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ORIGINAL ARTICLE

Do Older Employees Suffer More from Work Intensification and Other Intensified Job Demands? Evidence from Upper White-Collar Workers

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Background: Working life today is characterized by acceleration and intensification due to social, and particularly technological, acceleration affecting the whole of society. These phenomena also affect working life by intensifying job demands, possibly imposing new job stressors on the workforce. At the same time workforce is aging, raising a question how older employees manage to cope with these work life changes.
Methods: This study examined intensified job demands and their effects on occupational well-being from the age perspective utilizing Finnish survey data from upper white-collar workers (N = 2,200). Data was analyzed using multivariate analysis of covariance and hierarchical regression analyses.
Results: The findings show that older employees experienced more work intensification and intensified knowledge- and skill-related learning demands, whereas younger employees experienced more intensified career-related planning and decision-making demands. Intensified job demands were related to occupational well-being (job burnout, work engagement), but were rarely age-specific.
Conclusion: Aging does not necessarily mean higher intensified job demands, yet work intensification and intensified learning demands can be more common among older employees. However, more research is needed concerning the relationships between aging, intensified job demands and occupational well-being as empirical evidence is still scarce.

Keywords: intensified job demands; work intensification; aging; occupational well-being; moderator effects

According to many scholars, current working life is characterized by acceleration and intensification (Green, 2004; Franke, 2015; Korunka et al. 2015; Kubicek, Paškvan and Korunka, 2015) due to technological acceleration pervading the whole of society (Rosa, 2003). The work-related implications of this development include increased work pace and intensified cognitive job demands due to a wider use of digitalization, artificial intelligence and robotization in production and services (Chesley, 2014; Kubicek et al. 2015; Rosa, 2003; Mauno et al. in press). We approach these work-related implications via the concept of *intensified job demands* (henceforth *IJDs*), imposing new job stressors on employees (Green, 2004; Kubicek et al. 2015). Besides acceleration and intensification, another major challenge in contemporary working life is the rapidly aging workforce (+50 years) in industrialized countries. For instance, in Europe 45.6 percent of the workforce are aging (EC, 2010), and older employees may be more susceptible to job stressors.

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In spite of an increasingly aging workforce, we lack research evidence on how older employees appraise IJDs, referring to (1) work intensification, (2) intensified planning and decision-making demands, and (3) intensified learning demands at work (defined below, see also Kubicek et al. 2015). This study addresses this unexplored issue by comparing IJDs in employees in different age-groups with a particular focus on older employees (+50 years). As IJDs are stressors with harmful well-being implications (Green, 2004; Franke, 2015; Kubicek et al. 2015), we deemed it crucial to examine whether older employees suffer more from IJDs by investigating age as a moderator in the relationships between IJDs and occupational well-being (job burnout, work engagement). Research evidence concerning age differences in the appraisal of job stressors is somewhat scarce, as are studies examining the age-specific outcomes of job stressors (Mauno, Ruokolainen and Kinnunen, 2013; Mauno et al. 2017; Rauschenbach, et al. 2013; Zacher and Schmitt, 2016). This shortcoming concerns also IJDs and their outcomes, which we focus on. To fill these gaps our study investigates age-specifically new and recently identified job demands, that is, IJDs and their outcomes. The findings can be utilized in planning and implementing age-tailored job stress interventions focusing on these new job demands.

Defining IJDs and their relation to occupational well-being

According to social acceleration theory (Rosa, 2003), acceleration is endemic in modern life manifesting across three inter-related processes: technological acceleration, acceleration of social change and accelerated pace of life. Technological development hastens social change, which, in turn, accelerates the pace of life, thereby increasing the need for more effective technological performance (Rosa, 2003). This self-acceleration circle permeates working life, raising concerns about IJDs (Korunka et al. 2015; Kubicek et al. 2015). Specifically, IJDs cover five aspects (see more in Kubicek et al. 2015): (1) work intensification, (2) intensified job-related planning and decision-making demands, (3) intensified career-related planning and decision-making demands, (4) intensified knowledge-related learning demands, and (5) intensified skill-related learning demands.

Work intensification (WI) implies that the requirements of work, especially quantitative workload, have increased over time. WI includes increased time-related demands during the working day, such as intensified pace of work and multitasking attributable to accelerated technology use at work, e.g., in a form of digitalization (Kubicek et al. 2015; Mauno et al. in press). Intensified job-related planning and decision-making demands (JPD) refers to the increased extent to which employees need to autonomously plan and pursue their work goals and daily tasks (Kubicek et al. 2015; Wood, 2011). Employees may experience this increased autonomy as a requirement to make individual decisions on setting and achieving certain goals and accomplishing their work. Intensified career-related planning and decision-making demands (CPD) entail greater individual responsibility for career development and employability (Pongratz and Voß, 2003). Freedom to make self-directed choices in one's career may be positive, but simultaneously also pose career management demands on employees compelled to take more personal responsibility in order to maintain competitiveness on the labor market (Kubicek et al. 2015). In modern society knowledge constitutes an important competitive advantage for organizations, but may also imply a need to continuously update old information and acquire new work-relevant knowledge (e.g. because of rapid technological innovations and changes). Such pressures to adopt the latest professional knowledge fall under intensified knowledge-related learning demands (KLD). Finally, there is not only a need to constantly update one's work-relevant knowledge, but also one's skills, such as learning new competencies, enabling effective job performance. Maintaining personal skill level becomes challenging as different skills will be needed and need to match changing work practices. These demands are called intensified skill-related learning demands (SLD) (Korunka et al. 2015; Kubicek et al. 2015). Here, we apply the multi-dimensional scale developed by Kubicek and co-researchers (2015) to assess these five aspects of IJDs.

IJDs have mostly been conceptualized as job stressors, and as such are expected to be detrimental to employees' well-being/health (Kubicek et al. 2015). WI, which has already gained some attention, has been associated in earlier studies with increased psychosomatic complaints and job dissatisfaction (Franke, 2015; Green, 2004). Thus, empirical research supports the role of WI as a job stressor. However, other dimensions of IJDs, namely JPD, CPD, KLD and SLD, have so far been scarcely studied (cf. Kubicek et al. 2015). These demands may not only be harmful job stressors (causing negative outcomes), but may also pose positive challenges to employees, such as opportunities to learn new things at work (learning demands, KLD and SLD), to attain greater job-related autonomy (JPD), or to improve career prospects and employability (CPD). If IJDs are experienced as positive challenges, they could also have positive, mostly motivational, implications. In line with this idea, contemporary job stress research has divided job demands into hindrance and challenge demands (Crawford, LePine and Rich, 2010; LePine, Podsakoff and LePine, 2005); the former typically interferes with job tasks and performance, whereas the latter poses some positive challenges for employees, e.g., in terms of improved learning and opportunities for growth. Moreover, hindrance demands are hypothesized to cause negative 'distress', with negative outcomes, whereas challenge demands should cause positive 'eustress', with positive outcomes (Crawford et al. 2010).

