediating factors between health and early retirement [27]. It has also been shown that employees stay in work longer if working conditions are designed in such a way that they promote work ability and enable a balance between effort and reward [28]. In the long term, employees with poorer health in particular benefit from measures to reduce work demands and increase work resources [29].

Previous findings on the relationship between work ability, psychosocial work stress and premature career endings relate to panel surveys of the general population. Studies on teachers are largely lacking. However, it is expected that both constructs will play an important role in identifying the need for intervention in the school context in order to prevent early retirement among teachers. The following research questions will therefore be investigated:

1. What predictive value do work ability, psychosocial work stress and overcommitment have for the intention of secondary school teachers to leave the profession before reaching regular retirement age?
2. What measures do the teachers themselves suggest in order to reach the regular retirement age?

MATERIAL AND METHODS

Implementation and recruitment

The data was collected between January–April 2018 as part of a Germany-wide cross-sectional study. The study investigated the workload, work ability and health of secondary school teachers in all 16 federal states. A comprehensive description of the study design, sampling and implementation of the study can be found in Kreuzfeld et al. [4].

The study fulfils the requirements for representativeness for the characteristics of gender, age and teaching scope of secondary school teachers (hereinafter referred to as teachers) in Germany.

In the run-up to the study, flyers were distributed to all secondary schools to encourage voluntary participation. Before the study began, all teachers received information

on data protection, implementation, data analysis and the conditions of participation and access to the study. The anonymity of the data was guaranteed via transaction numbers (TANs) and an 8-digit personal code.

All procedures performed were in accordance with the Helsinki declaration (2013). The design and all details of the study were approved by the Local Ethics Committee (A 2018-0031). Informed consent was given by every participant prior to the inclusion in the study.

Recording methods

The study consisted of an online questionnaire (OQ) and an online protocol (OP). Both procedures were developed in-house [4]. Only participants for whom an OQ and an OP were available that met the quality requirements were included in the data analysis. The data from the OQ and OP were merged using the personal code.

Online questionnaire

The OQ consisted of standardised questionnaires on work ability, psychosocial work stress and self-developed questions; it only had to be completed once. In addition to socio-demographic (e.g. gender, age, marital status) and job-specific information (e.g. teaching duties, subjects, classes, number of pupils), the questions also included information on predicted retirement age and suggestions from teachers on health-promoting measures to help them reach regular retirement age.

Work ability

Work ability was surveyed using the German short version of the WAI, which consists of ten items and 14 disease categories and is summarised in 7 WAI indicators (WAI 1–7) [30]. The evaluation was carried out according to the calculation method of Freyer et al. [18], which weighted the 2 factors “subjective work ability and resources” (WAI factor 1) and “health conditions” (WAI factor 2).

In this article, only WAI factor 1 is considered, to which the indicators WAI 1 (current work ability compared with the lifetime best), WAI 2 (work ability in relation to the demands of the job), WAI 6 (own prognosis of work ability in 2 years) and WAI 7 (mental resources) are assigned. These indicators are added together to form the weighted sum score WAI factor 1, which can range from 4 pts (low work ability) to 31 pts (very good work ability).

The individual test score can be categorised using gender- and age-group-specific (31–40 years, 41–50 years and 51–60 years) reference values that represent the German working population [18].

Freyer et al. [20] state a Cronbach's α of 0.70 for the reliability of WAI factor 1. In the present study, a Cronbach's α of 0.78 was determined for this WAI factor. Both values are considered acceptable [31].

Psychosocial work stress

Psychosocial work stress was assessed using the German short version of the *Effort-Reward-Imbalance Questionnaire* (ERI-Q) [11]. This version comprises the main scales effort (3 items, range: 3–15 pts) and reward (7 items, range: 7–35 pts), as well as the effort-reward ratio (ER ratio). The reward scale is made up of the 3 subscales status or career advancement, appreciation or recognition and job security. High total values indicate a high perceived effort or reward.

The ER ratio is determined according to the following rule:

$$\text{ER ratio} = \Sigma \text{ effort} / (\Sigma \text{ reward} \times 0.54) \quad (1)$$

An ER ratio of >1 indicates ERI [11], which is said to be associated with a health risk. The greater the ERI, the higher the health risk.

The reliability of the German version of the ERI-Q is acceptable [31]. Internal consistency values >0.70 were obtained for the main subscales (effort: 0.74, reward: 0.79). In the present study, lower Cronbach's α were calculated

(effort: 0.62, reward: 0.73), which can be categorised as questionable respectively acceptable [31].

