

Work Ability: Assessment and Association with Self-Determination in the Transition to Retirement and Later Life Satisfaction

Doctoral thesis approved by the
Faculty of Economics
Leuphana University Lüneburg
for the award of the degree
Doctor of Philosophy
- Dr. phil. -

by Jan-Bennet Voltmer
born 7th of April 1988 in Hamburg, Germany

Date of Submission: March 20th, 2020

Date of oral defence (disputation): July 7th, 2020

1. Evaluator and Supervisor: Prof. Dr. Jürgen Deller
2. Evaluator: Prof. Dr. Dirk Lehr
3. Evaluator: Prof. Jacquelyn James, Ph.D.

The individual contributions of the cumulative dissertation project are or will be published including the synopsis as follows:

Voltmer, J.-B., & Deller, J. (2018). Measuring work ability with its antecedents: Evaluation of the Work Ability Survey. *Journal of Occupational Rehabilitation*, 28(2), 307–321. <https://doi.org/10/gc4m5x>

Voltmer, J.-B., Voltmer, E., & Deller, J. (2018). Differences of four work-related behavior and experience patterns in work ability and other work-related perceptions in a finance company. *International Journal of Environmental Research and Public Health*, 15(7), 1–20. <https://doi.org/10/gd7gqn>

Voltmer, J.-B., Voltmer, E., & Deller, J. (2020). *Living happily ever after: Control over the retirement process as direct and mediating factor for life satisfaction?* [Unpublished manuscript].

Year of publication: 2020

Acknowledgement

I thank Professor Jürgen Deller for his tireless support, for his patience, and for the many instructive conversations I had with him.

I thank Professor Dirk Lehr and Professor Jacquelyn James, who did not hesitate to participate in this journey.

I thank Katharina, Edgar, Jonathan, Elisabeth, Angela and Lara Voltmer for their support, backing, and love.

Table of Content

Abstract.....	VI
Introduction	3
Increasing life expectancy, longer retirement.....	3
Societal consequences of prolonged old-age pensions.....	4
Economic consequences of prolonged old-age pensions.	5
Individual consequences of prolonged old-age pensions.	5
Increasing life expectancy, longer working life	7
Societal consequences of a prolonged working life.	7
Economic consequences of a prolonged working life.	8
Individual consequences of a prolonged working life.....	8
Promotion of work ability to enable a prolonged working life	9
Control over the transition to retirement as a result of work ability	10
Contributions of the dissertation	10
Study 1: Measuring work ability with its antecedents: Evaluation of the Work Ability Survey	11
Study 2: Differences of four work-related behavior and experience patterns in work ability and other work-related perceptions in a finance company	12
Study 3: Living happily ever after: The mediating role of control over the retirement process in the relationship between work ability and life satisfaction	12
Contribution 1.....	14
Contribution 2.....	15
Contribution 3.....	16
Discussion.....	50
Integrating organizational resources into the measurement of work ability	51
The WAS-R in relation to other relevant constructs	52
Work ability and life satisfaction: The mediating role of perceived control.....	56
Theoretical implications	58

Practical implications	58
Limitations and research implications.....	60
Conclusion.....	62
References	63

Abstract

Due to increased life expectancy, a growing number of retirees are spending more and more time in retirement. Life satisfaction in later life therefore becomes an increasingly important societal issue. Good work ability and health are prerequisites for a self-determined transition to retirement, for example allowing for a continuation of gainful employment beyond retirement age. Such continued employment is one way of dealing with the consequences of a historically unique long retirement phase: a self-determined continued employment can have a positive effect on individual well-being, on societal level relieve the burden on the pension insurance system, and on meso-level provide companies with urgently needed human capital. The self-determination of life circumstances is postulated by Self-Determination Theory (SDT) as a basic psychological need with effects on individual well-being. This dissertation investigates work ability as a concept that supports workers, employers, and societies in the extension of working lives, and how work ability is related to the level of self-determination in the transition to retirement, and ultimately life satisfaction.

In the first study of this dissertation, the Work Ability Survey-R (WAS-R) was translated from English into German and then evaluated regarding its psychometric properties and construct validity. The WAS-R operationalizes work ability as the interplay of personal and organizational resources and thus allows companies to derive targeted interventions to maintain work ability.

In the second study, the WAS-R was examined together with the questionnaire Work-Related Behavior and Experience Pattern (Arbeitsbezogenes Verhaltens- und Erlebensmuster, AVEM) regarding its construct validity. A striking feature of this study was the high number of participants with the answering pattern indicating low work-related ambitions and protection. Persons with this pattern are in danger of entering the risk pattern for burnout in the future. The findings support the validity of the WAS-R.

In the third contribution, two studies examined the experience of control (i.e., autonomy) in the transition to retirement as a mediator between previous work ability, health, and financial well-being, and later life satisfaction in retirement. Control was found to partially mediate the relationship between work ability and later life satisfaction. Different mechanisms on later life satisfaction of work ability and health, and the subjective and objective financial situation were found.

This dissertation contributes to research on and practice with aging workers in two ways: (1) The German translation of the WAS-R is presented as a useful instrument for measuring work ability, assessing individual and organizational aspects and therefore enabling employers to make targeted interventions to maintain and improve work ability, and eventually enable control during later work life, the retirement transition and even old age. (2) This dissertation corroborates the importance of good work ability and health, even in old age, as well as control in these phases of life. Work ability is indirectly related to life satisfaction in the long period of retirement, mediated by a sense of control in the transition to retirement. This emphasizes the importance of the need for control as postulated by the SDT also in the transition to retirement.

VIII

Man plans and God laughs.

(Jewish proverb)

Introduction

Increasing life expectancy, longer retirement

In many industrialized societies, individuals spend increasingly longer periods in retirement, with Europe and Germany leading the world in aging (Börsch-Supan, 1992; Willekens, 2016). In particular, improved living conditions, education and medical care have led to a steady increase in life expectancy (Bomsdorf, 2004; Leon, 2011; Unger, 2006). So far, however, neither the statutory retirement age, nor the effective retirement age have (been) shifted in line with life expectancy (see Figure 1): When the first nationwide uniform pension insurance scheme came into force in 1889, the statutory retirement age was 70 years (Deppe & Foerster, 2014). At that time the average life expectancy was 45 years for men and 48 years for women (Bundesministerium für Arbeit und Soziales, 2017). Statistically, very few individuals at that time lived long enough to claim an old-age pension (Börsch-Supan & Wilke, 2004). By 2015, the statutory retirement age was reduced by almost five years to 65 years and 4 months (Sozialgesetzbuch (SGB) Sechstes Buch (VI): Gesetzliche Rentenversicherung, 2007). However, the average life expectancy of persons who were 65 years old at that time had almost doubled, to 83 years for men and 86 years for women (Bundesinstitut für Bevölkerungsforschung, 2018; Gendell, 1998). Statistically, these persons could expect 18 and 21 years in retirement respectively.

In addition to these demographic changes, the prolonged old-age pension also results from historical pension reforms: The flexibilization of the transition to retirement in 1972 led to greater recourse to early retirement schemes, resulting in a reduction in the effective retirement age from 61 to 59 years (Deutsche Rentenversicherung Bund, 2018b) and an increase in the average pension eligibility period from 11 years in 1970 to 15 years in 1990. Despite subsequent pension reforms to increase the retirement age, the effective pension eligibility period had risen to an average of 20 years by 2017 (Deutsche Rentenversicherung Bund, 2018a).

This extended retirement period affects the financing of pension systems and the cohesion of societies, the workforce available to businesses and the well-being and health of individuals. In the following, the social, economic and individual consequences of prolonged old-age pensions are presented.



Figure 1. Life expectancy of 65-year-olds (Deutsche Rentenversicherung Bund, 2018b), statutory retirement ages (Sozialgesetzbuch (SGB) Sechstes Buch (VI): Gesetzliche Rentenversicherung, 2007) and average retirement ages in Germany (Deutsche Rentenversicherung Bund, 2018b) over time.

Societal consequences of prolonged old-age pensions. The growing number of retirees is putting pressure on Germany's pay-as-you-go pension system: The German pension insurance relies on a large number of employed individuals who pay for a small number of individuals who are no longer in employment (Börsch-Supan & Wilke, 2004). Due to increased life expectancy and a low birth rate, the numerical ratio of those who are already retired to those who pay for their pensions, the so-called *old-age dependency ratio*, changes (Statistisches Bundesamt, 2015). Between 1990 and 2018, the old-age dependency ratio increased from about 20% to about 30%: While in 1990 five employees were responsible for the pension payments of a pensioner, in 2018 only slightly more than three employees covered these expenses (Statistisches Bundesamt, 2019). As a result, the cost of old-age pensions increased by a factor of 2.4 between 1992 and 2017 (from 86,280 million to 207,953 million euros), although the level of net pensions decreased by 4.8 percentage points in the same period (Deutsche

Rentenversicherung Bund, 2018b). Projections indicate a further increase in the old-age dependency ratio (e.g., Börsch-Supan, 2000; Sanderson & Scherbov, 2015).

Approaches to meeting these social challenges are being discussed both in Germany and worldwide (Börsch-Supan & Wilke, 2004; Dychtwald et al., 2004; Kilbom, 1999; Litwin et al., 2009; Y. Wang, 2013; Whiteford, 2006). In the early 2000s a shift in the effective retirement age in the German pension system was identified as a key response to the challenges of demographic change (Rürup, 2002). The resulting phased adjustment of the statutory retirement age from 65 to 67 adopted in 2007 is politically unpopular in the face of a growing group of voters of advanced age (Statistisches Bundesamt, 2019), although almost half of them express interest in continuing working beyond retirement (Dorbritz & Micheel, 2010).

Economic consequences of prolonged old-age pensions. The developments described above also represent a challenge for companies: The labor market is changing from a buyer's market to a seller's market (Astheimer, 2017). A very large cohort has been available to the labor market since the 1960s until today with the generation of *baby boomers* (Statistisches Bundesamt, 2019). As a result, in the 1980s, in particular larger companies in Germany took advantage of changes in retirement legislation to prematurely retire older employees and thus both rejuvenate and reduce the number of employees (Streeck & Hassel, 2003). Accordingly, in 1993 the proportion of disability pensions in new retirements in Germany was 26% and the average retirement age was 60.3 years (Deutsche Rentenversicherung Bund, 2018b). However, the low birth rate has already led and will continue to lead to a decline in the available work force after the baby boomers leave the labor market. Instead of retiring employees early, the long-term continuation of employment or even a return from retirement is therefore increasingly investigated (Dychtwald et al., 2004) and even tested in some companies (Conen et al., 2011). Consequently, research into measures to prevent work disability is receiving significant attention (Pransky et al., 2016; Schwarze et al., 2016; Viester et al., 2015).

Individual consequences of prolonged old-age pensions. Employment plays an important role in most people's lives: At the age of 25, about two thirds of the population in Germany are in employment and then spend about half of their waking hours working (Statistisches Bundesamt, 2018). People find meaning and identity in work, even or especially in older age (Fasbender et al., 2016; Mor-Barak, 1995; Pitt-Catsouphes et al., 2017). Nevertheless, in a survey of over 6,000 gainfully employed individuals aged 46 to 52 in 2011, 90% expressed the wish to retire before their respective statutory retirement age (Hasselhorn et al., 2019).

Consequently, in another study in 2018, the average desired retirement age of employees between 55 and 59 years of age was just slightly over 61 years (Hess, 2018). However, mismatch regarding retirement age seems to exist in both directions, namely “retirement too late”, where employees continue working involuntarily, as well as “retirement too early”, where workers involuntarily retire early (Steiber & Kohli, 2017). In line with this, a large share of older workers is interested in continuing to work beyond retirement (Dorbritz & Micheel, 2010). The withdrawal from gainful employment bears both opportunities and risks for individual well-being and health: Recent research is concerned with effects of the retirement itself on health and well-being (James & Spiro, 2006; Moen, 1996). For example, Wang (2007) found three different patterns of development of individual well-being during the transition to retirement: A U-shaped pattern with initially decreasing and later increasing well-being, especially among those with worsening physical health and individuals lacking control over their transition to retirement; a recovering pattern with increasing well-being, especially among those with physically demanding jobs; and a sustaining pattern with constant good well-being, especially among those who kept working for a certain time after retirement. For some, retirement can thus result in a gain in perceived autonomy (Henning et al., 2019). For others, the effects of retiring, and a long retirement in particular on mental health can be negative (J. E. Kim & Moen, 2002), leading to, for example, an increase in depressive symptoms (Calvo et al., 2009). The Diagnostic and Statistical Manual of Mental Disorders (DSM; American Psychiatric Association, 2013) even identifies retirement as a potential cause of adjustment disorder.

Continuity Theory (Atchley, 1989), as well as *Role Theory* (cf. M. Wang, 2007) offer explanations for the potential negative effect of retirement: Continuity Theory postulates that as individuals grow older, they try to hold on to their usual internal structures, such as their own ideas and beliefs, and external structures, such as social relationships and roles (Atchley, 1989). Within the framework of Continuity Theory, for example, a deterioration in well-being can be attributed to perceived discontinuities. Concordantly, Role Theory postulates that the loss of a role perceived as providing identity can lead to a deterioration of well-being as well (cf. M. Wang, 2007). The loss of routines and social roles through the abrupt ending of gainful employment could therefore lead to such a retirement-induced mental disorder.

However, the individual transition to retirement is a complex process that is affected by many factors, (Shultz & Wang, 2011), and in turn affects the adaptation to the new phase of life itself in different ways (cf. Moen, 1996; M. Wang et al., 2011; M. Wang & Shi, 2014). The following section briefly describes (1) benefits of a prolonged working life, (2) work ability as

a prerequisite of a prolonged working life and a self-determined transition to retirement, and (3) the effect of control over the transition to retirement on well-being and health.

Increasing life expectancy, longer working life

A prolonged working life could mitigate the consequences of increased life expectancy: At the societal level, the prolongation of working life would have a positive impact on the old-age dependency ratio by reducing the number of dependent persons who need to be provided for. At the same time, these persons would be available to companies as a valuable resource of skills and knowledge. At the individual level, a self-determined prolongation of working life could have positive effects on life satisfaction, health, and well-being. In order to promote such a prolongation of working life beyond statutory retirement age, measures on the social, economic, and individual levels are needed (Kilbom, 1999).

Societal consequences of a prolonged working life. At the societal level, legislation could ensure regulatory certainty and create incentives for employers and employees. If employees who are (re-)employed after reaching eligibility age have significantly more decision-making authority over the continuation or termination of this employment relationship than the companies that employ them, then the employment of persons beyond the eligibility age can become a major risk for the employer (Anxo et al., 2012). This decision asymmetry can be mitigated by legislation. On the employees' side, raising the statutory retirement age already represents an intervention in the direction of an extended working life. Although prolonging working life has advantages for employees and there is great interest among older employees in continuing to work beyond retirement, the acceptance of an increase in the statutory retirement age is low (Dorbritz & Micheel, 2010).

This can be explained by the Self-Determination Theory (SDT; cf. Ryan & Deci, 2012), which postulates the need for autonomy, that is, control over one's own behavior and life circumstances, as one of three basic psychological needs. If these needs are not met, the SDT postulates negative effects on individual growth and well-being (Deci & Ryan, 2008). The feeling of control in the transition to retirement can be influenced by social factors, such as the cultural norms about the right time to retire, occupational factors, such as the replacement of one's own job or the support of one's supervisor in a possible continued employment, as well as individual factors, such as one's own desired retirement age or one's own health (van Solinge & Henkens, 2007).

Therefore, individuals may wish for early retirement, as they see it as an end to externally determined work and a start to self-determined time use (Henning et al., 2019), but on the other hand look forward to a self-determined prolongation of working life (Dorbritz & Micheel, 2010). The externally determined prolongation of working life therefore represents an autonomy-reducing intervention in life organization, and should at least be accompanied by positive incentives to prolong working life (Rürup, 2002), for example, of course monetary rewards, but also self-determination related rewards like a more flexible arrangement of working schedule and the transition to retirement.

Economic consequences of a prolonged working life. At company level, a strong tendency towards discrimination against older workers can be observed (Ahmed et al., 2012; Albert et al., 2011; Bendick et al., 1999; Mulders et al., 2014). Possible reasons for this are both a lack of suffering on the part of companies, which can still fill vacancies despite declining numbers of employees, and the conviction that older employees are less efficient than younger employees (Karpinska et al., 2011, 2013; van Dalen et al., 2010, 2019). In line with the *contact hypothesis*, which postulates a positive effect of contact with foreign groups on possible stereotypes (Amir, 1969), Loretto and White (2006) found that employers whose attitudes were based on experience with older workers were more positive about employing older workers. In this respect, measures at the business level could aim at enabling positive experiences with older workers in order to overcome prejudices.

Individual consequences of a prolonged working life. At the individual level, several benefits from continuing to work already exist in old age: For example, employment can serve the function of social exchange with others or a meaningful activity (Fasbender et al., 2016), it can provide meaning and identity (Pitt-Catsoupes et al., 2017), pleasure and the opportunity to remain active (Kerr & Armstrong-Stassen, 2011), it can compensate for social losses and facilitate personal growth (Fasbender et al., 2014), and has been found to be related to better health and well-being (James & Spiro, 2006; Zhan et al., 2009). Despite the benefits of a prolonged working life, and despite the population's interest in continuing to work beyond retirement (Dorbritz & Micheel, 2010), involuntary early exit from work oftentimes prevents retirees from participating in post-retirement work (cf. van Rijn et al., 2014). In order to enable a self-determined continuation of employment it is therefore necessary to create conditions which serve the long-term maintenance of physical and mental health, which are closely related to the

concept of *work ability* in the context of employment and in conjunction with the requirements of employment.

Promotion of work ability to enable a prolonged working life

Work ability is the ability of workers to meet the demands of their work with respect to their physical and psychological resources, both now and in the near future (Tuomi, Ilmarinen, et al., 1991), and thus stands at the intersection between individual physical and mental health on the one hand, and the demands of work on the other.

