The determinants of presenteeism: a comprehensive investigation of stress-related factors at work, health, and individual factors among the aging workforce

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Abstract: The determinants of presenteeism: a comprehensive investigation of stress-related factors at work, health, and individual factors among the aging workforce. Tianan Yang, et al. Department of Organization and Human Resource Management, School of Management and Economics, Beijing Institute of Technology, P.R. China—Objectives: The aim of this study was to identify the determinants of presenteeism, taking health and individual factors into account. Methods: A quantitative analysis applying structural equation modelling analysis was conducted on the basis of secondary data from the Health and Retirement Survey (2008 wave), which measured presenteeism and its determinants. Results: Stress-related factors at work (β=−0.35, p<0.001), individual factors (β=−0.27, p<0.001), and health (β=0.24, p<0.001) were significantly related to presenteeism. Individual factors were found to be directly correlated with stress-related factors at work (β=0.22, p<0.001). Significant indirect effects between stress-related factors at work and presenteeism (Sobel z=−6.61; p<0.001) and between individual factors and presenteeism (Sobel z=−4.42; p<0.001), which were mediated by health, were also found. Overall, the final model accounted for 37% (R²=0.37) of the variance in presenteeism. Conclusions: Our study indicates some important and practical guidelines for employers to avoid the burdens of stress-related presenteeism among their employees. These findings could help select target factors in the design and implementation of effective presenteeism interventions in the aging working population.

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Key words: Discrimination, Health, Personality traits, Presenteeism, Stress-related factors at work

Working hard for long hours has been widely accepted for centuries as an indication of high productivity. Nowadays, enterprise has begun to prevent employees from working while sick, such as by providing sick leave1. This progress is the result of society progress, but it is also due to the comprehensive understanding of presenteeism.

As a key indicator for assessing recessive productivity loss, presenteeism has been used to refer to the act of attending work while unable to perform effectively because of health problems2−3. However, the definition has more recently been extended to include other conditions and events that limit productivity4−6. Meanwhile, perceived work ability has been confirmed as a robust indicator of presenteeism because perceived work ability can indicate potential productivity loss by measuring the extent to which participants feel that they cannot fulfil demands while they are still working7. Thus, in this study, presenteeism was defined as reduced productivity at work due to health problems or other events that distract one from full productivity5 and are often related to health outcomes for employees and stress-related factors at work6, which leads to extremely high economic and social burdens7. In the United States, for instance, the costs of presenteeism in the enterprises have accounted for 62% of total expenditures of employees’ salaries since 2000, while those of medical treatment and absenteeism have accounted for 24 and 6%, respectively8.

In order to reduce the potential productivity loss of presenteeism, scholars has devoted great efforts to investigating its determinants. The main determi-
nants of presenteeism investigated in previous studies were stress-related factors at work, health, and individual factors. Stress-related factors at work are the unavoidable work content and work context due to the demands of the contemporary work environment\(^{11}\), such as high work demands and work control and poor social climate. These factors make great contributions to presenteeism\(^{12-14}\). Health not only leads to presenteeism but is also considered a mediator between stress-related factors at work and presenteeism\(^{13, 14}\). In agreement with this, both individual factors, such as personality traits, and health have been found to lead to presenteeism\(^{15}\). Health has also been observed to be influenced by personality traits\(^{16}\).

The Job Demands-Resources Model (JD-R) interprets the relationship among job stressors, health, individual factors, and presenteeism. The JD-R states that when job demands are high and there are few job resources, job demands may turn into high-level of job stressors, resulting in health problems and other consequences. Since job demands have to be satisfied in order to perform adequately, employees with specific personality traits will pretend to work hard in the workplace without any absence, even when they are sick or not working at full productivity. This is because the higher the job demands, the more efforts employees will invest in meeting them and the higher the probability that they will work while sick or while there is work-home conflicts that influence their full-time presence\(^{17}\). Additionally, personality traits, such as “extraversion” were found to be significantly associated with increased expression of pro-inflammatory genes, which can deal effectively with infection with the help of the immune systems\(^{16}\), and thus, to impact the health and productivity of employees.

