

# Domain-Specific Active and Sedentary Behaviors in Relation to Workers' Presenteeism and Absenteeism

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**Objectives:** To examine the associations between domain-specific sedentary and active behaviors and workers' presenteeism and absenteeism in a sample of company employees. **Methods:** This study recruited participants ( $n = 2466$ ) from a nationwide online survey database (Japan, 2019). Participants completed a questionnaire that captured data on relative and absolute presenteeism and absenteeism and domain-specific physical activity and sedentary behaviors. **Results:** Daily minutes of work-related physical activity were negatively associated with relative absenteeism. Daily minutes of leisure-related physical activity were positively associated with absolute presenteeism (ie, better productivity). Daily minutes of total physical activity were negatively and positively associated with relative absenteeism and absolute presenteeism (ie, better productivity). There was also a positive association between car sitting time and absolute absenteeism. **Conclusions:** A change in work culture and practices that support active behaviors at work and outside of work may improve employee's productivity indices.

**Keywords:** physical activity, productivity, sitting time, workplace

Presenteeism and absenteeism are known to be closely associated with less work productivity.<sup>1,2</sup> Presenteeism is defined as the decrement in performance associated with remaining at work while impaired by health problems.<sup>1</sup> Absenteeism refers to the time away from work because of illness or disability.<sup>3</sup> Improvements in workers' absenteeism and presenteeism are important for companies of all types and sizes to achieve enhancements in workplace productivity.<sup>4,5</sup>

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**Clinical significance:** Significant associations were observed between work-related, leisure-related, and total physical activity and workers' presenteeism and absenteeism. There was a positive association between car sitting time and absolute absenteeism. A change in work culture and practices that support active behaviors at work and outside of work is necessary to improve employee's productivity indices.

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Several studies have explored the associations between physical activity and presenteeism and absenteeism.<sup>6–9</sup> For example, a cross-sectional study conducted in Spain found that weekly physical activity was negatively associated with sickness absenteeism among university workers.<sup>8</sup> A longitudinal study of university employees in the USA found that changes in physical activity were associated with reduced presenteeism (ie, lower productivity).<sup>9</sup> A few studies have also investigated the associations between sedentary time and presenteeism and absenteeism.<sup>6,10</sup> For example, an Australian study involving office employees found that objectively measured sedentary time was associated with presenteeism (ie, lower productivity).<sup>6</sup> These studies provide preliminary findings on the benefits of increasing physical activity and reducing sedentary time on workers' presenteeism and absenteeism.

Nevertheless, the exclusion of domain-specific active and sedentary behavior measures is a key limitation of the literature to date. Domain-specific physical activity and sedentary behavior include activities undertaken for different purposes (ie, transport, leisure, occupation, household).<sup>11</sup> Several studies have reported that different domains of active and sedentary behaviors have distinctive effects on health outcomes such as psychological distress,<sup>12</sup> cardiorespiratory fitness,<sup>13</sup> adiposity,<sup>14</sup> colorectal cancer,<sup>15</sup> and insomnia symptoms.<sup>16</sup> These effects may be one pathway through which domain-specific active and sedentary behaviors may impact workers' productivity. Evidence on domain-specific measures of physical activity and sedentary behavior is necessary to provide practical recommendations for developing workplace interventions to improve employee health, reduce presenteeism and absenteeism, and increase productivity. Notably, most previous studies investigating physical activity and sedentary behavior in relation to presenteeism and absenteeism have been undertaken in Western countries, with a dearth of studies undertaken in Asia. Since each country and region have their organisational norms and culture in their workplaces, evidence from non-Western environments is necessary to develop context-specific approaches to enhance employees' performance and health in Asia.

Therefore, the aim of this study was to examine the associations between domain-specific active and sedentary behaviors and workers' presenteeism and absenteeism in a sample of company employees in Japan.

## METHODS

### Participants and Study Design

This study included cross-sectional data from a nationwide online survey conducted in 2019. Data were obtained from the registered individuals of a Japanese internet research service company (MyVoice Communication, Inc. Tokyo, Japan). This company's dataset maintains sociodemographic information of approximately one million individuals across Japan who voluntarily participated in the online survey. In February 2019, an e-mail with a link to participate in the survey was forwarded to 45,659 workers (aged 20 to 59 years) who were randomly selected from the database according to gender and age groups (the 20s, 30s, 40s, and 50s). A total of 3200 individuals responded to the survey (a response rate of

7%); 1600 participants of each gender and 800 participants of each age group. The analysis was limited to participants ( $n = 2466$ ) who reported their occupation as company employees were included in this study. A cash reward valued at 140 yen (USA \$ 1.30) was offered as an incentive to complete the survey. All participants endorsed an online informed consent form. The study was approved by the Research Ethics Committee, Waseda University, Japan [2012—269, 2013—264].