The holistic model of work ability theoretically identifies different factors influencing work ability, that is, (1) the society in general, (2) the direct social environment and the family of the respondents, (3) working conditions, contents and requirements, the community and organization of work and the work and organization of supervisors, (4) values, attitudes, and motives, (5) knowledge and skills at the individual level, as well as (6) health and the functional capacity of the workers (Gould et al., 2008; Ilmarinen, 2006). However, the standard instrument to assess work ability, the Work Ability Index (WAI; Tuomi, Ilmarinen, et al., 1991) provides users with little information about the underlying mechanisms of different work ability scores (c.f., Cadiz et al., 2019), and consequently, starting points for interventions to maintain and promote work ability.

Supporting the holistic model, differences in work ability across countries have been obtained, indicating societal factors to be related to work ability (e.g., Camerino et al., 2006), as well as work factors (e.g., Alavinia et al., 2009) and individual factors (e.g., McGonagle et al., 2015). A measurement instrument to assess work ability that integrates the holistic model of work ability could provide users with insights on the underlying mechanisms of different work ability scores and consequently, starting points for interventions to maintain and promote work ability (cf. Cadiz et al., 2019).

The promotion of work ability throughout the working life could serve the prolongation of working lives: The relationship between work ability and work force participation has repeatedly been demonstrated in the past, for example, regarding long absences due to illness (e.g., Ahlstrom et al., 2010; Schouten et al., 2016; Sell et al., 2009), early retirement intentions (e.g., von Bonsdorff et al., 2010), and actual early retirement (e.g., Bethge et al., 2012; Jääskeläinen et al., 2016; Sell et al., 2009; Wind et al., 2015). While older workers may have to retire involuntarily as a result of limited work ability, older workers with good work ability have more control over the transition to retirement.

Control over the transition to retirement as a result of work ability

The SDT postulates, that not being able to control the circumstances of the transition to retirement violates the basic need for autonomy and can lead to a deterioration in well-being, even beyond the influence of decreasing health: Greater control over the circumstances of retirement is positively linked to *joie de vivre* (Calvo et al., 2009) and life satisfaction (Bender, 2012; Dingemans & Henkens, 2015; Shultz et al., 1998), and negatively associated with sadness, depression and loneliness (Calvo et al., 2009). A recent review states that a deterioration in well-being in the transition to retirement is often accompanied by a loss of resources perceived as substantial, for example by a loss of control over the circumstances of that transition (Henning et al., 2016).

The negative effects of involuntary retirement, however, were less pronounced among those who remained employed after retirement in a study by Dingemans and Henkens (2015). This finding points to another determinant of well-being and health in the transition to retirement, in addition to the fulfilment of the need for autonomy: continued employment beyond retirement, called *bridge employment* or *post-retirement work*, also referred to as *silver work* in Germany (Maxin & Deller, 2008), because the loss of the usual meaning- and identity-forming gainful employment itself can also have an influence on later well-being and health (Atchley, 1989; Henning et al., 2016). Instead of an abrupt end to gainful employment, continued employment offers the possibility of remaining in familiar structures and thus ensuring a constant source of well-being (M. Wang, 2007).

Bridge employment is related to less serious illness, functional limitations and mental health (Zhan et al., 2009). Positive relationships with life satisfaction and pension satisfaction were observed for continued employment both within and outside the original field of employment, also referred to as career bridge employment, and bridge employment, respectively (S. Kim & Feldman, 2000). Involuntary retirees who engaged in bridge employment did not experience the same decrease in life satisfaction as their counterparts who did not engage in bridge employment (Dingemans & Henkens, 2015). In sum, positive connections exist between control over the transition to retirement, for example through a self-determined continued employment, and well-being and health (James et al., 2020).

Contributions of the dissertation

Against the background described above, the question examined in the context of this dissertation were, (1) how work ability could be assessed to enable employees, employers and

societies to maintain a consistently high level of work ability over a longer working life, and (2) how this would affect control during the retirement process, and what effects this could have on older workers' and retirees' life satisfaction. For this purpose, the first two studies of this dissertation evaluated a questionnaire for the assessment of work ability in the sense of the holistic model of work ability on detailed subscales representing individual and organizational resources. In the third contribution, the positive effects of good work ability during working life on perceived control over and during the retirement process, and subsequent life satisfaction were investigated. In the next section, the main results of the three studies will be briefly summarized, followed by full texts of the three studies.

Study 1: Measuring work ability with its antecedents: Evaluation of the Work Ability Survey

A comprehensive instrument for assessing work ability, which depicts it in the sense of the holistic model as a function of both organizational and individual factors in German had previously been missing. With the Work Ability Survey-R (WAS-R; McLoughlin & Taylor, 2012; Noone et al., 2014), such an instrument had already been introduced in Australia. In the first study, this instrument was translated into German and evaluated regarding its psychometric properties and construct validity in two samples ($n_1 = 1,093$, $n_2 = 359$).

In the study, the 16 subscales of the questionnaire showed internal consistencies of an average of $\alpha = .78$ ($SD = 0.12$, $.45 \leq \alpha \leq .92$) and $\alpha = .79$ ($SD = 0.10$, $.57 \leq \alpha \leq .92$). The measurement model of the questionnaire reflected the holistic model of work ability as five latent factors (social environment, health, competence, values, and work environment). The correlation with the WAI was $.58 \leq r \leq .69$. The correlation between the part of the WAS-R that related to participants' personal resources and the WAI was higher, $.69 \leq r \leq .77$, than the part that related to organizational resources, $.41 \leq r \leq .53$. The WAS-R had a negative correlation with sick leave and a positive correlation with the desired retirement age. In both samples, the WAS-R was not linked to the expected retirement age.

The WAS-R provides satisfactory psychometric and structural characteristics. It operationalizes work ability at the intersection of personal and organizational resources. This integration of the holistic model of work ability allows companies to derive targeted interventions to maintain work ability.

Study 2: Differences of four work-related behavior and experience patterns in work ability and other work-related perceptions in a finance company

The *Work-related Behavior and Experience Pattern* (Arbeitsbezogenes Erlebens- und Verhaltensmuster: AVEM; Schaarschmidt & Fischer, 2008) measures health-maintaining and health-improving factors from a salutogenic approach rather than focusing on the prevention of impairments (e.g., Voltmer et al., 2010). The eleven subscales of the AVEM mainly capture resilience factors related to psychosocial stress at work, such as the importance of work or the ability to distance oneself from work. A positive AVEM result should therefore be accompanied by a high work ability and thus a low risk of early retirement. Accordingly, a positive AVEM result would then also be an antecedent of a comparatively high level of control over one's own circumstances in old age and in the transition to retirement. In the second study, we therefore examined the relationships between the WAS-R and the AVEM's work-related behavioral and experiential patterns, as well as other related factors, in a sample of 182 employees of an international financial services company.

In this study, 22% of the participants showed a risk pattern associated with burnout. However, among 45% of the participants, a work-related behavior and experience pattern was found which is characterized by low ambition and a pronounced attitude of taking care of one's own life while at the same time having a relatively high level of life satisfaction. More importantly, the WAS-R differentiated between those participants with the healthy pattern and the unambitious protection pattern, between those with the healthy pattern and risk pattern A or risk pattern B, and between those with the unambitious protection pattern and risk pattern B, $ps < .05$. Furthermore, the WAS-R was highly correlated with job satisfaction, $r = .57, p < .001$, the WAI, $r = .50, p < .001$, and three components of job engagement, $.63 \leq r \leq .69, ps < .001$, moderately correlated with absolute presenteeism, $r = .43, p < .001$, moderately negatively correlated with turnover intention, $r = -.39, p < .001$, and not significantly correlated with relative presenteeism, $r = .15, p \geq .05$.

In this study, too, the high importance of work ability for a healthy and fulfilled working life in the long term was demonstrated.

Study 3: Living happily ever after: The mediating role of control over the retirement process in the relationship between work ability and life satisfaction

The long-term maintenance of work ability over the life span serves the possibility of a self-determined life even in old age. According to SDT, ensuring self-determination as one of

three basic psychological needs well into old age should maintain well-being even at an older age and lead to higher life satisfaction. The third contribution examined the experience of autonomy and control during the transition to retirement as a mediator between previous work ability, health and financial well-being and later life satisfaction in retirement in two samples ($n_1 = 2,701$, $n_2 = 5,545$).

In Study 1, cross-sectional evidence was found for the hypothesized mediation effect of control between work ability and the financial situation on the one hand, and life satisfaction on the other hand: Indirect positive relations could be obtained between work ability and life satisfaction via control over the retirement process among retirees, $\beta = .03$, $p < .01$. In addition, and supporting the mediation hypothesis, the financial situation was found to be significantly indirectly related to life satisfaction via control over the retirement process for both groups, $\beta_s > .03$, $p_s < .001$.

To overcome the limited interpretability of mediating effects in cross-sectional data, the findings from Study 1 were validated using data from the international Study on Health, Aging, and Retirement in Europe (SHARE; Alcser et al., 2005; Börsch-Supan, 2019a, 2019b, 2019c, 2019d, 2019e, 2019f; Börsch-Supan et al., 2013) in Study 2. Supporting the findings from Study 1, we found the relationships between work ability and health at T1 and life satisfaction at T3 to be partially mediated by control in the transition to retirement at T2, $\beta_s = .001$, $p_s < .001$, even controlling for country and life satisfaction at T2. Furthermore, a more direct relationship between life satisfaction and the financial situation was found: Instead of being related to life satisfaction at T3 via control in the transition to retirement at T2, both the subjectively perceived financial situation as well as household income were directly linked to life satisfaction at T2, $.04 \leq \beta \leq .45$, $p_s < .05$.

The third contribution thus supported the relationship between autonomy and life satisfaction as postulated by SDT and found evidence for an indirect relationship between previous work ability and later life satisfaction mediated by perceived control during the transition to retirement.

Contribution 1

Voltmer, J.-B., & Deller, J. (2018). Measuring work ability with its antecedents: Evaluation of the Work Ability Survey. *Journal of Occupational Rehabilitation*, 28(2), 307–321.

<https://doi.org/10/gc4m5x>

Contribution 2

Voltmer, J.-B., Voltmer, E., & Deller, J. (2018). Differences of four work-related behavior and experience patterns in work ability and other work-related perceptions in a finance company. *International Journal of Environmental Research and Public Health*, 15(7), 1–20. <https://doi.org/10/gd7gqn>

Contribution 3

Voltmer, J.-B., Voltmer, E., & Deller, J. (2020). *Living happily ever after: The mediating role of control over the retirement process in the relationship between work ability and life satisfaction*. Unpublished manuscript.

Living Happily Ever After: The Mediating Role of Control Over the Retirement Process in the
Relationship Between Work Ability and Life Satisfaction

Jan-Bennet Voltmer^{1,2}, Edgar Voltmer³, & Jürgen Deller^{2,4}

¹ FernUniversität Hagen

² Leuphana Universität Lüneburg

³ Universität zu Lübeck

⁴ Silver Workers Research Institute, Berlin

Author Note

Jan-Bennet Voltmer is a doctoral student at Leuphana Universität Lüneburg, and a teacher at the Faculty for Psychology, Social Psychology Department at FernUniversität in Hagen. Edgar Voltmer is Professor for Health Promotion in Study and Work at Universität zu Lübeck (edgar.voltmer@uksh.de). Jürgen Deller is Professor of Business Psychology at Leuphana Universität Lüneburg (deller@uni.leuphana.de), and Research Director at Silver Workers Research Institute, Berlin. Correspondence concerning this article should be addressed to Jan-Bennet Voltmer, FernUniversität Hagen, Universitätsstraße 33, 58097 Hagen, Germany, jan-bennet.voltmer@fernuni-hagen.de.

Abstract

With large cohorts spending long periods in retirement, life satisfaction in later life becomes an increasingly important societal issue. Work ability, health, and the financial situation have been shown to be related to life satisfaction. Building on Self-Determination Theory, we investigated a sense of control over and during the retirement process as a mediator between work ability, health, financial resources on the one hand, and later life satisfaction on the other hand. Data from two independent samples were used to test our hypotheses: Study 1 employed cross-sectional data of German chemical managers ($n=2,701$), Study 2 used longitudinal data from 5,545 participants of the Survey on Health, Ageing and Retirement in Europe, covering a time span of more than five years on average. Two different processes were found to affect later life satisfaction: A sense of control over and during the transition to retirement partially mediated the relationships between work ability and health and later life satisfaction. In contrast, the financial situation was more directly linked to life satisfaction. Our analyses show that the promotion of work ability serves more than just economic considerations and enabling longer working lives, but instead is indirectly related to life satisfaction in later life via a sense of control over the transition to retirement.

Keywords: autonomy, Self Determination Theory, aging,

More and more retirees are experiencing long periods of being retired after the transition from work life to retirement, up to almost 20 years on average in Germany (Deutsche Rentenversicherung Bund, 2018a; Statistisches Bundesamt, 2019). With large cohorts spending long periods in retirement, maintenance of life satisfaction in later life becomes an increasingly important societal issue (Eagers, Franklin, Yau, & Broome, 2018; Hülür et al., 2017).

Research has identified numerous antecedents of life satisfaction, like work ability (Milosevic et al., 2011; Seitsamo & Ilmarinen, 1997; Sjögren-Rönkä, Ojanen, Leskinen, Mustalampi, & Mälkiä, 2002; Tuomi, Huuhtanen, Nykyri, & Ilmarinen, 2001), health (Palmore & Luikart, 1972; Puvill, Lindenberg, de Craen, Slaets, & Westendorp, 2016; Quick & Moen, 1998; Steptoe, Deaton, & Stone, 2015) or the financial situation (Boes & Winkelmann, 2009; Boyce, Brown, & Moore, 2010; Judge, Piccolo, Podsakoff, Shaw, & Rich, 2010; Kim & Feldman, 2000; Proto & Rustichini, 2015). Furthermore, Self-Determination Theory (SDT) proposes the satisfaction of the fundamental psychological need for a sense of control to be an important requirement for life satisfaction (Ryan & Deci, 2000). Consequently, involuntariness in the transition to retirement is related to decreased life satisfaction (Dingemans & Henkens, 2015; Henkens et al., 2018; van Solinge & Henkens, 2008), the self-perceived ability to cope with change has a positive effect on retirement adjustment (van Solinge & Henkens, 2005), and a sense of control over the retirement process is an important predictor of happiness in later life (Calvo, Haverstick, & Sass, 2009), linked to a healthier transition to retirement (Henkens, van Solinge, & Gallo, 2008), and even well-being at the end of life (Gerstorf et al., 2014).

Limited control over life's circumstances can on the other hand result from low work ability or deteriorating health, forcing workers to involuntarily exit the work force (Ahlstrom, Grimby-Ekman, Hagberg, & Dellve, 2010; Jääskeläinen et al., 2016; Reeuwijk et al., 2015;

Roelen et al., 2014; Schouten et al., 2016; van Rijn, Robroek, Brouwer, & Burdorf, 2014; von Bonsdorff, Huuhtanen, Tuomi, & Seitsamo, 2010), as well as a financial situation that either allows older workers to retire early or forces them to stay in paid employment out of financial necessity (Cahill, Giandrea, & Quinn, 2017; Wang & Shi, 2014).

Viewing the transition to retirement as a diverse process (Eagers et al., 2018; Wang & Shultz, 2010), it becomes more important for retirees, societies, and employers, how pre-retirement circumstances affect the transition to retirement, and ultimately, life satisfaction. Especially in Europe, research on retirement is of particular interest due to the advanced population age (Willekens, 2016). *Greying* work forces and societies challenge pay-as-you-go pension systems (Deutsche Rentenversicherung Bund, 2018b; Whiteford, 2006). Consequently, retirement policy in Germany has been exacerbated (Brown, 2012; Trampusch, 2005), effectively increasing actual retirement age (OECD, 2012; Trampusch, 2005), but at the same time reducing the potential for control over the transition to retirement.

In the present study, we investigate how perceived control over the retirement process mediates the relationship between work ability, health, the financial situation and life satisfaction. Understanding this mechanism offers the potential to partly counterbalance the loss of control resulting from limited availability of deliberate early exits from work by increasing control through (a) maintaining work ability and health, effectively reducing the risk of involuntary early exit from work, and (b) a fair salary, enabling workers to compensate for pension penalties arising from a self-determined exit from work.

The maintenance of work ability and health has already become imperative for employees and employers alike in order to facilitate longer working lives (Ilmarinen, 2019; Morelock, McNamara, & James, 2017). We propose that the maintenance of work ability and

health over the lifespan, as well as a fair salary serves more than just economic considerations, but instead is indirectly related to life satisfaction in later life. To explore the indirect effects outlined above, we conducted analyses in two independent samples, presented as Study 1 and Study 2 below.

Study 1

The sample in Study 1 consisted of members of a trade union of executives and academics of the German chemical industry with – at most – managerial responsibility. The chemical-pharmaceutical industry is the third-largest industry in Germany in terms of sales volume, and sixth in terms of work force (Verband der Chemischen Industrie e. V., 2018). We compared indirect relationships in cross-sectional data between those who had already undergone the transition to retirement and those who were not yet retired.

Method

Participants

The participants in this study were 1,708 non-retirees and 993 retirees. We invited those members aged 50 and older via e-mail to participate in an online self-report questionnaire regarding their transition to retirement. Response rate was 33.7%. The retired participants were aged $M=66.6$ ($SD=4.4$). Most of the retirees were male (94.3%) and stated to be living with a partner (91.2%). Actual retirement age among retirees was 61.8 ($SD=2.6$) years. Most of the non-retirees were male (86.3%) and living with a partner (88.9%). The large proportion of male participants is representative for academics and executives in the German chemical industry

(*Führungskräfte in der Chemie-Branche [Executives in the chemical industry]*, 2013). The average age among non-retirees was $M=58.3$ ($SD=2.6$) years, and preferred retirement age was higher than in the general public, $M=62.8$ ($SD=3.1$) years (Hess, 2018).

Measures

Life satisfaction. The Satisfaction with Life Scale (Glaesmer, Grande, Braehler, & Roth, 2011) was used to measure life satisfaction. It consists of five items (e.g., "In most ways my life is close to my ideal."). Participants rated the items on 7-point Likert answering scales.

Control regarding the retirement transition. Two facets of control over the retirement process were assessed: predictability ("The moment of retirement is/was long foreseeable for me") and voice ("I will be able to/could choose the moment of retirement"). The two items were rated on 5-point Likert answering scales. To reflect differences within retirees and non-retirees, the items were standardized within groups.