Here, we combine these approaches and ascertain whether IJDs are associated with positive well-being outcomes (as challenge demands) in addition to, or in contrast to negative outcomes (as hindrance demands). We also investigate whether the level of IJDs makes a difference by testing the curvilinear effects of IJDs on well-being outcomes. This would mean that the effects of IJDs on well-being are not necessary linear, but differ in low, moderate and high levels of IJDs. In this respect work engagement is particularly interesting as a positive outcome because it describes positive motivational states at work (e.g., vigour, dedication, and absorption) (Schaufeli, Bakker and Salanova, 2006), which might be improved, if an employee experiences challenging job demands. We also perform age-specific analyses by investigating whether there are differences between older and younger employees in the curvilinear associations between IJDs and well-being.

Theoretical foundations and empirical findings on aging and job stress

There are conflicting theoretical views regarding the linkages between aging, job stressors and strain. Some researchers have proposed that aging employees are likely to experience more job stressors/strain because aging causes inevitable decline in cognitive abilities (e.g., in working memory and information processing pace) and in physical strength (Czaja, et al. 2001; de Zwart, Frings-Dresen and van Dijk, 1996; Ilmarinen, 2001). Reductions in physical and cognitive functioning, in turn, are expected to have negative implications at work, causing older employees to experience more job stress (e.g., higher job demands) and strain (e.g., more job burnout). However, recent research evidence has partly contradicted this assumption, as older employees have not shown a

significant cognitive impairment at work, suggesting that this probably occurs later in life (Fisher et al. 2014; Rauschenbach et al. 2013).

Different views have also been presented by developmental psychologists and stress-coping researchers, who have approached stress and coping from a life course perspective. Life management models (Baltes and Baltes, 1990; Heckhausen, Wrosch and Schulz, 2010) and coping theories (Aldwin, 1991; Folkman, et al. 1987) propose that individuals' life management and coping strategies develop over the life course, and become more flexible and mature with aging. Accordingly, research has indicated that the use of primary coping strategies/problem-focused coping (trying to change stressful situations) and secondary coping strategies/emotion-focused coping (trying to influence one's emotions and mental representations of stressful situations) both improve with age (Folkman et al. 1987; Hertel, et al. 2015). Emotion regulation and emotion control also improve with chronological aging, providing more resources for an individual's stress management and adjustment (Gross, 1998). Moreover, older employees tend to have more work experience and accumulated job-relevant knowledge (Ackerman, 1996), and these resources may improve their stress resilience at work. Thus, older employees may have a better coping repertoire to manage job stress. However, it should be noted that we have relatively limited understanding and little empirical evidence of how employees of different ages perceive job stressors/demands, concerning also IJDs.

To summarize, there are two conflicting approaches to aging and job stress. On the one hand, aging causes certain cognitive and physical impairments that are hypothesized to render the employee more susceptible to job stressors and less stress-resilient. On the other hand, because of normal human development, including knowledge accumulation and work experience, older employees should be more stress-resilient and better 'copers' than younger employees. We now present some research evidence on the age-specificity of job stressors and their negative outcomes for well-being/health/strain.

Some studies on age variation in 'more traditional' job demands (age as a predictor) and on the associations between job demands and employees' well-being/health (age as a moderator) have been conducted. Overall, these previous findings reveal a rather inconsistent picture of age differences. Some studies have suggested that experiencing cognitive job demands or job complexity is not more stressful for older employees (Fisher et al. 2014), although some impairment may occur in cognitive capabilities when an employee is aging (Czaja et al. 2001; Ilmarinen, 2001). Concerning other, more traditional job demands, such as role overload/workload, job insecurity and emotional labor/demands at work, studies have drawn an inconsistent picture regarding the role of age. Ng and Feldman (2010) showed in their meta-analysis that older employees reported less workload (particularly role conflict and role ambiguity) than younger employees. By contrast, a Finnish study suggested that older employees perceived higher role overload (quantitative workload) than younger employees (Mauno et al. 2013). However, in this same study, aging was found to be a buffering factor against high workload in relation to job satisfaction. Thus, older employees were less negatively affected by high role overload than were younger employees. Finally, Rauschenbach and Hertel (2011) found no age differences in perceived workload (quantitative job demands) in a German sample, but in their study middle-aged workers reported higher strain and emotional reactivity to workload than did the other age groups.

Some evidence can also be found concerning age in relation to perceived job insecurity. In Finnish samples, Mauno and co-researchers (2013) found that although job insecurity was more common among younger employees, it was more stressful for older employees; when their job insecurity was high their well-being was more negatively affected than among younger employees. Finally, a few studies have tested age-related differences in experiences of emotional labor (social stressor caused by facing emotional load at work) as a job demand. For example, one recent Finnish study showed that even though emotional labor was more common among younger employees, poor recovery from job stress was more detrimental to middle-aged employees than to other age groups if they experienced high emotional labor (Mauno et al. 2017). Scheibe and co-researchers (2015), using a German sample, showed that emotional dissonance and sensitivity requirements at work (two core components of emotional labor) were more stressful for older employees; if older employees experienced these job demands at a high level, their well-being was poorer than that of younger employees in comparable stressful situations.

To conclude, earlier research evidence on age differences in experiencing job demands/stressors (age as a predictor) and on their effects on well-being/health (age as a moderator), is rather scarce and does not provide a coherent picture of age-related relationships. To the best of our knowledge, there are no systematic comparative studies on age differences in IJDs or in their effects on employees' well-being, the question of which we focus on. Due to the lack of earlier research concerning IJDs and conflicting theoretical views and earlier findings concerning other job demands/stressors, we pose no specific hypotheses on age differences in IJDs or in their relationships to occupational well-being (burnout, engagement); we approach age differences exploratively. However, finding age differences would provide valuable knowledge for job stress prevention and interventions, e.g., if certain IJDs need special attention among certain age groups.