Overcommitment

Overcommitment or the tendency to overexert oneself is part of the short version of the ERI-Q [11]. The OC scale comprises of 6 items that are rated on a 4-point Likert scale from 1 (strongly disagree) to 4 (strongly agree). In this scale, a sum score is formed from the 6 items (range: 6–24 pts), with high values corresponding to high commitment. The upper tercile of the sum score was defined as the risk group. Siegrist et al. [11] give a Cronbach's α of 0.79 for OC, which is considered acceptable [31]. In the present study, this Cronbach's α was confirmed for OC.

Retirement date and measures

to achieve regular retirement age

The teachers were asked about their intention to take early or regular retirement (self-developed question). They were also asked to suggest 2–3 specific measures that they believed were necessary in order to remain in employment until the regular retirement age. This free text information was analysed and categorised for all teachers by hand according to the specifications of structuring content analysis by Mayering [32]. Based on the intention to retire early or regularly, 2 retirement groups were formed and the teachers were assigned to the respective group (hereinafter early retirement group [ERG] vs. regular retirement group [RRG]).

Online protocol

The OP was used to determine the average weekly working time of the teachers. For this purpose, the working time had to be documented daily over 4 weeks (28 days) using 12 practicable, teacher-specific activity categories like teaching, teaching related activities (preparation and follow-up time of lessons, corrections) and non-teaching ac-

tivities (working with colleagues, co-operating with parents, administrative tasks, etc.) [4].

To calculate the weekly working time, the average value over 4 weeks was first determined for each activity category. These average values were then totalled. In the case of days of absence due to illness, the average value for the weekly working time was calculated from the remaining weeks; at least 21 days of documentation of working time had to be available.

Data control and analyses

Prior to the statistical calculations, the entire data set was checked for implausible data. Data records with incorrect values (6%) were excluded in advance. Extreme values within the individual activity categories were replaced by subject-specific mean values.

The statistical analysis of the data was carried out using the programme Statistical Package for the Social Science (SPSS) v. 29. Differences in mean values between the groups that predicted early or regular retirement (“retirement groups”) were analysed for metric variables using the t-test and for categorical variables using the χ^2 -test. The control variables gender and age were omitted because no gender and age effects were found in the preliminary analysis for the variables analysed (WAI factor 1, ER ratio, OC).

Binary logistic regression analyses were conducted to clarify the extent to which WAI factor 1, ER ratio, OC (independent variables) influenced the probability of reaching regular retirement age (response variable). The selection of the predictors contained in the overall model (method: enter) was based on the results of the correlation analysis. Nagelkerke R^2 was used to assess the goodness of fit of the model [33]: the higher Nagelkerke R^2 , the better the fit between model and data.

The correlation analysis was used to examine the correlations between WAI factor 1, ER ratio, OC and the variable “retirement group”. The η coefficient was calculated

and interpreted according to Cohen [34]. Correlation coefficients $\leq \pm 0.10$ were considered independent of each other. The contingency coefficient (CC) was used for nominal variables.

A probability of error of $\alpha = 5\%$ ($p < 0.05$) was defined as the statistical significance criterion and supplemented by effect sizes. The interpretation of the effect sizes was based on the conventions of Cohen [34]. Small effect sizes from $d \geq 0.20$ are considered to be practically relevant effects in the t-test or χ^2 -test.

Sample

More than 20 000 secondary school teachers took part in the study. Complete datasets were available from 18 791 teachers; 14 338 of them also fulfilled the quality requirements in the OP. The data for this analysis came from this sample. Only data records of full-time teachers aged ≥ 50 years were included ($N = 1496$, 58% women, 42% men). Full-time in the teaching profession corresponds to the collectively agreed standard working hours. Half of the teachers intend to take early retirement, with the proportion of women being around twice as high (67%) as men (33%) ($d = 0.37$, small effect). The composition of the sample is summarised in Table 1.

Both retirement groups are largely comparable in terms of their socio-demographic and work-related data ($d < 0.20$). The teachers’ age were mean (M) \pm standard deviation (SD) 55 ± 4 years old at the time of the survey. Most of the participants were living in a stable partnership (84%). Around 40% of the teachers were still caring for children in their own household; this applied to just over a third (36%) of the ERG and 44% of the RRG ($d = 0.26$, small effect). Twelve percent of teachers stated that they had to care for relatives at home.

The most frequently taught subjects were natural sciences (24%), languages (20%) or combinations of languages and social sciences (21%) or art, music and sport (20%) ($d = 0.23$, small effect).