Work ability. Work ability was measured with the Work Ability Score, a single item on perceived overall work ability of the Work Ability Index (Ahlstrom et al., 2010; Tuomi et al., 1991). Possible answers ranged from 0 ("not able to work at all") to 10. The predictive value of the Work Ability Score has repeatedly been demonstrated (Ahlstrom et al., 2010; Roelen et al., 2014).

Health. Overall health was assessed with the general health item of the Short Form-8 health questionnaire (SF-8; Ware, Kosinski, Dewey, & Gandek, 2001): "Overall, how would you rate your health during the past 4 weeks". The validity has repeatedly been demonstrated (Beierlein, Morfeld, Bergelt, Bullinger, & Brähler, 2012; DeSalvo et al., 2006; Ellert, Lampert, & Ravens-Sieberer, 2005).

Financial Situation. The perceived financial situation was assessed with one item

adapted from Kulik (2000): “How do you evaluate your current financial situation?” Participants could indicate their answers on an adapted four-point Likert answering scale.

Results

Table 1a and 1b report descriptive statistics, correlations, and internal consistencies. As can be seen, retirees reported a higher life satisfaction than non-retirees ($\Delta M = -0.20$, 95CI[-0.27, -0.14], $t_{(2,192.97)} = -6.23$, $p < .001$), more control over their past retirement process in contrast to the forthcoming retirement process of non-retirees ($\Delta M = -0.36$, 95CI[-0.44, -0.27], $t_{(1,915.14)} = -8.38$, $p < .001$), and better health ($\Delta M = -0.07$, 95CI[-0.15, 0.00], $t_{(2,97.51)} = -2.04$, $p = .042$). Moreover, retirees rated their financial situation better than non-retirees ($\Delta M = -0.07$, 95CI[-0.11, -0.03], $t_{(2,6.36)} = -3.15$, $p = .002$). In contrast, non-retirees reported a better work ability ($\Delta M = 0.62$, 95CI[0.48, 0.76], $t_{(1,748.42)} = -8.70$, $p < .001$).

To investigate the indirect relationship between work ability and life satisfaction, we conducted structural equation modeling, modeling life satisfaction as an outcome of work ability, with direct and indirect paths via control over the retirement process. The just-identified path model explained 13% of the variance in life satisfaction among non-retirees and 12% among retirees, as well as 0.2% of the variance in control among non-retirees and 2% among retirees. Direct relationships existed between life satisfaction and work ability in both non-retirees and retirees, between life satisfaction and control in non-retirees and retirees, and between control and work ability among retirees, but not non-retirees. Consequently, a significant indirect relationship between work ability and life satisfaction via control over the transition to retirement existed only among retirees, $\beta = .02$, $p = .001$, but not among non-retirees, $\beta = .01$, $p = .10$. Next, we reversed the order of work ability and control over the retirement transition, so that the direct relationship between control and life satisfaction was mediated by work ability. The resulting

model fit the data less good ($AIC=16,713$, $BIC=16,796$) than the original model ($AIC=13,953$, $BIC=14,035$), supporting the hypothesized order of work ability as predictor and control as mediator.

In the second path model, health and the financial situation were included as additional predictors. The just-identified model explained 23% of the variance in non-retirees' life satisfaction and 27 % among retirees, as well as 2% of the variance in non-retirees anticipated control over the transition to retirement, and 6% of the variance in retirees perceived control over the transition to retirement. Work ability, health, and the financial situation were all directly related to life satisfaction. Again, an indirect relationship between work ability and life satisfaction could be obtained in retirees, $\beta=.01$, $p=.03$, but not in non-retirees, $\beta=.001$, $p=.75$. In addition, the financial situation was indirectly related to life satisfaction in both groups, $\beta_{\text{non-retirees}}=.02$, $p<.001$, $\beta_{\text{retirees}}=.02$, $p=.006$. Contradicting our mediation hypothesis, no indirect relationship between health and life satisfaction via control over the retirement process could be obtained, $\beta<.01$, $p>.05$ (see Figure 1).

Discussion

Control over the retirement process and life satisfaction were positively related, supporting the validity of SDT (Ryan & Deci, 2000), as well as earlier findings that involuntary retirement can have detrimental effects on life satisfaction, and that perceived control in the retirement process is positively related to life satisfaction (Calvo et al., 2009; Dingemans & Henkens, 2015; Henkens et al., 2008; van Solinge & Henkens, 2005, 2008). In line with previous research, higher life satisfaction was associated with better work ability (Milosevic et al., 2011; Seitsamo & Ilmarinen, 1997; Sjögren-Rönkä et al., 2002; Tuomi et al., 2001, 2001) and health

(Palmore & Luikart, 1972; Puvill et al., 2016; Steptoe et al., 2015). Similarly, the financial situation was positively associated with higher life satisfaction. The relationship between perceived financial situation and life satisfaction was larger than those with work ability and health, indicating support for the importance of the subjective perception of the financial situation (Boyce et al., 2010; Proto & Rustichini, 2015).

More importantly, part of the relationship between work ability and life satisfaction could be explained by changes in perceived control over the transition to retirement among retirees, supporting the idea of work ability as a gatekeeper for a self-determined transition to retirement. Similarly, control over the retirement transition partially mediated the relationship between the perceived financial situation and life satisfaction in both groups. Among non-retirees, only a direct relationship between work ability and life satisfaction could be obtained.

Regarding health, no direct relationship with control over the transition to retirement was found. It is possible that participants did not attribute their individual level of control over their transition to retirement in the future or in the past to their momentary health condition, but instead to work ability and their financial situation.

Limitations

Only cross-sectional observations were employed to estimate the mediating effects. The issues with inferences of longitudinal effects, especially mediation, from cross-sectional data have long been subject to discussion (Maxwell & Cole, 2007). Accepting these issues, the results of this study represent an argument in favor of this study: The non-retirees, who had not yet passed the retirement process, were less affected by limited work ability, whereas among those who had already experienced this process, the relationship between work ability and life satisfaction could partially be attributed to differences in perceived control.

The given sample is anything but representative for the general public. However, if in a population with relatively homogeneous high levels of control, control is beneficial for the retirement process, this should apply even more to a population featuring more variance in levels of control over their daily lives.

Study 2

We replicated our analyses with data of the *Survey on Health Ageing, and Retirement in Europe* (SHARE¹). SHARE is a multi-national, multi-wave representative study on individuals born 1954 or earlier. It was designed in 2002 to be representative for “individuals born in 1954 or earlier, speaking the official language of the country and not living abroad or in an institution such as a prison” (Alcser et al., 2005). The first wave of SHARE took place in 2004/2005, conducting interviews in 11 European countries and Israel. Since then, a new wave of data was collected every other year. In 2017, the seventh wave was collected in now 27 European countries and Israel among 76,520 participants (Börsch-Supan, 2019a, 2019b, 2019c, 2019d, 2019e, 2019f), see Börsch-Supan et al. (2013) for methodological details. Individual response rates ranged from 39.5% to 48.1% (Bergmann, Kneip, de Luca, & Scherpenzeel, 2019). SHARE includes household income information, which we used as an additional predictor in this study. Data from three timepoints were analyzed in this study. Compared to Study 1, perceived control over the retirement process was assessed as voluntariness of the retirement process, asking participants why they had retired (e.g., “made redundant”, “own ill health”, or “to enjoy life”). Since the actual moment of retirement was on average two years past for the participants at timepoint 2, we also included a general sense of control over life circumstances at timepoint 2 as

an outcome of the voluntariness in the retirement transition.

Method

Participants

For the present study, we selected participants from SHARE who (a) participated in at least three waves ($n=58,265$), and (b) had indicated to be not retired but working or being self-employed in one wave, and to be retired in two subsequent waves. The panel for this study consisted of 5,545 individuals living in 17 European countries and Israel at T1. Of all participants, $n=2,536$ (46%) were female. At T1, participants were on average aged 62.0 ($SD=6.2$), 65.3 ($SD=6.1$) at T2, and 67.7 ($SD=6.1$) at T3, covering a timespan of more than five years. At T2, participants indicated a median retirement age two years in the past.

Measures

Life satisfaction. Participants indicated their overall life satisfaction at T3 on an answering scale from 0 to 10.

Control over/during the retirement transition. After their retirement, participants were asked why they had retired at T2. Answering options included “own ill health”, but also “to enjoy life”, etc. Indicating multiple reasons for retirement was possible. We recoded this item to reflect voluntariness of the retirement process: When participants indicated to have retired because they were “made redundant (for example pre-retirement)” or because of their “own ill health”, involuntary retirement was present. When none of these two reasons was indicated, participants were classified as having retired not involuntarily. Additionally, participants were asked “How often do you feel that what happens to you is out of your control?” and “How often do you think that you can do the things that you want to do”.

Work ability. Work ability was operationalized at T1 using a dichotomous item “Do you have any health problem or disability that limits the kind or amount of paid work you can do”, which reflects the definition of work ability as the worker’s capability to work with respect to work demands (Tuomi et al., 1991).

Health. Overall self-rated health was assessed at T1 with the general health item of the Short Form-8 health questionnaire (SF-8; Ware et al., 2001): "Overall, how would you rate your health during the past four weeks?". Answer options consisted of "excellent", "very good", "good", "fair", "poor". The validity of the SF-8 and its items has repeatedly been demonstrated (Beierlein et al., 2012; Ellert et al., 2005).

Financial situation. The perceived financial situation was assessed with one item at T1: “Thinking of your household’s total monthly income, would you say that your household is able to make ends meet...”.

Household income. In addition, household income was assessed at T1 with one item “How much was the overall income, after tax, that your entire household had in an average month in [the last year]?”. Income was z-standardized to enable path modeling.

Results

Table 2 reports descriptive statistics and correlations. To investigate the indirect relationship between work ability and life satisfaction, we modelled life satisfaction at T3 as an outcome of work ability. In addition to the direct path, we modelled an indirect path from work ability via (a) control over the retirement process and (b) control during the retirement process on life satisfaction at T3. To control for previous individual life satisfaction, we included life satisfaction at T2 as an additional mediator, that was also allowed to correlate with perceived control during the retirement process at T2, as well as control over the retirement. The model fit

the data well ($\chi^2(2)=28.7$, $p<.001$, $CFI=.990$, $RMSEA=.049$, $SRMR=.018$), explaining 29% of the variance in life satisfaction at T3, 0.8% of the variance in perceived control during, and 3% in control over the retirement process, as well as 1% in life satisfaction at T2.

No direct relationship existed between life satisfaction at T3 and work ability. On the mediation path via control over and during the retirement transition, direct relationships existed between work ability and control over the retirement at T2, between control over the retirement and perceived control during the retirement transition, as well as between perceived control during the retirement transition and life satisfaction at T3.

In addition, controlling for life satisfaction at T2, we found direct relationships between work ability and life satisfaction at T2, life satisfaction at T2 and T3, as well as significant covariances between life satisfaction at T2 and perceived control during the retirement transition, and between life satisfaction at T2 and control over the retirement.

In line with our hypothesis, the indirect path via control over the retirement process and perceived control during the retirement process partially mediated the relationship between work ability and life satisfaction at T3, $\beta=.001$, $p=.001$. Since control over the retirement and control during the retirement transition were both assessed at T2, we next reversed the order of these, so that the voluntariness of the retirement was modelled as an outcome of a general sense of control over life circumstances at T2. The resulting model fit the data less good ($AIC=53,389$, $BIC=53,508$) than the original model ($AIC=53,270$, $BIC=53,389$), supporting the hypothesized order of a general sense of control as an outcome of retirement voluntariness.

In the second path model, we included health, the financial situation, and household income as predictors of life satisfaction at T3. Perceived control over life circumstances at T1 was included as an additional exogenous predictor of perceived control over life circumstances at

T2. Mixed results were found on model fit, with *CFI*, *RMSEA*, and *SRMR* being at least acceptable ($\chi^2(8)=230.8$, $p<.001$, $CFI=.956$, $RMSEA=.071$, $SRMR=.036$).

Again, and in line with our hypotheses, control over the retirement and perceived control during the retirement transition partially mediated the relationships between work ability and life satisfaction at T3, $\beta=.001$, $p<.001$, as well as between health and life satisfaction at T3, $\beta=.001$, $p<.001$. In contrast, no direct relationships with control over the retirement could be obtained for neither the perceived financial situation, nor actual household income, with control over the retirement, resulting in no indirect paths via control, $\beta s<.001$, $p s>.80$ (see Figure 2). These effects persisted when controlling for country as additional predictor of all endogenous variables.

Discussion

Data from a unique panel of 5,545 individuals who participated in at least three waves of SHARE were used to test the hypothesized mediation. Again, life satisfaction at T3 was positively related with work ability, health, the perceived financial situation, and household income. More importantly, however, control over retirement and perceived control during the retirement transition mediated the relationship between both work ability and health and life satisfaction at T3. The results from Study 2 therefore further corroborate the mediating role of control in the relationship between work ability and life satisfaction.

General Discussion

The present study investigated mechanisms leading to life satisfaction in retirement in two unique samples of 2,701 managers from the German chemical industry, and longitudinal data from 5,545 participants of SHARE. With an increasing number of workers in the transition phase to retirement (Statistisches Bundesamt, 2019) and more people spending more time in retirement (Deutsche Rentenversicherung Bund, 2018b), maintenance of life satisfaction in this

phase becomes increasingly important for societies (Eagers et al., 2018; Moen, 1996). Previous research has identified work ability (Seitsamo & Ilmarinen, 1997; Tuomi et al., 2001), health (Puvill et al., 2016; Steptoe et al., 2015), and the financial situation (Boes & Winkelmann, 2009; Boyce et al., 2010; Judge et al., 2010) to be related to life satisfaction. Building on SDT (Ryan & Deci, 2012), we investigated a sense of control as a mediator in the relationship between previous work ability, health, and financial situation and later life satisfaction.

Two different mechanisms preceding later life satisfaction can be identified: First, and in line with our hypotheses, Study 2 shows that previous work ability and health are indirectly related to later life satisfaction, partially mediated by a sense of control over and during the retirement process. This finding emphasizes the importance of autonomy for later life satisfaction in the transition to retirement, supporting SDT (Ryan & Deci, 2012). Previous research has already linked involuntary early retirement to work ability and health (Jääskeläinen et al., 2016; Rice, Lang, Henley, & Melzer, 2010; Roelen et al., 2014; van Rijn et al., 2014), as well as a sense of control to life satisfaction (Dingemans & Henkens, 2015; Henkens et al., 2018; van Solinge & Henkens, 2008). To our knowledge, however, our study is the first to investigate the mediating role of a sense of control in the relationship between previous work ability, health, and the financial situation and later life satisfaction. Our findings support the idea that work ability and health can be interpreted as important preconditions of control over the retirement process: Workers with low work ability or ill-health are less likely to be able to freely choose when to retire, and instead are subject to autonomy-reducing constraints, which can lead to reduced life satisfaction.

Second, both the perceived financial situation and household income were more directly related to life satisfaction: In Study 1, the perceived financial situation was directly and

indirectly related with life satisfaction. In Study 2, neither the perceived financial situation, nor the actual household income were predictors of voluntariness over the retirement process, but instead had a direct effect on life satisfaction at T2 which was then closely related to life satisfaction at T3. Moreover, in line with earlier research (Judge et al., 2010), our analyses indicate considerably less importance of the objectively measurable household income compared to the perceived financial situation. Instead, the relationship between actual monetary worth and life satisfaction seems to be influenced by other factors, like social comparisons (Boyce et al., 2010), or personality (Proto & Rustichini, 2015).

The practical implications of these findings are threefold: First, promoting work ability and health should be imperative to employers, societies, and individuals. Maintaining work ability has become a priority for employers to facilitate longer working lives in the face of shrinking work forces (Ilmarinen, 2019). Our research shows that work ability is indirectly related to later life satisfaction, making its maintenance an even more noble goal for employers, but also requiring efforts from society and individuals (Eagers et al., 2018) in the light of aging populations (Statistisches Bundesamt, 2019) and especially because of possible relationships between life satisfaction, well-being, and mortality (Hülür et al., 2017; Saunders, Elkins, Christensen, & McGue, 2018).

Second, our findings emphasize the important role of a sense of control as proclaimed by SDT (Ryan & Deci, 2012), especially in the transition to retirement (Silver, Settels, Schafer, & Schieman, 2019). In addition to maintaining health and work ability of their staff, thus enabling a self-determined transition to retirement, employers should also be concerned about an active cooperation regarding their employees' later life career planning. Especially when faced with legislative measures to increase retirement age (OECD, 2012; Trampusch, 2005), employers

could alleviate the negative effects of these measures on perceived control and ultimately, life satisfaction, by offering a cooperative and transparent or even consensual pathway into retirement (James, Morrow-Howell, Gonzales, Matz-Costa, & Riddle-Wilder, 2020). To maintain satisfaction of older workers and retirees, these pathways might include a self-determined phased or abrupt retirement (Calvo et al., 2009) as well as a continued engagement in work even after retirement age (e.g., Hamm, Heckhausen, Shane, Infurna, & Lachman, 2019; Kim & Feldman, 2000).

Third, results of both studies can be interpreted in a way that income and the perceived financial situation are important predictors of and more directly linked to life satisfaction. In order to keep their staff satisfied, both in short and long term – employers should therefore pay employees enough so that they do not worry about their financial situation (Ng, 2015).

Limitations and further research

This study employed two large datasets, allowing for the detection of small effects. However, this large power comes at the expense of two limitations: First, oftentimes, only single item questionnaires could be employed. Although the use of single item questionnaires is valid (Ahlstrom et al., 2010; DeSalvo et al., 2006; Fisher, Matthews, & Gibbons, 2016; Wanous, Reichers, & Hudy, 1997; Ware et al., 2001), multiple item-measures are preferable. Further research should employ more detailed instruments. Second, the large number of participants enables the detection of small effects, but also subjects these effects to the question of relevance. Do single digit increases in explained variance matter? No definitive answer can be given to this question. However, two aspects should be considered: (a) Satisfaction in (later) life is subject to an abundance of impact factors, of which control over the retirement transition is only one among many others. Especially over a timespan of five years, small effects would therefore be

more likely than large effects. (b) For the individual, even a small increase in life satisfaction can make a huge difference.

