

## Work-Related Factors Affecting the Occurrence of Presenteeism—Recent Research Trends and Future Directions

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**Abstract :** Productivity loss due to presenteeism accounts for a large proportion of economic losses caused by workers' health problems. To reduce presenteeism, it is necessary to identify its causes, but, in contrast to the large amount of research on the effects of diseases and lifestyles, there is not enough research on the effects of work-related factors on presenteeism. In this study, those factors include the work environment and the work-related psychological status of workers. The purpose of this review was to identify research trends in presenteeism, defined as work-related productivity loss, and to examine future directions for presenteeism research. We conducted a search with only the keyword "presenteeism" using MEDLINE/PubMed for the last 5 years and extracted 30 relevant articles, most of which were cross-sectional studies. The articles were categorized into the following themes: 1) studies on the associations of various stress models and factors with presenteeism; 2) studies on the mediators and the pathways of association between stress factors and presenteeism; 3) studies on the relationships between organizational factors and presenteeism; and 4) studies on the link between workers' positive and negative psychological status and presenteeism. Our findings showed that, over the last 5 years, the relationship between psychological stress and presenteeism has been extended to include a variety of stress models and stressors. In addition, by putting many models and factors into a single statistical model and adjusting for their interrelationships, important factors have been examined by ensuring that a significant relationship with presenteeism remains. As there is still a lack of longitudinal studies necessary to discuss causality, more research of higher quality is needed.

**Keywords :** presenteeism, productivity loss, work-related factor, psychological status, organizational factor.

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### Introduction

The number of articles using presenteeism as a keyword has increased rapidly in recent years. This term is mainly used to describe two different concepts, and it is often used in a confusing way. The first concept describes "presenteeism" as going to work despite feeling unhealthy. Research using this definition often considers factors that prevent people from taking a

day off even when they are unwell, which can lead to problems such as long-term absence due to sickness. When this definition is used, it is often referred to as "sickness presenteeism". The second concept is productivity loss at work due to health problems, which is often viewed as a problem [1]. The latter definition is the focus of this review.

Health and productivity management (HPM) initiatives began to be implemented, mainly in the United

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States, in many corporations in the first decade of the 21st century. As part of these initiatives, the improvement of productivity loss due to health problems is an objective of workplace health promotion programs [2]. As the declining birthrate and aging of the population in Japan have made it essential for older workers to remain in the workforce over the long term, a government-led HPM policy is underway to encourage corporations to invest in their employees' health [3]. Studies have been conducted in the United States [4] and Japan [5] to investigate the degree of losses caused by workers' health problems, including medical costs, long-term absences, short-term absences, and presenteeism. These studies have pointed out that presenteeism accounts for an extremely large proportion of these losses. Presenteeism is used in HPM initiatives, therefore, as an indicator of the impact of health problems on management and to evaluate the results of the efforts being made.

To reduce presenteeism, it is first necessary to identify its causes. The causes of presenteeism have been identified as diseases, symptoms, and lifestyles of individual workers, and previous work has examined the effects of each of these factors on the occurrence of presenteeism, as well as the effects of improvements on presenteeism. Because the occurrence of presenteeism cannot be fully explained by individual health problems alone, the relationships between presenteeism and work-related factors have recently been examined [6]. The work-related factors include the work environment, particularly the psychological work environment and the work-related psychological status of workers [7], but research examining the relationships between the work-related factors that affect presenteeism is insufficient, despite the large variation in the effects of these factors. We defined work-related factors as the work environment and work-related workers' psychological status, and conducted a review of the literature within the last five years to identify the relationship between them and presenteeism, and to examine future directions for presenteeism research.

## Methods

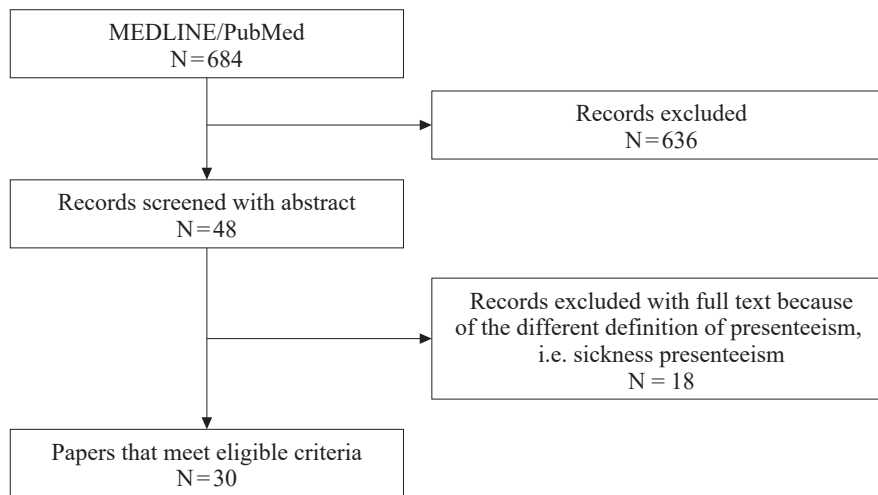
We used only "presenteeism" as the keyword in our search in order to explore recent research trends re-

garding the relationships between the widest possible range of work-related factors and presenteeism. The number of studies using presenteeism as a keyword has increased in recent years, with about 65% of the articles searched in MEDLINE/PubMed having been published within the last five years. Five years was considered to be the minimum period of time necessary to investigate recent trends and to develop a new study by citing prior articles, so we conducted a search on June 8, 2020, using MEDLINE/PubMed for the previous recent five years.