The JD-R model reveals the relationship among presenteeism and its determinants, such as job stressors, health, and individual factors, theoretically. However, empirical evidence is still lacking to support such a comprehensive model because previous studies have only examined part of the model. On the other hand, the global workforce is aging because of the development of science and technology\(^{18}\). This leads to the concerns of employers about the productivity of their organizations because the physical and cognitive capabilities of the aging workforce might decrease with age. Investigation of this issue in the aging workforce could provide empirical evidence to respond to their concerns. Therefore, we aimed to close these gaps, and we expect the JD-R to be an explanatory model for a negative relationship between stress-related factors at work and presenteeism and between individual factors and health. Moreover, we investigated the mediated effects of health on the relationship between stress-related factors at work and presenteeism, taking into account individual factors. A schematic framework that integrates the research questions is presented in Fig. 1.

**Subjects and Methods**

**Sample**

The sample was obtained from the Health and Retirement Survey (HRS), which was funded by the National Institute on Aging and the Social Security Administration of the United States\(^{19}\). The goal of this survey was to measure the effects of changes in health over time on labor market participation\(^{19, 20}\). A total of 17,217 participants were chosen from the HRS 2008 wave, and the overwhelming majority of the population were Caucasian. Since presenteeism was only observed among the working labor force, participants were eligible if they were currently working in a workplace and were Caucasians (n=3,727). Initially, a sample of 1,141 responders was included who answered at least one question on the Participant Lifestyle Questionnaire.

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Fig. 1. Schematic representation of the initial model.
Variables and instruments

Our initial model (Fig. 1) was specified using presenteeism and the factors that affect presenteeism as identified by the WHO, European Agency for Safety and Health at Work, and previous literatures.

The related variables and instruments were specified in the initial model as described below. The scales were taken from the Participant Lifestyle Questionnaire developed by the HRS Psychosocial Working Group and were the measured psychosocial indicators unless otherwise reported. The Cronbach’s alpha values of these indicators were reported in the Participant Lifestyle Questionnaire 2006–2010: Documentation Report from the HRS and varied from 0.70 to 0.96.

Presenteeism

Since perceived work ability has been validated as a robust indicator for examining perceived productivity loss, it is possible to examine presenteeism from the aspect of an individual and an organization. For our secondary data analysis, we measured presenteeism using Perceived Ability to Work Scale, a reliable and valid instrument that measures the concept of presenteeism from physical, mental, and interpersonal dimensions. The Perceived Ability to Work Scale consists of four items: 1) “How many points would you give your current ability to meet those demands?” 2) “Thinking about the physical demands of your job, how do you rate your current ability to meet those demands?” 3) “Thinking about the mental demands of your job, how do you rate your current ability to meet those demands?” and 4) “Thinking about the interpersonal demands of your job, how do you rate your current ability to meet those demands?” Each item of the Perceived Ability to Work Scale was rated from 0 (you cannot currently work at all) to 10 (your work ability is currently at its lifetime best). In this study, one latent variable was constructed using the four items to measure presenteeism.

Stress-related factors at work

Stress-related factors at work, such as inappropriate work design and work discrimination, are the stressors that can cause psychosocial or physical harm. Thus, consistent with a report of the WHO, stress-related factors at work in the current study could be used to construct a latent variable that includes three latent subvariables in the initial model, i.e., workload and schedule, work-life balance, and interpersonal relationship at work.

Workload is the amount of work that each employee has to achieve during a fixed period. Type of work done, hours of work per week, and decisions about pay and promotions were inquired about with a single question each in the Employment Questionnaire (“What sort of work do you do?” “How many hours do you usually work per week [in this job/in this business]?” and “In your job, do you make decisions about the pay and promotions of others?”)

Work-life balance indicates the prioritization between work and lifestyle, which was constructed with the interactions between work and one’s personal life, job stressors, and effort-reward balance. The positive and negative effects between work and one’s personal life were estimated based on the answers to four four-item scales, with answers varying from “never” to “almost every day”, i.e., the Work Interference with Personal Life Scale, Personal Life Interference with Work Scale, Work Enhancement of Personal Life Scale and the Personal Life Enhancement with Work Scale. Job stressors were evaluated by six questions on a four-point Job Stressors Scale with answers scored on a scale of 1 (strongly disagree) to 4 (strongly agree). The balance that participants experienced between the effort that they apply and the rewards they received from their effort was assessed based on their answers to a three-point Balance and Reciprocity Scale, with answers ranging from strongly disagree to strongly agree.