Conclusion

The present studies expand our understanding of the indirect effects of work ability, health, and the financial situation on life satisfaction, as well as the importance of control in the retirement process. Our findings suggest that employees, employers, and society should implement a two-fold strategy when aiming for the maintenance of life satisfaction in later life: First, support the maintenance of work ability, health, and a sufficient financial outcome over the life span, to enable a deliberate choice over one's retirement circumstances, and second, enable voice of future retirees in choosing their retirement circumstances, increasing (perceived) control in the retirement process.

Recent legislative measures in Germany already enabled older workers to take more control regarding their transition to retirement (Domnauer & Stosberg, 2017; Jähnert, 2018; Müller, 2018). Further steps of employers could include lifetime accounts, or phased retirement. Measures on societal and company level should aim for increased control of older workers regarding their transition to retirement. In addition, transparent communication from both sides, employer and employee, should be imperative to bring in line mutual requirements, plans, and wishes regarding the transition to retirement.

References

- Ahlstrom, L., Grimby-Ekman, A., Hagberg, M., & Dellve, L. (2010). The Work Ability Index and single-item question: Associations with sick leave, symptoms, and health. *Scandinavian Journal of Work, Environment and Health*, 36(5), 404–412. doi: 10/dsvbdf
- Alcser, K. H., Benson, G., Börsch-Supan, A., Brugiavini, A., Christelis, D., Croda, E., ... Weerman, B. (2005). *The Survey of Health, Ageing, and Retirement in Europe: Methodology* (A. Börsch-Supan & H. Jürges, Eds.). Mannheim: MEA.
- Beierlein, V., Morfeld, M., Bergelt, C., Bullinger, M., & Brähler, E. (2012). Messung der gesundheitsbezogenen Lebensqualität mit dem SF-8: Deutsche Normdaten aus einer repräsentativen schriftlichen Befragung [Measurement of health-related quality of life with the SF-8: German norm data from a representative written survey]. *Diagnostica*, 58(3), 145–153. doi: 10/gd847v
- Bergmann, M., Kneip, T., de Luca, G., & Scherpenzeel, A. (2019). Survey participation in the Survey of Health, Ageing and Retirement in Europe (SHARE), Wave 1-7: Based on Release 7.0.0. *SHARE Working Paper Series*, (41).
- Boes, S., & Winkelmann, R. (2009). The effect of income on general life satisfaction and dissatisfaction. *Social Indicators Research*, 95(1), 111. doi: 10/cgx62d
- Börsch-Supan, A. (2019a). *Survey of Health, Ageing and Retirement in Europe (SHARE) Wave 1* [Data set]. doi: 10.6103/SHARE.w1.700
- Börsch-Supan, A. (2019b). *Survey of Health, Ageing and Retirement in Europe (SHARE) Wave 2* [Data set]. doi: 10.6103/SHARE.w2.700
- Börsch-Supan, A. (2019c). *Survey of Health, Ageing and Retirement in Europe (SHARE) Wave 4* [Data set]. doi: 10.6103/SHARE.w4.700

- Börsch-Supan, A. (2019d). *Survey of Health, Ageing and Retirement in Europe (SHARE) Wave 5* [Data set]. doi: 10.6103/SHARE.w5.700
- Börsch-Supan, A. (2019e). *Survey of Health, Ageing and Retirement in Europe (SHARE) Wave 6* [Data set]. doi: 10.6103/SHARE.w6.700
- Börsch-Supan, A. (2019f). *Survey of Health, Ageing and Retirement in Europe (SHARE) Wave 7* [Data set]. doi: 10.6103/SHARE.w7.700
- Börsch-Supan, A., Brandt, M., Hunkler, C., Kneip, T., Korbmacher, J., Malter, F., ... Zuber, S. (2013). Data resource profile: The Survey of Health, Ageing and Retirement in Europe (SHARE). *International Journal of Epidemiology*, 42(4), 992–1001. doi: 10/f5dndk
- Boyce, C. J., Brown, G. D. A., & Moore, S. C. (2010). Money and happiness: Rank of income, not income, affects life satisfaction. *Psychological Science*, 21(4), 471–475. doi: 10/b3j9dj
- Brown, E. N. (2012, January 1). The takeaway: 14 countries raising retirement age [InternetDocument]. Retrieved from <http://blog.aarp.org/2012/07/12/europe-pension-reform-retirement-age-increases/>
- Bundesarbeitgeberverband Chemie (Series Ed.). (2013). *Führungskräfte in der Chemie-Branche [Executives in the chemical industry]* [PressRelease]. Retrieved from [https://www.bavc.de/bavc/mediendb.nsf/gfx/A7F99E4D9E5A7946C1257C0F003EB28E/\\$file/ib_10_13_F%C3%BChrungskr%C3%A4fte.pdf](https://www.bavc.de/bavc/mediendb.nsf/gfx/A7F99E4D9E5A7946C1257C0F003EB28E/$file/ib_10_13_F%C3%BChrungskr%C3%A4fte.pdf)
- Cahill, K. E., Giandrea, M. D., & Quinn, J. F. (2017). To what extent is gradual retirement a product of financial necessity? *Work, Aging and Retirement*, 3(1), 25–54. doi: 10/ggdj32
- Calvo, E., Haverstick, K., & Sass, S. A. (2009). Gradual retirement, sense of control, and retirees' happiness. *Research on Aging*, 31(1), 112–135. doi: 10/dcgh5g

- DeSalvo, K. B., Fisher, W. P., Tran, K., Bloser, N., Merrill, W., & Peabody, J. (2006). Assessing measurement properties of two single-item general health measures. *Quality of Life Research, 15*(2), 191–201. doi: 10/bq42zm
- Deutsche Rentenversicherung Bund. (2018a). *Aktuelle Daten 2018 [Current data 2018]*. Retrieved from Deutsche Rentenversicherung Bund website: https://www.deutsche-rentenversicherung.de/Allgemein/de/Inhalt/6_Wir_ueber_uns/03_fakten_und_zahlen/03_statistiken/02_statistikpublikationen/07_aktuelle_daten.pdf?__blob=publicationFile&v=18
- Deutsche Rentenversicherung Bund. (2018b). *Rentenversicherung in Zeitreihen [Statutory pension insurance scheme time series]*. Retrieved from http://www.deutsche-rentenversicherung.de/cae/servlet/contentblob/238700/publicationFile/62907/03_rv_in_zeitreihen.pdf
- Dingemans, E., & Henkens, K. (2015). How do retirement dynamics influence mental well-being in later life? A 10-year panel study. *Scandinavian Journal of Work, Environment & Health, 41*(1), 16–23. doi: 10/f8mdd9
- Domnauer, A., & Stosberg, R. (2017). Das Flexirentengesetz. *RVaktuell, (1)*, 7–17.
- Eagers, J., Franklin, R. C., Yau, M. K., & Broome, K. (2018). Pre-retirement job and the work-to-retirement occupational transition process in Australia: A review. *Australian Occupational Therapy Journal, 65*(4), 314–328. doi: 10/gcv4g5
- Ellert, U., Lampert, T., & Ravens-Sieberer, U. (2005). Messung der gesundheitsbezogenen Lebensqualität mit dem SF-8: Eine Normstichprobe für Deutschland [Measuring health-related quality of life with the SF-8: A norm sample for Germany]. *Bundesgesundheitsblatt, Gesundheitsforschung, Gesundheitsschutz, 48*, 1330–1337. doi:

10/fvrj5c

Fisher, G. G., Matthews, R. A., & Gibbons, A. M. (2016). Developing and investigating the use of single-item measures in organizational research. *Journal of Occupational Health Psychology, 21*(1), 3–23. doi: 10/f77jgg

Gerstorf, D., Heckhausen, J., Ram, N., Infurna, F. J., Schupp, J., & Wagner, G. G. (2014). Perceived personal control buffers terminal decline in well-being. *Psychology and Aging, 29*(3), 612–625. doi: 10/ggnng5

Glaesmer, H., Grande, G., Braehler, E., & Roth, M. (2011). The German version of the Satisfaction With Life Scale (SWLS). *European Journal of Psychological Assessment, 27*(2), 127–132. doi: 10/dc5fs9

Hamm, J. M., Heckhausen, J., Shane, J., Infurna, F. J., & Lachman, M. E. (2019). Engagement with six major life domains during the transition to retirement: Stability and change for better or worse. *Psychology and Aging, 34*(3), 441–456. doi: 10/gf7h4r

Henkens, K., van Dalen, H. P., Ekerdt, D. J., Hershey, D. A., Hyde, M., Radl, J., ... Zacher, H. (2018). What we need to know about retirement: Pressing issues for the coming decade. *The Gerontologist, 58*(5), 805–812. doi: 10/ggdjhd

Henkens, K., van Solinge, H., & Gallo, W. T. (2008). Effects of retirement voluntariness on changes in smoking, drinking and physical activity among Dutch older workers. *European Journal of Public Health, 18*(6), 644–649. doi: 10/bhft54

Hess, M. (2018). Expected and preferred retirement age in Germany. *Zeitschrift Für Gerontologie Und Geriatrie, 51*(1), 98–104. doi: 10/gcw2rz

Hülür, G., Heckhausen, J., Hoppmann, C. A., Infurna, F. J., Wagner, G. G., Ram, N., & Gerstorf, D. (2017). Levels of and changes in life satisfaction predict mortality hazards:

- Disentangling the role of physical health, perceived control, and social orientation. *Psychology and Aging*, 32(6), 507–520. doi: 10/ggnng8
- Ilmarinen. (2019). From work ability research to implementation. *International Journal of Environmental Research and Public Health*, 16(16), 2882. doi: 10/ggd35p
- Jääskeläinen, A., Kausto, J., Seitsamo, J., Ojajärvi, A., Nygård, C.-H., Arjas, E., & Leino-Arjas, P. (2016). Work Ability Index and perceived work ability as predictors of disability pension: A prospective study among Finnish municipal employees. *Scandinavian Journal of Work, Environment and Health*, 42(6), 490–499. doi: 10/f892v4
- Jähnert, C. (2018, November 8). Generationengerechtigkeit sieht anders aus [Generational justice looks different]. Retrieved August 5, 2019, from Swr.online website: <https://www.swr.de/swraktuell/Standpunkt-zum-neuen-Rentenpaket-Generationengerechtigkeit-sieht-anders-aus,standpunkt-rentenpaket-100.html>
- James, J. B., Morrow-Howell, N., Gonzales, E., Matz-Costa, C., & Riddle-Wilder, A. (2020). Beyond the lifelong workday: Is there a new face of retirement? In S. J. Czaja, J. Sharit, & J. B. James (Eds.), *Current and Emerging Trends in Aging and Work* (pp. 355–374). doi: 10.1007/978-3-030-24135-3_18
- Judge, T. A., Piccolo, R. F., Podsakoff, N. P., Shaw, J. C., & Rich, B. L. (2010). The relationship between pay and job satisfaction: A meta-analysis of the literature. *Journal of Vocational Behavior*, 77(2), 157–167. doi: 10/excmgh
- Kim, S., & Feldman, D. C. (2000). Working in retirement: The antecedents of bridge employment and its consequences for quality of life in retirement. *Academy of Management Journal*, 43, 1195–1210. doi: 10/dqvvn5
- Kulik, L. (2000). Jobless men and women: A comparative analysis of job search intensity,

- attitudes toward unemployment, and related responses. *Journal of Occupational and Organizational Psychology*, 73(4), 487–500. doi: 10/ctmkx3
- Maxwell, S. E., & Cole, D. A. (2007). Bias in cross-sectional analyses of longitudinal mediation. *Psychological Methods*, 12(1), 23–44. doi: 10/fnrjtt
- Milosevic, M., Golubic, R., Knezevic, B., Golubic, K., Bubas, M., & Mustajbegovic, J. (2011). Work ability as a major determinant of clinical nurses' quality of life. *Journal of Clinical Nursing*, 20(19–20), 2931–2938. doi: 10/dzb65v
- Moen, P. (1996). A life course perspective on retirement, gender, and well-being. *Journal of Occupational Health Psychology*, 1(2), 131–144. doi: 10/crhzs8
- Morelock, J. C., McNamara, T. K., & James, J. B. (2017). Workability and requests for flexible work arrangements among older adults: The role of a time and place management intervention. *Journal of Applied Gerontology*, 36(11), 1370–1392. doi: 10/gb4z67
- Müller, S. (2018, November 8). Lebendige Debatte zur Rente im Deutschen Bundestag [A lively debate on pensions in the German Bundestag]. Retrieved August 5, 2019, from Tagesschau.de website: <https://www.tagesschau.de/inland/rente-267.html>
- Ng, W. (2015). Processes underlying links to subjective well-being: Material concerns, autonomy, and personality. *Journal of Happiness Studies*, 16(6), 1575–1591. doi: 10/gf7rxs
- OECD. (2012, January 1). Average age of retirement in 1970-2012 in OECD countries [InternetDocument]. Retrieved from http://www.oecd.org/els/emp/Summary_1970+values.xls
- Palmore, E., & Luikart, C. (1972). Health and social factors related to life satisfaction. *Journal of Health and Social Behavior*, 13(1), 68–80. doi: 10/ccrdp4

- Proto, E., & Rustichini, A. (2015). Life satisfaction, income and personality. *Journal of Economic Psychology, 48*, 17–32. doi: 10/8jz
- Puvill, T., Lindenberg, J., de Craen, A. J. M., Slaets, J. P. J., & Westendorp, R. G. J. (2016). Impact of physical and mental health on life satisfaction in old age: A population based observational study. *BMC Geriatrics, 16*(1), 194. doi: 10/f9ch6j
- Quick, H. E., & Moen, P. (1998). Gender, employment and retirement quality: A life course approach to the differential experiences of men and women. *Journal of Occupational Health Psychology, 3*(1), 44–64. doi: 10/ffp26v
- Reeuwijk, K. G., Robroek, S. J. W., Niessen, M. A. J., Kraaijenhagen, R. A., Vergouwe, Y., & Burdorf, A. (2015). The prognostic value of the Work Ability Index for sickness absence among office workers. *PloS One, 10*(5), 0126969. doi: 10/gc4m6c
- Rice, N. E., Lang, I. A., Henley, W., & Melzer, D. (2010). Common health predictors of early retirement: Findings from the English Longitudinal Study of Ageing. *Age and Ageing, 40*, 54–61. doi: 10/bstkvv
- Roelen, C. A. M., van Rhenen, W., Groothoff, J. W., van der Klink, J. J. L., Twisk, J. W. R., & Heymans, M. W. (2014). Work ability as prognostic risk marker of disability pension: Single-item work ability score versus multi-item Work Ability Index. *Scandinavian Journal of Work, Environment and Health, 40*(4), 428–431. doi: 10/f59k3t
- Ryan, R. M., & Deci, E. L. (2000). Self-Determination Theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*(1), 68–78. doi: 10/c48g8h
- Ryan, R. M., & Deci, E. L. (2012). Overview of Self-Determination Theory: An organismic-dialectical perspective. In R. M. Ryan (Ed.), *Oxford Handbook of Human Motivation* (pp.

- 3–33). New York: Oxford University Press.
- Saunders, G. R. B., Elkins, I. J., Christensen, K., & McGue, M. (2018). The relationship between subjective wellbeing and mortality within discordant twin pairs from two independent samples. *Psychology and Aging, 33*(3), 439–447. doi: 10/ggnng7
- Schouten, L. S., Bültmann, U., Heymans, M. W., Joling, C. I., Twisk, J. W. R., & Roelen, C. A. M. (2016). Shortened version of the Work Ability Index to identify workers at risk of long-term sickness absence. *European Journal of Public Health, 26*(2), 301–305. doi: 10/f8m87t
- Seitsamo, J., & Ilmarinen, J. (1997). Life-style, aging and work ability among active Finnish workers in 1981—1992. *Scandinavian Journal of Work, Environment & Health, 23*, 20–26. Retrieved from JSTOR.
- Silver, M. P., Settels, J., Schafer, M. H., & Schieman, S. (2019). Getting the hours you want in the preretirement years: Work hour preferences and mismatch among older Canadian workers. *Work, Aging and Retirement, 5*(2), 175–188. doi: 10/ggdjh5
- Sjögren-Rönkä, T., Ojanen, M. T., Leskinen, E. K., Mustalampi, S. T., & Mälkiä, E. A. (2002). 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, 28*(3), 184–190. doi: 10/cf54mx
- Statistisches Bundesamt. (2019). *Annahmen und Ergebnisse der 14. Koordinierten Bevölkerungsvorausberechnung [Assumptions and results of the 14th coordinated population projection]*. Wiesbaden: Statistisches Bundesamt.
- Steptoe, A., Deaton, A., & Stone, A. A. (2015). Subjective wellbeing, health, and ageing. *Lancet, 385*(9968), 640–648. doi: 10/f25v3k

- Trampusch, C. (2005). Institutional resettlement: The case of early retirement in Germany. In W. Streeck & T. Kathleen (Eds.), *Beyond Continuity: Institutional Change in Advanced Political Economies* (pp. 203–228). Oxford: Oxford University Press.
- Tuomi, K., Huuhtanen, P., Nykyri, E., & Ilmarinen, J. (2001). Promotion of work ability, the quality of work and retirement. *Occupational Medicine (Oxford, England)*, *51*(5), 318–324. doi: 10/bjgrnw
- Tuomi, K., Ilmarinen, J., Eskelinen, L., Järvinen, E., Toikkanen, J., & Klockars, M. (1991). Prevalence and incidence rates of diseases and work ability in different work categories of municipal occupations. *Scandinavian Journal of Work, Environment and Health*, *17*(Suppl 1), 67–74.
- van Rijn, R. M., Robroek, S. J. W., Brouwer, S., & Burdorf, A. (2014). Influence of poor health on exit from paid employment: A systematic review. *Occupational and Environmental Medicine*, *71*, 295–301. doi: 10/f52k3n
- van Solinge, H., & Henkens, K. (2005). Couples' adjustment to retirement: A multi-actor panel study. *Journals of Gerontology*, *60*(1), 11–20. doi: 10/dt289j
- van Solinge, H., & Henkens, K. (2008). Adjustment to and satisfaction with retirement: Two of a kind? *Psychology and Aging*, *23*(2), 422–434. doi: 10/fsn6kf
- Verband der Chemischen Industrie e. V. (2018). *Auf einen Blick: Chemische Industrie [At a glance: Chemical industry]*. Retrieved from <https://www.vci.de/vci/downloads-vci/publikation/chemische-industrie-auf-einen-blick.pdf>
- von Bonsdorff, M. E., Huuhtanen, P., Tuomi, K., & Seitsamo, J. (2010). Predictors of employees' early retirement intentions: An 11-year longitudinal study. *Occupational Medicine*, *60*, 94–100. doi: 10/df256n

- Wang, M., & Shi, J. (2014). Psychological research on retirement. *Annual Review of Psychology*, 65, 209–233. doi: 10/gckfpp
- Wang, M., & Shultz, K. S. (2010). Employee retirement: A review and recommendations for future investigation. *Journal of Management*, 36, 172–206. doi: 10/dvtvsd
- Wanous, J. P., Reichers, A. E., & Hudy, M. J. (1997). Overall job satisfaction: How good are single-item measures? *Journal of Applied Psychology*, 82(2), 247–252. doi: 10/fgjq9z
- Ware, J. E., Kosinski, M., Dewey, J. E., & Gandek, B. (2001). *How to score and interpret single-item health status measures: A manual for users of the SF-8 health survey*. Lincoln, Rhode Island: QualityMetric Inc.
- Whiteford, P. (2006). Pension challenges and pension reforms in OECD countries. *Oxford Review of Economic Policy*, 22(1), 78–94. doi: 10/c6gx7s
- Willekens, F. (2016). Demographic transitions in Europe and the world. In Koenraad Matthijs, Karel Neels, Christiane Timmerman, & Jacques Haers (Eds.), *Population Change in Europe, the Middle-East and North Africa: Beyond the Demographic Divide* (pp. 13–44). London: Routledge.