We set the following inclusion criteria: all studies had to 1) examine the relationship between presenteeism and work-related factors (i.e., work environment and work-related personal psychological status); 2) be an original article; and 3) be written in English. First, we reviewed the abstracts of all the selected articles, and then, because it is difficult to determine whether the concept examined in an article is sickness presenteeism or productivity loss on the basis of the abstract alone, we reviewed the full text of the articles to exclude those dealing with sickness presenteeism, which means going to work despite feeling unhealthy (Figure 1). Both steps of the extraction of articles were performed by Koji Mori first, and if there was any doubt about the decision, it was discussed with Masako Nagata and Tomohisa Nagata.

## Results

A total of 30 articles were selected for this study. Of these, 25 were cross-sectional studies, 3 were longitudinal studies, and 2 were intervention studies. Presenteeism was measured by a variety of tools, but the World Health Organization Health and Work Performance Questionnaire (WHO-HPQ), including its short form, was the most commonly used tool. The articles were categorized into the following groups by the themes examined: 1) studies on the associations of various stress models and factors with presenteeism; 2) studies on the mediators and the pathways of association between stress and presenteeism; 3) studies on the relationships between organizational factors and presenteeism; and 4) studies on the link between workers' positive and negative psychological status and presenteeism. Some articles dealt with more than



**Figure 1. Flowchart of methodology for identifying articles meeting the eligibility criteria.**

one of these theme categories in a single paper.

#### *Studies on the associations of various stress models and factors with presenteeism*

Among the various stress models, four studies focused on the Effort-Reward Imbalance (ERI) model. Chang *et al* (2015) studied the relationship between presenteeism and organizational culture, measured by Shain's Stress Satisfaction Offset Score index, which comprises assessments of job control, job demands, reward, and effort. They found that workers in healthier organizational cultures had a lower presenteeism risk, after adjusting for health behaviors and health conditions [8]. Rosemberg & Li (2018) reported that higher ERI was significantly associated with higher relative presenteeism and higher work productivity, but ERI and absolute presenteeism were not found to be significantly correlated with WHO-HPQ score in a group of hotel housekeepers. Two studies that included the ERI model and that tested many stress models or many stressors in one model were reported during the study period [9]. Schmidt *et al* (2019) compared various stressors, ERI, overcommitment, the job demands-control model, and organizational injustice. They reported that there were significant associations between individual job stress models and presenteeism, but when all four stressors were analyzed together the association between ERI and presenteeism became nonsignificant and organizational injustice maintained

the strongest association [10]. In a longitudinal study, Oshio *et al* (2017) reported that presenteeism at 1-year follow-up was associated with all examined stressors (job demands, job control, effort, reward, procedural justice, and interaction justice) except effort [11].

Four articles focused on work-life balance or work-family conflict, and two of these were randomized controlled trials (RCTs). Yang *et al* (2016) investigated the relationships between stress-related factors at work and presenteeism and between individual factors and health, using data from the Health and Retirement Survey in the United States, and found that the stress-related factors consisted of interpersonal relationships, work-life balance, and individual factors. They found significant indirect effects between stress-related factors at work and presenteeism, and work-life balance showed the strongest influence on stress-related factors [12]. Cho *et al* (2016) investigated the associations between presenteeism and various psychosocial factors within the workplace (i.e., discrimination, work-life balance, bullying and harassment, job satisfaction, and support from colleagues and supervisors) using logistic regression analysis. Workers categorized as having work-life imbalance showed presenteeism 1.38 times more than others [13]. McGregor *et al* (2018) also studied associations between presenteeism and various work-related factors; specifically, job stress, work-life balance, job security, engagement, workplace support, communication, leadership, com-

mitment, and development. In linear regression analyses, work-life balance was found to be significantly associated with presenteeism [14].

There were two RCTs of programs designed to improve work-family conflict. At an information technology firm in the United States, Barbosa *et al* (2015) examined the return on investment of a work-family intervention called STAR (support, transform, achieve, results), which had three components designed to support and build on each other: participatory training sessions, computer-based training, and behavioral self-monitoring. The model-adjusted cost of the intervention was \$690, and company savings were \$1,850, including a decrease in presenteeism; the return on investment was 1.68, and this finding was found to be robust in sensitivity analyses [15]. In contrast, Bray *et al* (2018) also reported the effectiveness of STAR for employees in the information technology division of a single United States Fortune 500 organization. Across the nine examined performance outcomes including presenteeism, significant intervention effects were found only for expected hours worked; no significant effect was found for presenteeism [16].

Discrimination is also a very important stress factor in the workplace. The abovementioned study conducted by Cho *et al* (2016) reported that individuals experiencing various types of discrimination, such as age, education, regional, sexual, and contract discrimination, showed an increased risk of presenteeism. The study also examined violence and harassment [13]. In a study conducted among older workers, Deng *et al* (2020) examined the influence of perceived everyday discrimination on presenteeism, including the mediation effects of positive and negative affect and the moderating effect of conscientiousness. A direct positive association was found between discrimination and presenteeism [17]. The findings regarding the mediation and moderation effects are described later in this article.

