

Advance Publication

INDUSTRIAL HEALTH

Received: March 24, 2023

Accepted: September 14, 2023

J-STAGE Advance Published Date: September 26, 2023

Original Paper**Boredom and engagement at work: Do they have different antecedents and consequences?**

Running Title: BOREDOM AND WORK ENGAGEMENT: EMPIRICAL
DISTINCTIVENESS

Michiko KAWADA¹, Akihito SHIMAZU², Daisuke MIYANAKA^{2,3}, Masahito TOKITA⁴,
Keiko SAKAKIBARA⁵, Naana MORI^{4,6}, Fuad HAMSYAH^{1,7}, Lin YUHENG¹, Kojiro
SHOJIMA⁸, Wilmar B. SCHAUFELI^{9,10}

¹Graduate School of Media and Governance, Keio University, Fujisawa, Japan

²Faculty of Policy Management, Keio University, Fujisawa, Japan

³Better Options, Inc., Tokyo, Japan

⁴Keio Research Institute at SFC, Fujisawa, Japan

⁵Department of Social Psychology, Faculty of Sociology, Toyo University, Tokyo, Japan

⁶Department of Advanced Biomedical Research, Faculty of Medicine, University of
Yamanashi, Yamanashi, Japan

⁷Faculty of Psychology, Universitas Gadjah Mada, Yogyakarta, Indonesia⁸Research Division,
National Center for University Entrance Examinations

⁸Research Division, National Center for University Entrance Examinations, Tokyo, Japan

⁹Department of Psychology, Utrecht University, Utrecht, NL

¹⁰Research Unit Occupational & Organizational Psychology and Professional Learning, KU
Leuven, Leuven, BE

Corresponding Author

Michiko Kawada

Graduate School of Media and Governance, Keio University

5322 Endo, Fujisawa-shi, Kanagawa 252-0882, Japan

Phone & fax number: +81-466-48-3165

mkawada@keio.jp

Abstract

This study aimed to demonstrate the empirical distinctiveness of boredom at work and work engagement in relation to their potential antecedents (job demands and job resources) and consequences (psychological distress and turnover intention) based on the Job Demands-Resources model. A three-wave longitudinal survey was conducted among registered monitors of an Internet survey company in Japan. The questionnaire included scales for boredom at work, work engagement, psychological distress, and turnover intention as well as participants' job characteristics and demographic variables. The hypothesized model was evaluated via structural equation modeling with 1,019 participants who were employed full-time. As expected, boredom at work was negatively associated with quantitative job demands and job resources and positively associated with psychological distress and turnover intention. In contrast, work engagement was positively associated with job resources and negatively associated with turnover intention. Thus, boredom at work and work engagement had different potential antecedents and were inversely related to employee well-being and organizational outcomes. However, contrary to expectations, qualitative job demands were not significantly associated with boredom at work. Further investigation is needed to understand the relationship between boredom and qualitative job demands, which require sustained cognitive load and the use of higher skills.

Key words: Boredom at work, Work engagement, Structural equation modeling, Psychological distress, Turnover intention, Job demands-Resources model, Longitudinal design.

INTRODUCTION

Recently, work has changed drastically as demonstrated by the short working times, work sharing, and telecommuting. Furthermore, technological innovations, such as artificial intelligence (AI), have played a role in these changes. Going forward, AI will lead to a decrease in the volume of tasks for occupations that can be mechanized, while creating new occupations such as AI-based services or increasing the volume of tasks such as system development and operations required for AI¹⁾. For these new tasks, workers need to acquire new knowledge or refine their existing skills. Thus, changes in work styles and technological innovations may result in work overload and additional challenges for some, while others may feel underworked and under-challenged. From another perspective, to cope with employees' psychosocial stress during the coronavirus disease 2019 (COVID-19) pandemic, the International Labor Organization suggested an appropriate work distribution and emphasized the need to consider both work overload and work underload²⁾.

Occupational health research has mainly focused on the antecedents and consequences of work overload or working hard (burnout, work engagement, and workaholism) and neglected the problem of work underload or lack of stimulation³⁻⁵⁾. Recently, boredom at work owing to a lack of a challenge and under-stimulation has been recognized as being associated with employee ill-being as well as burnout. Therefore, research on boredom has been increasing⁶⁾.

This study examined the differences between boredom at work and work engagement by investigating their potential antecedents and consequences. In other words, we examined the difference between two opposite states, a low-energy state (boredom), which has not been sufficiently examined, and a desirable high-energy state (work engagement). We employed the Job Demands-Resources (JD-R) model⁷⁾, which explains the relationships between a wide range of work environment factors and well-being. Compared with work engagement, the

comprehensive mechanisms underlying the antecedents and consequences of boredom at work are still unclear.

Boredom at work

Boredom has been defined as “a state of relatively low arousal and dissatisfaction, which is attributed to an inadequately stimulating situation⁸⁾.” In short, boredom at work can be described as a state within the context of work in which employees feel under-challenged or understimulated⁹⁾. Although boredom is mainly an affective response, several studies have suggested that it also includes cognitive aspects, such as attention deficits and daydreaming¹⁰⁾, as well as behavioral aspects, such as performing non-work-related tasks or chatting¹¹⁾.

Correlates of boredom at work

Based on prior literature reviews^{9,12)}, Schaufeli and Salanova¹³⁾ summarized the antecedents of boredom as low job demands (e.g., monotonous, repetitive work, and mental underload) and poor job resources (e.g., poor skill utilization, behavioral constraints, such as bureaucratization and standardization, and absence of meaning). Job demands can be categorized as quantitative or qualitative; while quantitative demands refer to the amount and speed of work (e.g., time pressure), qualitative demands refer to the type of skill and/or effort needed to perform work tasks^{14,15)}. A recent study¹⁶⁾ that examined the relationship with boredom separately for challenge and hindrance demands reported that, contrary to the hypothesis, workload (quantitative demands and challenge demands) did not negatively predict boredom, and red tape (hindrance demands) positively predicted boredom. Therefore, the relationship between boredom and job demands may depend on the type of job demands.

In addition, several studies suggest that boredom arises from a lack of meaningful

work¹⁷⁻¹⁹). Traditionally, according to job characteristic theory, when one experiences work as important and meaningful, one is motivated and performs better²⁰. On the contrary, when one cannot perceive the meaning of a job, one may become bored and disengage from the job^{18,21,22}). The perception of meaningful work is not dependent on objective job characteristics; rather, it is a subjective matter. This is because even work of low complexity can be perceived as meaningful^{23,24}), while even objectively complex and autonomous work can be perceived as meaningless²⁵). Recently, a study²⁶) using the JD-R framework reported that the social utility of work was more strongly related to lower boredom than job demands, workplace support, and autonomy, which have previously been examined in relation to boredom⁵).

When boredom at work persists, employees tend to become dissatisfied with work, which reduces their commitment to the organization and increases their willingness to leave^{5,27,28}). In addition, employees who are bored usually experience various potential negative consequences, such as psychological distress, sickness absence, work ineffectiveness, withdrawal, and counterproductive work behaviors^{4,29,30}). While these negative effects are well known, boredom can also have positive effects, in that it can motivate people toward more meaningful behaviors, which in turn can restore a sense of purpose and motivate prosocial behavior^{18,19,31}).

Work engagement

Work engagement is a concept proposed as a counterpart to burnout (exhaustive depression due to expending excessive energy on work)³²). It refers to a positive, fulfilling, work-related state of mind characterized by vigor, dedication, and absorption³²).