Footnotes

1The SHARE data collection has been funded by the European Commission through FP5 (QLK6-CT-2001-00360), FP6 (SHARE-I3: RII-CT-2006-062193, COMPARE: CIT5-CT-2005-028857, SHARELIFE: CIT4-CT-2006-028812), FP7 (SHARE-PREP: GA N°211909, SHARE-LEAP: GA N°227822, SHARE M4: GA N°261982) and Horizon 2020 (SHARE-DEV3: GA N°676536, SERISS: GA N°654221) and by DG Employment, Social Affairs & Inclusion. Additional funding from the German Ministry of Education and Research, the Max Planck Society for the Advancement of Science, the U.S. National Institute on Aging (U01_AG09740-13S2, P01_AG005842, P01_AG08291, P30_AG12815, R21_AG025169, Y1-AG-4553-01, IAG_BSR06-11, OGHA_04-064, HHSN271201300071C) and from various national funding sources is gratefully acknowledged (see www.share-project.org).

Acknowledgments

The present study did not receive financial support. The authors declare no conflicts of interest. Participants gave informed consent and could omit any question in the survey. All procedures followed were in accordance with the Helsinki Declaration as revised in 2008.

Table 1a

Means, Standard Deviations, Intercorrelations, and Internal Consistencies for the Variables in Non-Retirees in Study 1

Variables	<i>N</i>	<i>M</i>	<i>SD</i>	1	2	3	4	5
1 Life satisfaction	1.707	5.46	0.86	.87 ^a				
2 Control over retirement process	1.708	3.24	1.01	.16***	.29 ^b			
3 Work ability	1.704	8.85	1.55	.33***	.04	-		
4 Health	1.697	4.45	0.92	.34***	.05*	.58***	-	
5 Financial Situation	1.691	3.37	0.53	.32***	.14***	.11***	.16***	-

Note. ^a Cronbach's α for measures with three items and more ^b Pearson's r for two-item measures.

* $p < .05$. *** $p < .001$.

Table 1b

Means, Standard Deviations, Intercorrelations, and Internal Consistencies for the Relevant Variables in Retirees in Study 1

Variables	<i>N</i>	<i>M</i>	<i>SD</i>	1	2	3	4	5
1 Life satisfaction	992	5.66	0.80	.86 ^a				
2 Control over retirement process	990	3.47	1.18	.20***	.28 ^b			
3 Work ability	989	8.23	1.90	.31***	.15***	-		
4 Health	988	4.52	0.90	.37***	.11***	.58***	-	
5 Financial situation	980	3.44	0.54	.40***	.21***	.15***	.17***	-

Note. ^a Cronbach's α for measures with three items and more ^b Pearson's r for two-item measures.

*** $p < .001$.

Table 2

Means, Standard Deviations, Intercorrelations, and Internal Consistencies for the Relevant

Variables in Study 2.

Variables	<i>N</i>	<i>M</i>	<i>SD</i>	1	2	3	4	5	6
1 Life satisfaction (T3)	5,467	8.0	1.5	-					
2 Sense of control (T2)	5,504	3.2	0.6	.26***	.21 ^c				
3 Retirement voluntariness (T2)	4,108	11.1 ^a	-	.08***	.08***	-			
4 Work ability (T1)	4,610	13.0 ^b	-	.08***	.09***	.16***	-		
5 Health (T1)	5,092	3.3	1.0	.25***	.18***	.17***	.35***	-	
6 Perceived financial situation (T1)	3,640	3.2	0.9	.26***	.20***	.04*	.11***	.25***	-
7 Household income (T1)	2,451	5,315	10,157	.07***	.05**	.01	.03	.08***	.15***

Note. ^a percent reporting involuntary retirement ^b percent reporting health problems or disabilities ^c Pearson's *r*.

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

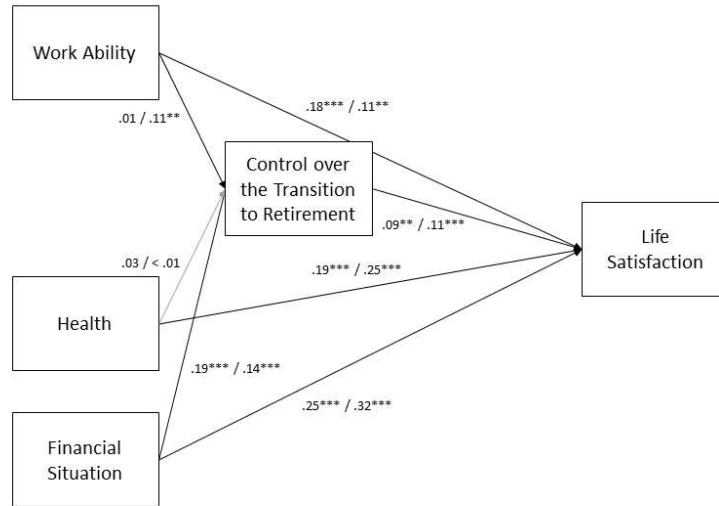


Figure 1

Direct paths of work ability, health, and the perceived financial situation on life satisfaction, and indirect paths via anticipated (for non-retirees) or perceived (for retirees) control over the transition to retirement. Standardized path coefficients for non-retirees / retirees. Non-significant paths are displayed in grey. Covariances between exogenous variables were allowed but are not displayed.

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

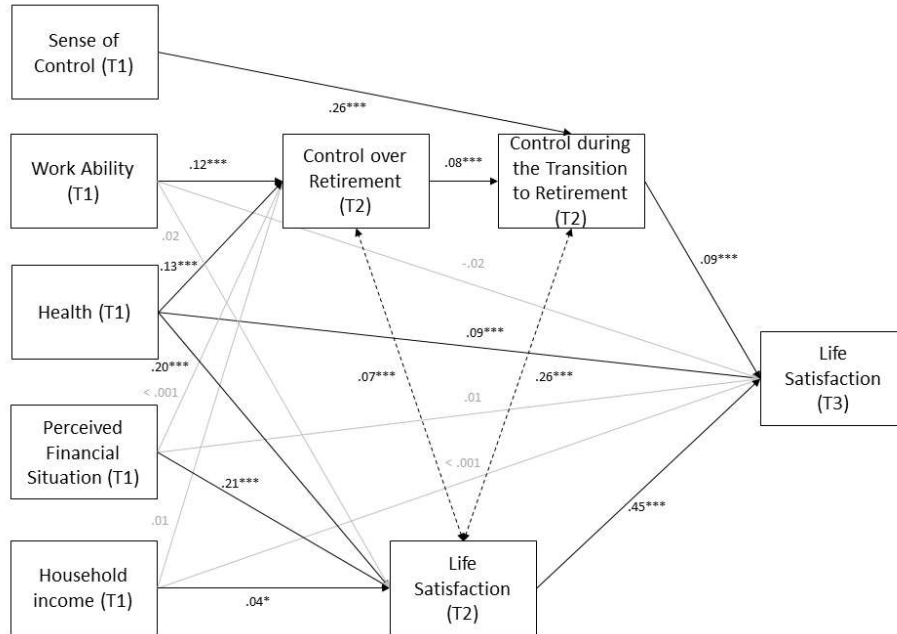


Figure 2

Direct paths of work ability, health, the perceived financial situation, and household income at T1 on life satisfaction at T3, and indirect paths via (a) control over retirement and the perceived control during the retirement transition, (b) life satisfaction at T2. Path coefficients are standardized, and non-significant paths are displayed in grey. Covariances between endogenous variables are displayed with dashed lines. Covariances between exogenous variables were allowed but are not displayed.

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

Discussion

The questions fueling this dissertation were, how work ability could be assessed to help workers, employers and societies to enable extended working lives and how promoting work ability over the working life relates to later life satisfaction. The long-term benefits of promoting work ability would unfold on three levels: At company level, a consistently high work ability throughout the working life would enable workers to engage in gainful employment even beyond their retirement age, thus alleviating the effects of large cohorts leaving the work force for employers regarding skills shortages and brain drain. At societal level, the same effect could reduce the pressure on pension systems. At the individual level, workers would be able to consciously choose how to spend their time in retirement and whether to engage in gainful employment or not.

To provide employers, societies, and individuals with potential starting points for intervention to maintain work ability, in the first study of this dissertation, the WAS-R was presented as an alternative measurement instrument for work ability. The questionnaire was translated from English to German via translation and back translation and evaluated in two samples of 1,093 executives and academics of the German chemical industry, and 359 employees of a financial service company. In this study, the structure of the WAS-R was examined, as well as its relationships with the WAI (Tuomi, Ilmarinen, et al., 1991), sick leave, expected and desired retirement age, and the intention to remain employed after retirement.

In the second study, the relations of work ability as measured by the WAS-R, and job satisfaction, turnover intention, work engagement and presenteeism, as well as the frequency of four work-related behavior and experience patterns measured by the AVEM, health, protection, overexertion and burnout, were examined in a sample of 182 employees of an international financial service company. This study further explored relations of the WAS-R and the AVEM to other relevant constructs and differences between them.

In the third contribution, perceived control over or during the retirement process was tested as a mediator of the relationship between work ability, health, and the financial situation on the one hand, and later life satisfaction on the other hand. Based on SDT, a higher work ability, as well as better health and financial situation, in old age was hypothesized to lead to a higher perceived control over one's life circumstances, which in turn was hypothesized to have a positive effect on life satisfaction. Two studies were conducted to test the model: one study employed cross-sectional data from 2,701 managers from the German chemical industry aged

50 and older, and the other longitudinal data from SHARE of individuals aged 50 and older and spanning an average period of more than five years. Data on life satisfaction, autonomy, work ability, health, and the financial situation were analyzed regarding the assumed relationships using structural equation models, and direct and indirect effects were compared.

The following discussion will be organized around three main findings of this dissertation: (1) the structural integration of organizational resources into the measurement of work ability by the WAS-R compared to the WAI, (2) construct validity of the WAS-R, and (3) the meaning of work ability regarding control over life circumstances, for example, a continued engagement in gainful employment, and later life satisfaction.

Integrating organizational resources into the measurement of work ability

The WAS-R was designed to integrate the holistic model of work ability into the measurement of work ability. Its 16 subscales depict several aspects of personal resources, such as physical and mental health, and the area of organizational resources, such as the abilities of the direct supervisor, respect and autonomy in the workplace, and showed predominantly satisfactory internal consistencies. The results of structural equation modeling indicated that the WAS-R may represent five latent factors, which could be described as: social environment, health, competence, values, and work. Consequently, the WAS-R may posit a valuable representation of the holistic model of work ability (Ilmarinen & Ilmarinen, 2015), and support previous research on the holistic model of work ability (Martinez et al., 2016).

Of the two parts of the WAS-R, that is, individual and organizational resources, higher correlations with the original WAI were found with the part that refers to individual rather than organizational resources. This expected finding indicates in particular the great importance that the WAI ascribes solely to the individual factors of work ability, especially physical and mental health (e.g., Tuomi, Eskelinen, et al., 1991).

The integration of organizational resources, however, benefits the practical relevance of work ability and the WAS-R for employers. Among the organizational resources, the communicative competencies of the direct supervisor, the perceived respect at the workplace and the perceived control over one's working conditions showed comparatively high correlations with the WAI, sick leave, and the desired retirement age. Differences in these parameters are therefore accompanied by the highest differences in terms of work ability as measured by the WAI, illness, and desired work force participation. Other research has found work ability to be related to, for example, on-the-job training and community at the work place (Cotrim et al., 2019), the

organization of the workplace (Fischer et al., 2006), and supervisor support (Gharibi et al., 2016). As it is easier to reform the working life and working environment than to adapt human beings and aging to the working life (Ilmarinen & Ilmarinen, 2015), the organizational resources parts of the WAS-R can help employers to target interventions at areas that most affect the work ability of their staff (Ilmarinen, 2019).

The WAS-R in relation to other relevant constructs

When it was coined, the term work ability was operationally defined (Tuomi, Ilmarinen, et al., 1991). To be construct-valid, an inventory with the claim to measure work ability should therefore be as closely related as possible to the operational definition of work ability, that is, the WAI. In this dissertation, the correlations between the WAS-R and the WAI were high in three different samples, indicating construct validity of the WAS-R. The fact that WAS-R and WAI were not perfectly correlated can probably be attributed to the two goals of the WAS-R: (1) measuring work ability as accurately as possible and (2) integrating the holistic model of work ability. Therefore, non-perfect correlations with the WAI are first and foremost an indication for the necessity of further research on both, the WAS-R as well as the construct of work ability itself (Cadiz et al., 2019). In addition to the overall correlation of WAI and WAS-R in the present studies, recent research indirectly supports the validity of the WAS-R regarding the WAI on subscale level, finding correlations of the WAI with measures of managerial support and peer support comparable to the correlations of the respective WAS-R subscales and the WAI in the present studies (Gharibi et al., 2016).

To be considered construct-valid, the WAS-R should furthermore yield similar relations to the job and retirement attitudes, sick leave and presenteeism, as well as the work-related experience and behavior patterns like the WAI. These relations were investigated in the first two articles of the present dissertation:

Regarding job attitudes, high correlations were found between the WAS-R and job satisfaction, and job engagement in the second study. In general, these findings are in line with earlier research indicating moderate relationships of job satisfaction and job engagement with the WAI (Airila et al., 2012, 2014; Tomietto et al., 2019), thus yielding evidence for the construct validity of the WAS-R. However, the observed relationships of the WAS-R with job satisfaction and job engagement seem to be closer than those of the WAI with these two job attitudes. This finding might be attributed to the integration of more organizational resources with closer relations to job attitudes: While the WAI emphasizes individual resources and is thus closer related to the respective parts of the WAS-R, the additional integration of

organizational resources might yield total WAS-R results closer related to job attitudes when compared to the WAI.

Regarding retirement attitudes, comparable small to moderate correlations were found between the desired retirement age and the WAS-R and WAI in both samples in the first study, again supporting the construct validity of the WAS-R. Later work force participation and retirement behavior (Jääskeläinen et al., 2016; Sell et al., 2009; von Bonsdorff et al., 2010), as well as retirement intentions (e.g., von Bonsdorff et al., 2010) have been shown to be related to the WAI. The positive relation of the WAS-R and desired retirement age indicates that those with higher work ability scores intend to work longer, which can be interpreted as support for the validity of the WAS-R regarding retirement intentions.

Furthermore, like the WAI, the WAS-R has been found to be positively related to avoided productivity loss, that is, the inverse of absolute presenteeism (Scuffham et al., 2014). As work ability has previously been demonstrated to be related to presenteeism (Vänni et al., 2012), this finding can again be interpreted as supporting the validity of the WAS-R. Moreover, it emphasizes the importance of maintaining work ability not only as a matter of altruistic goodwill towards employees, but also as an economical factor for employers with regards to workforce productivity. No significant relationship was found between the WAS-R and relative presenteeism, which compares participants' own performance to that of an imagined "typical worker" in the same field, in the second study – in contrast to the WAI, which yielded a positive albeit small correlation. For both measures, WAS-R and WAI, however, the relation with absolute presenteeism was stronger than that with relative presenteeism. This could indicate that participants take their own work ability into account and correct for it when estimating their current performance. Those with reduced work ability would then tend to underestimate the amount of work that has not been done, whereas those with a higher work ability would tend to overestimate it. Further research should specifically investigate the different relations between the two measurements of work ability and the two operationalizations of presenteeism.

The negative relations with turnover intention in the second study, sickness absence in both samples of the first study, and post-retirement work intention in the sample of financial service providers in the first study were small to moderate and provide mixed evidence for construct validity of the WAS-R:

The findings on turnover intention expectedly mirror those on job satisfaction and are in line with research on the relationship between WAI scores and turnover intention (Camerino

et al., 2006; Derycke et al., 2012), again indicating support for the validity of the WAS-R. Likewise, the negative relation between the WAS-R and sickness absence, indicating that those with higher work ability scores reported less days of sick leave from work, is in line with research on the relation between sickness absence and the WAI (Airila et al., 2012; Reeuwijk et al., 2015; Schouten et al., 2016).

In contrast, the negative relation between WAS-R scores and post-retirement work intention seems to contradict the positive relationship between WAS-R scores and the participants' desired retirement ages, and is also not in line with the non-significant relationship between WAI scores and post-retirement work intention in that sample. First, this finding indicates that a good work ability might be a necessary but by no means sufficient condition for the willingness to extend the individual's working life. Without a good work ability at the end of the work life, further pursuing gainful employment is beyond the individual's capabilities. A good work ability, on the other hand, does not automatically result in the wish to continue gainful employment.