Research questions

We examine four research questions in this study:

1. Are there age-differences in perceptions of five IJDs (WI, JPD, CPD, KLD, and SLD), and if so, how do employees of different ages perceive them?
2. Does age moderate the associations between IJDs and occupational well-being (burnout, engagement)? A moderator effect would indicate

that the relationship between IJDs and occupational well-being is stronger or weaker at certain ages. Scale-based variation may emerge as IJDs describe different job demands and burnout and engagement are also diverse indicators of occupational well-being.

3. Are IJDs related to occupational well-being irrespective of age (i.e., direct effects of IJDs on well-being)? Regarding this question, we hypothesize that IJDs, as job stressors, are related to poorer occupational well-being (i.e., higher burnout, lower engagement). Again, there may be some scale-based variation in these direct relationships due to the reason mentioned above.
4. Are (some) IJDs related to better well-being and are these relationships age-specific? Curvilinear associations in particular would show that some dimensions of IJDs may act as challenge demands, which could relate to positive employee outcomes, especially higher engagement in this present study. Age-specificity would mean that these curvilinear effects show age variation.

Methods

Statistical analyses

We used two statistical approaches to analyze the research questions: multivariate analysis of covariance (MANCOVA) and hierarchical regression analyses. MANCOVA is a suitable method to analyze statistically significant mean differences among groups in the case of several dependent variables and covariates (Tabachnick & Fidell, 2013). MANCOVA was executed to study age differences in the perceptions of IJDs. Five dimensions of IJDs (WI, JPD, CPD, KLD and SLD) were used as dependent variables and five age groups (Group 1 = 18–34, Group 2 = 35–44, Group 3 = 45–54, Group 4 = 55–64, Group 5 = over 65 years old) were used as independent variables (fixed factors) in order to compare their effects on IJDs. We used as many age groups as possible in terms of sample sizes in order to explore age differences comprehensively. If age variation was found to be significant in the multivariate test, paired differences (to examine which age groups differed from each other) were analyzed using the Bonferroni test. In reporting MANCOVAs parameter estimates for covariates and the explanatory rates were also checked and reported.

Second, hierarchical regression analyses were conducted to test whether the five dimensions of IJDs (WI, JPD, CPD, KLD and SLD) explained occupational well-being (burnout, engagement). More importantly, we also investigated whether these relationships were age-specific by analyzing age as a moderator between IJDs and well-being. The moderator effects were examined by computing the following interaction terms for the five dimensions of IJDs and age: WI*age, JPD*age, CPD*age, KLD*age, SLD*age. We also examined the curvilinear effects of IJDs on well-being by testing the so-called challenge vs. hindrance hypothesis. These effects were also tested age-specifically to be consistent in the analysis procedure. Specifically, we computed two new interaction terms in which each dimension of IJDs was multiplied by itself, resulting altogether in five multiplied interaction terms: WI*WI, JPD*JPD, CPD*CPD, KLD*KLD and SLD*SLD. In addition, these interaction terms were then multiplied by age (i.e. WI*WI*age, JPD*JPD*age, CPD*CPD*age, KLD*KLD*age and SLD*SLD*age) in order to examine whether curvilinear effects were age-specific. Both these interaction terms were entered into the regression equations in the fifth (two-way interaction terms) and in the sixth step of analysis (three-way interaction terms). Significant interaction effects were plotted into figures if the effects were consistent with the respective correlation coefficients. Two-way interaction effects were plotted into figures by placing standardized values of −1 and +1 standard deviation for both variables in the same figure. Curvilinear effects were plotted into figures by giving multiply standardized values between −2 and +2 standard deviation for the variable in order to visualize the effect.

Specifically, the hierarchical regression analyses included the following six steps: (1) control variables, (2) age (as a standardized continuous variable), (3) IJDs (WI, JPD, CPD, KLD and SLD as standardized continuous variables), (4) IJDs*age interaction term, (5) IJDs*IJDs interaction term, and (6) IJDs*IJDs*age interaction term. In order to avoid multi-collinearity caused by analyzing the dimensions of IJDs simultaneously in one regression model (as the IJDs showed significant inter-correlations), we estimated separate regression models for each of the five dimensions of IJDs. This approach would better reveal the actual effects of each dimension of IJDs on well-being without any suppression effects due to multi-collinearity.

Data

The data was collected by means of an online survey in 2017. The sample was derived from the membership registers of four Finnish trade unions: The Finnish Union of University Researchers and Teachers, the Finnish Union of University Professors, the Finnish Business School Graduates, and the Academic Engineers and Architects in Finland. Altogether, 2,200 subjects responded to the questionnaire and over half of them (61%; n = 586 professors, n = 773 researchers/teachers) were academics (i.e., professors, researchers, university teachers) typically working in universities or research institutes. The rest of the participants (39%) worked either in technical/architectural occupations (n = 373) or in business (n = 486). Thus, the sample represents upper white-collar occupations. The response rate was 31% among the academics and 19% among the others. In this study we were not interested in differences between occupational groups, and for this reason we recoded a new variable including two occupational categories (1 = academics, 2 = business and technical occupations), which was used in subsequent analyses.

The overall mean age in the sample was 48.7 (SD = 10.57) years. Nearly all participants had either a master's (48%) or doctoral level (47%) university education. Moreover, almost half of the participants (44%) worked in management/leadership positions. Half of the participants were women (52%) and the vast majority (69%) did not have children under the age of

17. The participants were divided into the following age groups: 18–34 (12%, n = 242), 35–44 (23%, n = 472), 45–54 (32%, n = 648), 55–64 (28%, n = 581), and over 65 (5%, n = 96) years old.

Dependent and independent variables

IJDs were used as dependent variables in MANCOVA (research question 1) and independent variables in the hierarchical regression analyses (research questions 2–4). IJDs were measured using the recently validated Intensification of Job Demands Scale (Kubicek et al. 2015). In order to capture the increased intensity of IJDs, the respondents are requested to compare the last five years in their work (or less, if a participant had been working less than five years) to their current work. Specifically, the scale is designed to measure five dimensions of IJDs: 1) WI (5 items; e.g., '...ever more work has to be completed by fewer and fewer employees'), 2) JPD (5 items; e.g., 'one increasingly has to check independently whether the work goals have been reached'), 3) CPD (3 items; e.g., 'one is increasingly required to maintain one's attractiveness for the job market, e.g., through advanced education, networking', 4) KLD (3 items, e.g., 'one has to update one's knowledge level more frequently'), and 5) SLD (3 items; e.g., 'one increasingly has to familiarize oneself with new work processes'). The response scale ranges from 1 (not at all) to 5 (completely), higher values indicating more frequent/higher intensified job demands. The respective Cronbach's alpha coefficients of the five IJD sub-dimensions were 0.88, 0.84, 0.79, 0.87 and 0.89. The experiences of IJDs were relatively common in the whole data: more than half of the respondents reported that IJDs were often increased (WI 58.9%, JPD 54.7%, CPD 52.5%, KLD 58.8%, and SLD 59.7%).

