# Managing office worker presenteeism by providing financial aid for acupuncture therapy: a pragmatic multicenter randomized comparative study

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Abstract: To evaluate whether financial aid for acupuncture therapy is beneficial for non-manufacturing job workers (office workers) who are aware of reduced job performance due to health issues (presenteeism), a four-wk pragmatic multicenter randomized controlled trial was conducted with office workers who were aware of their presenteeism. The control group only implemented the workplace-recommended presenteeism measures, whereas the intervention group received financial aid for acupuncture therapy of up to 8,000 JPY (Japanese yen) in addition to implementing the presenteeism measures recommended by each workplace. The major outcome measure was the World Health Organization Health and Work Performance Questionnaire relative presenteeism score. A total of 203 patients were assigned to the intervention (n=103) and control (n=108) groups. The intervention group underwent a median of 1.0 (interquartile range [IQR], 1.0 to 2.0) sessions of acupuncture for neck disorders (64%), back disorders (16%), and depressed mood/anxiety/irritation (5%), among others. Results showed that the intervention group had slightly better job performance than the control group (effect size [r]=0.15, p=0.03). Financial aid for acupuncture therapy may help compensate for losses incurred by enterprises in the form of 14,117 JPY per worker a month.

**Key words:** Presenteeism, Acupuncture therapy, Financial aid, Health services accessibility, Occupational health, Costs and cost analysis

# Introduction

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Presenteeism refers to a worker's practice of being present in one's workplace despite poor job performance due to physical and mental health issues. Since 2000, studies have highlighted that presenteeism reduces worker pro-

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ductivity, causing company losses<sup>1, 2)</sup>.

Measures focusing on chronic lifestyle-related diseases have been implemented to improve the health of workers in Japan. However, it has recently been revealed that the losses incurred by enterprises due to chronic symptoms (e.g., allergy, shoulder stiffness, depressed mood, anxiety, and chronic headache) are greater than those incurred due to medical expenses to treat such diseases and workers' leave of absence from work due to illness. Therefore, presenteeism is an urgent issue from the standpoint of enterprise management and industrial health control<sup>3</sup>).

Previous studies have highlighted that the effects of acupuncture therapy on diseases or symptoms contributing to presenteeism (e.g., allergic rhinitis<sup>4</sup>), neck pain<sup>5</sup>), low back pain<sup>6</sup>), depressed mood<sup>7</sup>), and headache<sup>8</sup>) are superior to other non-drug therapies in terms of cost-effectiveness.

Sawazaki *et al.*<sup>9)</sup> implemented a combination of applied acupuncture and the meridian test for eight wk on manufacturing workers of a major steel company in Japan. Their study found that symptoms such as shoulder stiffness and low back pain reduced; moreover, the workers' healthcare expenses decreased to about one-third of their costs. Nicolian *et al.*<sup>10)</sup> applied acupuncture to pregnant women with low back pain or pelvic pain complaints and reported that the losses incurred from absence from work or presenteeism reduced by  $\notin$ 312; however, the therapy incurred an additional cost of  $\notin$ 60.

Therefore, we hypothesized acupuncture to be a promising, effective, and comprehensive means for controlling diverse health issues among workers. Despite its effectiveness, however, its introduction into the workforce has been hindered. We speculated that the reason for this may be related to the financial situation in Japan, where insurance (reimbursement) coverage for acupuncture treatment costs is limited and paid mainly by the patient's copayment<sup>11</sup>). Thus, increasing its feasibility and cost-effectiveness will promote its adoption for industrial health.

Under such circumstances, this study adopted a randomized comparison design to evaluate whether financial aid for acupuncture therapy (cashback of up to 8,000 JPY (Japanese yen) per month) would benefit workers in charge of non-manufacturing jobs who are aware of reduced job performance due to health issues.

In our previous study<sup>12)</sup>, an interim analysis of 52 patients, financial aid for acupuncture therapy was provided for an average of 1.4 sessions. The results suggested that treatment expense allowance would increase workers' performance efficiency by approximately 4% (equivalent to 19,691 JPY per person) compared with those without it. Therefore, in this study, we report the results of the final analysis using a larger sample size.

# **Subjects and Methods**

## Study design

We designed a four-wk pragmatic multicenter randomized study involving an intergroup comparison. This study received ethical approval from the Teikyo Heisei University Ethics Committee (30-049). Information regarding this clinical study was registered in advance with the UMIN Clinical Trials Registry System (ID: UMIN000035321).

## Participants

Office workers who were aware of the effect of presenteeism on their job performance were recruited through online advertisements. The inclusion criteria were as follows: (1) awareness of the decline in one's job performance due to health issues during the past month, (2) being employed and working continuously for three months before and after enrollment in the study (excluding nonregular employees), (3) being engaged in administrative/ clerical/technical jobs, and (4) aged between 18 and 65 yr old. The exclusion criterion was participation in any other clinical study or trial during the study period.