Correlates of work engagement

The antecedents of work engagement that have been investigated, based on the JD-R model, include both job and personal resources. According to literature reviews³³⁻³⁵⁾ and meta-analyses^{36,37)}, job resources (e.g., performance feedback, social support, supervisor coaching, and job control) and personal resources (e.g., goal setting and self-efficacy) are positively related to work engagement. In addition, Crawford et al.³⁸⁾ reviewed previous studies about relationships between job demands and work engagement, and reported that hindrance demands (e.g., role conflict, role ambiguity, and bureaucratic work) may negatively affect workers' well-being, while challenge demands (e.g., high workload, time pressure, and job responsibility) may promote work engagement.

Work engagement has been reported to be positively related to several organizational consequences such as positive attitudes toward work and the organization³⁹⁾, job performance, and job satisfaction^{40,41)}. In addition, work engagement has been known to have a beneficial impact on well-being and show a negative correlation with psychological distress and physical complaints⁴²⁻⁴⁴⁾.

Difference between boredom and work engagement

The distinctiveness of boredom at work and work engagement is supported by Bakker and Oerlemans's work-related subjective well-being model⁴⁵⁾, which states that boredom at work is in the "unpleasant-low activation quadrant," whereas work engagement is in the "pleasant-high activation quadrant." Thus, work engagement and boredom could be considered to be in opposite quadrants. In fact, the contrast between the two is confirmed by their different correlation patterns with, for example, antecedents such as job resources and job crafting⁴⁶⁾ and personality traits such as conscientiousness^{47,48)}. Furthermore, the correlations between the two are small enough to allow for the co-occurrence of boredom at work and work engagement^{5,49)}.

Boredom is characterized by emotional aspects such as unpleasantness and avoidance; cognitive aspects such as distorted perception of time (feeling as though time is not passing); arousal aspects such as low arousal level; and motivation such as passively killing time or trying to leave the situation⁵⁰). On the contrary, work engagement refers to a positive, fulfilling, work-related state of mind characterized by vigor, dedication, and absorption³²). Thus, work engagement, in contrast to boredom, is characterized by emotional aspects such as pleasantness and approachability (dedication); cognitive aspects such as the perception of time going by quickly (absorption); arousal aspects such as high arousal level (vigor); and motivation such as trying to maintain activities (dedication, vigor). In sum, engaged employees tend to be “proactive,” open to new information, and motivated to perform well at work⁵¹). In contrast, bored employees are “passive,” unpleasant, and characterized by a reduced attention span and distorted sense of time^{3,5}).

The current study

The JD-R model states that work engagement plays an important role in the motivational process. That is, job resources are linked to organizational consequences (e.g., turnover intention) through work engagement. Meanwhile, burnout plays an important role in the health impairment process. That is, job demands are linked to health problems through burnout. Although boredom is not mentioned in the original JD-R model, previous research^{5,27,52}) suggests that it can play a similar role in the health impairment process as burnout. However, boredom at work differs from burnout as it is negatively associated with job demands. In other words, burnout is related to high job demands, whereas boredom is related to low job demands. Reijseger et al.⁵) examined antecedents and consequences of boredom from cross-sectional data based on the JD-R model and found that low job demands and low job resources were associated with boredom. However, that study treated challenge

demands (workload) and hindrance demands (mental/emotional load) as a composite, and the consequences were limited to organizational outcomes (job satisfaction, organizational commitment, and turnover intention). More recently, although some developmental studies have examined the relationship between two types of demands (challenge and hindrance)¹⁶⁾ and boredom, workload, and job resources, with a greater focus on the meaning of work compared to other job resources²⁶⁾, they do not mention the mediating function of boredom in the health impairment process, including the consequences. To the best of our knowledge, no previous empirical studies have examined the role of boredom and work engagement simultaneously in one model in relation to their possible antecedents (job demands and job resources) and consequences (organizational outcomes and health problems).

Therefore, this study aimed to demonstrate the empirical distinctiveness of boredom at work and work engagement by examining their relationships with their potential antecedents using a three-wave longitudinal design.

Based on the abovementioned notions, we used the JD-R model as a conceptual framework and formulated a hypothesized model (Fig. 1) with the following hypotheses.

Hypothesis 1: Boredom at work mediates the relationship between quantitative job demands and psychological distress (health impairment process).

Hypothesis 2: Boredom at work mediates the relationship between qualitative job demands and psychological distress (health impairment process).

Hypothesis 3: Work engagement mediates the relationship between job resources and (low) turnover intention (motivational process).

Hypothesis 4: Boredom at work and work engagement are negatively correlated.

Hypothesis 5: Job resources are negatively related to boredom at work.

Note that, in order to examine the relationship between job demands and boredom in

more detail, we analyzed the hypotheses separately for quantitative (Hypothesis 1) and qualitative (Hypothesis 2) job demands. Both are considered challenge demands and assumed to be negatively correlated with boredom.

---Fig. 1 about here ---

PARTICIPANTS AND METHODS

Participants

This study was conducted as part of the research project “Longitudinal study on work style change, health, and well-being due to the pandemic of novel coronavirus infection (COVID-19).” Full-time employees aged 20–59 years, who were monitors of an Internet survey company, were recruited. The first survey was conducted in June 2020 with 1,600 respondents. This study used data from the three time points that involved the measurement of turnover intention—the fourth (March 2021), fifth (June 2021), and sixth (September 2021) waves. For the analysis, we used the data of 1,019 individuals who responded to all surveys from the fourth to sixth waves (response rate: 69.3%). For ease of understanding, we henceforth refer to the fourth wave as T1, fifth wave as T2, and sixth wave as T3.

Table 1 shows the participants’ characteristics at T1. Their mean age was 42.2 years (standard deviation [SD] = 10.2). Of the participants, 52.6% were male, 49.8% were married, and 85.2% were white collar workers. The average working hours per week was 40.5 hours (SD = 16.1). The proportion of white collar and non-shift workers in this study was somewhat larger than that of the working population in Japan (approximately 67% and 77%, respectively)^{53,54}.

This study was approved by the Ethics Review Board of the Public Health Research Foundation and Research Ethics Committee, SFC, Keio University (approval numbers: 20E0004 and 336). The participants were free to not respond to any part of the questionnaire

and could discontinue/withdraw at any point. Participants' consent was confirmed based on their completion of the questionnaire. This study was also registered in the University Hospital Medical Information Network clinical trial registry (ID: UMIN000040683).

--- Table 1 about here ---

Measurements

Boredom was assessed via the Dutch Boredom Scale (DUBS)⁵⁾, which has been validated in Japanese as well (DUBS-J)⁴⁹⁾. The DUBS-J included six items that measured common feelings, thoughts, or behaviors associated with boredom at work. All items were scored on a 7-point Likert scale that ranged from 0 (never) to 6 (always).

Work engagement was assessed via the short form of the Utrecht Work Engagement Scale³²⁾, which has also been validated in Japanese⁴⁴⁾. The instrument included three subscales: vigor (three items; e.g., "At my job, I feel strong and vigorous"), dedication (three items; e.g., "I am enthusiastic about my job"), and absorption (three items; e.g., "I am immersed in my work"). All items were scored on a 7-point Likert scale that ranged from 0 (never) to 6 (always).

Job demands were assessed via the corresponding subscales of the Brief Job Stress Questionnaire (BJSQ)⁵⁵⁾. This study used the subscales for quantitative (three items; e.g., "I have plenty of work to do") and qualitative job demands (three items; e.g., "My work is difficult because it requires a high level of knowledge and skills"). All items were scored on a 4-point Likert scale that ranged from 1 (disagree) to 4 (agree).