This could point to the second finding, that is, the demonstration of the importance of the basic psychological need for autonomy as postulated by the SDT: The executives and academics in Sample 1 possess both, a higher autonomy in their work life as well as a better work ability than the employees of the financial service provider in Sample 2, and can also be assumed to have larger financial resources. When it comes to post-retirement work, those in Sample 1 are thus (1) accustomed to a high level of autonomy, and consequently self-determined decision-making, (2) able to consciously decide whether to continue working or to fully retire, considering their work ability and financial resources, (3) more inclined to post-retirement work in their own field, but less to post-retirement work at all (M. Wang & Shi, 2014). Those in Sample 2, on the other hand, experience less autonomy during their work life and may thus perceive retirement as a means to regain control over their life circumstances, thus supporting the importance of satisfying the need for autonomy. In line with the continuity theory of normal aging (Atchley, 1989), a higher work ability might then put them in a situation where they feel fit enough to rather consider full retirement and to try something new, instead of avoiding this risk by continuing the work they are used to. This notion is supported by findings that low intrinsic motivation for work is associated with gains in perceived autonomy via full retirement (Henning et al., 2019). However, this does neither explain the non-significant relation of post-retirement work intention with the WAI nor with the WAS-R scores in the other sample. The latter could indicate a potential type I error, where a significant result is obtained due to

sampling bias. Future research should investigate not only the relationship between WAS-R scores and post-retirement work intention, but preferably also actual post-retirement work behavior.

Furthermore, mixed evidence was found regarding the relation with the expected retirement age in both samples of the first study: For the WAS-R, consistently no correlation was found with expected retirement age. The non-significant relationship might be attributed to the legislative attempts to reduce early retirement as described earlier (Börsch-Supan & Jürges, 2009), effectively reducing variance of expected retirement ages. In line with that, relatively little variance in expected retirement ages compared to variance in desired retirement ages was found in the sample of financial service providers. Contradicting this explanation, however, is the significant positive relationship between the expected retirement age and the WAI in the sample of financial service providers in the first study. To further explain these differences, the characteristics of the two samples and of the WAS-R as well must be considered: Those in the managerial sample possess higher control over their working circumstances compared to the financial service provider sample. Consequently, a reduced work ability in terms of their individual resources might be counterbalanced by a self-determined adjustment of the working life circumstances, that is, the organizational resources. In contrast, those in the financial service provider sample possess less of these possible controls regarding their organizational resources. A decrease in individual resources consequently is related to a decreased expected retirement age, leading to a significant correlation between WAI and the latter. The WAS-R, however, takes more organizational resources into account than the WAI. These organizational resources cannot be deliberately adjusted by workers in low-control jobs, to counterbalance losses in individual resources. This might explain why no relation between WAS-R and expected retirement age could be obtained in this group, in contrast to the significant relation between WAI and expected retirement age.

Lastly, the WAS-R successfully differentiated between the four work-related behavior and experience patterns measured by the AVEM in the second study: Participants with a healthy pattern showed a significantly higher work ability than persons in the patterns protection, as well as risk patterns A and B. Persons with the unambitious pattern still had a higher work ability than persons with a risk pattern B. The salutogenic approach of the AVEM to focus on factors supporting a healthy work experience complements evidence-based claims from scholars in favor of the promotion and maintenance of work ability throughout the working life (e.g., Ilmarinen & Ilmarinen, 2015). In contrast, the WAI only differentiated between those

participants in the healthy versus risk pattern B, and between those in the protection versus risk pattern B. Regarding construct validity, this finding has to be interpreted as a potential drawback: An instrument that aims for an accurate measurement of work ability should yield similar work ability scores regarding the four patterns of the AVEM. On the other hand, especially the differentiation between those in the healthy pattern and in the protective pattern could benefit the measurement of work ability: The protective pattern is characterized by low ambition and a pronounced attitude of protection combined with relatively high life satisfaction. Similarly high proportions of the unambitious resting pattern were already found in studies among young teachers (cf. Zimmermann et al., 2012). Individuals with a protective pattern oftentimes "descend" into the risk pattern for burnout over time (Vollmer et al., 2010).

The protective pattern thus is a double burden for individuals and companies alike: In the present study, individuals with the protective pattern already had a lower ability to work than individuals with the health pattern. Accordingly, these individuals are more susceptible to sick leave and early retirement. In addition, the present study also showed the relationship between the pattern of protection and reduced work engagement compared to individuals in the healthy pattern. Work engagement has also been shown in earlier studies to be a determinant of work ability and health (Airila et al., 2014; Leijten et al., 2015).

The large proportion of individuals in the unambitious protection pattern should therefore be seen as a warning signal: Neither the already reduced work ability and a possible "descent" into the risk pattern of burnout, nor a long-lasting joyless execution of work and the resulting reduced efficiency (Bakker et al., 2008) are in the interest of employers and employees. Positive correlations between organizational resources and work engagement (Bakker et al., 2008) indicate that both companies and individuals can benefit in terms of improved work ability from measures to improve organizational resources.

Work ability and life satisfaction: The mediating role of perceived control

In addition to the operationalization of work ability, the present dissertation was concerned with the relationship between later life satisfaction, control over life circumstances, and work ability throughout the working life. With regard to population aging and long periods of retirement, maintenance of life satisfaction in this phase becomes a pressing issue for societies (Eagers et al., 2018; Ilmarinen, 2019; Silver et al., 2019; Statistisches Bundesamt, 2019). Work ability (Seitsamo & Ilmarinen, 1997; Tuomi et al., 2001), health (Puvill et al., 2016; Steptoe et al., 2015), and the financial situation (Boes & Winkelmann, 2009; Boyce et al., 2010; Judge et al., 2010) have been found to be related to life satisfaction. In line with SDT (Ryan & Deci,

2012), the third contribution investigated the mediation role of a sense of control in the relationship between former work ability, health, and financial situation and later life satisfaction.

In Study 1 of the third contribution, control over the retirement was found to partially mediate the relationship between retirees' work ability and life satisfaction, and to partially mediate the relationship between the perceived financial situation and life satisfaction in retirees and non-retirees. In Study 2, control consistently partially mediated the relationships between work ability and life satisfaction, and health and life satisfaction. These findings support the model derived from SDT and the importance of satisfying the basic need for autonomy: the higher the participants' work ability, the better their health and perceived financial situation, the higher their control over the circumstances of the transition to retirement, the higher their subsequent life satisfaction. The findings are in line with earlier research finding involuntary early retirement to be related to reduced work ability and health (Jääskeläinen et al., 2016; Rice et al., 2010; Roelen et al., 2014; van Rijn et al., 2014), and a sense of control to be related to higher life satisfaction (Dingemans & Henkens, 2015; Henkens et al., 2018; van Solinge & Henkens, 2008).

Furthermore, these findings emphasize the importance of maintaining work ability and health over the (work) life span not only from an employer's perspective facing labor force shortages (Ilmarinen, 2019). In contrast, work ability is indirectly related to later life satisfaction, making its maintenance imperative for employers, societies, and individuals alike (Eagers et al., 2018). Moreover, employers should also be concerned about participating older workers in planning their transition to retirement. Offering cooperative pathways into retirement could satisfy older workers' need for a sense of control over their lives' circumstances as proclaimed by SDT (Ryan & Deci, 2012), especially in the transition to retirement (e.g., Silver et al., 2019), and ultimately be beneficial for later life satisfaction.

The higher work ability scores in the managerial sample with higher control over work circumstances in the first study had already indicated a positive relationship between work ability and autonomy. The two studies in the third contribution further investigated this relationship and the effect of higher control on later life satisfaction, and found support for the expected mediating effect of control in the transition to retirement between work ability on the one hand and later life satisfaction on the other hand.

Theoretical implications

The present dissertation investigated the relationship between control over or during the retirement process and later life satisfaction, and work ability as a potential enabler of such control. The support for this mediation effect in two samples supports the importance of promoting work ability throughout the working life, and of a sense of control for life satisfaction as hypothesized by SDT.

The theoretical implications of this dissertation are twofold: First, the integration of the holistic model into the measurement of work ability by the WAS-R highlights the need for further research into the concept and measurement of work ability (cf. Cadiz et al., 2019). The original construction of the WAI provided industrial and organizational researchers with an instrument with high relevance for work force participation, but little insight into the underlying mechanisms (Cadiz et al., 2019). Regarding work ability, important questions still remain unanswered, for example, the integration of the WAS-R into other models of work force participation and well-being, for example, the Job-Demands Resources Model (Bakker & Demerouti, 2007), or a concise theoretical definition of work ability in conjunction with and in contrast to other related constructs, especially in industrial and organizational research, which should be addressed in future research.

Second, the mediating role of a sense of control over the retirement process emphasizes the importance of a sense of control in the transition to retirement and in older ages. These findings corroborate the fundamental significance of a sense of control or autonomy as proposed by SDT (Ryan & Deci, 2012). The present dissertation for the first time investigated the mediating role of a sense of control in the relationship between former work ability, health, and the financial situation and later life satisfaction.

Practical implications

The practical implications of this dissertation unfold on three levels: On individual level, the long-term positive relationships between work ability, control over life circumstances, and life satisfaction in later life are imperative for workers to take care for their work ability even in younger ages. In doing so, workers secure the important potential for a self-determined transition to retirement and increase the chance of a satisfying adjustment to the possibly long phase of full retirement. Moreover, the positive relationship between control over life circumstances and life satisfaction highlights a potential to increase life satisfaction: Early communication between employee and employer regarding wishes and expectations for the individual transition

to retirement might lead to employees' perception of active participation in the process and self-determination, consequently leading to higher life satisfaction.

On company level, the positive relationships between work ability and autonomy emphasize the importance of work ability management (Ilmarinen & Ilmarinen, 2015), that is, maintaining staff work ability throughout the working life. The higher work ability provides older workers with the opportunity to continue their career even beyond retirement age, consequently preserving valuable skills and knowledge part of the companies' work force. The negative relationship between work ability and post-retirement work intention in the sample with lower perceived control in contrast to the non-significant relationship in the sample with higher perceived control further indicates the importance of the psychological need for autonomy: The perception of paid work as an obstacle to a self-determined life might lead to such negative relationship. Providing workers with a feeling of control over their life circumstances at work might benefit their willingness to prolong their working lives, and thus preserve valuable resources for the work force.

The same applies to the societal level: The maintenance of a high work ability of the work force throughout the working life is in the best interest of societies. In doing so, societies first provide workers with the opportunity to lead a self-determined life in retirement, leading to potentially more satisfied older individuals. Second, the maintenance of work ability ensures that the deliberate choice to prolong working lives becomes an option for workers who otherwise might have been pushed out of the work force due to deteriorating work ability. Furthermore, the findings described above point to the expectation that positive incentives, like increased control over working life circumstances, might support the decision to prolong working lives, whereas negative measures, for example, an increase in statutory retirement age alone, might lead to resistance and reactance in workers regarding the prolongation of their working lives.

The integration of the holistic model into the measurement of work ability by the WAS-R serves the goal of maintaining work ability throughout the working life on all three levels. From a practitioners' perspective, the WAS-R constitutes a comprehensive instrument to measure work ability and several of its antecedents among both individual and organizational resources in an easy-to-administer, online based questionnaire. In the present studies, the acceptance of employees and employers was high, leading to high participation rates and positive feedback during the projects. The WAS-R thus represents a supplement to more qualitative

approaches like, for example, the Work Ability Personal/Company Radar (Ilmarinen & Ilmarinen, 2015). Compared to, for example, the Copenhagen Psychosocial Questionnaire (Kristensen et al., 2005), the WAS-R integrates organizational resources into the measurement of work ability from a more salutogenic perspective, and additionally assesses aspects of physical health. The subscales on organizational resources thus provide employers with indications on where to start interventions to maintain and promote work ability.

Limitations and research implications

The present dissertation employed data from five samples, $182 \leq n \leq 5,545$ with different occupational and educational features, and in part even longitudinal and multinational data. Some limitations must be considered when interpreting the findings:

First, the available findings were mainly obtained based on cross-sectional surveys. Recent research conceptualizes the transition to retirement as a process over a longer period of time that is influenced by many factors (Shultz & Wang, 2011; M. Wang & Shi, 2014), so that longitudinal data is preferable. While the first two articles focused on cross-sectional relationships, the third contribution addressed the longitudinal relationships between work ability, control over the transition to retirement, and life satisfaction. Given the sample size of both groups in Study 1, the correlative findings of this study have great power to detect even small effects. Nevertheless, a second study was conducted to validate the findings from the first study in longitudinal data from the international panel study SHARE. In SHARE, as in other large panel studies, the advantages of large power and long periods of time are countered by psychometric limitations through the use of short scales and limitations of validity through the use of ad hoc indicators as disadvantages (Eisinga et al., 2013; Emons et al., 2007; Furr, 2011). However, the long-term histories in large panel studies make it possible to observe the entire transition phase into retirement, which usually takes place between the ages of 55 and 70 (e.g., Adams & Rau, 2011; Wöhrmann et al., 2014), and does not necessarily end then (Shultz & Wang, 2011; M. Wang & Shi, 2014), so that targeted recruitment in smaller individual studies is hardly possible.

Second, as many factors influence the transition to retirement and its potential outcomes, only small but consistent effects especially over the long timespan of five years in the third contribution could be obtained. SDT itself postulates two additional psychological needs that might impact later life satisfaction, the need for relatedness, and the need for competence (cf. Ryan & Deci, 2012). Recent research from an SDT perspective revealed that those intrinsically motivated for work benefit from continuing employment by satisfying their need for relatedness, whereas those without intrinsic motivation for work benefit from full retirement by

satisfying their need for autonomy (Henning et al., 2019). In line with that, Fasbender, Wang, Voltmer, and Deller (2016) found personal and social meanings of work to be positively related to engagement in post-retirement work. As a continued engagement in paid work provides older workers with continued social contact with co-workers, and also bears the potential to experience competence in daily work life, further research should investigate the interplay of life satisfaction as a result of the satisfaction of these needs in the transition to retirement.

Third, some of the constructs that have been simply bi-directionally linked in this dissertation may have more complex relationships (Elovainio et al., 2015; Xanthopoulou et al., 2009). Health, for example, has repeatedly been found to not only affect post-retirement workforce participation (Krause et al., 1997), but also to be affected by post-retirement work vice versa (Lux & Scherger, 2018; Zhan et al., 2009). Likewise, work engagement may affect work ability, which in turn affects work engagement. In addition, some of the applied multidimensional inventories overlap: The AVEM, for example, contains a dimension "Professional ambition", which could have parallels with the Utrecht Work Engagement Scale also used. These overlaps may be due to interacting relationships and the resulting chicken-and-egg problem. Future studies should, however, focus more on discriminatory validity by careful a priori selection of appropriate instruments and a posteriori statistical methods to delimit the existing constructs, for example factor analyses.

Fourth, care should be taken when generalizing the findings to a general population. One of the two samples of the first study as well as one of the samples of the third contribution consisted of executives and academics from the German chemical industry. These groups differed from the overall population not least in terms of their high level of education. In addition, the second sample of the first study as well as the sample of the second study were all white-collar workers. A transfer of the results in particular to blue-collar workers must therefore be critically examined. On the one hand, the homogeneity of the groups could result in a lower variance, for example, in health, ability to work and life satisfaction. Effects that show up in data with such low variance could become more apparent in groups with greater variance. On the other hand, the results could be confounded by homogeneity characteristics, for example by the fact that certain factors - which have a negative influence on the ability to work - may not occur at all in the selected group.

Conclusion

The current long period of time that older individuals spend in retirement is a major challenge for societies, companies and individuals. The long-term maintenance of work ability is of great relevance in order to enable older individuals to lead a self-determined life. Consequently, the calls to promote work ability to enable a healthy, active, and happy life in older ages are manifold (e.g, Derycke et al., 2012; Vänni et al., 2012; von Bonsdorff et al., 2016).

In order to meet this challenge, the integration of the holistic model of work ability into the measurement of work ability as reflected by the WAS-R provides users with the opportunity to target interventions to improve work ability directly from the measurement results. The perspective of intersecting personal and organizational resources in the assessment of work ability can also be interpreted in line with the patterns of the AVEM as shown in the second study. Moreover, the promotion of work ability supports the salutogenic approach of the AVEM in maintaining resources instead of curing losses. Finally, the results of the third contribution emphasize the importance of maintaining work ability throughout the working life to ensure perceived self-determination also in old age and especially in the transition to retirement. The present dissertation therefore contributed to research on work ability, participation in the labor market, and life satisfaction. In doing so, the dissertation concerned factors at the intersection of work and organizational psychology, health and social sciences.