Occupational well-being indicators served as dependent variables in the hierarchical regression analyses. Specifically, well-being was operationalized via job-related burnout and engagement. *Burnout* was assessed with the nine-item Bergen Burnout Indicator (Salmela-Aro et al. 2011; see also Feldt et al. 2014), which includes three sub-dimensions of burnout (exhaustion, cynicism and professional efficacy were each measured with three items). All the items were rated on a 6-point Likert-type scale ranging from 1 (completely disagree) to 6 (completely agree). We used a total score of burnout, including all nine items. Cronbach's alpha for the burnout scale was 0.87. *Engagement* was measured by the Utrecht Work Environment Scale (UWES)-Short Form (see e.g., Schaufeli et al. 2006), including three sub-dimensions of engagement (vigour, dedication and absorption were each measured with three items). All items were rated on a 7-point scale ranging from 1 (never) to 7 (every day). A total score of engagement was used, containing all nine items. Cronbach's alpha for the engagement scale was 0.94.

We used certain control/covariate variables in the statistical analyses. These variables included gender (women/men), parenting status (yes/no), management/leadership position (yes/no), and occupational group (academics vs. technical/business professionals). Only these control variables were identical across the sub-samples and were therefore usable as covariates. The same control variables were included in the MANCOVA and hierarchical regression analyses.

Correlations between the study variables are presented in Appendix 1. Inter-correlations between the dimensions of IJDs show that they are not exceptionally high (r = 0.28–0.81) except for SLD and KLD (r = 0.81), and therefore we treated IJDs as separate sub-scales in the subsequent analyses. The original validation study (Kubicek et al. 2015) has also shown that the dimensions of IJD can be used separately.

Results

Comparing IJDs between different age groups: results of MANCOVA analysis

We examined mean differences in IJDs by age groups via MANCOVA analysis where IJDs (five inter-correlated dimensions) served as dependent variables and five following age groups as independent variables/fixed factors: 18–34 (n = 242), 35–44 (n = 472), 45–54 (n = 648), 55–64 (n = 581), and over 65 (n = 96) years old. Covariates included gender (women/men), parenting status (yes/no), management/leadership position (yes/no), and occupational group (academics vs. technical/business professionals). In reporting the results of these mean comparison analyses, we next concentrate on (1) multi-variate test (for the total model), (2) tests of between-subjects effects (for each dimension of IJDs) and paired comparisons results for the age groups in different dimensions of IJDs (computed via Bonferroni tests). Noteworthy is that tests of between-subjects effects and paired comparisons are interpreted only if the multivariate test is significant as significant multivariate effects form a precondition to interpret other effects. Means and standard deviations of IJDs across the age groups can be found in **Table 1** and will not be repeated in the text, whereas other parameter values (i.e., F-, df-, p-values, η_p^2, and β-coefficients for parameter estimates concerning the covariates) are reported below in relation to the multivariate test and for the tests of between-subjects effects.

A multi-variate test of MANCOVA showed that the age groups differed significantly in their perceptions of IJDs (F (20 000, 5174,885) = 5.58, $p < 0.001$, $\eta_p^2 = 0.018$). More detailed between-subjects tests for five dimensions of IJDs (WI, JPD, CPD, KLD, and SLD) showed that the age groups differed on all dimensions of IJDs (parameter values reported in a greater detail below) except JPD (F (4, 1573) = 1.35, $p = 0.248$, $\eta_p^2 = 0.003$).

Work Intensification (WI, for means see **Table 1**): Older employees reported higher WI than did younger employees (tests of between-subjects effects F (4, 1573) = 6.26, $p < 0.001$, $\eta_p^2 = 0.016$). Paired comparisons (via Bonferroni test, p-values ranged from $p < 0.01$ to $p < 0.001$) confirmed that the youngest age group differed from the three older age groups (35–44, 45–54, 55–64 years old) by reporting less WI. In addition, 35–44 year-olds differed significantly from 55–64 year-olds. Concerning covariates, we found that women (F (1) = 37.28, p < 0.001, $\beta = -0.32$, $p < 0.001$ $\eta_p^2 = 0.023$), supervisors (F (1) = 20.64, $p < 0.001$,

Table 1: Means and Standard Deviations in Intensified Job Demands across the Age Groups.

	Age groups (in years)	*Mean*	*SD*	*N*
WORK INTENSIFICATION (WI)	18–34	3.20	1.08	168
	35–44	3.54	1.01	373
	45–54	3.72	0.99	527
	55–64	3.78	0.96	432
	65+	3.55	1.11	73
	Total	3.63	1.02	1573
INTENSIFIED JOB-RELATED PLANNING & DECISION MAKING DEMANDS (JPD)	18–34	3.58	0.89	168
	35–44	3.53	0.90	373
	45–54	3.56	0.88	527
	55–64	3.53	0.89	432
	65+	3.23	0.98	73
	Total	3.53	0.90	1573
INTENSIFIED CAREER-RELATED PLANNING & DECISION-MAKING DEMANDS (CPD)	18–34	3.72	0.88	168
	35–44	3.73	0.97	373
	45–54	3.48	0.94	527
	55–64	3.29	0.95	432
	65+	2.95	0.92	73
	Total	3.49	0.97	1573
INTENSIFIED KNOWLEDGE-RELATED LEARNING DEMANDS (KLD)	18–34	3.47	0.87	168
	35–44	3.51	0.94	373
	45–54	3.64	0.93	527
	55–64	3.80	0.87	432
	65+	3.64	0.87	73
	Total	3.64	0.92	1573
INTENSIFIED SKILL-RELATED LEARNING DEMANDS (SLD)	18–34	3.30	0.92	168
	35–44	3.55	0.99	373
	45–54	3.73	0.94	527
	55–64	3.84	0.93	432
	65+	3.72	0.92	73
	Total	3.67	0.96	1573

$\beta = -0.24$, $p < 0.001$, $\eta_p^2 = 0.013$), and academics (F (1) = 36.89, $p < 0.001$, $\beta = -0.32$, $p < 0.001$, $\eta_p^2 = 0.023$) reported higher WI than men, non-supervisors or those working in the technical/business field.