One study examined the effect of working hours on presenteeism. Okazaki *et al* (2019) investigated the associations of presenteeism with working hours and work engagement, additionally investigating whether work engagement moderated the influence of working hours on presenteeism. In a univariate analysis, working > 40 to 50 hours per week and working > 50 hours

per week were significantly positively associated with work productivity (i.e., absolute presenteeism), as evaluated by the WHO-HPQ, but the significant association no longer held after adjusting for work engagement [18].

Nylén *et al* (2019) studied the association of presenteeism with personal resources—signaling and limit-setting strategies, as well as the demand-control-support (DCS) model. These researchers observed that limit-setting strategies were negatively associated with presenteeism [19].

Building on the previous findings of association between stress models and presenteeism, a few studies investigated the impact of each factor in these models on presenteeism. Saijo *et al* (2017) sought to elucidate the impact of social support and its interrelations with the DCS model factors on presenteeism, evaluated by the 13-item version of the Stanford Presenteeism Scale, which comprises the Work Impairment Score (WIS) and the Work Output Score (WOS). These researchers reported that support from supervisors had a significant protective effect on higher WIS for women and on lower WOS for men. Support from coworkers had a significant protective effect on higher WIS for men. The combination of high job strain and low support from supervisors had a significantly worsening effect. High job strain and low support from coworkers also had significant harmful effects, except on WOS for men [20]. Nylén *et al* (2019) reported that job demands accounted for 6% of the variance in presenteeism. The two job resources examined, control and feedback, together were estimated to explain another 3% of presenteeism [19].

#### *Studies on mediators and pathways of association between stress and presenteeism*

Several studies investigated how health status mediates the association between stress and presenteeism. Chang *et al* (2015) reported that the effect of organizational culture, which was measured by Shain's Stress Satisfaction Offset Score index, became insignificant after adjusting for health status using the numbers of subjective health complaints and chronic diseases [8]. In contrast, Yang *et al* (2016) observed that both stress-related factors at work and individual factors were directly associated with presenteeism, but health

status, measured by the Health Status Questionnaire, partially mediated these relationships [21]. Oshio *et al* (2017) reported that psychological distress, assessed by the Kessler 6 scale, mediated 11.5%–36.2% of the impact of stressors on presenteeism [11]. Yang *et al* (2018) studied the associations of two types of stress with presenteeism and reported that challenge stress was directly negatively associated with presenteeism, whereas hindrance stress was positively associated with presenteeism. They also observed that these associations with presenteeism were partially mediated by general health, measured by the 8-item Short-Form Health Survey. These findings suggest that health is a major mediator of the relationship between stress and presenteeism, but there are also direct relations or other mediators between these two variables [22]. Kim *et al* (2019) took a different approach, investigating workers' presenteeism with a focus on job-related stress, stratified by the presence of depression. When the model was fully adjusted by general and work-related characteristics, higher job demands and interpersonal conflict significantly elevated the odds of presenteeism in participants without depression but not in those with depression [23].

Two psychological conditions of workers were studied as other mediators among Chinese health care workers: affective commitment by Yang *et al* (2017) [24] and public service motivation by Deng *et al* (2019) [25]. Affective commitment and public service motivation partially mediated the associations of challenge and hindrance stress with presenteeism. Sense of control and positive and negative affect were also studied by the same research groups, using data from the United States Health and Retirement Survey. Yang *et al* (2019) found that sense of control (comprising personal mastery and perceived constraints) mediated the relationship between psychological work environment and presenteeism [26], and Deng *et al* (2020) found that positive and negative affect had mediating effects on the association between discrimination and presenteeism [17].

#### *Studies on the relationships between organizational factors and presenteeism*

Health culture in the workplace, including leadership support from management and supervisors, af-

fects subordinates' behaviors and health outcomes. Laing & Jones (2016) revealed that a healthy lifestyle workplace culture was associated with presenteeism, and this association was mediated by mental health status, such as depression and anxiety [27]. Schmid *et al* (2017) reported that an increase in supportive leadership behavior was associated with a decrease in presenteeism; after additional adjustment for lifestyle factors and symptoms of depression, the association between supportive leadership behavior and presenteeism was reduced but remained significant [28]. Vänni *et al* (2017) also reported that perceived poor leadership was a potential risk factor for presenteeism, and that the risk varied by gender and occupation [29]. In a study examining the associations of various work-related factors with presenteeism, McGregor *et al* (2018) found that quality of leadership of the immediate supervisor was significantly associated with presenteeism in linear regression analyses. The same study also reported that a lack of development opportunities was associated with presenteeism [14].

Workplace social capital (WSC) comprises mutual benefit, mutual respect and trust, participation in collective action and work networks, and the credibility of the leadership among the employees of a work unit. Zhu *et al* (2018) reported that high individual-level WSC and workplace-level WSC were negatively associated with absolute presenteeism after including all individual and workplace-level variables, such as working years, job stress, self-rated health, and socioeconomic characteristics [30].