Table 1. Characteristics of the sample of school teachers in cross-sectional study on retirement intention, Germany, January–April 2018

Variable	Participants (N = 1496)		Test value*	p	d
	early retirement (N = 744)	regular retirement (N = 752)			
Socio-demographic characteristics					
age [years] (M±SD)	56.3±4.4	55.6±3.8	4.56	<0.001	0.111
gender [n (%)]					
male	248 (33.3)	385 (51.2)	48.89	<0.001	0.368
female	496 (66.7)	367 (48.8)			
family obligations [n (%)]					
permanent partnership	621 (83.5)	632 (84.0)	0.09	0.763	0.016
children in the household	265 (35.6)	332 (44.1)	24.64	<0.001	0.259
care of relatives	102 (13.7)	79 (10.5)	3.61	0.057	0.098
Work-related characteristics					
languages [n (%)]	169 (22.7)	129 (17.2)	20.19	0.005	0.234
social sciences [n (%)]	15 (2.0)	26 (3.5)			
natural sciences [n (%)]	158 (21.2)	201 (26.7)			
languages and social sciences [n (%)]	150 (20.2)	165 (21.9)			
languages and natural sciences [n (%)]	18 (2.4)	20 (2.7)			
social and natural sciences [n (%)]	44 (5.9)	58 (7.7)			
art, music, sports [n (%)]	21 (2.8)	16 (2.1)			
subject combinations with art, music, sports [n (%)]	169 (22.7)	137 (18.2)			
working time [h/week] (M±SD)	44.4±8.6	44.1±8.4	0.82	0.413	0.042
teaching (45 min)	22.6±3.3	22.1±3.4	2.80	0.005	0.145
teaching-related activities (60 min)	18.7±7.6	18.1±7.3	1.35	0.178	0.070
non-teaching activities (60 min)	8.8±4.1	9.3±4.5	2.36	0.018	0.122

P-value significance (two-sided): $p < 0.001$, $p < 0.01$, $p < 0.05$.

Effect size (d): <0.20 – no effect, 0.20–0.49 – small effect, 0.50–0.79 – medium effect, ≥ 0.80 – large effect [34].

M±SD: t-test – test size: t-value, effect size: d-value.

n (%): χ^2 -test by Pearson – test size: χ^2 -value, effect size: d-value.

* Chi-square and t-values.

For the total sample of teachers, a teaching commitment/week of an average of 24 school hours (45 min each) was determined. The teachers actually taught $M \pm SD$ 22±3 school hours/week. The total working time/week was $M \pm SD$ 44±9 h. Of these, an average of 18 h was spent on teaching-related activities and 9 h on non-teaching activities.

RESULTS

Work ability

The results for the work ability (WAI factor 1) of the 2 retirement groups are shown in Table 2 and Figure 1 (raw data). There was a significant difference in work ability between the 2 groups ($d = 0.69$, medium effect); the ERG reported a poorer work ability compared to the RRG

Table 2. Subscales of work ability index (WAI) factor 1, work-related characteristics of effort-reward model with overcommitment in cross-sectional study on retirement intention among school teachers, Germany, January–April 2018

Variable	Participants (N = 1496)		Test value*	p	d
	early retirement (N = 744)	regular retirement (N = 752)			
Work ability characteristics					
WAI factor 1 (range: 4–31 pts) [pts] (M±SD)	22.6±4.0	25.2±3.4	13.41	<0.001	0.694
WAI 1: Current work ability compared with lifetime best (range: 0–10 pts)	6.9±1.9	8.0±1.6	11.56	<0.001	0.598
WAI 2: Work ability in relation to the demands of the job (range: 2–10 pts)	7.0±1.4	7.8±1.3	11.67	<0.001	0.604
WAI 6: Own prognosis of work ability 2 years from now (score: 1, 4, 7 pts)	6.6±1.1	6.9±0.6	7.12	<0.001	0.138
WAI 7: Mental resources (range: 1–4 pts)	3.0±0.8	3.4±0.6	9.98	<0.001	0.767
Work-related characteristics of effort-reward model					
effort (range: 3–15 pts) [pts] (M±SD)	10.5±2.5	9.2±2.6	9.77	<0.001	0.505
reward (range: 7–35 pts) [pts] (M±SD)	24.6±5.4	27.0±5.2	8.68	<0.001	0.449
job promotion (range: 3–15 pts) [pts] (M±SD)	10.4±3.1	11.2±3.0	4.65	<0.001	0.240
esteem (range: 2–10 pts) [pts] (M±SD)	6.5±2.3	7.4±2.2	8.11	<0.001	0.419
job security (range: 2–10 pts) [pts] (M±SD)	7.6±1.6	8.3±1.5	9.12	<0.001	0.427
effort-reward ratio (ER ratio) (M±SD)	1.07±0.43	0.85±0.36	1.46	<0.001	
ER ratio >1 [n (%)]	362 (48.7)	203 (27.0)	74.76	<0.001	0.459
Overcommitment (OC) (range: 6–24 pts) [pts] (M±SD)	18.6±3.1	16.6±3.7	11.57	<0.001	0.598
normal (range: 6–18 pts) [n (%)]	354 (47.6)	522 (69.4)	73.47	<0.001	0.454
high (range: 19–24 pts) [n (%)]	390 (52.4)	230 (30.6)			