Job resources were assessed via the corresponding subscales of the BJSQ⁵⁵⁾ and the New BJSQ⁵⁶⁾. This study used the subscales for supervisor support (three items; e.g., "How freely can you talk with your supervisor?"), coworker support (three items; e.g., "How freely can you talk with your coworkers?"), job control (three items; e.g., "I have the freedom to decide the order and way of my work"), and meaningfulness of work (three items; e.g., "My

job is so difficult that it requires a high level of knowledge and skill”). Note that supervisor support and coworker support were combined as workplace support, as they are highly correlated. Prior research^{5,57)} demonstrated that these resources were negatively related to boredom and positively related to work engagement. All items were scored on a 4-point Likert scale that ranged from 1 (disagree) to 4 (agree).

Psychological distress was assessed via the Japanese version of the Kessler Psychological Distress Scale (K6)^{58,59)}. The K6 is a six-item self-report measure of psychological distress intended to be used as a quick tool to assess the risk of serious mental illness in the general population. Participants indicated how often they experienced six different feelings or experiences during the past 30 days on a 5-point Likert scale that ranged from 0 (never) to 4 (all the time).

Turnover intention was assessed via three items developed by Geurts et al.⁶⁰⁾, which were translated into Japanese and validated⁶¹⁾. The scale originally comprised four items, of which three items were worded negatively; the other was worded positively and reverse-scored. Based on a Japanese study⁶²⁾ reporting that utilization of all four items resulted in a lower Cronbach’s alpha, we excluded the positively worded item and used the remaining three items. Participants rated the extent to which they felt like leaving their organization over the last month on a 5-point Likert scale that ranged from 1 (completely agree) to 5 (completely disagree).

Statistical analyses

Participants’ responses were analyzed via SEM using the maximum likelihood method of estimation for the covariance matrix analyses. To assess the fit of the model to the data, the chi-squared (χ^2) goodness-of-fit statistic, root mean square error of approximation (RMSEA), Tucker–Lewis index (TLI), and comparative fit index (CFI) were examined. In

general, TLI and CFI values of $> .90$ and RMSEA values of $< .08$ indicated a close fit between the hypothesized model and data⁶³⁻⁶⁴).

We examined the hypothesized model, as shown in Fig. 1. This model assumed that boredom at work and work engagement fully mediated the paths from the potential antecedents (i.e., quantitative/qualitative job demands and job resources) to the consequences (i.e., psychological distress and turnover intention). We used standardized residual scores for the mediation and consequences variables to control the baseline^{65,66}). In addition, we evaluated the statistical significance of the indirect effect by employing the bias-corrected bootstrap method⁶⁷) and conducted random sampling with 2,000 iterations with replacement.

As this study is based on survey data with self-report measures, common method variance might have played a role, especially in examining data from the same respondents. Therefore, Harman's single-factor test⁶⁸) and confirmatory factor analysis were conducted to test the presence of a common method effect.

We used SPSS Statistics version 26 (IBM Corp., Armonk, NY, USA) and Amos 24 for Windows (IBM SPSS, Chicago, IL, USA) for descriptive statistics and SEM analyses, respectively.

Results

Descriptive statistics

Table 2 presents the means, SDs, internal Cronbach's alpha coefficients, and intercorrelations for all the study variables. Cronbach's alpha reliability coefficients were calculated from T1 for the antecedent variables (job demands and job resources), T1 and T2, respectively, for the mediating variables (boredom and work engagement), and T1 and T3, respectively, for the consequences variables (psychological distress and turnover intention). Most variables had Cronbach's alpha coefficients that exceeded $.80$ and met the acceptable

reliability criteria⁶⁹), except for qualitative job demands ($\alpha = .78$) and job control ($\alpha = .78$). For correlation coefficients, T1 scores were used for the antecedent variable, T2 scores and T1–T2 standardized residual scores for the mediating variable, and T3 scores and T1–T3 standardized residual scores for the consequences variable.

--- Table 2 about here ---

In terms of Harman's single-factor test, all the variables of interest (i.e., job demands, job resources, boredom at work, work engagement, psychological distress, and turnover intention) at T1 were entered into factor analyses. The unrotated factor analysis revealed the presence of eight factors with eigenvalues greater than 1.0, rather than a single factor. These factors accounted for 74.0% of the total variance; the first (largest) factor did not account for a majority of the variance (26.8%). Thus, no general factor was apparent. In addition, the confirmatory factor analysis at T1 showed that the six-factor model, which assumes that each construct is independent, although correlated, was superior (adjusted goodness of fit index = .81 and .80, CFI = .91 and .91, TLI = .90 and .90, and RMSEA = .08 and .08, for quantitative and qualitative demands, respectively) to the one-factor model, which assumes that all items measuring the six constructs load on one general factor (adjusted goodness of fit index = .29 and .30, CFI = .43 and .43, TLI = .38 and .39, and RMSEA = .19 and .18, for quantitative and qualitative demands, respectively). The results of these analyses suggested that common method variance was not of great concern and thus was unlikely to confound the interpretations of the results. Note that the same analyses were performed for T2 and T3, and those result also suggested that common method variance was not of great concern. Furthermore, the validity of each scale was confirmed as shown in Table 3, which shows the composite reliability (CR), average variance extracted (AVE), maximum shared variance (MSV), and average shared variance (ASV) for each scale. All concepts met the criteria^{70,71}), except for job resources (AVE

= .38–.39 and MSV = .57–.59).

--- Table 3 about here ---

Model testing

The hypothesized full mediation model fit the data well for quantitative job demands, $\chi^2 (N = 1,019, df = 394) = 1466.48, p < .001, CFI = .93, TLI = .92,$ and $RMSEA = .05,$ and for qualitative job demands, $\chi^2 (N = 1,019, df = 394) = 1423.35, p < .001, CFI = .93, TLI = .92,$ and $RMSEA = .05,$ respectively (Fig. 2). In these models, all indicators loaded significantly on their intended latent factors.

Quantitative job demands were negatively related to boredom at work, which in turn, was positively related to psychological distress. The bootstrap method indicated that this indirect relationship was significant ($-.03; 95\%$ bias-corrected confidence intervals [BCCIs] = $[-.01, -.06], p = .002$). This supported Hypothesis 1. However, contrary to Hypothesis 2, qualitative job demands were not significantly related to boredom at work, which in turn, was positively related to psychological distress. In addition, the bootstrap method indicated that this indirect relationship was not significant ($-.01; 95\%$ BCCIs = $[-.01, -.04], p = .226$).

Job resources were positively related to work engagement, which in turn, was negatively related to turnover intention. The bootstrap method also indicated that this indirect relationship was significant (in the case of quantitative demands: $-.04; 95\%$ BCCIs = $[-.01, -.08], p = .002$; in the case of qualitative demands: $-.04; 95\%$ BCCIs = $[-.01, -.08], p = .003$). Thus, Hypothesis 3 was confirmed.

Finally, boredom at work and work engagement were negatively correlated, which confirmed Hypothesis 4.

In addition, as shown in Fig. 2, our results revealed various cross-links that existed

between the health impairment and motivational processes. That is, job resources were negatively related to boredom at work, which confirmed Hypothesis 5. In addition, boredom at work was positively related to turnover intention.

Note that the DUBS includes “At my work, there is not so much to do,” which indicates underload. This may have been confused with quantitative job demands, which is an antecedent, and may have affected the results. To check the possibility of this problem, an analysis excluding this one item was also conducted. As the results were not significantly different from those using all items, the results using all items were used as the results of this study.