In the DCS model, supervisor support and coworker support are known predictors of presenteeism. Yang *et al* studied the mediating role of distributive justice (2019a) [31] and organizational commitment (2019b) [32] on the association between perceived social support and presenteeism among health care workers. They observed that distributive justice partially mediated the association between supervisor support and presenteeism and fully mediated the association between coworker support and presenteeism [31]. They also reported that organizational commitment fully mediated the association between supervisor support and presenteeism and partially mediated the relationship between coworker support and presenteeism [32].

### *Studies on the link between workers' positive and negative psychological status and presenteeism*

In terms of positive psychological status, several articles studied the associations of work engagement and job satisfaction with presenteeism. Work engagement was one of the work-environmental factors examined in association with presenteeism by McGregor *et al* (2018) [14], who found that work engagement had a strong impact on health conditions but was not significantly associated with presenteeism, after all work environmental factors and health conditions were included in one model. In the aforementioned study by Okazaki *et al* (2019), work engagement was observed to be positively associated with presenteeism, even when controlling for potential confounders and considering working hours [18]. Eguchi *et al* (2020) studied the associations between work engagement and presenteeism in a prospective cohort study and reported that work engagement at baseline was significantly associated with absolute presenteeism at follow-up, and this association remained significant after additionally adjusting for work performance at baseline [33]. Black *et al* (2017) studied the relationship between the physiological response to acute psychological stress and work-related variables, including presenteeism, among older manual workers. A significant positive association was found between presenteeism and heart rate reactivity to an acute psychological stress task, such that those with higher presenteeism had higher heart rate reactivity. When work engagement and presenteeism were both entered into the model, only work engagement remained a significant predictor. Work engagement significantly mediated the association between presenteeism and heart rate reactivity [34].

Arnold *et al* (2016) observed a statistically significant relationship between job satisfaction and presenteeism; this relationship was negative for both blue-collar and white-collar workers in a longitudinal analysis [35]. Pereira *et al* (2017) reported that job satisfaction level was significantly associated with monetized health-related productivity loss, as estimated with the WHO-HPQ, after occupational category and individual factors, including psychological wellbeing and presence of musculoskeletal symptoms, were added to the generalized linear multivariate model [36]. In Cho *et al*'s (2016) study investigating the associa-

tions between presenteeism and various psychosocial factors in the workplace, individuals with low job satisfaction exhibited presenteeism 2.04 times more often than others [13].

Tuithof *et al* (2017) studied the association of the negative psychological status of emotional exhaustion with presenteeism, as measured by the World Health Organization Disability Assessment Schedule, which includes three subscales. Mild exhaustion was associated with short work loss (0.5–7 days/30 days), extended work loss (>7 days), and impaired emotional, physical, and social functioning. Severe exhaustion was not associated with short work loss, but it was strongly associated with extended work loss and with the three areas of functioning [37].

## **Discussion**

The occurrence of presenteeism has been shown to lead to significant productivity loss due to worker health, and it requires an approach of improvement in occupational health and HPM initiatives. To successfully implement this approach, it is essential to first identify the factors that give rise to presenteeism. The major factors associated with presenteeism include health-related factors related to illness and symptoms, as well as work-related factors such as organizational factors and workers' work-related psychological status, which were the focus of this study. In studying the improvement of presenteeism through interventions targeting health-related factors, many studies have focused on the treatment of painful diseases such as chronic rheumatoid arthritis [38] and on the effects of improving lifestyle habits such as exercise [39]. The approach of treating diseases, however, is extremely limited in scope, making it difficult to use it to improve productivity at the population level, and the effects of improvements in lifestyle habits are often small in magnitude, even when they are significant. It is important, therefore, to intervene on work-related factors to improve presenteeism in the population as a whole.

The relationship between psychological stress and presenteeism has been examined extensively in relation to work-related factors, and, in the last 5 years, this relationship has been extended to include a variety of stress models and stressors, as described in the pres-