## Measures

### Presenteeism and Absenteeism

Relative and absolute presenteeism and absenteeism were assessed using the relevant items from the World Health Organization Health and Work Performance Questionnaire (HPQ).<sup>17,18</sup> The cleaning and scoring HPQ data method has been described in detail elsewhere.<sup>19</sup> Briefly, absolute presenteeism was a measure of actual performance during work ranging from 0 (worst job performance) to 100 (no lack of performance). Relative presenteeism was measured as a ratio of worker's actual performance to the most workers' average performance at the same job, with higher scores indicating better relative performance. Absolute absenteeism was assessed as the difference between the number of hours employees worked in the past 4 weeks and the number of hours their employer expected them to work, with a negative lower bound (if the person works more than expected) and a positive upper bound (the number of hours the person is expected to work).<sup>19</sup> Relative absenteeism was expressed as the absolute absenteeism divided by the expected hours of work and ranged from a negative number (works more than expected) and 1 (always absent).<sup>19</sup>

### Domain-Specific Active Behaviors

The Global Physical Activity Questionnaire (GPAQ) was used to measure domain-specific physical activity.<sup>20</sup> This questionnaire has acceptable reliability and validity in Japanese adults.<sup>21</sup> The GPAQ contains 16 questions that assess self-reported physical activity during work, transport, and leisure in a typical week. The GPAQ data cleaning and the scoring procedure has been described elsewhere.<sup>22</sup> The frequency and duration of moderate- and vigorous-intensity physical activity spent on the work domain were used to calculate average minutes of work-related physical activity per day.

### Domain-Specific Sedentary Behaviors

Domain-specific sedentary behaviors were evaluated using a Japanese self-reported questionnaire with a 1-week recall period.<sup>23</sup> Participants reported their daily average sedentary behaviors over the past 7 days separately for workdays and non-workdays (weekends) in the following six domains: driving or riding by car; using public transport; at work; watching television, videos, and DVDs; using a computer, cell phone, or tablet PC outside of working hours; and in leisure time (excluding watching television, videos, and DVDs). The questionnaire has acceptable reliability and validity.<sup>23</sup> Average daily values of total sedentary time and each domain's sedentary time were also calculated with weighting for the number of workdays and non-workdays.

### Covariates

Participants self-reported their age, sex (female or male), marital status (single or couple), educational attainment (tertiary, below tertiary), gross annual individual income (<¥4,000,000 or ≥¥4,000,000), and workplace size (small, medium, large, not applicable).

### Statistical Analysis

Descriptive statistics, including means, standard deviations, and frequencies, were calculated for all covariates. Covariate-

adjusted multivariable linear regression models estimated the associations between domain-specific sedentary and active behaviors (independent variables) and workers' presenteeism and absenteeism (dependent variables). For all point estimates ( $b$  = unstandardized regression coefficients), 95% confidence intervals (CIs) were estimated. Normality assumptions were checked by the quantile–quantile plots of the residuals, and no violations were identified. A complete-case analysis was chosen because the percentage of missing data for our variables of interest was low (5%). Cases were included in the analysis if they provided complete covariate data and provided either complete physical activity or sedentary behavior data. Stata 15.0 (Stata Corp., College Station, TX) was used to conduct the analyses, and the level of significance was set at  $P < 0.05$ .

## RESULTS

Table 1 presents the characteristics of the study participants. The average age was  $39.6 \pm 10.7$  (range 20 to 59) years. Our sample included mostly male (50.9%), single (56.5%), tertiary educated (80.7%), those with a gross annual individual income of fewer than four million yen (55.9%), and those working in a large workplace (60.5%). Mean daily total physical activity and total sedentary time hours were  $1.73 \pm 2.80$  and  $8.93 \pm 3.57$ .

Table 2 presents the associations between workers' domain-specific and total physical activity, presenteeism, and absenteeism. Adjusting for covariates, minutes of work-related physical activity was negatively associated with relative absenteeism ( $b = -0.002$ , 95% CI  $-0.003, -0.001$ ,  $P = 0.000$ ). There was a significant positive association between leisure-related physical activity and absolute presenteeism (ie, better productivity) ( $b = 0.039$ , 95% CI 0.014, 0.064,  $P = 0.002$ ). Total physical activity was negatively and positively associated with relative absenteeism ( $b = -0.001$ , 95% CI  $-0.001, -0.000$ ,  $P = 0.010$ ) and absolute presenteeism (ie, better productivity) ( $b = 0.006$ , 95% CI 0.002, 0.010,  $P = 0.006$ ), respectively.