Interpersonal relationships at work refers to the psychosocial environment that each employee experiences, such as discrimination at work, psychosocial working environment and support from colleagues and supervisors. The psychosocial working environment was measured by five questions from the General Social Survey. Support from respondents’ colleagues and supervisors was evaluated using the three-item Co-worker Support Scale and four-item Supervisor Support Scale, respectively. All the scales were four-point instruments with answers ranging from strongly disagree to strongly agree. Discrimination at work was assessed by six questions from the Chronic Work Discrimination Scale, such as “How often are you watched more closely than others?” with answers ranging from 1 (never) to 6 (almost every day).

Individual factors

Previous evidence revealed that personality traits could be considered as individual factors. The personality traits extroversion, agreeableness, conscientiousness, openness and neuroticism were measured using four components of the Big Five Inventory, which consists of items (8 to 10 items per scale) answered using a 1 (a lot) to 4 (not at all) response scale.

Health

The WHO defines health as a state of complete
physical, mental, and social well-being and not merely the absence of disease or infirmity\textsuperscript{34}. To propose a comprehensive metric of health in this study, all aspects, including grip strength, lung function, balance, cognitive function, impairments in bodily and mental functions, and difficulties in activities of daily life of each respondent were taken into account. The health score was then calculated using the Rasch psychometric model\textsuperscript{35} based on the information collected from 34 self-reported questions in the Health Status Questionnaire. The final scores ranged from 0 (worst health) to 100 (best health). Further detailed information can be found in the study by Cieza et al.\textsuperscript{36}.

Control variables

Three variables were controlled for their potential confounding effects. These included gender (coded as male=1, female=2), age, and level of education. Age (coded as older=1, younger=2) was categorized as over full retirement age (67 years of age or over) and under full retirement age (younger than 67 years).

Level of education was divided into two categories: low (no formal education, some education, or completing high school) and high (some college education, graduated from college, or over 17 years of education). Age was divided into two categories based on the latest full retirement age (67 years old) of the United States in 2008\textsuperscript{37}. Age, gender, and education were collected using the Cover Screen Questionnaire 2008 and the Demographics Questionnaire 2008.

Statistical analysis

Structural equation modelling (SEM) analysis was conducted in this study. Data preparation and all statistical analyses were executed in SPSS 21.0 and AMOS 21.0.0 if not specifically reported.

Before imputing the indicators into the structural equation modelling, Pearson correlation analysis was conducted to check the correlations of the indicators to construct presenteeism, stress-related factors at work, individual factors, the three latent subvariables of stress-related factors at work (interpersonal relationships, workload and schedule, and work-life balance) (Fig. 1). The sum of the items of the Perceived Ability to Work Scale was calculated as the presenteeism value for each respondent in the Pearson correlation analysis as suggested by the Participant Lifestyle Questionnaire 2006–2010: Documentation Report.

Several recommendations have been made regarding adequate evaluation methods and sample sizes for non-normally distributed data when the normality test does not support the normality assumption for measured variables. Gold et al.\textsuperscript{39} insist that implementation of expectation-maximization (EM) with maximum likelihood estimates is much better than using the asymptotically distribution-free method on a model when the sample is over 500. As our study applied EM to 1,141 participants, the method applied to evaluate model and sample size fulfilled both of these criteria.

Measures of local and global fit were checked when performing model testing. The local fit of the model was assessed on the basis of the following criteria: factor reliability values of 0.6 or more, indicator reliability value of 0.3 or more for each indicator of an underlying latent variable, \( p < 0.05 \) for all factor loadings, and value of average proportions of indicator variance extracted over 0.5 or more\textsuperscript{40}. The criteria used to evaluate good global fit were the chi-square minimal degrees of freedom (CMIN/DF\textless;5)\textsuperscript{41}; a root mean square error of approximation (RMSEA) value of less than 0.05; Goodness of Fit Index (GFI), Normed Fit Index (NFI), Comparative Fit Index (CFI), and Tucker-Lewis index (TLI) values of 0.90 or more; and the smallest expected Cross-Validation Index (ECVI)\textsuperscript{42}. The statistical significance of mediated effects was determined using the Sobel Test\textsuperscript{43}.