**Table 1. Summary of papers on work-related factors related to presenteeism for recent five years**

Authors	Main factors	Published year	Research objectives	Research design	Data source/study setting	Measure of presenteeism	Key findings on presenteeism
<b>Studies on the associations of various stress models and factors with presenteeism</b>							
Chang YT <i>et al</i> [8]	Organization culture measured with Shan's Stress Satisfaction Offset Score index, which includes factors on job control, job demand, reward, and effort. Mediator: Health condition	2015	To study whether organizational culture is related to presenteeism and whether health status is a mediator between these variables.	Cross-sectional study	Employees in seven enterprises in northern Taiwan	A single question that assessed how often employees had come to work during the last month despite being ill.	After adjusting for health behaviors and health conditions, those with healthier organizational cultures had a lower presenteeism risk.
Roseberg MAS & Li Y [9]	Effort-Reward Imbalance (ERI)	2018	To explore ERI and work productivity among a group of hotel housekeepers.	Cross-sectional Study	Hotel housekeepers with community participatory-based approach in the United States	World Health Organization-Health and Work Performance Questionnaire (WHO-HPQ)	Higher ERI was significantly associated with higher relative presenteeism and higher work productivity. No significant correlations were found between ERI and absolute presenteeism.
Schmidt B <i>et al</i> [10]	Job stress model (ERI, overcommitment, job demands-control model, organizational injustice)	2019	To investigate the associations of various stress models with presenteeism.	Cross-sectional study	Employees of a large pharmaceutical company in Germany	An item from the Work Ability Index: The number of days they went to work despite feeling ill during the last year	Associations between individual job stressors and presenteeism were significant and positive throughout when evaluated in separate models, with overcommitment showing the highest association. However, when analyzing all four job stressors in the same model, ERI lost its significant association with presenteeism, whereas overcommitment maintained the strongest association.
Oshio T <i>et al</i> [11]	Job stressors (job demands-control model, ERI model, organizational justice model) Mediator: Psychological distress	2017	To examine the reciprocal relationship between presenteeism and health in response to job stressors, with specific reference to psychological distress as workers' state of health.	Longitudinal study	Occupational cohort study on social class and health in Japan	WHO-HPQ-short form	Psychological distress mediated 11.5%-36.2% of the impact of job control, reward, and procedural and interactional justice on presenteeism, whereas presenteeism mediated their impact on psychological distress, albeit to a much lesser extent (range: 3.4%-11.3%). Neither presenteeism nor psychological distress mediated the impact of job demands or effort.
Yang T <i>et al</i> [12]	Job stress, coworker support, supervisor support	2016	To examine the complicated effects of coworker and supervisor support on job stress and presenteeism in an aging workforce.	Cross-sectional study	Data from the Health and Retirement Survey in the United States	The Perceived Ability to Work Scale (PAWS)	Job stress had a significant direct positive effect on presenteeism. Coworker support had moderate direct negative effects on presenteeism and job stress. Supervisor support had a direct negative effect on job stress. There was a significant positive relationship between coworker support and supervisor support.
Cho YS <i>et al</i> [13]	Various work-related factors including discrimination, bullying and harassment, work-life balance, job satisfaction, colleague and supervisor support, job stress, emotional labor, work intensity, job autonomy, and job strain	2016	To investigate presenteeism and its association with various psychosocial factors in the workplace.	Cross-sectional study	Data from the third Korean Working Conditions Survey in 2011	A single question: "Have you ever worked in the past 12 months despite being sick?"	Presenteeism was associated with a variety of experiences of discrimination (age, education, regional, sexual, and contract discrimination). Similarly, it was also associated with experiences of physical violence and sexual harassment. However, it was not significantly related to experiences of ostracizing and bullying harassment. There were also significant associations between presenteeism and other stress factors, job strain, job insecurity, work-life imbalance, low job satisfaction, absence of colleague support, emotional labor, hiding one's emotions, and high work intensity, but the relationships with supervisor support and job autonomy were not significant.
McGregor A <i>et al</i> [14]	Work environment (job stress, work-life balance, job security, engagement, workplace support, communication, leadership, commitment, development)	2018	To investigate the pathways linking employee health and presenteeism and work-environmental factors (WEFs) and presenteeism, as well as the relationship between employee health and WEFs.	Cross-sectional study	A third party online survey, with participants recruited using the LinkedIn network of one of the coauthors	Two questions: "How many days in the last 4 weeks, were you affected by the health condition while working?" and "The last time you had the health condition while at work, about how much effect did it have on your productivity?"	Work-life balance, leadership, and arthritis development were significantly related to presenteeism in linear regression analyses examining the extent to which the nine WEFs were associated with three health conditions.
Barbosa C <i>et al</i> [15]	Work-family conflict	2015	To estimate the return on investment of an intervention to improve work-family conflict.	Randomized controlled trial	Employees of an information technology firm in the United States	WHO-HPQ	Model-adjusted costs of the intervention were \$690, and company savings were \$1,850. The return on investment was 1.68, and this was robust in sensitivity analyses.
Bry JW <i>et al</i> [16]	Work-family conflict	2018	To estimate the effects of a workplace initiative to reduce work-family conflict on employee performance.	Randomized controlled trial	Employees in IT division within a single US Fortune 500 organization	WHO-HPQ	Across the nine performance outcomes, significant intervention effects were found only for expected hours worked-not for job performance.