---Fig. 2 about here ---

DISCUSSION

Boredom vs work engagement

This study investigated the empirical distinctiveness of boredom at work and work engagement in relation to their antecedents (job demands and job resources) and consequences (psychological distress and turnover intention) based on the JD-R model. Results of the SEM showed that quantitative job demands were negatively related to boredom at work, which in turn, was positively related to psychological distress. As the effects of boredom on psychological distress ($\beta = .22$) were greater than those on turnover intention ($\beta = .15$), boredom at work played a major role in the health impairment process that linked job demands to psychological distress, as predicted in Hypothesis 1. This finding was notable as most prior research has focused on the negative effects of boredom on work attitudes and performance rather than on health⁹). Few studies have reported the negative effects of boredom on health and burnout^{16,72}). However, qualitative job demands were not significantly related to boredom at work. Qualitative job demands can be considered challenge demands, as there is cognitive load and the need to utilize advanced skills. Although challenge demands

are thought to reduce boredom and increase work engagement, the present study found no association between the two. This gap could be attributed to the following two points: (1) long attention spans, which are a cognitive load, can cause boredom and (2) there are individual differences in whether difficult tasks requiring high skills are considered challenge or hindrance demands. First, because monitoring tasks that require constant attention could lead to boredom^{73,74}, if the qualitative demands placed on the participants in this study were similar to those of monitoring tasks, they would be perceived not as challenge but hindrance demands. Second, the qualitative burden presupposes a person–environment fit^{15,22,75}. For example, when the qualitative demands is far beyond an individual’s skills, it leads to boredom^{22,76}. Therefore, owing to individual differences in skill level and sensitivity, qualitative burden may not have been an attractive challenge demand for some. As this may have complicated the relationship between qualitative demands and boredom, it is necessary to consider qualitative requirements other than cognitive load and in terms of fit with the individual in the future.

The results of the SEM also showed that job resources were positively related to work engagement, which in turn, was negatively related to turnover intention. Thus, work engagement played a major role in the motivational process that linked job resources to turnover intention. This supported Hypothesis 3 and was consistent with the JD-R model and previous results^{7,33}).

Regarding the possible antecedents of boredom and work engagement, we found that boredom was related to low quantitative job demands and poor job resources. In addition, work engagement was related to abundant job resources, which was consistent with the JD-R model. This suggested that boredom and work engagement had different potential antecedents.

Regarding the consequences of boredom and work engagement, boredom was related

to both higher psychological distress and turnover intention. Furthermore, it was strongly related to psychological distress. In contrast, work engagement was related to lower turnover intention. These findings suggested that boredom and work engagement had different consequences. Taken together, as boredom at work and work engagement had different potential antecedents and consequences, they could be considered empirically distinct concepts.

Finally, boredom and work engagement were negatively correlated ($r = -.11$ – $-.12$), which supported Hypothesis 4. Their weak correlation may suggest that boredom and work engagement are not two poles on a single dimension but are located on different dimensions. The reason for this may be considered in terms of the differences in the motivational backgrounds of the two. Boredom is thought to have a background of promotion of avoidance motivation rather than lack of approach motivation. This is because boredom is different from lack of interest⁵⁰⁾ and the experience of boredom induces another activity^{11,30)}. On the contrary, work engagement is thought to be driven by the positive intrinsic value of being interested in and enjoying an activity⁷⁷⁾, which in turn promotes approach motivation. Thus, boredom, caused by the promotion of avoidance motivation, and low work engagement, caused by the lack of approach motivation, are considered to be different. Nevertheless, as workers are engaged in a variety of jobs during a given period of time, leading to the simultaneous occurrence of boredom and low work engagement, the difference between the two concepts, including their backgrounds, requires further study.

Implications for future research and practice

Our findings provide implications for future research and practices to prevent boredom at work from three viewpoints: job resources, job demands, and balance between job resources and job demands.

First, our results showed that quantitative job demands and job resources were negatively associated with boredom at work. As job resources had a positive association with work engagement, an increase in job resources could be the most promising way to improve occupational health regarding the reduction of boredom at work. However, convergent validity of the job resources composite of workplace support, job control, and meaning of work was low, and the three need to be examined separately. Future studies should clarify the detailed mechanisms of how each job resource may lead to reduced boredom at work and develop strategies to reduce boredom through boosting these specific resources.

Second, this study showed that quantitative job demands were negatively related to boredom, which in turn, was positively related to psychological distress and turnover intentions. As the JD-R model suggests that higher job demands lead to burnout⁸⁾, identifying the optimal level of job demands to simultaneously reduce boredom at work and prevent psychological distress and turnover intention is crucial.

Third, it is also useful to investigate the optimal *balance* between job demands and job resources. To boost work engagement, job resources are important, especially in situations with high job demands⁷⁸⁾. Therefore, examining the specific balance between job demands and job resources is necessary to reduce boredom.

Limitations and future directions

This study had several limitations. First, the findings were based on survey data that used self-reported measures. Self-report bias (e.g., due to negative affection or common method variance) may have affected the results, which implied that the true association between the variables might be weaker or stronger than those observed. Therefore, our findings should be replicated in the future with objective measures (e.g., actual turnover or physician-diagnosed health status). Second, data were collected through an Internet survey,

which suggested that our findings may not be generalizable, for instance, to employees with limited Internet access or literacy. Furthermore, most participants were white collar workers and not involved in shift work. Therefore, future research should examine whether our findings can be generalized to blue collar and shift workers. Fourth, the survey was conducted during the COVID-19 pandemic. Future research should examine whether our findings can be generalized to those obtained after the pandemic. Third, although this study confirmed that low quantitative demands and low resources lead to boredom, the possibility of reverse causality, that is, boredom leading to lower quantitative demands and low resources, cannot be ruled out. In addition, although this study confirmed that boredom worsens both health and organizational outcomes, the opposite direction is also possible. Therefore, more research is needed to prepare sufficient data and to investigate these two-way relationships. Finally, although this study was based on the JD-R model, personal resources, such as self-efficacy and individual skills, were not examined as antecedents of boredom. According to Csikszentmihalyi's flow theory⁷⁹⁾, which focused on the balance between individual skills and challenges of tasks, boredom occurs when an individual has an intermediate skill level and a lower challenge level. Thus, future studies should determine an optimal combination of personal resources and job demands to prevent boredom at work.

Conclusion

Boredom at work and work engagement are different aspects of work-related well-being. Boredom at work can be due to low quantitative job demands and job resources. Furthermore, it is positively related to psychological distress and turnover intention. Conversely, work engagement can occur as a result of high job resources and may help reduce turnover intention. Thus, boredom at work and work engagement have different potential antecedents and are differentially associated with employee well-being. Our

research model, in which boredom plays a key role in the health impairment process of the JD-R model, may boost future research on employee ill-being caused by low job stimulation, an under-researched topic in occupational health psychology.

Acknowledgments

We thank all the Internet survey participants for their cooperation. We would also like to thank Yukino Sato for collaboration on the early stages of this work.

Conflict of Interest

All authors declare no relevant conflicts of interest in relation to the subject of the manuscript.

Authors' Contributions

MK was responsible for the statistical analyses and writing of the manuscript. AS planned the research design as a principal investigator of the project and contributed to the writing of the manuscript. MT was responsible for data collection. Keiko S, NM, and LY created the questionnaires. DM and Kojiro S significantly contributed to data analysis and interpretation. WS reviewed the manuscript and provided expert opinions. All authors revised the manuscript critically and approved the final manuscript prior to submission for publication.

Registration of the Study/Trial

The protocol was registered in the UMIN Clinical Trials Registry (UMIN000040683).