A series of multigroup analyses within different age groups, genders, and levels of education was conducted to investigate whether the theoretical parameters differed across the selected control variables.

Results

Demographic characteristics of the participants

This sample of 1,141 responders included those who answered at least one question on the Participant Lifestyle Questionnaire; 59% of responders were female, and 41% of respondents were male (Table 1). The majority of responders were married (60.4%), and the rest were separated or divorced (23.8%), widowed (10.6%), never married (5.0%), or unknown (reported by one responder). The average age was 61.92 years (standard deviation=6.72), and age ranged from 50 to 80 years. The overall level of education was good: 25.7% attended college, and 31.1% held a college degree or higher. The health of participants was good: their health scores (mean=67.51, standard deviation=10.85) varied from 22.94 to 96.94, and the majority of the scores (77.1%) were over 60.

Since a person receiving treatment might have a reduced work ability regardless of his/her perceived health status, the correlations between health and presenteeism in subjects receiving treatment and those not receiving treatment were compared (\( z = 0.46, p = 0.65 \)) using Fisher’s \( z \) correlation comparison analysis\textsuperscript{44}. The result indicates that the subjects receiving treatment had presenteeism that was comparable to that of the subjects not receiving treatment.
The indices for this initial model indicated that the model did not have acceptable fit. The indicators that were not significantly associated with presenteeism in the Pearson correlation analysis (such as neuroticism) and yielded nonsignificant results ($p > 0.05$) were eliminated from the initial model (such as type of work done, hours of work per week, and decisions about pay and promotion). After these modifications, the model fit better. Subsequently, the indicators with low reliabilities ($<0.3$) (such as the Personal Life Interference with Work Scale and Personal Life Enhancement with Work Scale) were deleted from the model. These modifications resulted in a measurement model with an acceptable fit (Table 2).

Local fit indices showed that each latent construct in the final model was reliably measured by its indicators and that all factor loadings were significant except the indicator reliability of the Co-worker support Scale. All the composite reliabilities achieved the thresholds for acceptable fit. Although the marginal violation that the Average Proportions of Indicator Variance Extracted (AVE) of interpersonal relationships and individual factors did not report acceptable fit (Table 3), the scores of composite reliability suggest acceptable reliability. A cross-validation test was conducted to check the robustness of the model using two random subsamples of 570 participants, and the results approached those of the original sample, which verified that the model was significantly robust.

**Table 1.** Demographic characteristics of the final sample with information of the aging participants from the 2008 wave of the Health and Retirement Survey, USA

<table>
<thead>
<tr>
<th>Category</th>
<th>Final Sample (n=1141)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>468 (41.0%)</td>
</tr>
<tr>
<td>Female</td>
<td>673 (59.0%)</td>
</tr>
<tr>
<td>Age (years)</td>
<td></td>
</tr>
<tr>
<td>50−59</td>
<td>496 (47.7%)</td>
</tr>
<tr>
<td>60−69</td>
<td>464 (38.8%)</td>
</tr>
<tr>
<td>70−79</td>
<td>181 (13.1%)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
</tr>
<tr>
<td>Grade 1−9</td>
<td>98 (8.5%)</td>
</tr>
<tr>
<td>High school diploma</td>
<td>396 (34.7%)</td>
</tr>
<tr>
<td>Some college</td>
<td>293 (25.7%)</td>
</tr>
<tr>
<td>College degree</td>
<td>156 (13.7%)</td>
</tr>
<tr>
<td>Postgraduate degree (Master, Ph.D., M.D., and J.D.)</td>
<td>194 (17.0%)</td>
</tr>
<tr>
<td>Degree unknown</td>
<td>4 (0.4%)</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>689 (60.4%)</td>
</tr>
<tr>
<td>Separated/divorced</td>
<td>272 (23.8%)</td>
</tr>
<tr>
<td>Widowed</td>
<td>121 (10.6%)</td>
</tr>
<tr>
<td>Never married</td>
<td>57 (5.0%)</td>
</tr>
<tr>
<td>Marital status unknown</td>
<td>2 (0.2%)</td>
</tr>
<tr>
<td>Health scores</td>
<td></td>
</tr>
<tr>
<td>20−29</td>
<td>1 (0.1%)</td>
</tr>
<tr>
<td>30−39</td>
<td>10 (0.9%)</td>
</tr>
<tr>
<td>40−49</td>
<td>61 (5.3%)</td>
</tr>
<tr>
<td>50−59</td>
<td>190 (16.7%)</td>
</tr>
<tr>
<td>60−69</td>
<td>386 (33.8%)</td>
</tr>
<tr>
<td>70−79</td>
<td>365 (32.0%)</td>
</tr>
<tr>
<td>80−89</td>
<td>116 (10.2%)</td>
</tr>
<tr>
<td>90−99</td>
<td>12 (1.1%)</td>
</tr>
</tbody>
</table>