**Table 1. Summary of papers on work-related factors related to presenteeism for recent five years (Continued)**

Authors	Main factors	Published year	Research objectives	Research design	Data source/study setting	Measure of presenteeism	Key findings on presenteeism
Deng J <i>et al</i> [17]	Discrimination Mediators: Positive affect and negative affect	2020	To examine how perceived everyday discrimination influences presenteeism and how conscientiousness moderates the relationship between discrimination and positive affect among older workers.	Cross-sectional study	The United States Health and Retirement Survey	The Perceived Ability to Work Scale (PAWS)	Discrimination was directly positively associated with presenteeism. Furthermore, positive affect was significantly inversely correlated with discrimination and presenteeism. In addition, negative affect was significantly positively correlated with discrimination and presenteeism. The significant indirect effect between perceived everyday discrimination and positive affect was significantly mediated by positive and negative affect. In addition, the results of the moderated mediation model indicate that positive affect was more likely to be influenced by perceived everyday discrimination among older workers with less conscientiousness, as compared with those with greater conscientiousness.
Okazaki E <i>et al</i> [18]	Working hours, work engagement	2019	To investigate the associations of work productivity with working hours and work engagement, and to examine if work engagement moderates the influence of working hours on work productivity.	Cross-sectional study	Data from an occupational cohort study on social factors and health in Japan (J-HOPE)	WHO-HPQ	Working > 40 to 50 hours per week and working > 50 hours per week were significantly positively associated with work productivity in univariate analyses. However, the significant association no longer held after adjusting for work engagement. Work engagement was positively associated with work productivity even after controlling for potential confounders.
Nylén EC <i>et al</i> [19]	Job demands, job resources (control), personal resources (limit-setting strategy)	2019	To investigate the importance of job demands, job resources, and personal resources for health-related outcomes, as well as the mitigating effects of resources, among working women.	Cross-sectional study	Employees of a public social care and welfare organization in Sweden	A single question: "Has it happened over the previous 12 months that you have gone to work despite feeling that you really should have taken sick-leave because of your state of health?"	Job demands explained 6% of the variance in presenteeism. Quantitative demands predicted presenteeism. The two job resources explained another 3% of the variance in presenteeism. Control, but not feedback, was negatively associated with presenteeism. Personal resources explained another 2% of the variance in presenteeism. Limit-setting strategies were negatively associated with presenteeism.
Sajjo Y <i>et al</i> [20]	Job strain (job demand and job control), social support (supervisor support, coworker support)	2017	To elucidate the impact of social support and its interrelations with demand-control-support (DCS) model factors on presenteeism, and to determine which of the DCS factors was most closely related to presenteeism, as well as investigating the iso-strain effect on presenteeism.	Cross-sectional study	Local government employees in Japan	Stanford Presenteeism Scale 13-item version Work Impairment Score (WIS) Work Output Score (WOS)	Support from supervisors had a significant protective effect on higher WIS for women and on lower WOS for men. Support from coworkers had a significant protective effect on higher WIS for men. The combination of high job strain and low support from supervisors had a significantly worsening effect. High job strain and low support from coworkers had a significantly worsening effect except on WOS in men.
<b>Studies on mediators and pathways of the association between stress and presenteeism</b>							
Chang YT <i>et al</i> [18]	See the section on "Studies on the associations of various stress models and factors with presenteeism"						
Yang T <i>et al</i> [21]	Stress-related factors at work, including workload, work-life balance, interpersonal relationships, co-worker support, and supervisor support Mediator: General health status	2016	To investigate the Job Demand-Resource model as an explanatory model for a negative relationship between stress-related factors at work and presenteeism and between individual factors and health, and to investigate the mediation effects of health on the relationship between stress-related factors at work and presenteeism, taking into account individual factors.	Cross-sectional study	Data from the Health and Retirement Survey in the United States	The Perceived Ability to Work Scale (PAWS)	Stress-related factors at work were significantly related to presenteeism. Individual factors were found to be directly correlated with stress-related factors at work. Significant indirect effects between stress-related factors at work and presenteeism and between individual factors and presenteeism, which were mediated by health, were also found.
Oshio T <i>et al</i> [11]	See the section on "Studies on the associations of various stress models and factors with presenteeism"						
Yang T <i>et al</i> [22]	Hindrance stress and challenge stress Mediator: General health	2018	To examine the effects of challenge stress and hindrance stress on general health and presenteeism among Chinese health care workers.	Cross-sectional study	Health care workers employed in Class A tertiary hospitals in China	The Perceived Ability to Work Scale (PAWS)	Challenge stress had a slight direct effect on presenteeism, but its total effects significantly reduced presenteeism. Both challenge stress and hindrance stress caused impairment in the health of workers. Hindrance stress was associated with a significant adverse impact on presenteeism. These associations were partially mediated by health.



Table 1. Summary of papers on work-related factors related to presenteeism for recent five years (Continued)