References

- 1) Frey C, Osborne M (2017) The future of employment: How susceptible are jobs to computerization? *Technol Forecast Soc* **114**, 254–280. doi: 10.1016/j.techfore.2016.08.019.
- 2) International Labor Organization. Managing Work-Related Psychosocial Risks During the COVID-19 Pandemic 2020. https://www.ilo.org/global/topics/safety-and-health-at-work/resources-library/publications/WCMS_748638/lang--en/index.html. Accessed September 2, 2022.
- 3) Fisher CD (1993) Boredom at work: A neglected concept. *Hum Relat* **46**, 395–417. doi: 10.1177/001872679304600305.
- 4) Game AM (2007) Workplace boredom coping: Health, safety, and HR implications. *Pers Rev* **36**, 701–721. doi: 10.1108/00483480710774007.
- 5) Reijseger G, Schaufeli WB, Peeters MC, Taris TW, van Beek I, Ouweneel E (2013) Watching the paint dry at work: Psychometric examination of the Dutch Boredom Scale. *Anxiety Stress Coping* **26**, 508–525. doi: 10.1080/10615806.2012.720676.
- 6) Vodanovich SJ, Watt JD (2016) Self-report measures of boredom: An updated review of the literature. *J Psychol* **150**, 196–228. doi: 10.1080/00223980.2015.1074531.
- 7) Schaufeli WB, Bakker AB (2004) Job demands, job resources, and their relationship with burnout and engagement: A multi-sample study. *J Organ Behav* **25**, 293–315. doi: 10.1002/job.248.
- 8) Mikulas WL, Vodanovich SJ (1993) The essence of boredom. *Psychol Rec* **43**, 3–12.
- 9) Loukidou L, Loan-Clarke J, Daniels K (2009) Boredom in the workplace: More than monotonous tasks. *Int J Manag Rev* **11**, 381–405. doi: 10.1111/j.1468-2370.2009.00267.x.
- 10) Damrad-Frye R, Laird JD (1989) The experience of boredom: The role of the self-

- perception of attention. *J Pers Soc Psychol* **57**, 315–320. doi: 10.1037/0022-3514.57.2.315
- 11) Baker PL (1992) Bored and busy: Sociology of knowledge of clerical workers. *Sociol Perspect* **35**, 489–503. doi: 10.2307/1389331.
 - 12) van der Heijden GA, Schepers JJ, Nijssen EJ (2012) Understanding workplace boredom among white collar employees: Temporary reactions and individual differences. *Eur J Work Organ Psychol* **21**, 349–375. doi: 10.1080/1359432X.2011.578824.
 - 13) Schaufeli WB, Salanova M (2014) Burnout, boredom and engagement in the workplace. In: *An introduction to contemporary work psychology*, Peeters MCW, de Jonge J, and Taris TW (Eds.), 293–320, Wiley-Blackwell, New Jersey.
 - 14) van Veldhoven, MJ (2014) Quantitative job demands. In: *An introduction to contemporary work psychology*, Peeters MCW, de Jonge J, and Taris TW (Eds.), 117–143, Wiley-Blackwell, New Jersey.
 - 15) Zapf D, Semmer NK, Johnson S (2014) Qualitative demands at work. In: *An introduction to contemporary work psychology*, Peeters MCW, de Jonge J, and Taris TW (Eds.), 144–168, Wiley-Blackwell, New Jersey.
 - 16) Harju LK, Van Hootegem A, De Witte H (2022) Bored or burning out? Reciprocal effects between job stressors, boredom and burnout. *J Vocat Behav* **139**, 103807, doi: org/10.1016/j.jvb.2022.103807.
 - 17) Fahlman SA, Mercer KB, Gaskovski P, Eastwood AE, Eastwood JD (2009) Does a lack of life meaning cause boredom? Results from psychometric, longitudinal, and experimental analyses. *J Soc Clin Psychol* **28**, 307–340. doi: 10.1521/jscp.2009.28.3.307
 - 18) Van Tilburg WAP, Igou ER (2012) On boredom: Lack of challenge and meaning as distinct boredom experiences. *Motiv Emotion* **36**, 181–194. doi:10.1007/s11031-011-9234-9.
 - 19) Harju LK, Kaltiainen J, Hakanen JJ (2021) The double-edged sword of job crafting: The effects of job crafting on changes in job demands and employee well-being. *Hum Resour*

- Manage **60**, 953–968. doi: 10.1002/hrm.22054.
- 20) Hackman JR, Oldham GR (1976) Motivation through the design of work: Test of a theory. *Organ Behav Hum Perf* **16**, 250–279. doi: [10.1016/0030-5073\(76\)90016-7](https://doi.org/10.1016/0030-5073(76)90016-7).
- 21) Johnsen R (2016) Boredom and organization studies. *Organ Stud* **37**, 1403–1415. doi: [10.1177/0170840616640849](https://doi.org/10.1177/0170840616640849).
- 22) Pekrun R (2006) The control-value theory of achievement emotions: Assumptions, corollaries, and implications for educational research and practice. *Educ Psychol Rev* **18**, 315–341 doi: [org/10.1007/s10648-006-9029-9](https://doi.org/10.1007/s10648-006-9029-9).
- 23) Tsai CJ (2016) Boredom at work and job monotony: An exploratory case study within the catering sector. *Hum Resour Dev Q*, **27**, 207-236. doi: [org/10.1002/hrdq.21249](https://doi.org/10.1002/hrdq.21249)
- 24) Isaksen J (2000) Constructing meaning despite the drudgery of repetitive work. *J Humanist Psychol* **40**, 84–107. doi: [10.1177/0022167800403008](https://doi.org/10.1177/0022167800403008).
- 25) Hill AB, Perkins RE (1985) Towards a model of boredom. *Brit J Psycho* **76**, 235–240. doi: [10.1111/j.2044-8295.1985.tb01947.x](https://doi.org/10.1111/j.2044-8295.1985.tb01947.x).
- 26) Toscanelli C, Udayar S, Urbanaviciute I, Massoudi K. (2022) The role of individual characteristics and working conditions in understanding boredom at work. *Pers Rev* **51**, 480–500. <https://doi.org/10.1108/PR-07-2020-0510>.
- 27) van Wyk SM, de Beer LT, Pienaar J, Schaufeli WB (2016) The psychometric properties of a workplace boredom scale (DUBS) within the South African context. *S Afr J Ind Psychol* **42**, 1–10. doi: [10.4102/sajip.v42i1.1326](https://doi.org/10.4102/sajip.v42i1.1326).
- 28) Kass SJ, Vodanovich SJ, Callender A (2001) State-trait boredom: The relationship to absenteeism, tenure and job satisfaction. *J Bus Psychol* **16**, 317–327. doi: [10.1023/A:1011121503118](https://doi.org/10.1023/A:1011121503118).
- 29) Drory A (1982) Individual differences in boredom proneness and task effectiveness at work. *Pers Psychol* **35**, 141–151. doi: [10.1111/j.1744-6570.1982.tb02190.x](https://doi.org/10.1111/j.1744-6570.1982.tb02190.x).