Career-related planning and decision-making demands (CPD, for means see **Table 1**) showed a declining trend with aging (tests of between-subjects effects F (4, 1573) = 8.06, $p < 0.001$, $\eta_p^2 = 0.020$). Means presented in **Table 1** indicate that these demands were highest among the two youngest age groups (18–34 and 35–44 years) and lowest among the two older age groups (45–54 years, 55–64 years) and showing a further decline in the oldest age group (over 65 years). Paired comparisons also confirmed that 18–34 and 35–44 years old differed significantly from all older age groups by showing higher CPD (via Bonferroni test, p-values ranged from $p < 0.01$ to $p < 0.001$). Only the two oldest age groups (55–64 and over 65 years old) did not differ from each other in paired comparisons. Moreover, women (F (1) = 38.32, $p < 0.001$, $\beta = -0.29$, $p < 0.001$, $\eta_p^2 = 0.024$) and non-supervisors (F (1) = 12.56, $p < 0.001$, $\beta = 0.18$, $p < 0.001$, $\eta_p^2 = 0.008$) reported higher CPD than did men and supervisors.

For *knowledge-* (KLD) and *skill-related* (SLD) *learning demands* an increasing trend with aging was found. Regarding KLD (tests of between-subjects effects F (4, 1573) = 4.50, $p < 0.001$, $\eta_p^2 = 0.011$) and SLD (tests of between-subjects effects F (4, 1573) = 6.92, $p < 0.001$, $\eta_p^2 = 0.017$) we observed significant age variation. Means for age groups in KLD and SLD are presented in **Table 1**. Paired comparisons (via Bonferroni test) concerning KLD showed that the second oldest group (55–64 years) differed significantly ($p < 0.001$) from the two younger groups (18–34, 35–44 years) by showing higher KLD than the younger age groups. Paired comparisons (via Bonferroni test) for SLD showed also various significant paired differences across the age groups: 18–34 year-olds reported less SLD than 45–54, 55–64 and over 65 year-olds (p-values ranged from <0.05 to <0.001). Furthermore, 45–54 year-olds reported more SLD than 35-44 year-olds ($p < 0.05$) and 55–64 year-olds more than 35–44 year-olds ($p < 0.001$). Furthermore, parameter estimates for covariates indicated that women experienced higher KLD (F (1) = 35.97, $p < 0.001$, $\beta = -0.28$, $p < 0.001$, $\eta_p^2 = 0.022$) and SLD (F (1) = 38.17, $p < 0.001$, $\beta = -0.29$, $p < 0.001$, $\eta_p^2 = 0.024$) than men. Moreover, non-supervisors perceived higher SLD than did supervisors (F (1) = 16.26, $p < 0.001$, $\beta = 0.18$, $p < 0.001$; $\eta_p^2 = 0.010$).

In job-related planning and decision-making demands (JPD), even though the perceptions of JPD did not vary significantly by age group (tests of between-subject effects, $p = 0.248$), two covariates were significant: gender (F (1) = 21.89, $p < 0.001$, $\beta = -0.21$, $p < 0.001$, $\eta_p^2 = 0.014$) and occupational group (F (1) = 8.37, $p < 0.01$, $\beta = 0.14$, $p < 0.01$, $\eta_p^2 = 0.005$): women and those working in technical/business occupations experienced higher JPD than men and those working as academics.

To summarize, we found significant differences in the perceptions of IJDs by age groups. Specifically, older employees reported higher work intensification (e.g., intensified working pace, multitasking) and higher learning demands at work (KLD, SLD). In contrast, younger employees reported higher intensified pressures to manage and plan their career-related tasks and actions (CPD) more often than older employees. Age group explained 0–2% of the variance of IJDs depending on the dimension of IJDs (1.6% for WI, not significant for JPD, 0.2% for CPD, 1.1% for KLD, and 1.7% for SLD. Although the predictive power of age group was not very strong, it was significant (except JPD).

Predicting burnout and engagement: results of the regression analyses

The results of the regression analyses are presented in **Table 2**. We first report the direct effects of IJDs on well-being as they were estimated before the moderator effects. As can be seen from regression coefficients (β) and explanation rates (ΔR^2), all five dimensions of IJDs were related to higher burnout, and WI had the greatest amount of explained variance regarding burnout (12%). However, IJDs explained engagement less decisively: WI and CPD did not significantly predict engagement and JPD, KLD and SLD explained only 1–2% of the variation of engagement. Furthermore, JPD, KLD and SLD were related to higher (not lower) engagement, but these same job demands showed a positive relationship with (higher) burnout, thus suggesting that they may be simultaneously hindrance and challenge demands.

Age predicted neither burnout nor engagement directly. However, we found two significant interaction effects concerning age as a moderator. These moderator

Table 2: Predicting Burnout and Engagement by Age, IJDs (WI, JPD, CPD, KLD, and SLD), IJDs*Age, and IJDs*IJDs Interaction Terms.

Predictors[1]	Burnout			Engagement		
	Stand. β	R	ΔR^2	Stand. β	R	ΔR^2
WI						
Age	–0.03	–0.01	0.00	0.04	0.09***	0.00
WI	0.41***	0.35***	0.12***	–0.05	0.02	0.00
WI*age	0.01	0.00	0.00	0.02	0.01	0.00
WI*WI	0.10***[2]	–0.06*	0.01***	–0.05	–0.04	0.00
JPD						
Age	0.01	–0.01	0.00	0.04	0.09***	0.00
JPD	0.17***	0.16***	0.03***	0.09***	0.10***	0.01***
JPD*age	–0.06*	–0.05*	0.04*	0.03	0.03	0.00
JPD*JPD	0.01	–0.04*	0.00	–0.03	–0.05*	0.00
CPD						
Age	0.04	–0.01	0.00	0.04	0.09***	0.00
CPD	0.21***	0.20***	0.04***	0.01	0.01	0.00
CPD*age	–0.05*	–0.06*	0.03*	0.03	0.03	0.00
CPD*CPD	0.03	–0.01	0.00	–0.04	–0.05*	0.00
KLD						
Age	–0.00	–0.01	0.00	0.02	0.09***	0.00
KLD	0.09***	0.07**	0.05**	0.13***	0.18***	0.02***
KLD*age	0.01	0.01	0.00	0.01	0.00	0.00
KLD*KLD	0.06*	0.02	0.00	–0.09***	–0.14**	0.06***
SLD						
Age	–0.01	–0.01	0.00	0.03	0.09***	0.00
SLD	0.16***	0.13***	0.02***	0.06*	0.13***	0.01***
SLD*age	0.00	0.01	0.00	0.03	0.01	0.00
SLD*SLD	0.08**	0.02	0.05**	–0.11**	–0.13***	0.01***

Note: *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

[1] Control variables (gender, parenting status, management/leadership position, and occupational group) entered at Step 1 not shown for clarity. β-coefficients derived from the final (5th) step after entering all variables. Only those regression coefficients which are consistent with the correlation's coefficients are underlined and reported.