P-value significance (two-sided): $p < 0.001$, $p < 0.01$, $p < 0.05$.

Effect size (d): <0.20 – no effect, 0.20–0.49 – small effect, 0.50–0.79 – medium effect, ≥ 0.80 – large effect [34].

M±SD: t-test – test size: t-value, effect size: d-value.

n (%): χ^2 -test by Pearson – test size: χ^2 -value, effect size: d-value.

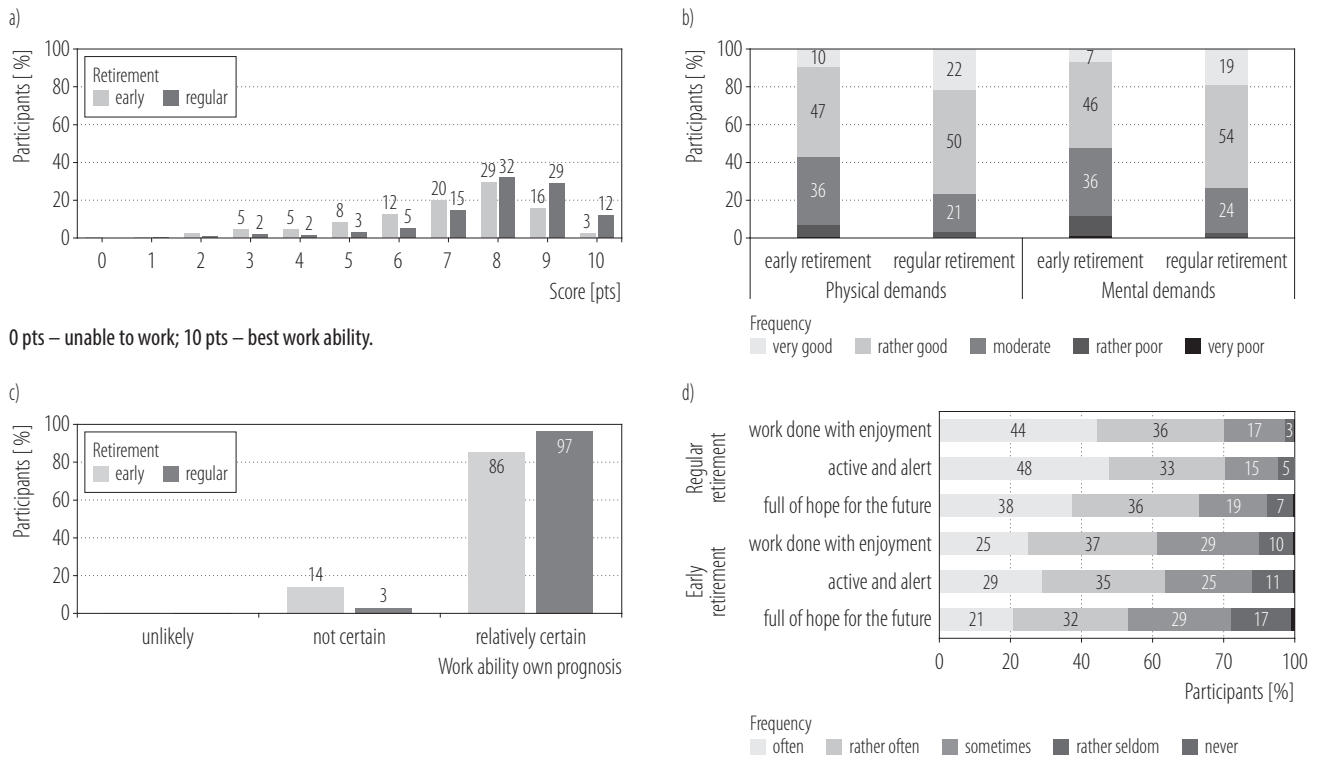
* Chi-square and t-values.