References

- Adams, G. A., & Rau, B. L. (2011). Putting off tomorrow to do what you want today: Planning for retirement. *American Psychologist, 66*(3), 180–192.
<https://doi.org/10.1037/a0022131>
- Ahlstrom, L., Grimby-Ekman, A., Hagberg, M., & Dellve, L. (2010). The Work Ability Index and single-item question: Associations with sick leave, symptoms, and health. *Scandinavian Journal of Work, Environment and Health, 36*(5), 404–412.
<https://doi.org/10.5271/sjweh.2917>
- Ahmed, A. M., Andersson, L., & Hammarstedt, M. (2012). Does age matter for employability? A field experiment on ageism in the Swedish labour market. *Applied Economics Letters, 19*(4), 403–406. <https://doi.org/10.1080/13504851.2011.581199>
- Airila, A., Hakanen, J. J., Punakallio, A., Lusa, S., & Luukkonen, R. (2012). Is work engagement related to work ability beyond working conditions and lifestyle factors? *International Archives of Occupational and Environmental Health, 85*(8), 915–925.
<https://doi.org/10.1007/s00420-012-0732-1>
- Airila, A., Hakanen, J. J., Schaufeli, W. B., Luukkonen, R., Punakallio, A., & Lusa, S. (2014). Are job and personal resources associated with work ability 10 years later? The mediating role of work engagement. *Work and Stress, 28*(1), 87–105.
<https://doi.org/10.1080/02678373.2013.872208>
- Alavinia, S. M., van den Berg, T. I. J., van Duivenbooden, J. C., Elders, L. A. M., & Burdorf, A. (2009). Impact of work-related factors, lifestyle, and work ability on sickness absence among Dutch construction workers. *Scandinavian Journal of Work, Environment and Health, 35*(5), 325–333. <https://doi.org/10.5271/sjweh.1340>
- Albert, R., Escot, L., & Fernández-Cornejo, J. A. (2011). A field experiment to study sex and age discrimination in the Madrid labour market. *International Journal of Human Resource Management, 22*(2), 351–375. <https://doi.org/10.1080/09585192.2011.540160>

- Alcser, K. H., Benson, G., Börsch-Supan, A., Brugiavini, A., Christelis, D., Croda, E., Das, M., Luca, G. de, Harkness, J., Hesselius, P., Jappelli, T., Jürges, H., Kalwij, A., Kemperman, M.-L., Klevmarcken, A., Lipps, O., Paccagnella, O., Padula, M., Perrachi, F., ... Weerman, B. (2005). *The Survey of Health, Ageing, and Retirement in Europe: Methodology* (A. Börsch-Supan & H. Jürges, Eds.). MEA.
- American Psychiatric Association. (2013). *Diagnostic and Statistical Manual of Mental Disorders (DSM-5)*. American Psychiatric Pub.
- Amir, Y. (1969). Contact hypothesis in ethnic relations. *Psychological Bulletin*, *71*(5), 319–342. <https://doi.org/10.1037/h0027352>
- Anxo, D., Ericson, T., & Jovilet, A. (2012). Working longer in European countries: Underestimated and unexpected effects. *International Journal of Manpower*, *33*, 612–628. <https://doi.org/10.1108/01437721211261787>
- Astheimer, S. (2017). Fachkräfte-Engpässe: Die Bewerber sind die Chefs [Skilled manpower bottlenecks: The applicants are the bosses]. *Frankfurter Allgemeine Zeitung*. <https://www.faz.net/1.5296060>
- Atchley, R. C. (1989). A continuity theory of normal aging. *Gerontologist*, *29*, 183–190. <https://doi.org/10.1093/geront/29.2.183>
- Bakker, A. B., & Demerouti, E. (2007). The Job Demands-Resources model: State of the art. *Journal of Managerial Psychology*, *22*(3), 309–328. <https://doi.org/10.1108/02683940710733115>
- Bakker, A. B., Schaufeli, W. B., Leiter, M. P., & Taris, T. W. (2008). Work engagement: An emerging concept in occupational health psychology. *Work and Stress*, *22*(3), 187–200. <https://doi.org/10.1080/02678370802393649>
- Bender, K. A. (2012). An analysis of well-being in retirement: The role of pensions, health, and ‘voluntariness’ of retirement. *Journal of Socio-Economics*, *41*(4), 424–433. <https://doi.org/10.1016/j.socec.2011.05.010>

- Bendick, M., Brown, L. E., & Wall, K. (1999). No foot in the door: An experimental study of employment discrimination against older workers. *Journal of Aging and Social Policy*, *10*(4), 5–23. https://doi.org/10.1300/j031v10n04_02
- Bethge, M., Radoschewski, F. M., & Gutenbrunner, C. (2012). The Work Ability Index as a screening tool to identify the need for rehabilitation: Longitudinal findings from the Second German Sociomedical Panel of Employees. *Journal of Rehabilitation Medicine*, *44*(11), 980–987. <https://doi.org/10.2340/16501977-1063>
- Boes, S., & Winkelmann, R. (2009). The effect of income on general life satisfaction and dissatisfaction. *Social Indicators Research*, *95*(1), 111. <https://doi.org/10.1007/s11205-009-9452-7>
- Bomsdorf, E. (2004). Life expectancy in Germany until 2050. *Experimental Gerontology*, *39*(2), 159–163. <https://doi.org/10.1016/j.exger.2003.11.002>
- Börsch-Supan, A. (1992). Population aging, social security design, and early retirement. *Journal of Institutional and Theoretical Economics*, *148*(4), 533–557.
- Börsch-Supan, A. (2000). A model under siege: A case study of the German retirement insurance system. *Economic Journal*, *110*(461), 24–45. <https://doi.org/10.1111/1468-0297.00506>
- Börsch-Supan, A. (2019a). *Survey of Health, Ageing and Retirement in Europe (SHARE) Wave 1* [Data set]. SHARE–ERIC. <https://doi.org/10.6103/SHARE.w1.700>
- Börsch-Supan, A. (2019b). *Survey of Health, Ageing and Retirement in Europe (SHARE) Wave 2* [Data set]. SHARE–ERIC. <https://doi.org/10.6103/SHARE.w2.700>
- Börsch-Supan, A. (2019c). *Survey of Health, Ageing and Retirement in Europe (SHARE) Wave 4* [Data set]. SHARE–ERIC. <https://doi.org/10.6103/SHARE.w4.700>
- Börsch-Supan, A. (2019d). *Survey of Health, Ageing and Retirement in Europe (SHARE) Wave 5* [Data set]. SHARE–ERIC. <https://doi.org/10.6103/SHARE.w5.700>

- Börsch-Supan, A. (2019e). *Survey of Health, Ageing and Retirement in Europe (SHARE) Wave 6* [Data set]. SHARE–ERIC. <https://doi.org/10.6103/SHARE.w6.700>
- Börsch-Supan, A. (2019f). *Survey of Health, Ageing and Retirement in Europe (SHARE) Wave 7* [Data set]. SHARE–ERIC. <https://doi.org/10.6103/SHARE.w7.700>
- Börsch-Supan, A., Brandt, M., Hunkler, C., Kneip, T., Korbmacher, J., Malter, F., Schaan, B., Stuck, S., & Zuber, S. (2013). Data resource profile: The Survey of Health, Ageing and Retirement in Europe (SHARE). *International Journal of Epidemiology*, 42(4), 992–1001. <https://doi.org/10.1093/ije/dyt088>
- Börsch-Supan, A., & Jürges, H. (2009). Early retirement, social security and well-being in Germany. In *Developments in the economics of aging* (pp. 173–199). University of Chicago Press.
- Börsch-Supan, A., & Wilke, C. B. (2004). The German public pension system: How it was, how it will be. *National Bureau of Economic Research Working Paper, w10525*. <https://doi.org/10.2139/ssrn.1090895>
- Boyce, C. J., Brown, G. D. A., & Moore, S. C. (2010). Money and happiness: Rank of income, not income, affects life satisfaction. *Psychological Science*, 21(4), 471–475. <https://doi.org/10.1177/0956797610362671>
- Bundesinstitut für Bevölkerungsforschung. (2018). *Lebenserwartung: Fernere Lebenserwartung im Alter 65 in West- und Ostdeutschland nach Geschlecht, Sterbetafel 1958 bis 2015 [Life expectancy: Distant life expectancy at age 65 in West and East Germany by gender, actuarial table 1958 to 2015]*. Bundesinstitut Für Bevölkerungsforschung. https://www.bib.bund.de/DE/Fakten/Fakt/S37-Lebenserwartung-Alter-65-Geschlecht-West-Ost-ab-1958.html;jsessionid=28EFF5AC9728CACBBF9CFD64BC5ECFBD.2_cid380?nn=9992060
- Bundesministerium für Arbeit und Soziales. (2017). *Geschichte der gesetzlichen Rentenversicherung [History of statutory pension insurance]*.

<https://www.bmas.de/DE/Themen/Rente/Gesetzliche-Rentenversicherung/Geschichte-GUV/geschichte-der-gesetzlichen-rentenversicherung.html>

Sozialgesetzbuch (SGB) Sechstes Buch (VI): Gesetzliche Rentenversicherung, Pub. L. No.

SGB VI § 235 Regelaltersrente (2007). https://www.gesetze-im-internet.de/sgb_6/___235.html

Cadiz, D. M., Brady, G., Rineer, J. R., & Truxillo, D. M. (2019). A review and synthesis of the work ability literature. *Work, Aging and Retirement*, 5(1), 114–138.

<https://doi.org/10.1093/workar/way010>

Calvo, E., Haverstick, K., & Sass, S. A. (2009). Gradual retirement, sense of control, and retirees' happiness. *Research on Aging*, 31(1), 112–135.

<https://doi.org/10.1177/0164027508324704>

Camerino, D., Conway, P. M., van der Heijden, B. I. J. M., Estryng-Behar, M., Consonni, D., Gould, D., & Hasselhorn, H.-M. (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. <https://doi.org/10.1111/j.1365-2648.2006.04046.x>

Conen, W. S., Henkens, K., & Schippers, J. J. (2011). Are employers changing their behavior toward older workers? An analysis of employers' surveys 2000-2009. *Journal of Aging and Social Policy*, 23, 141–158. <https://doi.org/10.1080/08959420.2011.551612>

Cotrim, T. P., Ribeiro, C., Teles, J., Reis, V., Guerreiro, M. J., Janicas, A. S., Candeias, S., & Costa, M. (2019). Monitoring Work Ability Index during a two-year period among portuguese municipality workers. *International Journal of Environmental Research and Public Health*, 16(19), 3674. <https://doi.org/10.3390/ijerph16193674>

Deci, E. L., & Ryan, R. M. (2008). Self-Determination Theory: A macrotheory of human motivation, development, and health. *Canadian Psychology/Psychologie Canadienne*, 49, 182–185. <https://doi.org/10.1037/a0012801>

- Deppe, I., & Foerster, L. (2014). *125 Jahre gesetzliche Rentenversicherung [125 years of statutory pension insurance]* (Deutsche Rentenversicherung Bund, Ed.). August Dreesbach.
- Derycke, H., Clays, E., Vlerick, P., D'Hoore, W., Hasselhorn, H. M., & Braeckman, L. (2012). Perceived work ability and turnover intentions: A prospective study among Belgian healthcare workers. *Journal of Advanced Nursing*, *68*(7), 1556–1566.
<https://doi.org/10.1111/j.1365-2648.2012.05961.x>
- Deutsche Rentenversicherung Bund. (2018a). *Aktuelle Daten 2018 [Current data 2018]*. Deutsche Rentenversicherung Bund. https://www.deutsche-rentenversicherung.de/Allgemein/de/Inhalt/6_Wir_ueber_uns/03_fakten_und_zahlen/03_statistiken/02_statistik-publicationen/07_aktuelle_daten.pdf?__blob=publicationFile&v=18
- Deutsche Rentenversicherung Bund. (2018b). *Rentenversicherung in Zeitreihen [Statutory pension insurance scheme time series]*. http://www.deutsche-rentenversicherung.de/cae/servlet/contentblob/238700/publicationFile/62907/03_rv_in_zeitreihen.pdf
- Dingemans, E., & Henkens, K. (2015). How do retirement dynamics influence mental well-being in later life? A 10-year panel study. *Scandinavian Journal of Work, Environment & Health*, *41*(1), 16–23. JSTOR. <https://doi.org/10.5271/sjweh.3464>
- Dorbritz, J., & Micheel, F. (2010). Weiterbeschäftigung im Rentenalter: Potenziale, Einstellungen und Bedingungen [Retention at retirement age: Potentials, attitudes and conditions]. *Bevölkerungsforschung Aktuell*, *3*, 2–7.
- Dychtwald, K., Erickson, T., & Morison, B. (2004). It's time to retire retirement. *Harvard Business Review*, *82*(3), 48–57.
- Eagers, J., Franklin, R. C., Yau, M. K., & Broome, K. (2018). Pre-retirement job and the work-to-retirement occupational transition process in Australia: A review. *Australian*

- Occupational Therapy Journal*, 65(4), 314–328. <https://doi.org/10.1111/1440-1630.12452>
- Eisinga, R., Grotenhuis, M. te, & Pelzer, B. (2013). The reliability of a two-item scale: Pearson, Cronbach, or Spearman-Brown? *International Journal of Public Health*, 58(4), 637–642. <https://doi.org/10.1007/s00038-012-0416-3>
- Elovainio, M., Heponiemi, T., Jokela, M., Hakulinen, C., Penseu, J., Aalto, A.-M., & Kivimäki, M. (2015). Stressful work environment and wellbeing: What comes first? *Journal of Occupational Health Psychology*, 20(3), 289–300. <https://doi.org/10.1037/a0038684>
- Emons, W. H. M., Sijtsma, K., & Meijer, R. R. (2007). On the consistency of individual classification using short scales. *Psychological Methods*, 12(1), 105–120. <https://doi.org/10.1037/1082-989x.12.1.105>
- Fasbender, U., Deller, J., Wang, M., & Wiernik, B. M. (2014). Deciding whether to work after retirement: The role of the psychological experience of aging. *Journal of Vocational Behavior*, 84, 215–224. <https://doi.org/10.1016/j.jvb.2014.01.006>
- Fasbender, U., Wang, M., Voltmer, J.-B., & Deller, J. (2016). The meaning of work for post-retirement employment decisions. *Work, Aging and Retirement*, 2(1), 12–23. <https://doi.org/10/gc4m79>
- Fischer, F. M., Borges, F. N. da S., Rotenberg, L., Latorre, M. do R. D. de O., Soares, N. S., Rosa, P. L. F. S., Teixeira, L. R., Nagai, R., Steluti, J., & Landsbergis, P. (2006). Work ability of health care shift workers: What matters? *Chronobiology International*, 23(6), 1165–1179. <https://doi.org/10.1080/07420520601065083>
- Furr, M. (2011). *Scale Construction and Psychometrics for Social and Personality Psychology*. SAGE Publications Ltd.
- Gendell, M. (1998). Trends in retirement age in four countries, 1965-95. *Monthly Labor Review*, 121, 20–30.

- Gharibi, V., Mokarami, H., Taban, A., Yazdani Aval, M., Samimi, K., & Salesi, M. (2016). Effects of work-related stress on Work Ability Index among Iranian workers. *Safety and Health at Work*, 7(1), 43–48. <https://doi.org/10.1016/j.shaw.2015.10.005>
- Gould, R., Ilmarinen, J., Järvisalo, J., & Koskinen, S. (Eds.). (2008). *Dimensions of Work Ability: Results of the Health 2000 Survey*. Finnish Centre for Pensions.
- Hasselhorn, M., Borchart, D., Brühn, L., Dettmann, M., Prel, J.-B. du, Ebener, M., Garthe, N., Müller, B. H., Rings, A., Ruhaas, R., Schmitz, M., Schröder, C. C., & Tiede, R. (2019). *Leben in der Arbeit (LidA): Idee, Studie, Ergebnisse [Life at work: Background, methodology, results]*. https://www.arbeit.uni-wuppertal.de/fileadmin/arbeit/lidA_Brosch%C3%BCre.pdf
- Henkens, K., van Dalen, H. P., Ekerdt, D. J., Hershey, D. A., Hyde, M., Radl, J., van Solinge, H., Wang, M., & Zacher, H. (2018). What we need to know about retirement: Pressing issues for the coming decade. *The Gerontologist*, 58(5), 805–812. <https://doi.org/10.1093/geront/gnx095>
- Henning, G., Lindwall, M., & Johansson, B. (2016). Continuity in well-being in the transition to retirement. *GeroPsych*, 29(4), 225–237. <https://doi.org/10.1024/1662-9647/a000155>
- Henning, G., Stenling, A., Tafvelin, S., Hansson, I., Kivi, M., Johansson, B., & Lindwall, M. (2019). Preretirement work motivation and subsequent retirement adjustment: A Self-Determination Theory perspective. *Work, Aging and Retirement*, 5(2), 189–203. <https://doi.org/10.1093/workar/way017>
- Hess, M. (2018). Expected and preferred retirement age in Germany. *Zeitschrift Für Gerontologie Und Geriatrie*, 51(1), 98–104. <https://doi.org/10.1007/s00391-016-1053-x>
- Ilmarinen. (2019). From work ability research to implementation. *International Journal of Environmental Research and Public Health*, 16(16), 2882. <https://doi.org/10.3390/ijerph16162882>

- Ilmarinen, J. (2006). *Towards a longer worklife: Ageing and the quality of worklife in the European Union*. Finnish Institute of Occupational Health.
- Ilmarinen, J., & Ilmarinen, V. (2015). Work ability and aging. In L. M. Finkelstein, D. M. Truxillo, F. Fraccaroli, & R. Kanfer, *Facing the Challenges of a Multi-Age Workforce: A Use-Inspired Approach*. Routledge. https://helda.helsinki.fi/bitstream/handle/10138/299167/Ilmarinen_work_ability_and_aging_postprint.pdf?sequence=1&is-Allowed=y
- Jääskeläinen, A., Kausto, J., Seitsamo, J., Ojajärvi, A., Nygård, C.-H., Arjas, E., & Leino-Arjas, P. (2016). Work Ability Index and perceived work ability as predictors of disability pension: A prospective study among Finnish municipal employees. *Scandinavian Journal of Work, Environment and Health*, 42(6), 490–499.
<https://doi.org/10.5271/sjweh.3598>
- James, J. B., Morrow-Howell, N., Gonzales, E., Matz-Costa, C., & Riddle-Wilder, A. (2020). Beyond the lifelong workday: Is there a new face of retirement? In S. J. Czaja, J. Sharit, & J. B. James (Eds.), *Current and Emerging Trends in Aging and Work* (pp. 355–374). Springer. https://doi.org/10.1007/978-3-030-24135-3_18
- James, J. B., & Spiro, A. (2006). The impact of work on the psychological health and well-being of older Americans. *Annual Review of Gerontology & Geriatrics*, 26(1), 153–173.
- Judge, T. A., Piccolo, R. F., Podsakoff, N. P., Shaw, J. C., & Rich, B. L. (2010). The relationship between pay and job satisfaction: A meta-analysis of the literature. *Journal of Vocational Behavior*, 77(2), 157–167. <https://doi.org/10.1016/j.jvb.2010.04.002>
- Karpinska, K., Henkens, K., & Schippers, J. J. (2011). The recruitment of early retirees: A vignette study of the factors that affect managers' decisions. *Ageing and Society*, 31, 570–589. <https://doi.org/10.1017/s0144686x10001078>