**Model fit**
Impact of work stress-related factors, individual factors, and health

Regression weights were the factor loadings of the observed variables on their latent variable, and the standardized regression weights (SRWs) were shown as β values (standardized path coefficients)\(^3\). In the SEM analysis (Table 4), stress-related factors at work (β=−0.35, p<0.001), individual factors (β=−0.27, p<0.001), and health (β=0.24, p<0.001) were significantly related to presenteeism. A strong influence of stress-related factors at work on health was also seen (β=−0.26, p<0.001). Work-life balance and inter-
Table 4. Standardized regression weights ($\beta$) with $p$ values ($\alpha=0.05$) for the components of the multigroup analyses

<table>
<thead>
<tr>
<th>Path</th>
<th>Men</th>
<th>Women</th>
<th>Age over full retirement age</th>
<th>Age under full retirement age</th>
<th>Lower education level</th>
<th>Higher education level</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Path</strong></td>
<td>$\beta$</td>
<td>$p$ value</td>
<td>$\beta$</td>
<td>$p$ value</td>
<td>$\beta$</td>
<td>$p$ value</td>
</tr>
<tr>
<td>SFW to IR</td>
<td>$-0.81$</td>
<td>***</td>
<td>$-0.81$</td>
<td>***</td>
<td>$-0.83$</td>
<td>***</td>
</tr>
<tr>
<td>SFW to WB</td>
<td>0.99</td>
<td>—</td>
<td>1.02</td>
<td>—</td>
<td>0.95</td>
<td>—</td>
</tr>
<tr>
<td>SFW to HS</td>
<td>$-0.23$</td>
<td>***</td>
<td>$-0.27$</td>
<td>***</td>
<td>$-0.22$</td>
<td>0.005*</td>
</tr>
<tr>
<td>SFW to presenteeism</td>
<td>$-0.34$</td>
<td>***</td>
<td>$-0.35$</td>
<td>***</td>
<td>$-0.37$</td>
<td>***</td>
</tr>
<tr>
<td>SFW to IF</td>
<td>0.20</td>
<td>***</td>
<td>0.24</td>
<td>***</td>
<td>0.15</td>
<td>***</td>
</tr>
<tr>
<td>IF to HS</td>
<td>$-0.09$</td>
<td>0.113</td>
<td>$-0.22$</td>
<td>***</td>
<td>$-0.21$</td>
<td>0.001*</td>
</tr>
<tr>
<td>IF to presenteeism</td>
<td>$-0.26$</td>
<td>***</td>
<td>$-0.25$</td>
<td>***</td>
<td>$-0.18$</td>
<td>0.004*</td>
</tr>
<tr>
<td>HS to presenteeism</td>
<td>0.27</td>
<td>***</td>
<td>0.22</td>
<td>***</td>
<td>0.30</td>
<td>***</td>
</tr>
</tbody>
</table>

Interpersonal relationships

- Chronic work discrimination: 0.89
- Co-worker support: 0.43
- Supervisor support: 0.51

Work-life balance

- Job stressors: 0.83
- Work interference with personal life: 0.66
- Work enhancement of personal life: $-0.54$

Individual factors

- Openness: 0.63
- Conscientiousness: 0.45
- Agreeableness: 0.68
- Extraversion: 0.76

Presenteeism

- Rate current ability to work: 0.61
- Rate ability to meet physical demands: 0.71
- Rate ability to meet mental demands: 0.78
- Rate ability to meet interpersonal demands: 0.82

SFW, stress-related factor at work; IR, interpersonal relationship; WB, work-life balance; HS, Health score; IF, individual factor. *Significant at $\alpha=0.05$; *** significant at $p<0.001$. A dash (—) indicates that the regression weight was constrained to 1.0 in the initial model.
personal relationships were significantly associated with stress-related factors at work (Fig. 2). In the multigroup analyses, all the relationships were higher in females than in males, except the influence of individual factors and health on presenteeism (Table 4).