(M = 23 pts vs. 25 pts out of 31 pts), although these average values were only in the medium range in both groups. This effect was also recognised for the subscales (WAI 1, WAI 2, WAI 6, WAI 7) of WAI factor 1, according to which the ERG differed from the RRG in terms of a significantly poorer current ability to work (WAI 1: $d = 0.60$, medium effect) and coping with demands (WAI 2: $d = 0.60$, medium effect), as well as lower mental resources (WAI 7: $d = 0.76$, medium effect).

The WAI 1 was categorised based on Gould et al. [35]: just under half of the ERG (48%) and just under three-quarters of

the RRG (73%) were found to have very good (10 pts) or good current work ability (9–8 pts) ($d = 0.61$, medium effect).

In addition, only 57% of the ERG, but more than three-quarters (77%) of the RRG, stated that they were still able to cope very well or rather well with the physical demands of the teaching profession (WAI 2.1) ($d = 0.45$, small effect). The situation was similar with regard to the mental demands (WAI 2.2), although significantly more teachers of the ERG (12% vs. 3%) reported that they were only able to cope with these demands poorly or very poorly ($d = 0.57$, medium effect).



0 pts – unable to work; 10 pts – best work ability.

Groups with the intention of taking either early or regular retirement.

Figure 1. Raw values of subscales of work ability index (WAI) factor 1: a) current work ability (WAI 1), b) work ability in relation to the demands of the job (WAI 2), c) own prognosis of work ability 2 years from now (WAI 6), d) mental resources (WAI 7), in cross-sectional study among school teachers (N = 1496), Germany, January–April 2018

It is noteworthy that – based on their current state of health – the vast majority of teachers (ERG: 86%, RRG: 97%) estimated that they would be able to continue in their current job for the next 2 years (WAI 6: $d = 0.40$, small effect). Almost two-thirds (62%) of the ERG and 80% of the RRG frequently or fairly frequently enjoyed their work (WAI 7.1: $d = 0.52$, medium effect). In addition, 64% of the ERG and 81% of the RRG stated that they were often or fairly often active and lively (WAI 7.2: $d = 0.47$, small effect). More than half (53%) of the ERG and around three-quarters (74%) of the RRG were confident about the future (WAI 7.3: $d = 0.48$, small effect).

Psychosocial work stress

To determine the psychosocial work stress, the results of the ERI-Q were considered; they are summarised in Ta-

ble 2. The mean values of the ER subscales differed significantly between the 2 groups ($d = 0.24$ – 0.50 , small and medium effects). On average, the ERG was found to have higher effort ($M = 11$ vs. 9 pts) but lower reward ($M = 25$ pts vs. 27 pts) compared to the RRG. This related to career opportunities, recognition and appreciation as well as job security ($d = 0.20$ – 0.49 , small effects). Almost half of the ERG had an ERI (49%), which was almost twice as high as for the RRG (27%, $d = 0.46$, small effect). For the ERG, the mean (1.07 pts) was within the health risk range.

Overcommitment

The OC was investigated as a person-related characteristic with a relation to self-harming behaviour (Table 2). On average, teachers of the ERG ($M = 19$ pts) tended to

Table 3. Binary logistic regression model of teachers reaching early vs. regular retirement in cross-sectional study on retirement intention among school teachers, Germany, January–April 2018

Model	β	SE	Wald statistics	p	OR	95% CI
Work ability index factor 1 [pts]	0.14	0.02	61.43	<0.001	1.153	1.112–1.194
Effort-reward ratio	–0.58	0.17	11.97	<0.001	0.558	0.401–0.777
Overcommitment [pts]	–0.07	0.02	12.02	<0.001	0.934	0.898–0.971
Age [years]	0.06	0.01	16.66	<0.001	1.061	1.031–1.091
Gender (male – 0 [ref.], female – 1)	–0.66	0.12	30.87	<0.001	0.519	0.412–0.654
Constant	–5.20	1.09	22.66	<0.001	0.006	

Ref. – reference; dependent variable: early vs. regular retirement: 0–1 coded.

Binary logistic regression (method: enter).

Significance (two-sided): $p < 0.001$.