- 30) Bruursema K, Kessler SR, Spector PE (2011) Bored employees misbehaving: The relationship between boredom and counterproductive work behavior. *Work Stress* **25**, 93–107. doi: 10.1080/02678373.2011.596670.
- 31) van Tilburg WAP, Igou ER (2013) On the meaningfulness of behavior: An expectancy x value approach. *Motiv Emotion* **37**, 373–388. do: 10.1007/s11031-012-9316-3.
- 32) Schaufeli WB, Salanova M, González-romá V, Bakker AB (2002) The measurement of engagement and burnout: A two sample confirmatory factor analytic approach. *J Happiness Stud* **3**, 71–92. doi: 10.1023/A:1015630930326.
- 33) Salanova M, Schaufeli WB (2008) A cross-national study of work engagement as a mediator between job resources and proactive behaviour. *Int J Hum Resour Man* **19**, 116–131. doi: 10.1080/09585190701763982.
- 34) Simpson MR (2009) Engagement at work: A review of the literature. *Int J Nurs Stud* **46**, 1012–1024. doi: 10.1016/j.ijnurstu.2008.05.003.
- 35) Mauno S, Kinnunen U, Mäkikangas A, Feldt T (2010) Job demands and resources as antecedents of work engagement: A qualitative review and directions for future research. In: *Handbook of employee engagement: Perspectives, issues, research and practice*, Albrecht SL (Ed.), 111–128, Edward Elgar Publishing, Cheltenham. doi: 10.4337/9781849806374.00016.
- 36) Christian MS, Garza AS, Slaughter JE (2011) Work engagement: A quantitative review and test of its relations with task and contextual performance. *Pers Psychol* **64**, 89–136. doi: 10.1111/j.1744-6570.2010.01203.x.
- 37) Halbesleben JRB (2010) A meta-analysis of work engagement: Relationships with burnout, demands, resources, and consequences. In: *Work engagement: A handbook of essential theory and research*, Bakker AB and Leiter MP (Eds.), 102–117, Psychology Press, London.

- 38) Crawford ER, LePine JA, Rich BL (2010) Linking job demands and resources to employee engagement and burnout: A theoretical extension and meta-analytic test. *J Appl Psychol* **95**, 834–848. doi: 10.1037/a0019364.
- 39) Bakker AB, Schaufeli WB, Leiter MP, Taris TW (2008) Work engagement: An emerging concept in occupational health psychology. *Work Stress* **22**, 187–200. doi: 10.1080/02678370802393649.
- 40) Shimazu A, Schaufeli WB (2009) Is workaholism good or bad for employee well-being? The distinctiveness of workaholism and work engagement among Japanese employees. *Ind Health* **47**, 495–502. doi: 10.2486/indhealth.47.495.
- 41) Shimazu A, Schaufeli WB, Kubota K, Kawakami N (2012) Do workaholism and work engagement predict employee well-being and performance in opposite directions? *Ind Health* **50**, 316–321. doi: 10.2486/indhealth.MS1355.
- 42) Schaufeli WB, Taris TW, Van Rhenen W (2008) Workaholism, burnout, and work engagement: Three of a kind or three different kinds of employee well-being? *Appl Psychol* **57**, 173–203. doi: 10.1111/j.1464-0597.2007.00285.x.
- 43) Demerouti E, Bakker AB, de Jonge J, Janssen PP, Schaufeli WB (2001) Burnout and engagement at work as a function of demands and control. *Scand J Work Environ Health* **27**, 279–286. doi: 10.5271/sjweh.615.
- 44) Shimazu A, Schaufeli WB, Kosugi S, Suzuki A, Nashiwa H, Kato A, Sakamoto M, Irimajiri H, Amano S, Hirohata K, Goto R, Kitaoka-Higashiguchi K (2008) Work engagement in Japan: Validation of the Japanese version of the Utrecht Work Engagement Scale. *Appl Psychol* **57**, 510–523. doi: 10.1111/j.1464-0597.2008.00333.x.
- 45) Bakker AB, Oerlemans WGM (2011) Subjective well-being. In: *The Oxford handbook of positive organizational scholarship*, Cameron KS and Spreitzer GM (Eds.), 178–189, Oxford University Press, Oxford.

- 46) Harju LK, Hakanen JJ, Schaufeli WB (2016) Can job crafting reduce job boredom and increase work engagement? A three-year cross-lagged panel study. *J Vocat Behav* **95**, 11–20. doi: 10.1016/j.jvb.2016.07.001.
- 47) Young HR, Glerum DR, Wang W, Joseph DL (2018) Who are the most engaged at work? A meta-analysis of personality and employee engagement. *J Organ Behav* **39**, 1330–1346. doi: 10.1002/job.2303.
- 48) Culp NA (2006) The relations of two facets of boredom proneness with the major dimensions of personality. *Pers Indiv Differ* **41**, 999–1007. doi: 10.1016/j.paid.2006.02.018.
- 49) Kawada M, Shimazu A, Tokita M, Miyanaka D, Schaufeli WB (2022) Validation of the Japanese version of the Dutch Boredom Scale. *J Occup Health* **64**, e12354. doi: 10.1002/1348-9585.12354.
- 50) Pekrun R, Goetz T, Daniels LM, Stupnisky RH, Perry RP (2010) Boredom in achievement settings: Exploring control–value antecedents and performance outcomes of a neglected emotion. *J Educ Psychol* **102**, 531–549. doi: 10.1037/a0019243.
- 51) Bakker AB (2011) An evidence-based model of work engagement. *Curr Dir Psychol Sci* **20**, 265–269. doi: 10.1177/0963721411414534.
- 52) Rimaz S, Alimohammadi I, Abolghasemi J, Gholami A, Taheri F, Moradi Y (2020) Psychometric properties of a Farsi version of the Dutch Boredom Scale Questionnaire (DUBS) in Iranian University of Medical Sciences employees. *Iran Occup Health* **17**, 11–24.
- 53) Ministry of Health, Labour and Welfare. Basic Surveys on Employment Structure, the 29th year of Heisei (in Japanese) 2017. <https://www.stat.go.jp/data/shugyou/2017/index.html>. Accessed April 8, 2022.

- 54) Ministry of Health, Labour and Welfare. Survey on Industrial Safety and Health, the 2nd year of Reiwa (in Japanese) 2020. <https://www.e-stat.go.jp/stat-search/files?page=1&toukei=00450110&tstat=000001069310>. Accessed April 25, 2022.
- 55) Shimomitsu T, Yokoyama K, Ono Y, Maruta T, Tanigawa T (1998) Development of a novel brief job stress questionnaire. In: Report of the research grant for the prevention of work-related diseases from the Ministry of Labor, Japanese Ministry of Labor, Kato S (Ed.), 107–115 (in Japanese).
- 56) Inoue A, Kawakami N, Shimomitsu T, Tsutsumi A, Haratani T, Yoshikawa T, Shimazu A, Odagiri Y (2014) Development of a short questionnaire to measure an extended set of job demands, job resources, and positive health outcomes: The New Brief Job Stress Questionnaire. *Ind Health* **52**, 175–189. doi: 10.2486/indhealth.2013-0185.
- 57) Schaufeli WB, Shimazu A, Hakanen J, Salanova M, De Witte H (2019) An ultra-short measure for work engagement: The UWES-3 validation across five countries. *Eur J Psychol Assess* **35**, 577–591. doi: org/10.1027/1015-5759/a000430.
- 58) Kessler RC, Andrews G, Colpe LJ, Hiripi E, Mroczek DK, Normand SL, Walters EE, Zaslavsky AM (2002) Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychol Med* **32**, 959–976. doi:10.1017/S0033291702006074.
- 59) Furukawa TA, Kawakami N, Saitoh M, Ono Y, Nakane Y, Nakamura Y, Tachimori H, Iwata N, Uda H, Nakane H, Watanabe M, Naganuma Y, Hata Y, Kobayashi M, Miyake Y, Takeshima T, Kikkawa T (2008) The performance of the Japanese version of the K6 and K10 in the World Mental Health Survey Japan. *Int J Methods Psychiatr Res* **17**, 152–158. doi: 10.1002/mpr.257.