[2] This interaction effect is artificial and unreliable as the correlation coefficient points in a different direction, the result is not reported.

Abbreviations: WI = work intensification, JPD = intensified job-related planning and decision-making demands, CPD = intensified career-related planning and decision-making demands, KLD = knowledge-related learning demands, SLD = skill-related learning demands.

effects were consistent with the correlation coefficients and therefore reliable. Age moderated (a) the association between JPD and burnout (interaction effect $\beta = -0.06$, $p < 0.01$), and between (b) CPD and burnout (interaction effect $\beta = -0.05$, $p < 0.01$). Graphical illustrations of these interaction effects are presented in **Figure 1** (JPD) and **Figure 2** (CPD). **Figure 1** shows that JPD was more strongly related to higher job burnout among younger than among older employees and younger participants also reported a sharper increase in burnout if the level of JPD was high (compared to low a level of JPD). CPD (**Figure 2**) was also more stressful for younger employees as they reported a more marked increase in burnout if the level of CPD was high (compared to a low level of CPD). It is noteworthy that younger and older respondents differed more in a low demand situation, i.e., when CPD was low, regarding burnout.

Three-way interaction effects (IJD*IJD*age computed individually for each of the five IJDs) were all non-significant, signifying that curvilinear effects were not age-specific, and therefore we excluded these three-way interaction terms from the final regression models. However, analyses of two-way curvilinear effects indicated that KLD (KLD*KLD) and SLD (SLD*SLD) showed curvilinear interaction effects in relation to burnout and engagement. However, a detailed inspection of these interaction effects revealed that only three of them resulted in a significant change in explanatory rate (see columns for ΔR^2), and are therefore reported in more detail. A graphical inspection of the interaction effect of SLD*SLD on burnout showed that burnout increased linearly with increased SLD, and no clear curvilinear effect was observable (figures available from the first author upon request). However, two other interaction effects, i.e., KLD*KLD and SLD*SLD, on engagement showed a clear reversed curvilinear pattern. Furthermore, the curvilinear pattern was most visible in the SLD*SLD effect and is graphically shown in **Figure 3** (the interaction effect of KLD*KLD on engagement is available from the first author upon request). Employees experiencing very high SLD reported lower engagement, whereas employees reporting moderately high SLD reported the highest level of engagement. Moreover, a low level of SLD was also associated with lower engagement.

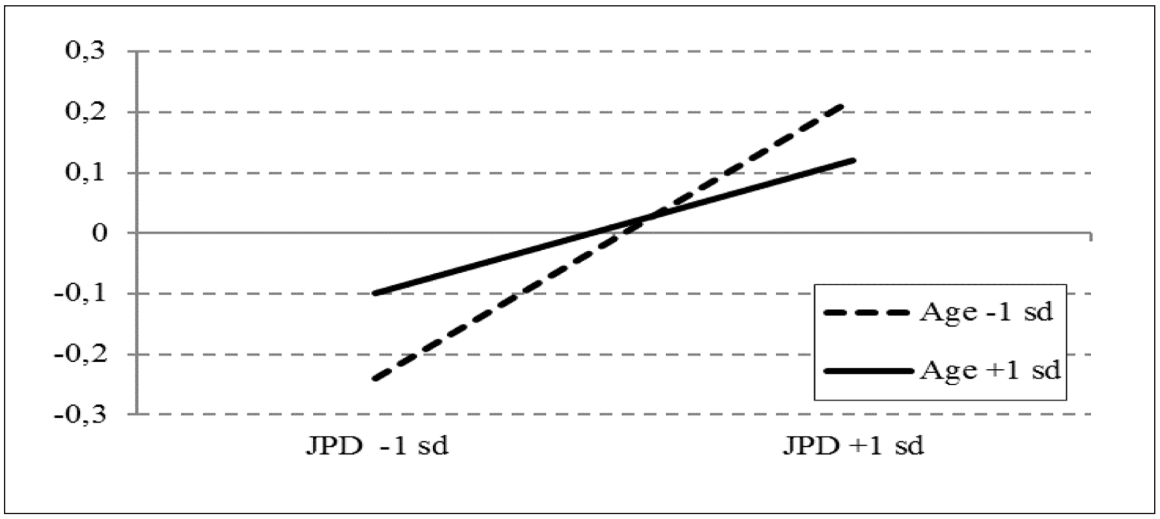

Figure 1: An interaction effect of *JPD* and *age* (JPD*age) on burnout.

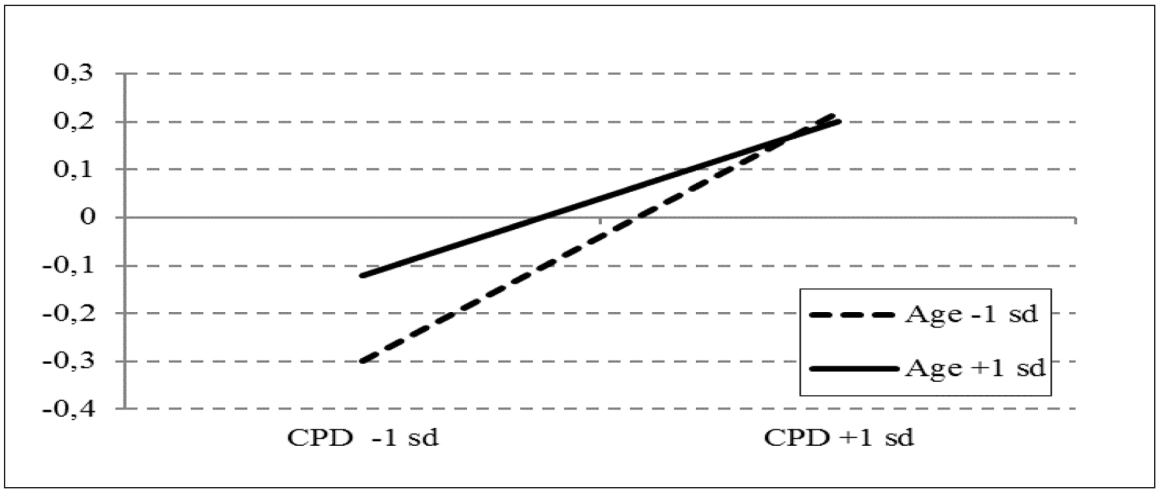

Figure 2: An interaction effect of *CPD* and *age* (CPD*age) on burnout.