Nagelkerke $R^2 = 0.224$.

overcommit more than teachers of the RRG ($M = 17$ pts, $d = 0.60$, medium effect). The average scores of the ERG were in the high range (>18 pts). For more than half of these teachers (52%), there was a clear health risk due to self-harming behaviour.

Predictors of retirement

The relationship between WAI factor 1, ER ratio and OC with the retirement group variable was first analysed using the η coefficient. In this regard, a medium correlation was determined for WAI factor 1 ($\eta = 0.33$), and a low correlation for ER ratio ($\eta = 0.27$) and OC ($\eta = 0.29$). This means that the lower the ability to work and the higher the ER ratio and OC, the more likely the intention was to take early retirement. In addition, age ($\eta = 0.12$) and gender ($CC = 0.18$) were included in the correlation analysis; only very low correlations to retirement were found for them. Only 18% of the ERG and 42% of the RRG were found to have no noticeable work-related or personal values of the variables. A quarter of the ERG (26%) and 9% of the RRG were characterised by poor work ability, ERI, OC and a lack of resources ($\chi^2(7) = 160.90$, $d = 0.69$, medium effect). One third (32%) of the ERG and 13% of the RRG were found to have both ERI and high values of OC ($\chi^2(7) = 116.52$, $d = 0.58$, medium effect).

In the second step, a binary logistic regression analysis was calculated to identify predictors with an influence on the intention to retire. Possible predictors included in the model were WAI factor 1, ER ratio, OC, age and gender. The results are summarised in Table 3.

The model was statistically significant (omnibus test: $\chi^2(5) = 275.30$, $p < 0.001$) and had a goodness-of-fit (Hosmer-Lemeshow test: ($\chi^2(8) = 6.89$, $p > 0.05$). All model variables had a significant ($p < 0.001$) influence on the predictive performance of the model and thus on the retirement intention. A variance explanation of 22% was achieved, which is considered an acceptable fit between model and data [36]. The model correctly classified 65% of the teachers of the ERG and 67% of cases of the RRG. Assuming that the WAI factor 1 increased by 1 pt, the probability of reaching regular retirement age increased by 15%. If the ER ratio increased by one unit or the OC by 1 pt, this probability decreased by 44% and 7% respectively.

When looking at each individual predictor, WAI factor 1 proved to be the most important predictor of retirement intention with a variance explanation of 14%; while ER ratio and OC explained 10% and 11% of this variance respectively. Age and gender are of secondary importance in this context (Nagelkerke R^2 : 0.018% and 0.058%, respectively).

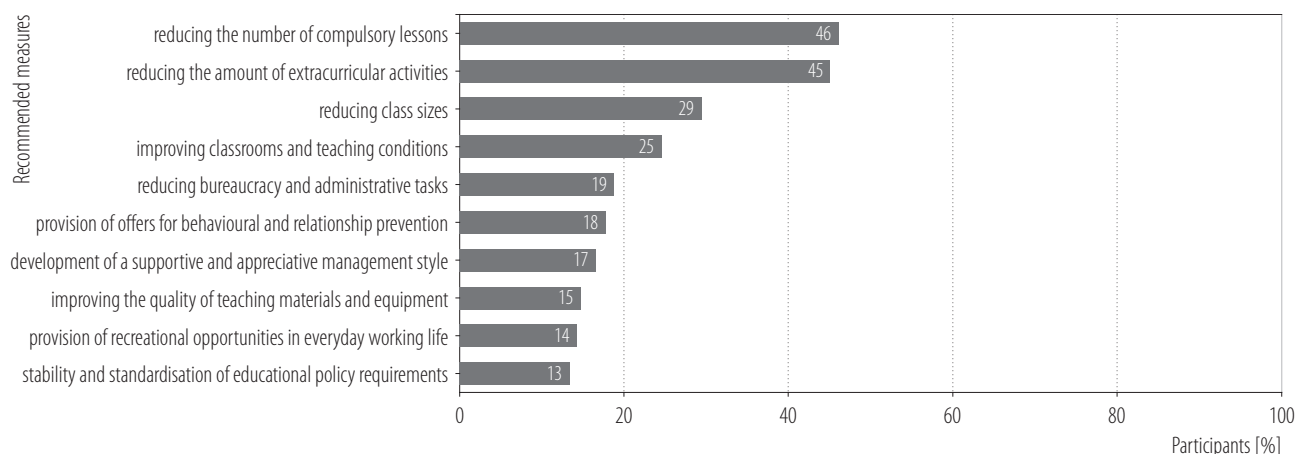


Figure 2. Recommended measures to maintain work ability and health in a cross-sectional study among teachers (N = 1496), Germany, January–April 2018