Authors	Main factors	Published year	Research objectives	Research design	Data source/study setting	Measure of presenteeism	Key findings on presenteeism
Kim J <i>et al</i> [23]	Job-related stress (job demands, interpersonal conflicts, job control)	2019	To investigate workers' presenteeism, focusing on job-related stress, with stratification by the presence of depression.	Cross-sectional study	Employees of 59 enterprises participating in the study in Korea	Work Productivity and Activity Impairment Questionnaire-General Health (WPAL-GH)	Higher job demands and higher interpersonal conflict showed significantly elevated odds ratios (ORs) in univariate models and in the multivariate multilevel model. In the final model for the total population, fully adjusted by general and work-related characteristics, higher job demands and interpersonal conflict had significantly higher ORs – a tendency that remained for participants without depression, but not for those with depression.
Yang T <i>et al</i> [24]	Hindrance stress and challenge stress Mediator: Affective commitment	2017	To examine associations between job stress, affective commitment, and presenteeism among health care workers.	Cross-sectional study	Health care workers employed in Class A tertiary hospitals in China	The Perceived Ability to Work Scale (PAWS)	Hindrance stress significantly increased presenteeism among health care workers, but the increase attributable to challenge stress was not significant. Affective commitment was associated with a significant adverse impact on presenteeism. These associations were partially mediated by affective commitment.
Deng J <i>et al</i> [25]	Hindrance stress and challenge stress Mediator: Public service motivation	2019	To examine the mediating effect of public service motivation (PSM) on the association between job stress and presenteeism and the effects of different types of job stress on PSM and presenteeism.	Cross-sectional study	Health care workers from 11 randomly selected representative Class A tertiary hospitals in China	The Perceived Ability to Work Scale (PAWS)	Public service motivation was directly inversely associated with presenteeism. Hindrance stress was negatively associated with PSM but significantly positively associated with presenteeism. However, the path from challenge stress to PSM and presenteeism was not significant.
Yang T <i>et al</i> [26]	Psychological work environment Mediator: Sense of control (personal mastery, perceived constraints)	2019	To assess work environment, sense of control (measured in relation to personal mastery and perceived constraints), and associations with presenteeism.	Cross-sectional study	The United States Health and Retirement Survey	The Perceived Ability to Work Scale (PAWS)	Work environment was directly inversely associated with presenteeism, and work environment was significantly inversely associated with perceived constraints. There were direct positive associations between work environment and personal mastery and between perceived constraints and presenteeism. There was a significant inverse association between personal mastery and presenteeism. The significant indirect effects between work environment and presenteeism were significantly mediated by sense of control.
Deng J <i>et al</i> [17]	See the section on "Studies on the associations of various stress models and factors with presenteeism"						
<b>Studies on the relationships between organizational factors and presenteeism</b>							
Laing SS & Jones SMW [27]	Perceived health support for healthy lifestyle Mediators: Anxiety and depression	2016	To assess the roles of anxiety and depression in the relationship between workplace culture and work productivity (absenteeism and presenteeism).	Cross-sectional study	Employees at six Washington state agencies and three subdivisions of the Washington Department of Transportation	Work Productivity and Activity Impairment Questionnaire (WPAL)	It was found that the relationship between workplace health support and work productivity occurred via mental health. The direct effects from workplace culture to work productivity were mostly not significant.
Schmid JA <i>et al</i> [28]	Supportive leadership behavior	2017	To investigate associations between supportive leadership behavior (SLB) and presenteeism.	Cross-sectional study	Data from the Mannheim Industrial Cohort Study; employees of multiple industrial companies	A single question: "Approximately how many days during the past year did you come to work although you were sick?"	An increase in SLB is associated with a decrease in presenteeism. After additionally adjusting for lifestyle factors and symptoms of depression, the association between SLB and presenteeism was reduced but remained significant. The interaction between SLB and depressive symptoms (Mental Health Inventory 5) improved the model of presenteeism significantly.
Vänni KI <i>et al</i> [29]	Perceived leadership	2017	To study whether perceived leadership is a relevant factor that might more precisely explain the variation in presenteeism.	Cross-sectional study	Employees of a leading Finnish food processing company	The presenteeism scale for reporting perceived work ability-related presenteeism	Perceived poor leadership is a potential risk factor for presenteeism. The risk of presenteeism seemed to be lowest among female office workers and highest among male factory workers.
McGregor A <i>et al</i> [14]	See the section on "Studies on the associations of various stress models and factors with presenteeism"						
Zhu Y <i>et al</i> [30]	Workplace social capital, job stress	2018	To investigate the association between workplace social capital (WSC) and presenteeism in a Chinese context.	Cross-sectional study Multilevel analysis	Employees from 34 workplaces randomly selected in China	WHO-HPQ short form	Job stress was positively associated with absolute presenteeism. High individual-level WSC and workplace-level WSC were negatively associated with absolute presenteeism.