- 60) Geurts S, Schaufeli W, De Jonge J (1998) Burnout and intention to leave among mental health-care professionals: A social psychological approach. *J Soc Clin Psychol* **17**, 341–362. doi: 10.1521/jscp.1998.17.3.341.
- 61) Tsuno K, Kawachi I, Kawakami N, Miyashita K (2018) Workplace bullying and psychological distress: A longitudinal multilevel analysis among Japanese employees. *J Occup Environ Med* **60**, 1067–1072. doi: 10.1097/JOM.0000000000001433.
- 62) Sakakibara K, Shimazu A, Toyama H, Schaufeli WB (2020) Validation of the Japanese version of the Burnout Assessment Tool. *Front Psychol* **11**, 1819. doi: 10.3389/fpsyg.2020.01819.
- 63) Hoyle RH (1995) The structural equation modeling approach: Basic concepts and fundamental issues. In: *Structural equation modeling: Concepts, issues, and applications*, Hoyle RH (Ed.), 1–15, Sage Publications, Thousand Oaks.
- 64) Hu L, Bentler PM (1998) Fit indices in covariance structure modeling: Sensitivity to underparameterized model misspecification. *Psychol Methods* **3**, 424–453. doi: 10.1037/1082-989X.3.4.424.
- 65) Smith P, Beaton D (2008) Measuring change in psychosocial working conditions: Methodological issues to consider when data are collected at baseline and one follow-up time point. *Occup Environ Med* **65**, 288–296. doi: 10.1136/oem.2006.032144.
- 66) Cronbach LJ, Furby L (1970) How we should measure “change”: Or should we? *Psychol Bull* **74**, 68–80. doi: 10.1037/h0029382.
- 67) Mackinnon DP, Lockwood CM, Williams J (2004) Multivariate behavioral confidence limits for the indirect effect: Distribution of the product and resampling methods. *Multivariate Behav Res* **39**, 99–128. doi: 10.1207/s15327906mbr3901_4.
- 68) Podsakoff PM, Organ DW (1986). Self-reports in organizational research: Problems and prospects. *J Manage* **12**, 531–544. doi: 10.1177/014920638601200408.

- 69) Nunnally JC, Bernstein IH (1994) The assessment of reliability. *Psychometric Theory* **3**, 248–292.
- 70) Bagozzi R, Yi Y (1988) On the evaluation of structural equation models. *J Acad Market Sci* **16**, 74–94. doi: 10.1007/BF02723327.
- 71) Fornell C, Larcker DF (1981) Evaluating structural equation models with unobservable variables and measurement error. *J Marketing Res*, **18**, 39–50. doi: 10.2307/3151312.
- 72) Harju L, Hakanen JJ, Schaufeli WB (2014) Job boredom and its correlates in 87 Finnish organizations. *J Occup Environ Med* **56**, 911–918. doi: 10.1097/JOM.0000000000000248.
- 73) Becker AB, Warm JS, Dember WN, Hancock PA (1995) Effects of jet engine noise and performance feedback on perceived workload in a monitoring task. *Int J Aviat Psychol* **5**, 49–62. doi: 10.1207/s15327108ijap0501_4.
- 74) Prinzel LJ 3rd, Freeman FG (1997) Task-specific sex differences in vigilance performance: Subjective workload and boredom. *Percept Mot Skills* **85**, 1195–202. doi: 10.2466/pms.1997.85.3f.1195. PMID: 9450271.
- 75) Csikszentmihalyi M (1975) *Beyond boredom and anxiety*. Jossey-Bass Publishers, Washington.
- 76) Acee TW, Kim H, Kim HJ, Kim JI, Chu HNR, Kim M, Cho Y, Wicker FW, Boredom Research Group (2010) Academic boredom in under- and over-challenging situations. *Contemp Educ Psychol* **35**, 17–27. doi: 10.1016/j.cedpsych.2009.08.002.
- 77) Eccles JS (2005) Subjective task value and the Eccles et al. model of achievement-related choices. In: *Handbook of competence and motivation*, Elliot AJ, Dweck CS (Eds.), 105–121. Guilford Publications, New York.
- 78) Bakker AB, Hakanen JJ, Demerouti E, Xanthopoulou D (2007) Job resources boost work engagement, particularly when job demands are high. *J Educ Psychol* **99**, 274–284. doi: 10.1037/0022-0663.99.2.274.

- 79) Csikszentmihalyi M (1990) Flow: The psychology of optimal experience. Harper Perennial Modern Classics, New York.

Table 1. Participants' demographic characteristics at T1 (N = 1,019).

	n (%)	Mean (SD)
Age (Years)		42.2 (10.2)
Gender		
Male	536 (52.6)	
Female	483 (47.4)	
Marital Status		
Married (including cohabitation)	507 (49.8)	
Unmarried	512 (50.2)	
Education		
College or lower	436 (42.8)	
University or higher	583 (57.2)	
Occupation		
White collar	868 (85.2)	
Blue collar	110 (10.8)	
Other	41 (4.0)	
Shift Work		
No	917 (90.0)	
Yes	102 (10.0)	
Working Hours/Week		40.5 (16.1)

Table 2. Means, standard deviations, correlations, and internal consistencies (Cronbach's α coefficients on the diagonal) of the variables (N = 1,019).

Variables	Mean	SD	1	2	3	4	5	6	7	8	9	10
1 Quantitative job demands (T1)	2.57	0.77	(.84)									
2 Qualitative job demands (T1)	2.63	0.69	.72**	(.78)								
3 Job resources (T1)	2.49	0.53	.09**	.18**	(.88)							
4 Workplace support (T1)	2.35	0.66	.05	.08**	.88**	(.91)						
5 Job control (T1)	2.61	0.67	-.06 ⁺	-.03	.68**	.37**	(.78)					
6 Meaning of work (T1)	2.65	0.71	.24**	.40**	.71**	.39**	.39**	(.89)				
7 Boredom at work standardized residual score (T1/T2)	0.00	1.00	-.09**	-.12**	-.04	.01	-.02	-.10**	-			
8 Work engagement standardized residual score (T1/T2)	0.00	1.00	-.04	.02	.11**	.08*	.06 ⁺	.13**	-.12**	-		
9 Psychological distress standardized residual score (T1/T3)	0.00	1.00	.04	.03	-.09**	-.06 ⁺	-.11**	-.06 ⁺	.12**	-.07*	-	
10 Turnover intention standardized residual score (T1/T3)	0.00	1.00	.08*	.03	-.10**	-.06 ⁺	-.12**	-.07*	.07*	-.13**	.20**	-