Proposed measures to maintain the ability to work

Teachers of the ERG and RRG made comparable suggestions as to which measures could be used to reach the regular retirement age with good work ability and health ($d < 0.20$). The 10 most important measures are therefore summarised in Figure 2 for the overall sample of teachers. Reducing the number of compulsory hours (46%) and reducing the workload of non-teaching tasks (45%) were seen as decisive measures. Teachers also wanted smaller and more homogeneous classes (29%). Furthermore, the teaching-related framework conditions should be improved (25%), and additional or non-subject-related tasks (22%) as well as bureaucracy and administrative work (19%) should be reduced. Other suggestions related to the provision of offers for behavioural and relationship prevention (18%) and ranged from the desire for reliable educational policy guidelines which should also apply uniformly throughout Germany (13%).

DISCUSSION

The early retirement of teachers is a significant but controllable cause of the teacher shortage. A better understanding of the specific factors that influence early retirement can help policy makers and school leaders better support

teachers to stay in the profession. This includes maintaining the ability to work and creating working conditions that promote health. However, the ability to work is only one of many factors that influence the intention to retire [26]. It is also necessary to analyse which personal and work-related aspects contribute to early retirement in order to identify teachers in need of support at an early stage.

Until now, little attention has been paid to the specific factors involved in the early retirement of teachers. The fact that more than half of the teachers in the study intend to leave the profession before the normal retirement age clearly shows how urgent it is to analyse the accompanying factors. The ERG differs significantly ($d > 0.20$) from the RRG in terms of lower work ability and resources, a less favourable ER ratio and OC. For more than a quarter of the ERG (26%), but also 9% of the RRG, there is an urgent need for action; they are characterised by poor work ability and a lack of resources as well as an ERI and OC. The predictors analysed contribute to varying degrees to the explanation of the intended retirement; they explain a total of 22% of the variance in the retirement forecast. WAI factor 1 (variance explanation: 14%) was identified as the most important predictor of the intention to retire. The factors psychosocial work stress (ER ratio) and OC

each contribute around 10% to the variance explanation. This emphasises the relevance of the selected predictors, but also illustrates that other factors that were not investigated also influence the intention to retire.

As the determination of WAI factor 1 is a new calculation method [20], the results can only be compared with a representative sample of employees in Germany (Federal Institute for Occupational Safety and Health, $N = 3870$, age: 31–60 years) [37]. Compared to this sample, the ERG is characterised by significantly lower work ability and resources ($M \pm SD$ 26 ± 4 vs. 23 ± 4 pts, $d = 0.46$, small effect), while the work ability and resources of the RRG ($M \pm SD$ 25 ± 3 pts) are comparable to the representative population sample ($d = 0.16$).

It is alarming that every second teacher who intends to take early retirement reports an effort-reward imbalance (ER ratio > 1) (49%) or is too committed in the job (52%). For the RRG, this only applies to around a quarter (27%) and a third (31%) of cases respectively. This finding is supported by the results of the long-term study by Sousa-Ribeiro et al. [28], in which those in employment with the highest ERI values intended to leave work early, while those with significantly lower ERI values aimed for regular retirement. Compared to earlier German teacher studies [38,39], it is noticeable that the proportion of older teachers with ERI has increased significantly. In the study by Unterbrink et al. [38] 24% ($M \pm SD$ 0.79 ± 0.28) and in the study by Hinz et al. [39] only 7% of respondents reported an ERI.

These results emphasise that working conditions and work culture in the teaching profession have changed over the years. Decreasing social recognition and interference in autonomy are often cited by teachers as potential reasons for leaving the profession [40]. For the older teachers among them, the decision is negatively influenced in particular by the increase in workload [5]. In line with this, 46% and 45% of teachers in the authors' study suggest a reduction in compulsory teaching hours and extracurricular tasks re-

spectively, as well as an improvement in organisational and working conditions in schools in order to prevent early retirement. The spectrum of suggestions ranges from the provision of high-quality teaching materials and the creation of appropriate time slots for school tasks to realisable curricula and more time to build relationships with pupils.

In many countries, in recent years new work requirements for teachers have arisen that relate to the objectification and comparability of student performance [41]. While younger teachers accept the measurability of educational success as necessary, older teachers perceive such educational policy requirements not only as an additional workload, but also as an attack on their autonomy and a questioning of their professionalism [42,43]. In the authors' study, a fifth of the teachers surveyed (19%) suggested a reduction in bureaucratic and administrative tasks for staying in the profession in the long term.