Individual factors were found to be directly correlated with stress-related factors at work ($\beta=0.22, p<0.001$). A weaker relationship was observed in the influence of individual factors on health ($\beta=-0.15, p<0.001$). This relationship was strongest in females ($\beta=-0.22, p<0.001$) and not significant in males ($\beta=-0.09, p=0.113$) and those with a higher level of education ($\beta=-0.06, p=0.164$).

The impact of health on presenteeism also varies significantly at different ages and education levels. For example, health had a much higher impact on presenteeism in the group over full retirement age than in the group under full retirement age. The health of employees with a lower level of education contributed more to presenteeism than the group with a higher level of education. The full list of regression weights, SRWs and $p$ values per latent variable is shown in Table 4.

Significant indirect effects between stress-related factors at work and presenteeism (Sobel $z=-6.61; p<0.001$), and between individual factors and presenteeism (Sobel $z=-4.42; p<0.001$), which were mediated by health, were also found.

Specific aspects of stress-related factors at work and individual factors

To effectively address the factors that have the highest impact on stress-related factors at work, the influence of specific indicators on stress-related factors at work were examined. In all models and analyses, work-life balance showed the greatest influence on stress-related factors at work, and its influence was higher than that of interpersonal relationships. The job stressors component of work-life balance and chronic work discrimination component of interpersonal relationships had the greatest and next greatest influences on stress-related factors at work. The influence of specific individual factors was also identified in the final model. “Extroversion” showed the greatest impact on individual factors.

However, multigroup analyses showed a different pattern as to the greatest influence on stress-related factors at work and individual factors. In the male group, the under full retirement age group, the low and high levels of education groups, and chronic work discrimination contributed more to stress-related factors at work than job stress. In the female group and over full retirement age group, extroversion contributed more to individual factors than other personality traits. Interestingly, individual factors contributed more to health in the under full retirement age group than in the over full retirement age group.

The Work Enhancement with Personal Life Scale and Work Interference with Personal Life Scale all showed less consequential but significant contributions to work-life balance. The Supervisor Support Scale and Co-worker Support Scale indicators showed less consequential but significant contributions to interpersonal relationships. The extroversion, openness, agreeableness, and consciousness all showed less consequential but significant contributions to presenteeism. Overall, the final model accounted for 37% ($R^2=0.37$) of the variance in presenteeism (Fig. 2).

Discussion

In the present study, we aimed to figure out the stress-related factors at work that have the greatest influence on presenteeism, defined as productivity loss due to sickness and other issues. Work-life balance showed the greatest influences on stress-related factors in the aging working population. Job stressors and chronic work discrimination should be investigated further.

The present findings contribute to the understanding presenteeism and its determinants in several ways. First, our study provides empirical evidence for the determinants of presenteeism based a broader concept of health. On one side, our findings showed that stress-related factors at work significantly impact presenteeism, which is influenced by health. The link was quite robust, as the results were consistent with previous studies.

These findings demonstrate that relevant stress-related factors at work predict presenteeism because they predispose employees to react to their health problems in certain ways. In other words, the finding that stress-related factors at work influence presenteeism is important to understanding the mechanism through which stress-related factors at work impact presenteeism. On the other hand, we provided strong empirical evidence to corroborate that health, as a broader concept, is a very important factor that directly and indirectly affects presenteeism in aging work populations. Although health was considered an important determinant of presenteeism in previous studies, in contrast to the WHO definition of health, health mainly referred to health conditions in most studies. In our study, the range of health was broadened and it took into account all the aspects of health in the definition of the WHO International Classification of Functioning, Disability and Health, such as grip strength, lung function, balance, cognitive function, impairments in bodily and mental function, and difficulties in the activities of daily life of each respondent. Recent evidence also supports our findings. For example, after confirming that pres-
Presenteeism is directly related to both health and stress-related factors at work, such as job stress and work-life balance. McGregor et al.\textsuperscript{46} identified that health partially mediated the relationship between stress-related factors at work and presenteeism.