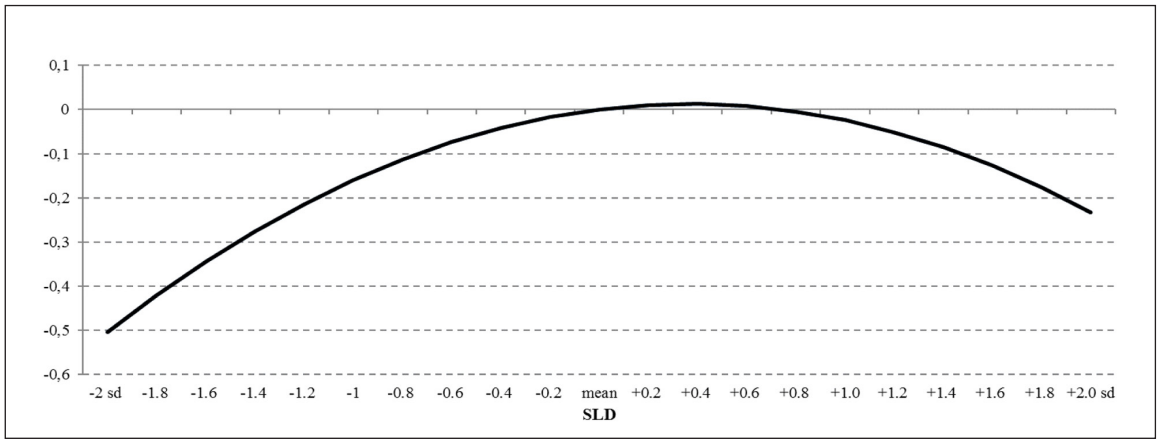

Figure 3: A curvilinear interaction effect of *SLD* (SLD*SLD) on engagement.

Discussion

The aim of this study was to examine age differences in intensified job demands (IJDs) and in their relationships with occupational well-being (burnout, engagement). We also analyzed direct (non-age-specific) relationships between IJDs and well-being. This study has two major strengths. First, we focused on new and so far understudied job demands arising from contemporary social and technological acceleration (Chesley, 2014; Green, 2004; Kubicek et al. 2015; Rosa, 2003), that is, IJDs. Second, we paid particular attention to age differences, which is important as there is no empirical evidence on age differences in experiences of IJDs or in their relationships to well-being. In studying age differences, we were particularly interested in the experiences of older employees as workforce aging is a major challenge in Europe (EC, 2010). Moreover, age differences, if emerging, would also provide a basis for tailored job stress interventions planned for and targeted at different age groups.

Age-specific findings

The results showed various age differences in perceived IJDs and some of these differences favored older, and some younger employees. Such mixed findings are nevertheless consistent with those of earlier studies on age differences in job stress research (e.g., Hertel et al. 2015; Johnson, et al. 2013; Mauno et al. 2013, 2017; Zacher and Schmitt, 2016). Specifically, we found that work intensification, intensified skill- and knowledge-related learning demands were reported more often by older employees, particularly those aged between 55–64 years. However, intensified career-related planning and decision-making demands were more prevalent among younger employees (aged between 18–44 years). Interestingly, we found no age differences in intensified job-related planning and decision-making demands.

There are two explanations for the finding, which indicated that the older employees report more certain IJDs. First, older employees may experience more work intensification and intensified learning demands at work because aging implies certain losses in cognitive (e.g., in working memory) or in physical capacity factors of which may affect work ability (Czaja et al. 2001; Ilmarinen, 2001; de Zwart et al. 1996). However, it should be taken into account that we did not measure employees' physical or cognitive functioning and therefore this interpretation remains speculative. Future studies should focus on such explanatory mechanisms between aging and IJDs.

Second, cohort effect may also explain these findings: older generations may have been used to a slower working pace and performing one task at time rather than multi-tasking. Overall, the pace of work was slower a few decades ago (e.g., Green, 2004; Franke, 2015). In addition, older employees may be more used to a 'stable working life', where learning requirements have not been so intense, and not required continuous updating. It should also be recalled that older employees typically have different developmental goals and tasks as well as different coping skills compared to younger employees and that such factors may function as mechanisms explaining the age differences found here (see e.g., Aldwin, 1991; Baltes and Baltes, 2010; Heckhausen et al. 2010; Hertel et al. 2015). Also, these explanatory mechanisms deserve more attention in future studies as we did not assess them in our survey.

Finally, one interesting finding was that the oldest age group (65+ years) in some cases reported less IJDs than younger age groups. Health selection may explain this finding: these oldest employees might be healthier and more motivated as they have continued working despite of retirement age. In contrast, those oldest employees who have some health issues or/and lower work motivation are no longer in working life but probably retired. As our study was not longitudinal, we were not able to test this health selection hypothesis.

Concerning implications, we propose that employers should be aware that older employees may encounter difficulties if the pace of work, multi-tasking and learning demands they face in their daily work are too intense. This would need particular attention today, when the workforce is aging and many organizations employ older employees. Furthermore, our findings point to the conclusion that employees aged between 55 and 65 years would need particular attention in ongoing technological

revolution, causing an intensification of work, concerning also IJDs (Green, 2004; Kubicek et al. 2015; Mauno et al. in press; Rosa, 2003).

However, it should be recognized that some effects disfavored younger, not older, employees. Namely, we found that younger employees reported more intensified career-related planning and decision-making demands than older employees, a finding which suggests that employers should pay attention to younger employees' career management and development issues. This could be of particular relevance in today's working life, which is characterized by instability and job insecurity, which are detrimental to all employees (De Witte, Pienaar and De Cruyper, 2016) but could be even more problematic for younger employees who are establishing their careers. A related aspect might be to consider younger employees' work-family balance as many of them also have family obligations likely to cause extra stress if accompanied by intensified career-management requirements. One way to help younger employees would be to provide family-friendly organizational arrangements, which may reduce their stress levels and allow more resources for advancing their careers (Mesmer-Magnus and Viswesvaran, 2006).