Table 3 shows the associations between workers' domain-specific and total sedentary behaviors, presenteeism, and absenteeism. Adjusting for covariates, there was a positive association between car sitting time and absolute absenteeism ( $b = 0.063$ , 95% CI 0.009, 0.116,  $P = 0.021$ ). No significant associations were observed between other domain-specific and total sedentary behaviors with workers' presenteeism and absenteeism.

**TABLE 1.** Baseline Characteristics of Study Participants ( $N = 2432$ )

Variable	Mean (SD) or N (%)
Age (yrs)	39.6 (10.7)
Gender	
Female	1193 (49.1)
Male	1239 (50.9)
Marital status	
Single	1374 (56.5)
Couple	1058 (43.5)
Educational attainment	
Tertiary	1963 (80.7)
Below tertiary	469 (19.3)
Gross annual individual income	
<¥4,000,000	1360 (55.9)
≥¥4,000,000	1072 (44.1)
Workplace scale	
Small (<29 employees)	481 (19.8)
Medium (30–99 employees)	423 (17.4)
Large (≥100 employees)	1472 (60.5)
Not applicable	56 (2.3)

SD, standard deviation.

**TABLE 2.** Associations Between Minutes of Workers' Domain-specific and Total Physical Activity, Presenteeism, and Absenteeism (*n* = 2428)

	Work <i>b</i> (95% CI)	Transport <i>b</i> (95% CI)	Leisure <i>b</i> (95% CI)	Total Physical Activity <i>b</i> (95% CI)
Absolute absenteeism	0.007 (−0.024, 0.038)	−0.008 (−0.078, 0.062)	0.039 (−0.047, 0.125)	0.013 (−0.001, 0.027)
Relative absenteeism	−0.002 (−0.003, −0.001)*	0.001 (−0.001, 0.003)	−0.001 (−0.004, 0.002)	−0.001 (−0.001, −0.000)*
Absolute presenteeism	0.008 (−0.001, 0.017)	0.004 (−0.016, 0.025)	0.039 (0.014, 0.064)*	0.006 (0.002, 0.010)*
Relative presenteeism	0.000 (−0.000, 0.000)	−0.000 (−0.001, 0.000)	−0.000 (−0.001, 0.000)	0.000 (−0.000, 0.000)

Absolute presenteeism ranged from 0 (worst job performance) to 100 (no lack of performance).

Higher scores of relative presenteeism indicated better relative performance.

Absolute absenteeism had a negative lower bound (if the person works more than expected) and a positive upper bound (the number of hours the person is expected to work).

Relative absenteeism ranged from a negative number (works more than expected) and 1 (always absent).

*b*, regression unstandardized coefficients; CI, confidence interval. All models adjusted for age, gender, marital status, educational attainment, gross annual individual income, and workplace size.

\**P* < 0.05.

### DISCUSSION

This study examined the associations between domain-specific active and sedentary behavior and presenteeism and absenteeism in a sample of workers in Japan. Significant associations were observed between work-related, leisure-related, and total physical activity and workers' presenteeism and absenteeism. For example, a 1-minute increase in average daily leisure-related physical activity was associated with a 0.039 unit increase in absolute presenteeism. This implies that a 30-minute increase in daily leisure-related physical activity would result in about a 1-unit gain in absolute presenteeism (ie, better productivity). These findings support previous evidence suggesting that physical activity improves employees' work performance indices such as presenteeism and absenteeism.<sup>7–9</sup> For example, a longitudinal study conducted in the United States found that increased physical activity was associated with a decrease in presenteeism among a university employee sample.<sup>9</sup> Our study contributes to previous evidence by providing insights into which physical activity domains are associated with better presenteeism and absenteeism. These understandings are essential for developing domain-specific physical activity interventions for workers. For instance, to improve employees' work performance, companies can provide opportunities for employees to be more active at work while also providing incentives or supporting non-work physical activity (eg, flexible work hours, shorter work hours, longer lunch breaks, work benefits that include subsidised fitness classes and public transit). Our findings suggest that physical activity interventions that are not workplace-based may benefit workplaces by improving

presenteeism. Our study also extends previous findings to a less-explored context in Asia, such as Japan, which has the longest working hours in the world.<sup>24</sup> Region-specific evidence is needed to guide future public health interventions to improve work-related outcomes in each region.