Second, the current study contributed to the understanding of the aging working population. The results from our study revealed that, as the health of employees decreases with aging, the burdens of presenteeism in the aging working population will increase. This is consistent with a WHO study\textsuperscript{47}; which indicated that the health of labor forces deteriorates as the working population ages. Although studies focusing on the health of aging labor forces have been reported in recent years, few of them investigated presenteeism. For example, Leggett\textsuperscript{48} reported that aging nurses suffered from physiological and psychological problems, such as decreased stamina and loss of family or friends. The burdens of these problems were extremely high, but presenteeism was not taken into account. As the global labor forces are increasing in age, employers, policy makers, and researchers should be aware of their specific characteristics and the effects of health in different age groups to effectively reduce the burdens of presenteeism and healthcare. Health promotion programs and appropriate working patterns for aging working population are encouraged.

It is also necessary to improve the understanding of the importance of appropriate organizational policies. Johns\textsuperscript{49} and Yang et al.\textsuperscript{50} revealed that interventions targeting these determinants of presenteeism have mainly been conducted in the fields of health and psychology. There exist few studies in the field of organizational behavior to date. Organizational behavior studies investigate the mechanisms that explain how workplace policies induce these psychosocial factors. Grinyer and Singleton\textsuperscript{51} carried out a quantitative study in the British public sector. Their study suggested that changes in team work, such as encouraging employees to take sick leave while ill, might essentially improve presenteeism by assuaging the reluctance of team members to stay home when ill. Policies designed to reduce the number of sick leaves consequently led to an increase in absences and other productivity loss. Presenteeism interventions that apply appropriate policies in organizations and institutions are seldomly reported. Regarding the negative effects of policies in the workplace, such as attendance control and teamwork, the inclusion of appropriate organizational policies in presenteeism interventions in the workplace can greatly reduce stress at work and significantly reduce presenteeism. This point has not been fully realized by investigators of presenteeism interventions, necessitating more combined studies in the fields of health, psychology, and organizational behavior. Moreover, these policies, special services, and programs for employees in enterprises and organizations, such as health-promotion programs, workshops to learn how to cope with stress and balance work and life, leadership programs that teach employers and leaders in enterprises how to support and respect their employees with appropriate behavior, flexible work schedules for workers with children, redesigned independent jobs, and an equal social climate at work, are good investments rather than costly burdens for any enterprise. General Electric has set this concept into practice and reaped abundant benefits from their global health-promotion programs\textsuperscript{52}.

This study has several limitations due to the use of secondary data. First, a conservative approach was followed in selecting variables. Some important factors that have the highest impact on presenteeism might have been inappropriately excluded. For example, variables related to workload, such as working hours were excluded due to their non-normal distribution. Second, the generalizability of our results and implications to other countries is limited due to the aging employees in the sample; the population was derived only from Caucasians in the United States, and measures of cross-culture factors are lacking. Third, some factors that are considered to be important modulators for presenteeism, such as policies in the workplace, were not measured in the HRS. Fourth, in addition to those currently receiving treatment, people returning to work after a sickness absence might also have a reduced work ability, but information about this is not available in the HRS. Finally, the use of self-reported presenteeism, rather than quantitative measures, also limits the generalizability of our conclusions.

Altogether, our study indicates some important and practical guidelines for employers to avoid the burdens of stress-related factors at work and presenteeism among their employees, such as appropriate working hours for each employee, higher decision latitude, more freedom in the work schedule, and correct behavior or attitudes toward employees on the part of their superiors. This would include respect and concerns for their personal lives, the balance between work and life, the necessary support in their work from colleagues and employers, and comfortable interpersonal relationships among colleagues and between employers and employees. Encouraging self-adjustments in personality and healthier lifestyles could reduce negative spillover between work and private lives and result in less presenteeism.

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