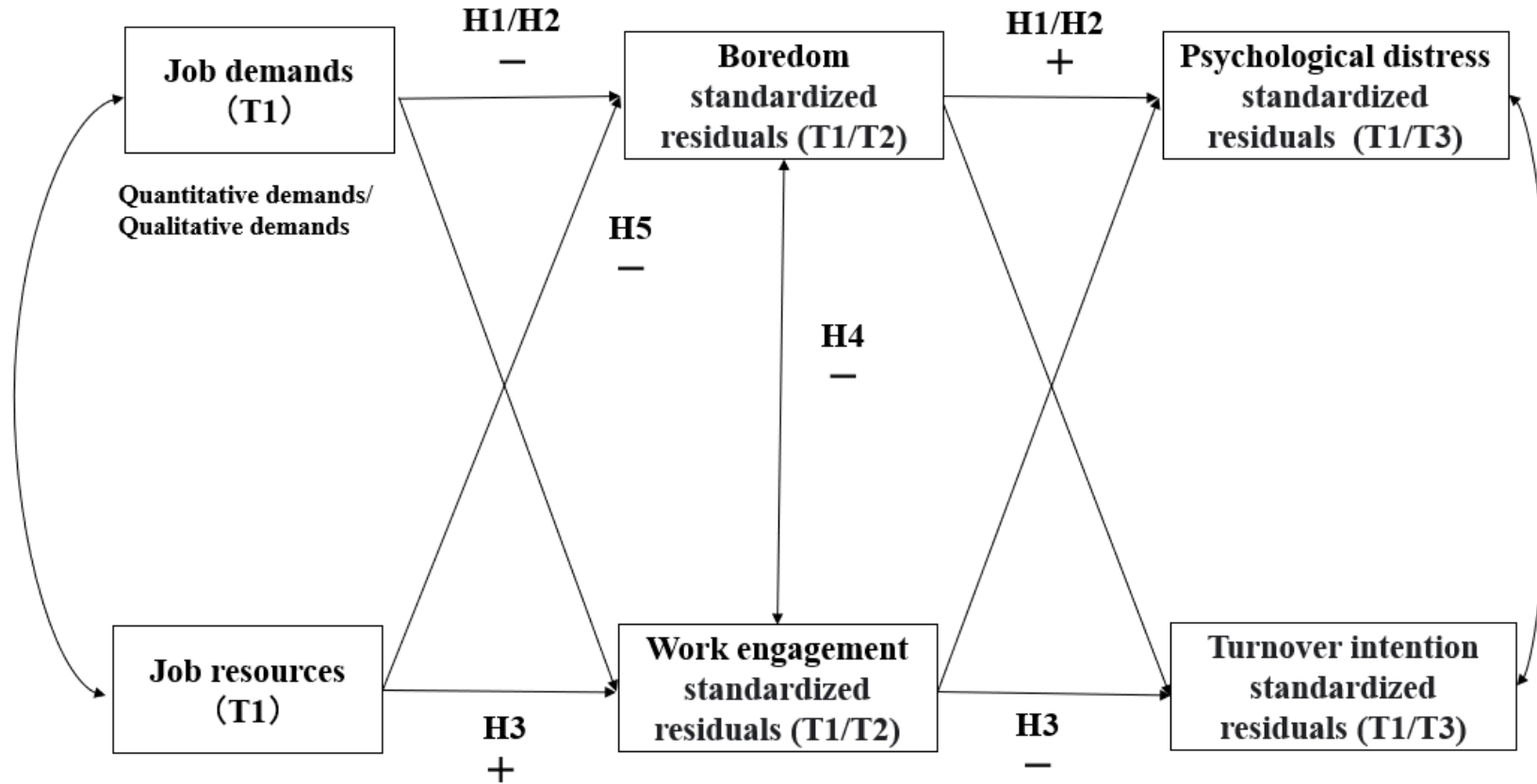
Note: ** $p < .01$, * $p < .05$, + $p < 0.1$. Cronbach's alpha coefficients are displayed in parentheses.

Table 3. The CR, AVE, MSV and ASV values of all constructs (N = 1,019).

Construct	CR	AVE	MSV	ASV
1 Boredom	.89/.89	.58/.58	.12/.12	.06/.06
2 Work engagement	.96/.96	.73/.73	.57/.55	.16/.16
3 Quantitative job demands	.84	.64	.08	.04
4 Qualitative job demands	.78	.55	.18	.06
5 Job resources	.64/.64	.38/.39	.57/.55	.22/.24
6 Psychological distress	.95/.95	.76/.76	.12/.12	.07/.07
7 Turnover intention	.87/.87	.68/.68	.32/.30	.14/.13

Note: CR = construct reliability; AVE = average variance extracted; MSV = maximum shared variance; ASV = average shared variance. The two results for boredom, work engagement, psychological distress, and turnover intention were in the case of “quantitative job demands”/ “qualitative job demands.”

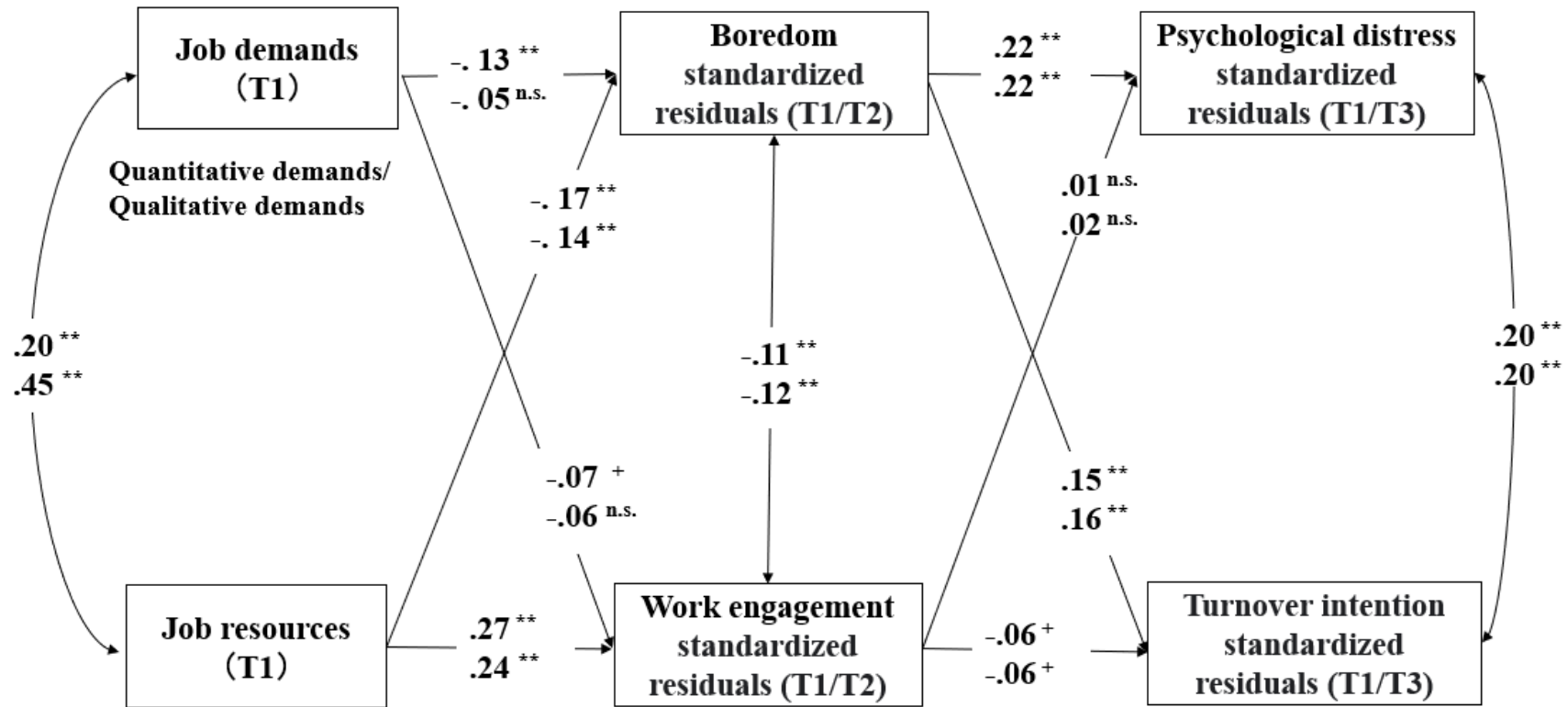
Fig. 1. The hypothesized full mediation model.



Note: In H1, quantitative demands were examined; in H2, qualitative demands were examined.

Standard residual scores were calculated from T1 to T2 regression analysis for boredom and work engagement, and from T1 to T3 regression analysis for psychological distress and turnover intention.

Fig. 2. Standardized solution (maximum likelihood estimates) of the hypothesized full mediation model.



Note: $**p < 0.01$, $*p < 0.05$, $+p < 0.1$.

Top standardized coefficients represented estimates for quantitative demands, and bottom standardized coefficients represented estimates for qualitative demands.

Figure Captions

Fig 1. The hypothesized full mediation model.

Fig 2. Standardized solution (maximum likelihood estimates) of the hypothesized model.