We found that car sitting time was positively associated with employees' absolute absenteeism. A 1-minute increase in car sitting time was associated with a 0.063 unit increase in absolute absenteeism (about a 2-hour increase in absenteeism for every 30-minutes/day of car use). While this seems like a slight increase in a practical sense at the individual level, these small effects could have large impacts at a population level and even have a negative impact on large and small workplaces. Few previous studies exist examining the associations between sedentary behavior and presenteeism and absenteeism, some of them reporting adverse effects of sedentary time on presenteeism.<sup>6,10</sup> For instance, a study conducted in Australia found that objectively measured sitting time was unfavorably associated with office workers' presenteeism.<sup>6</sup> The pathways through which car sitting time impacts absenteeism are yet to be investigated. It is possible that commuting time (ie, spending more time in traffic or more travel time) is a confounder between absenteeism and car sitting time. Spending more sitting time in cars has worse health outcomes which may lead to absenteeism. For example, a study conducted in Australia found that prolonged sitting in cars was adversely associated with adults' cardiometabolic markers.<sup>25</sup> However, one study found that higher sitting time was associated with better presenteeism among a sample of Australian workers.<sup>26</sup> Using different questionnaires in assessing presenteeism and

**TABLE 3.** Associations Between Workers' Domain-specific and Total Sedentary Behaviors, Presenteeism, and Absenteeism (*n* = 2154)

	Work <i>b</i> (95% CI)	Car use <i>b</i> (95% CI)	Public Transportation <i>b</i> (95% CI)	TV Viewing <i>b</i> (95% CI)	PC Use <i>b</i> (95% CI)	Total Sedentary Time <i>b</i> (95% CI)
Absolute absenteeism	−0.011 (−0.028, 0.005)	0.063 (0.009, 0.116)*	−0.063 (−0.133, 0.006)	−0.006 (−0.033, 0.021)	0.010 (−0.019, 0.040)	−0.003 (−0.015, 0.009)
Relative absenteeism	0.000 (−0.000, 0.001)	0.001 (−0.001, 0.002)	−0.001 (−0.003, 0.001)	−0.000 (−0.001, 0.000)	0.000 (−0.001, 0.001)	0.000 (−0.000, 0.000)
Absolute presenteeism	−0.003 (−0.008, 0.002)	0.014 (−0.002, 0.029)	0.004 (−0.017, 0.024)	0.001 (−0.006, 0.009)	−0.005 (−0.014, 0.003)	−0.001 (−0.004, 0.002)
Relative presenteeism	0.000 (−0.000, 0.000)	−0.000 (−0.000, 0.000)	−0.000 (−0.001, 0.000)	−0.000 (−0.000, 0.000)	−0.000 (−0.000, 0.000)	−0.000 (−0.000, 0.000)

Absolute presenteeism ranged from 0 (worst job performance) to 100 (no lack of performance).

Higher scores of relative presenteeism indicated better relative performance.

Absolute absenteeism had a negative lower bound (if the person works more than expected) and a positive upper bound (the number of hours the person is expected to work).

Relative absenteeism ranged from a negative number (works more than expected) and 1 (always absent).

*b*, regression unstandardized coefficients; CI, confidence interval. All models adjusted for age, gender, marital status, educational attainment, gross annual individual income, and workplace size.

\**P* < 0.05.

absenteeism may account partially for these inconsistencies in the findings.<sup>27</sup>

This study has several limitations. The cross-sectional design of this study precludes inference between active and sedentary behavior and presenteeism and absenteeism. For instance, jobs that encourage presenteeism may provide more out of work time/flexibility for leisure physical activity and total physical activity. Self-reported measures of active and sedentary behavior are also subject to recall bias. The observed relationships may also differ based on workplace characteristics such as work hour, flexible work schedules, and work incentives to be physically active. Future studies may also apply a more valid measure of absenteeism (an objective measure of days not attending work reported in workplace records). While participants from recruited nationally, we cannot generalize the findings to all company employees in Japan.

## CONCLUSION

Our study adds to the growing literature that seeks to identify correlates of employees' presenteeism and absenteeism. Focussing on domain-specific active and sedentary behaviors in a less-explored context, we found several associations between physical activity and sedentary behavior and workers' presenteeism and absenteeism in Japan. A change in work culture and practices that support active behaviors at work and outside of work is necessary to improve employee's productivity indices. More longitudinal studies using objective and self-reported context-specific active and sedentary behaviors are needed to explore behavioral interventions to support employees' work performance.

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