Even though we found various age differences in the prevalence of IJDs, as described above, the relationships between IJDs and well-being (burnout, engagement) were seldom age-specific. Furthermore, certain IJDs (planning and decision-making demands) were not experienced as more stressful among the aging employees, but among the younger ones. Specifically, age moderated the relationship between job- (JPD) and career-related (CPD) planning and decision-making demands and burnout. We found that younger employees reported more burnout than did older employees, if they perceived a high level of planning and decision-making demands in relation to job or career. Thus, younger employees seem to be more vulnerable to burnout if they experience high pressures to plan and perform in their work too independently (JPD component) or to plan and advance their careers very intensively (CPD component). Such pressures could be alleviated if employers were willing to pay more attention to younger employees' overall life situations, also considering their family obligations (see discussion above). Moreover, younger employees could benefit, for example, from mentoring or supervised practice, which might reduce the stressfulness of job- and career-related planning and the decision-making demands they experience. Competence-related support (e.g., giving professional advice, sharing expertise) from more senior employees would be helpful for younger employees. This could be extremely relevant, particularly in mentally demanding white-collar occupations, which were our focus.

Non-age-specific findings

We also examined non-age-specific relationships between IJDs and well-being and found that not all tested relationships were age-specific but that many of them were robust across the sample. First, we found that all IJDs were related to higher burnout regardless of employees' age. Thus IJDs are clearly job stressors, or hindrance demands (Crawford et al. 2010; LePine et al. 2005), as they associated with poorer occupational well-being. Similar results have been reported also previously (e.g., Chesley, 2014; Franke, 2015; Green, 2004; Kubicek et al. 2015). Of the IJD dimensions, work intensification had the strongest relationship with burnout. This finding has clear implications; if employers would like to reduce the risk of personnel burnout, particularly work intensification, i.e., excessive pace of work, multi-tasking requirements, and inability to take breaks at work, needs to be reduced. Job resources, e.g., job control and social support, could be useful resources against work intensification (Mauno et al. in press). Moreover, when aiming continuously at more effective and productive organizations, it should be recalled that employees' perceptions of work intensification tend to have negative implications for their well-being.

Second, we found that IJDs showed weaker relationships with engagement than with burnout across the entire sample. Only three IJD dimensions (i.e., job-related planning and decision-making, and skill- and knowledge-related learning demands) were associated with engagement but with a relatively low explanatory power (1–2%). More importantly, these relationships were all positive, implying that the more employees experienced these job demands, the more they experienced engagement at work. Furthermore, both knowledge- and skill-related learning demands showed a curvilinear effect: both low and high levels of learning demands were associated with lower engagement, whereas moderately high level was associated with higher engagement. Thus certain dimensions of IJDs, that is, learning demands at work, can be described as both negative hindrance demands (causing poorer well-being) and as positive challenge demands (causing improved motivation/growth at work) (Crawford et al. 2010; LePine et al. 2005). However, it is good to recall that when work-related learning demands become too high, the effects will be negative, also for engagement. Thus, the *level* of learning demands is a crucial factor determining their consequences particularly in relation to work motivation (e.g., engagement).

Concerning implications, a challenge for organizations and employers would be to identify the optimal level of learning demands, because not experiencing them at all could be detrimental to personnel work motivation (here engagement), while an excess has negative implications for motivation. The optimal level of an employee's IJDs could be negotiated between the employee and the supervisor, and these demand levels should also be (re-) evaluated on a regular basis. However, it must be born in mind that in spite of personal variation in employees' preferences for seeking challenging job demands, it is likely that very low or very high levels could cause negative motivational side effects for all employees. Lifelong learning is nowadays presented as one weapon against dramatic changes inevitably occurring in future working life with the advance in technological acceleration. Lifelong learning will be needed to lengthen careers and cope with working life changes but simultaneously it

should be realized that excessive learning demands are harmful for employees' motivation, a result of which we also found in this study.

Limitations and future directions

Even though this was a pioneer study focusing on age-differences in IJDs and their age-specific relationships with occupational well-being, the study also has few noteworthy limitations.

First, the design was cross-sectional, and we were not able to test cause-effect relationships reliably. However, on the basis of stress theories (e.g., Lazarus and Folkman, 1984; LePine et al. 2005), we expected that IJDs would function as stressors leading to stress reactions (more burnout, less engagement) but future longitudinal studies should confirm this expectation.

Second, all data were collected via self-reports, which is sensitive to common method variance bias. Thus, concerning IJDs, for example, we measured employees' *appraisal* of such demands and not objective job demands/environment. However, psychological stress research often emphasizes individuals' appraisals of their environments (e.g., Lazarus and Folkman, 1984) and we followed this tradition.

Third, time-frame in assessing IJDs is not without problems. We requested our participants to use five years in comparing their present and past work experiences but some other time-lag (e.g., shorter) could be more appropriate. A five-year time-frame was used in the original IJDs scale (Kubicek et al. 2015) and we relied on that. On the one hand, so long time-frame may cause retrospective bias particularly in self-reports which we used. On the other hand, longer time-frame is sensible considering the processes of social and technological accelerations which occur more slowly in society and are stated to form the ground for IJDs (see e.g., Green, 2004; Kubicek et al. 2015; Mauno et al. in press; Rosa, 2003).

Fourth, some relationships were relatively weak or even non-significant, e.g., relationships with IJDs and engagement as well as the interaction effects. It has to be acknowledged that the effects found may also be sample-specific; we sampled upper white-collar workers and more research evidence on this topic is needed in blue-collar samples. Some effects may be stronger in different samples than those found here.

Fifth, the response rate in the online survey was low but this is also a more general challenge in contemporary survey research. Luckily, our sample size was large enough to enable age-specific analyses and reasonably good statistical power.

Sixth, even though some relationships were age-specific, we did not examine mechanisms likely to explain or mediate the associations studied. For example, employees at different ages typically face different developmental tasks, life situations, and may also have different coping skills (see e.g., Aldwin, 1991; Baltes and Baltes, 1990; Heckhausen et al. 2010; Hertel et al. 2015). Consequently, future studies could focus more on explanatory mechanisms between age(ing), IJDs and occupational well-being.

Additional File

The additional file for this article can be found as follows:

- **Appendix 1.** Correlations (Pearson) between study variables. DOI: https://doi.org/10.16993/sjwop.60.s1

Competing Interests

The authors have no competing interests to declare.

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