**Table 1. Summary of papers on work-related factors related to presenteeism for recent five years (Continued)**

Authors	Main factors	Published year	Research objectives	Research design	Data source/study setting	Measure of presenteeism	Key findings on presenteeism
Yang T <i>et al</i> [31]	Supervisor support, coworker support Mediator: Distributive justice	2019	To analyze distributive justice and the association of supervisor and coworker support with presenteeism in this population.	Cross-sectional study	Health care workers from 64 primary, secondary, and tertiary hospitals in China	The Perceived Ability to Work Scale (PAWS)	Distributive justice was directly inversely associated with presenteeism. Supervisor support was significantly inversely associated with presenteeism, but the path from coworker support to presenteeism was not significant and was fully mediated by distributive justice. Supervisor support and coworker support were significantly positively associated with distributive justice.
Yang T <i>et al</i> [32]	Social Support (supervisor support and coworker support) Mediator: Organizational commitment	2019	To assess the role of social support in presenteeism by examining organizational commitment among health care workers.	Cross-sectional study	Health care workers employed in Class A tertiary hospitals in China	The Perceived Ability to Work Scale (PAWS)	Organizational commitment was directly inversely associated with presenteeism. Coworker support was moderately but significantly inversely associated with presenteeism, while supervisor support had no significant effect on presenteeism. Supervisor support had a stronger effect than coworker support on organizational commitment, but both associations were significant.
<b>Studies on the link between workers' positive and negative psychological status and presenteeism</b>							
McGregor A <i>et al</i> [14]			See the section on "Studies on the associations of various stress models and factors with presenteeism"				
Okazaki E <i>et al</i> [18]			See the section on "Studies on the associations of various stress models and factors with presenteeism"				
Eguchi H <i>et al</i> [33]	Work engagement	2020	To investigate the prospective association between work engagement and work performance overall and stratified by sex.	Longitudinal study	Data from the J-HOPE cohort, a large-scale workplace-based prospective study (Japan)	WHO-HPQ-short form	Work engagement at baseline was significantly associated with work performance at follow-up. This association remained significant after additionally adjusting for work performance at baseline. In the sex-stratified analysis, the impact of work engagement at baseline on work performance at follow-up was significant among both men and women. The associations were stronger among women than among men.
Black JK <i>et al</i> [34]	Heart rate reactivity Mediator: Work engagement	2017	To identify the relationship between the physiological response to acute psychological stress and perceived psychological resilience to stress and work-related variables in older manual workers.	Cross-sectional study	Manual workers recruited via posters in 20 organizations from various industries in the United Kingdom	Work Limitations Questionnaire (WLQ)	A significant positive association was found between presenteeism and heart rate reactivity, such that those with higher presenteeism had higher heart rate reactivity. When work engagement and presenteeism were entered together into the model, only work engagement remained a significant predictor. Work engagement significantly mediated the association between presenteeism and heart rate reactivity.
Arnold AE <i>et al</i> [35]	Job satisfaction	2016	To examine the longitudinal relationship between job satisfaction and total productivity-related costs, absenteeism, and presenteeism among Dutch workers.	Longitudinal study (sophisticated longitudinal data analysis technique)	Employees in two research institutes in the governmental sector in the Netherlands	WHO-HPQ	A statistically significant relationship was found between job satisfaction and presenteeism costs. The relationship between job satisfaction and presenteeism costs was statistically significantly negative for both blue-collar and white-collar workers.
Pereira MJ <i>et al</i> [36]	Work-related factors including time using computer at work, workplace psychosocial risks measured by the Job Content Questionnaire, overall job satisfaction	2017	To identify individual and work-related factors associated with health-related productivity levels in office workers from an employer's perspective, with a focus on musculoskeletal health.	Cross-sectional study	Recruited from both public and private sectors in an Australian metropolitan city and its surrounds	WHO-HPQ	Health-related productivity loss was significantly associated with occupational category, level of job satisfaction, and level of psychological stress.
Cho YS <i>et al</i> [13]			See the section on "Studies on the associations of various stress models and factors with presenteeism"				
Turthof M <i>et al</i> [37]	Emotional exhaustion	2017	To study the associations of emotional exhaustion with work loss and impaired emotional, physical, and social functioning.	Cross-sectional study	Data from the Netherlands Mental Health Survey and Incidence Study-2 (NEMESIS-2)	Work loss with the WHO Disability Assessment Schedule, general functioning with the 36 item Short Form	Mild exhaustion was associated with short and extended work loss; impaired emotional, physical, and social functioning; and use of general and mental health care. Severe exhaustion was not associated with short work loss, but it was strongly associated with extended work loss, the three areas of functioning, and health care use. Co-occurrence of exhaustion and common mental disorders resulted in an additional high risk of extended work loss and impaired emotional and social functioning.

ent study. In addition, many stress models and factors have been simultaneously included in statistical models to determine which factors are most important in relation to presenteeism. For example, Schmidt *et al* (2019) reported that, when many stress models are included in a model together, the effect of overcommitment was observed to be significant, whereas the effect of ERI was no longer significant [10].

Several other studies have examined the mediators of the relationships between stressors and presenteeism; when focusing on job resources, which is part of the job-demand-resource model, these factors have been found to influence health through work engagement. It has also been suggested that work-related psychological states such as work engagement and job satisfaction reduce presenteeism (i.e., job resources affect positive psychological states, which in turn reduce presenteeism). Miraglia & Johns (2016) examined a wide range of stress factors and pathways through which resources affect presenteeism and proposed a model in which many factors are related to presenteeism through two of these stress factors: health and job satisfaction [6].

Fostering a climate that includes, for example, workplace social capital may be related to presenteeism through complex processes. It has been shown that increased social capital moderates the effects of adverse work-related outcomes on psychological distress [40], which in turn reduces presenteeism; this improvement in presenteeism may operate through increased job satisfaction [41], participation in health promotion programs [42], or lifestyle changes, such as smoking cessation [43]. Thus, although there have not been enough studies on this topic, various studies examining the relationship between work-related factors and presenteeism over the past 5 years have accumulated knowledge that is helpful in clarifying the complex processes through which presenteeism develops.

Most of these studies, however, have been cross-sectional, and longitudinal studies are needed to make it possible to discuss causality. Among the work factors associated with presenteeism, only two RCT intervention studies have attempted to improve work-life conflict, and results are conflicting with regard to the effects on improvement in presenteeism. In other words, compared with the amount of research on the magni-

tude of productivity loss due to presenteeism, research on work-related factors, which are considered to be a major influence on presenteeism, remains insufficient, and more studies of higher quality are needed.

The present review is limited by its focus on research published over 5 years and the use of PubMed only, but by purposefully selecting articles from the search results using only “presenteeism” as a search term, without assuming a relationship with specific factors, we could cover a wide range of relevant articles. It was also important to confirm that the selected articles used the definition of presenteeism being considered in this review, because some studies have instead examined “sickness presenteeism, whereas our focus was on productivity loss [11]. For this reason, it is also significant that the abstracts of all the articles in this review were examined.

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### Conflict of Interest

The authors have no conflicts of interest to declare.

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