In addition, a supportive working environment and good interpersonal relationships with colleagues and superiors are essential work resources that have a positive influence on the ability to work [15,44] and help to keep teachers in the profession [40]. The teachers in the authors' study see an appreciative approach from the management level in particular as an important measure to prevent premature career endings. This suggestion is also emphasised in the qualitative survey by Keogh and Roan [44], in which older teachers in particular emphasise good communication and interpersonal relationships with the director of the school as a prerequisite for job satisfaction and remaining in the profession. The results of the Swedish longitudinal study by Sousa-Ribeiro et al. [45] also emphasise that an age-friendly workplace and positive work prospects can contribute to a longer working life.

Ilmarinen [10] considered health to be the most important prerequisite for good work ability, especially in older working age. However, Hasselhorn et al. [26] emphasise that health is not necessarily the key factor for remaining in employment, but that the ability to work and motivation

contribute significantly to this. As health restrictions increase in frequency and importance with the age of teachers, it is all the more important to offer support at an early stage to maintain their ability to work. Regular occupational health check-ups at schools would be suitable for recognising those teachers whose ability to work or mental health is at risk. Individual counselling services and training courses to develop skills in time management and dealing with high workload and emotional interactions could also help to prevent older teachers from leaving the profession prematurely [46]. However, the promotion of personal resources cannot replace the necessary changes at group and organisational level but can only supplement them.

Strengths and weaknesses of the study

The originality of the study lies in the fact that, for the first time, predictors of retirement intentions were analysed using data from a homogeneous sample of older full-time secondary school teachers (≥ 50 years) from all over Germany. Previous studies on work ability and psychosocial work stress were based on heterogeneous teacher samples, in which there was a mixture of full-time and part-time employees as well as teachers from different types of schools. The sample analysed here can be regarded as representative of the German secondary school teaching staff up to the age of 60 years in terms of gender and age. However, teachers between the ages of 60–65 years were represented somewhat less frequently in the study for both genders than in the German teaching staff at upper secondary schools as a whole.

It should be emphasised that the free text responses on early retirement and possible measures to achieve regular retirement – in accordance with the quality criteria of qualitative research [32] – were evaluated manually for all 1496 teachers and assigned to categories developed by the researchers themselves. Teachers can be regarded as experts in this context, which means that the measures are highly relevant to practice.

The generalisability of the WAI results is limited for persons >60 years of age, as the sample of the Federal Institute for Occupational Safety and Health used for comparison only contained employees <60 years of age.

When interpreting the results, it should be noted that the data was collected as a cross-sectional study. Thus, no causal relationships between the analysed predictors and the predicted retirement of the teachers can be reported. As participation in the study was voluntary, selection effects and the healthy-worker effect cannot be ruled out. As a result, effects may have been underestimated.

With regard to data collection, the results are subject to the known limitations of self-assessments (including distortions due to social desirability, response tendencies and memory deficits). In addition, the intended date of retirement was only surveyed as a single question. However, according to de Boer et al. [47], a single global item need not have any significant disadvantages in terms of validity and reliability compared to larger question complexes.

CONCLUSIONS

For teachers, the likelihood of leaving the profession before the normal retirement age increases as their work ability decreases, the imbalance between effort and reward increases and the tendency to overcommit rises. At an individual level, it is therefore important that teachers learn strategies early in their careers to cope with the many demands of the profession with appropriate effort and to plan sufficient recovery time for themselves. Corresponding training programmes should be an essential part of teacher training.

The ability to work and the imbalance between effort and reward can be positively influenced by improving working conditions. In the long term, employees with poorer health in particular benefit from a reduction in the demands of work and an improvement in work resources. Identifying at-risk employees using predictors is therefore an important way of providing them with targeted

and effective support. This could be achieved as part of occupational health promotion programmes. The WAI and ERI concepts can form the framework for analysing needs and planning preventive measures to maintain and improve fitness for work and health. Supplemented by medical examinations and workplace analyses, a holistic assessment of work ability is possible. As health impairments increase in an ageing labour force, it is all the more important to create framework conditions that preserve employees' individual resources and at the same time increase their motivation to continue working until the normal retirement age.

From a methodological perspective, longitudinal studies are required that analyse the complex interplay of individual and work-related influences on the retirement intentions of older teachers and investigate the possible effects of preventive measures.

Author contributions

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