- Karpinska, K., Henkens, K., & Schippers, J. J. (2013). Hiring retirees: Impact of age norms and stereotypes. *Journal of Managerial Psychology, 28*(7/8), 886–906.
<https://doi.org/10.1108/jmp-07-2013-0223>
- Kerr, G., & Armstrong-Stassen, M. (2011). The bridge to retirement: Older workers' engagement in post-career entrepreneurship and wage-and-salary employment. *Journal of Entrepreneurship, 20*, 55–76. <https://doi.org/10.1177/097135571002000103>
- Kilbom, A. (1999). Evidence-based programs for the prevention of early exit from work. *Experimental Aging Research, 25*, 291–299. <https://doi.org/10.1080/036107399243733>
- Kim, J. E., & Moen, P. (2002). Retirement transitions, gender, and psychological well-being: A life-course, ecological model. *Journals of Gerontology, 57*(3), 212–222.
<https://doi.org/10.1093/geronb/57.3.p212>
- Kim, S., & Feldman, D. C. (2000). Working in retirement: The antecedents of bridge employment and its consequences for quality of life in retirement. *Academy of Management Journal, 43*, 1195–1210. <https://doi.org/10.2307/1556345>
- Krause, N., Lynch, J., Kaplan, G. A., Cohen, R. D., Goldberg, D. F., & Salonen, J. T. (1997). Predictors of disability retirement. *Scandinavian Journal of Work, Environment and Health, 23*, 403–413. <https://doi.org/10.5271/sjweh.262>
- Kristensen, T. S., Hannerz, H., Høgh, A., & Borg, V. (2005). The Copenhagen Psychosocial Questionnaire: A tool for the assessment and improvement of the psychosocial work environment. *Scandinavian Journal of Work, Environment and Health, 31*, 438–449.
- Leijten, F. R. M., van den Heuvel, S. G., van der Beek, A. J., Ybema, J. F., Robroek, S. J. W., & Burdorf, A. (2015). Associations of work-related factors and work engagement with mental and physical health: A 1-year follow-up study among older workers. *Journal of Occupational Rehabilitation, 25*(1), 86–95. [https://doi.org/10.1007/s10926-014-9525-](https://doi.org/10.1007/s10926-014-9525-6)

- Leon, D. A. (2011). Trends in European life expectancy: A salutary view. *International Journal of Epidemiology*, *40*, 271–277. <https://doi.org/10.1093/ije/dyr061>
- Litwin, H., Achdut, L., & Youssim, I. (2009). Who supports delayed retirement? A study of older workers in Israel. *Journal of European Social Policy*, *19*, 245–257. <https://doi.org/10.1177/0958928709104739>
- Loretto, W., & White, P. (2006). Employers' attitudes, practices and policies towards older workers. *Human Resource Management Journal*, *16*(3), 313–330. <https://doi.org/10.1111/j.1748-8583.2006.00013.x>
- Lux, T., & Scherger, S. (2018). The effects of taking up employment after pension age on self-rated health in Germany and the UK: Evidence based on fixed effects models. *Work, Aging and Retirement*, *4*(3), 262–273. <https://doi.org/10.1093/workar/way003>
- Martinez, M. C., Latorre, M. do R. D. de O., Fischer, F. M., Martinez, M. C., Latorre, M. do R. D. de O., & Fischer, F. M. (2016). Testing the “Work Ability House” Model in hospital workers. *Revista Brasileira de Epidemiologia*, *19*(2), 403–418. <https://doi.org/10.1590/1980-5497201600020016>
- Maxin, L., & Deller, J. (2008). „Silver Workers“: Eine explorative Studie zu aktiven Rentnern in Deutschland [“Silver Workers”: An exploratory study on active pensioners in Germany]. *Arbeit*, *17*(3). <https://doi.org/10.1515/arbeit-2008-0304>
- McGonagle, A. K., Fisher, G. G., Barnes-Farrell, J. L., & Grosch, J. W. (2015). Individual and work factors related to perceived work ability and labor force outcomes. *Journal of Applied Psychology*, *100*(2), 376–398. <https://doi.org/10.1037/a0037974>
- McLoughlin, C., & Taylor, P. (2012). *Australian work ability pilot survey: A report to Safe Work Australia*.
- Moen, P. (1996). A life course perspective on retirement, gender, and well-being. *Journal of Occupational Health Psychology*, *1*(2), 131–144. <https://doi.org/10.1037/1076-8998.1.2.131>

- Mor-Barak, M. E. (1995). The meaning of work for older adults seeking employment: The generativity factor. *International Journal of Aging and Human Development*, *41*, 325–344. <https://doi.org/10.2190/vgtg-epk6-q4bh-q67q>
- Mulders, J. O., van Dalen, H. P., Henkens, K., & Schippers, J. J. (2014). How likely are employers to rehire older workers after mandatory retirement? A vignette study among managers. *De Economist*, *162*(4), 415–431. <https://doi.org/10.1007/s10645-014-9234-8>
- Noone, J. H., Mackey, M. G., & Bohle, P. (2014). *Work ability in Australia – pilot study: A report to Safe Work Australia*. <http://www.safeworkaustralia.gov.au/sites/SWA/about/Publications/Documents/868/Work-Ability-in-Australia-July-2014.pdf>
- Pitt-Catsouphes, M., McNamara, T., James, J., & Halvorsen, C. (2017). Innovative pathways to meaningful work: Older adults as volunteers and self-employed entrepreneurs. In E. Parry & J. McCarthy (Eds.), *The Palgrave Handbook of Age Diversity and Work* (pp. 195–224). Palgrave Macmillan UK. https://doi.org/10.1057/978-1-137-46781-2_9
- Pransky, G. S., Fassier, J.-B., Besen, E., Blanck, P., Ekberg, K., Feuerstein, M., & Munir, F. (2016). Sustaining work participation across the life course. *Journal of Occupational Rehabilitation*, *26*(4), 465–479. <https://doi.org/10.1007/s10926-016-9670-1>
- Puvill, T., Lindenberg, J., de Craen, A. J. M., Slaets, J. P. J., & Westendorp, R. G. J. (2016). Impact of physical and mental health on life satisfaction in old age: A population based observational study. *BMC Geriatrics*, *16*(1), 194. <https://doi.org/10.1186/s12877-016-0365-4>
- Reeuwijk, K. G., Robroek, S. J. W., Niessen, M. A. J., Kraaijenhagen, R. A., Vergouwe, Y., & Burdorf, A. (2015). The prognostic value of the Work Ability Index for sickness absence among office workers. *PloS One*, *10*(5), 0126969. <https://doi.org/10.1371/journal.pone.0126969>

- Rice, N. E., Lang, I. A., Henley, W., & Melzer, D. (2010). Common health predictors of early retirement: Findings from the English Longitudinal Study of Ageing. *Age and Ageing, 40*, 54–61. <https://doi.org/10.1093/ageing/afq153>
- Roelen, C. A. M., van Rhenen, W., Groothoff, J. W., van der Klink, J. J. L., Twisk, J. W. R., & Heymans, M. W. (2014). Work ability as prognostic risk marker of disability pension: Single-item work ability score versus multi-item Work Ability Index. *Scandinavian Journal of Work, Environment and Health, 40*(4), 428–431. <https://doi.org/10.5271/sjweh.3428>
- Rürup, B. (2002). The German pension system: Status quo and reform options. In M. S. Feldstein & H. Siebert (Eds.), *Social Security Pension Reform in Europe* (pp. 137–169). Univ. of Chicago Press.
- Ryan, R. M., & Deci, E. L. (2012). Overview of Self-Determination Theory: An organismic-dialectical perspective. In R. M. Ryan (Ed.), *Oxford Handbook of Human Motivation* (pp. 3–33). Oxford University Press.
- Sanderson, W. C., & Scherbov, S. (2015). Are we overly dependent on conventional dependency ratios? *Population and Development Review, 41*(4), 687–708. <https://doi.org/10.1111/j.1728-4457.2015.00091.x>
- Schaarschmidt, U., & Fischer, A. W. (2008). *Arbeitsbezogenes Verhaltens- und Erlebensmuster AVEM (Standardform) AVEM-44 (Kurzform) [Work-related behavior and experience pattern AVEM (Standard form) AVEM-44 (Short form)* (3., überarb. und erw. Aufl.). Pearson.
- Schouten, L. S., Bültmann, U., Heymans, M. W., Joling, C. I., Twisk, J. W. R., & Roelen, C. A. M. (2016). Shortened version of the Work Ability Index to identify workers at risk of long-term sickness absence. *European Journal of Public Health, 26*(2), 301–305. <https://doi.org/10.1093/eurpub/ckv198>

- Schwarze, M., Egen, C., Gutenbrunner, C., & Schriek, S. (2016). Early workplace intervention to improve the work ability of employees with musculoskeletal disorders in a German university hospital: Results of a pilot study. *Healthcare, 4*(3), 64–76.
<https://doi.org/10.3390/healthcare4030064>
- Scuffham, P. A., Vecchio, N., & Whiteford, H. A. (2014). Exploring the validity of HPQ-based presenteeism measures to estimate productivity losses in the health and education sectors. *Medical Decision Making, 34*(1), 127–137.
<https://doi.org/10.1177/0272989x13497996>
- Seitsamo, J., & Ilmarinen, J. (1997). Life-style, aging and work ability among active Finnish workers in 1981—1992. *Scandinavian Journal of Work, Environment & Health, 23*, 20–26. JSTOR.
- Sell, L., Bültmann, U., Rugulies, R., Villadsen, E., Faber, A., & Søgaard, K. (2009). Predicting long-term sickness absence and early retirement pension from self-reported work ability. *International Archives of Occupational and Environmental Health, 82*(9), 1133–1138. <https://doi.org/10.1007/s00420-009-0417-6>
- Shultz, K. S., Morton, K. R., & Weckerle, J. R. (1998). The influence of push and pull factors on voluntary and involuntary early retirees' retirement decision and adjustment. *Journal of Vocational Behavior, 53*, 45–57. <https://doi.org/10.1006/jvbe.1997.1610>
- Shultz, K. S., & Wang, M. (2011). Psychological perspectives on the changing nature of retirement. *American Psychologist, 66*, 170–179. <https://doi.org/10.1037/a0022411>
- Silver, M. P., Settels, J., Schafer, M. H., & Schieman, S. (2019). Getting the hours you want in the preretirement years: Work hour preferences and mismatch among older Canadian workers. *Work, Aging and Retirement, 5*(2), 175–188.
<https://doi.org/10.1093/workar/way015>

- Statistisches Bundesamt. (2015). *Internationale Indikatoren: Gebiet und Bevölkerung [International indicators: Territory and population]*. <https://www-genesis.destatis.de/genesis/online?sequenz=tabelleAufbau&selectionname=99911-0001&sprache=de>
- Statistisches Bundesamt. (2018). *Statistisches Jahrbuch 2018 [Statistical Yearbook 2018]*.
- Statistisches Bundesamt. (2019). *Annahmen und Ergebnisse der 14. Koordinierten Bevölkerungsvorausberechnung [Assumptions and results of the 14th coordinated population projection]*. Statistisches Bundesamt.
- Steiber, N., & Kohli, M. (2017). You can't always get what you want: Actual and preferred ages of retirement in Europe. *Ageing & Society, 37*(2), 352–385.
<https://doi.org/10.1017/s0144686x15001130>
- Stephoe, A., Deaton, A., & Stone, A. A. (2015). Subjective wellbeing, health, and ageing. *Lancet, 385*(9968), 640–648. [https://doi.org/10.1016/s0140-6736\(13\)61489-0](https://doi.org/10.1016/s0140-6736(13)61489-0)
- Streeck, W., & Hassel, A. (2003). The crumbling pillars of social partnership. *West European Politics, 26*(4), 101–124. <https://doi.org/10.1080/01402380312331280708>
- Tomietto, M., Paro, E., Sartori, R., Maricchio, R., Clarizia, L., Lucia, P. D., Pedrinelli, G., & Finos, R. (2019). Work engagement and perceived work ability: An evidence-based model to enhance nurses' well-being. *Journal of Advanced Nursing, 75*(9), 1933–1942. <https://doi.org/10.1111/jan.13981>
- Tuomi, K., Eskelinen, L., Toikkanen, J., Järvinen, E., Ilmarinen, J., & Klockars, M. (1991). Work load and individual factors affecting work ability among aging municipal employees. *Scandinavian Journal of Work, Environment and Health, 17*(Suppl. 1), 128–134.
- Tuomi, K., Huuhtanen, P., Nykyri, E., & Ilmarinen, J. (2001). Promotion of work ability, the quality of work and retirement. *Occupational Medicine (Oxford, England), 51*(5), 318–324. <https://doi.org/10.1093/occmed/51.5.318>

- Tuomi, K., Ilmarinen, J., Eskelinen, L., Järvinen, E., Toikkanen, J., & Klockars, M. (1991). Prevalence and incidence rates of diseases and work ability in different work categories of municipal occupations. *Scandinavian Journal of Work, Environment and Health*, 17(Suppl 1), 67–74.
- Unger, R. (2006). Trends in active life expectancy in Germany between 1984 and 2003: A cohort analysis with different health indicators. *Journal of Public Health*, 14(3), 155–163. <https://doi.org/10.1007/s10389-006-0037-5>
- van Dalen, H. P., Henkens, K., & Oude Mulders, J. (2019). Increasing the public pension age: Employers' concerns and policy preferences. *Work, Aging and Retirement*, 5(3), 255–263. <https://doi.org/10.1093/workar/waz004>
- van Dalen, H. P., Henkens, K., & Schippers, J. J. (2010). Productivity of older workers: Perceptions of employers and employees. *Population and Development Review*, 36, 309–330. <https://doi.org/10.1111/j.1728-4457.2010.00331.x>
- van Rijn, R. M., Robroek, S. J. W., Brouwer, S., & Burdorf, A. (2014). Influence of poor health on exit from paid employment: A systematic review. *Occupational and Environmental Medicine*, 71, 295–301. <https://doi.org/10.1136/oemed-2013-101591>
- van Solinge, H., & Henkens, K. (2007). Involuntary retirement: The role of restrictive circumstances, timing, and social embeddedness. *Journals of Gerontology*, 62(5), 295–303. <https://doi.org/10.1093/geronb/62.5.s295>
- van Solinge, H., & Henkens, K. (2008). Adjustment to and satisfaction with retirement: Two of a kind? *Psychology and Aging*, 23(2), 422–434. <https://doi.org/10.1037/0882-7974.23.2.422>
- Vänni, K., Virtanen, P., Luukkaala, T., & Nygård, C.-H. (2012). Relationship between perceived work ability and productivity loss. *International Journal of Occupational Safety and Ergonomics*, 18(3), 299–309. <https://doi.org/10.1080/10803548.2012.11076946>

- Viester, L., Verhagen, E. A. L. M., Bongers, P. M., & van der Beek, A. J. (2015). The effect of a health promotion intervention for construction workers on work-related outcomes: Results from a randomized controlled trial. *International Archives of Occupational and Environmental Health*, *88*(6), 789–798. <https://doi.org/10.1007/s00420-014-1007-9>
- Voltmer, E., Rosta, J., Aasland, O. G., & Spahn, C. (2010). Study-related health and behavior patterns of medical students: A longitudinal study. *Medical Teacher*, *32*(10), 422–428. <https://doi.org/10/crhsf5>
- von Bonsdorff, M. E., Huuhtanen, P., Tuomi, K., & Seitsamo, J. (2010). Predictors of employees' early retirement intentions: An 11-year longitudinal study. *Occupational Medicine*, *60*, 94–100. <https://doi.org/10.1093/occmed/kqp126>
- von Bonsdorff, M. E., Rantanen, T., Törmäkangas, T., Kulmala, J., Hinrichs, T., Seitsamo, J., Nygård, C.-H., Ilmarinen, J., & von Bonsdorff, M. B. (2016). Midlife work ability and mobility limitation in old age among non-disability and disability retirees: A prospective study. *BMC Public Health*, *16*(1), 154. <https://doi.org/10.1186/s12889-016-2846-y>
- Wang, M. (2007). Profiling retirees in the retirement transition and adjustment process: Examining the longitudinal change patterns of retirees' psychological well-being. *Journal of Applied Psychology*, *92*, 455–474. <https://doi.org/10.1037/0021-9010.92.2.455>
- Wang, M., Henkens, K., & van Solinge, H. (2011). Retirement adjustment: A review of theoretical and empirical advancements. *American Psychologist*, *66*, 204–213. <https://doi.org/10.1037/a0022414>
- Wang, M., & Shi, J. (2014). Psychological research on retirement. *Annual Review of Psychology*, *65*, 209–233. <https://doi.org/10.1146/annurev-psych-010213-115131>

- Wang, Y. (2013). China's pension system gets more troubled. *Forbes Asia*.
<http://www.forbes.com/sites/ywang/2013/12/12/chinas-pension-system-gets-more-troubled/>
- Whiteford, P. (2006). Pension challenges and pension reforms in OECD countries. *Oxford Review of Economic Policy*, 22(1), 78–94. <https://doi.org/10.1093/oxrep/grj006>
- Willekens, F. (2016). Demographic transitions in Europe and the world. In Koenraad Matthijs, Karel Neels, Christiane Timmerman, & Jacques Haers (Eds.), *Population Change in Europe, the Middle-East and North Africa: Beyond the Demographic Divide* (pp. 13–44). Routledge.
- Wind, A., Geuskens, G. A., Ybema, J. F., Bongers, P. M., & van der Beek, A. J. (2015). The role of ability, motivation, and opportunity to work in the transition from work to early retirement: Testing and optimizing the Early Retirement Model. *Scandinavian Journal of Work, Environment and Health*, 41(1), 24–35. <https://doi.org/10.5271/sjweh.3468>
- Wöhrmann, A. M., Deller, J., & Wang, M. (2014). Postretirement career planning: Testing a model based on social cognitive career theory. *Journal of Career Development*, 41(5), 363–381. <https://doi.org/10.1177/0894845313507749>
- Xanthopoulou, D., Bakker, A. B., Demerouti, E., & Schaufeli, W. B. (2009). Reciprocal relationships between job resources, personal resources, and work engagement. *Journal of Vocational Behavior*, 74(3), 235–244. <https://doi.org/10.1016/j.jvb.2008.11.003>
- Zhan, Y., Wang, M., Liu, S., & Shultz, K. S. (2009). Bridge employment and retirees' health: A longitudinal investigation. *Journal of Occupational Health Psychology*, 14, 374–389. <https://doi.org/10.1037/a0015285>
- Zimmermann, L., Unterbrink, T., Pfeifer, R., Wirsching, M., Rose, U., Stößel, U., Nübling, M., Buhl-Grießhaber, V., Frommhold, M., Schaarschmidt, U., & Bauer, J. (2012). Mental health and patterns of work-related coping behaviour in a German sample of

student teachers: A cross-sectional study. *International Archives of Occupational and Environmental Health*, 85(8), 865–876. <https://doi.org/10.1007/s00420-011-0731-7>