## Intervention

The control group participants were informed that they would only be allowed to implement measures encouraged at their workplace to deal with presenteeism. The intervention group participants were informed that besides implementing the presenteeism measures encouraged at their workplace, they were allowed to avail acupuncture therapy at the clinics where any of the publicly recruited acupuncturists for this study worked. Moreover, they were informed that the therapy expenses incurred during the four-wk observation period would be partially reimbursed through a "cashback" (up to 8,000 JPY per month) provision after submitting an out-of-pocket payment certificate.

The amount of financial support was established in correspondence with the financial support system for acupuncture therapy received by the older adults, available at several national health insurance unions in Japan (the mean upper limit of support for one therapy session was 753.5 JPY, which is 8,289 JPY for 11 sessions per month).<sup>13)</sup>

Each intervention group participant rated the intensity of and satisfaction with the treatment of health issues that most affected their ability to work on an 11-point scale (0-10).

## Outcome

In this study, the major outcome measure was the relative presenteeism score, as defined in the Japanese version<sup>14)</sup> of the Health and Work Performance Questionnaire (WHO-HPQ) developed by Kessler *et al*<sup>15)</sup>.

The relative presenteeism score was determined as follows: First, the job performance of each participant on every working day during the past four wk was rated on an 11-grade scale ranging from 0 (worst performance) to 10 (best performance). This rating was divided by the performance of other workers with similar jobs to obtain the relative presenteeism score. For cost conversion, a relative score higher than 1.0 was deemed as 1.0, resulting in a relative score ranging from 0.25 (lowest job performance compared to workers with similar jobs) to 1.0 (job performance comparable to or better than workers with similar jobs)<sup>16</sup>.

The monetary value by presenteeism was estimated using the following formula:

- presenteeism cost per worker (JPY) = (average total annual remuneration for all participants / 365 d × 28 d) × (1 – average relative presenteeism score)
- Monthly remuneration per worker that can be expected from the intervention (cashback; JPY) = presenteeism cost per worker in the control group (JPY) – presenteeism cost per worker in the intervention group + per-worker acupuncture financial aid (cashback; JPY)

The total annual remuneration was checked from the most recent year's certification of income and local tax withheld from regular pay.

The secondary outcome measures were the absolute presenteeism score (described above), the number of absentee days in four wk (absenteeism), and the Japanese version of the Stanford Presenteeism Scale<sup>3</sup>). The absolute presenteeism score was obtained by multiplying the job performance score, which was evaluated on an 11-point scale (ranging from 0–10) when calculating the relative presenteeism score, by 10. Absenteeism was determined as the number of days of absence in four wk. For the Japanese version of the Stanford Presenteeism Scale, the primary health condition was used, and the original "back pain or neck disorder" was divided into "back disorder" and "neck disorder".

## Sample size

Based on the assumption that the effect size in the difference in mean between the two groups would be 0.4, the detective power would be 80%, and the  $\alpha$  level would be 5%, 100 participants were allocated to each group. In addition, up to 10% of participants (10 cases) were recruited in anticipation of dropouts.

#### Allocation

Dynamic allocation using the non-deterministic minimization method was conducted by including the allocation factors anticipated to affect the outcome. These factors included age, gender, relative presenteeism score, and acupuncture therapy status.

#### Statistical analysis

Statistical analysis was conducted by excluding the dropout participants on whom no data were available after randomization, following the intention-to-treat principle. For instance, participants who did not receive acupuncture therapy despite being allocated to the intervention group were analyzed as members of the intervention group.

For the outcome measure, a normality test (Shapiro– Wilk test) was conducted. For an intergroup comparison, the two-sample *t*-test, a parametric method, was applied when the normal distribution was followed, and the Mann– Whitney test, a non-parametric method, was applied for non-normal distributions. In addition, for the major outcome measure, *d* or *r* was determined as an indicator of effect size (effect size *d* if it followed a normal distribution, *r* if it did not). For confirmation, relative presenteeism values were stratified into nine categories (0.25, 0.26–0.34, 0.35–0.44, 0.45–0.54, 0.55–0.64, 0.65–0.74, 0.75–0.84, 0.85–0.94, and 0.95–1.00)<sup>14, 16)</sup> as for allocation, and the Mantel–Haenszel test for trend (extended Mantel test) was used to test for independence, adjusting for the effect of baseline values.

Statistical analysis was conducted using the software IBM SPSS Statistics 19 (SPSS, IBM Company, Tokyo, Japan).

## Results

The participants of this study were recruited from January 26, 2019, to December 28, 2020. Of the 211 participants who met the eligibility criteria and provided informed consent, 103 (including six participants who could not receive the allocated intervention) and 108 were allocated to the intervention and control groups, respectively. Participants were observed for four wk (Fig. 1). After excluding eight dropouts, 203 participants were included in the final analysis.

Table 1 summarizes the participants' basic attributes at baseline. Both groups were approximately matched with



**Fig. 1.** Flow diagram of the progress through the phases of a parallel randomized trial of two groups. Flowchart showing the process of each stage of a randomized controlled trial (enrollment, allocation, follow-up, and analysis).

each other. The median age of the 203 participants was 46 (interquartile range [IQR], 36–51) yr, the percentage of men was 53%, and the relative presenteeism score (the major outcome measure) was a median of 0.75 (IQR, 0.57–1.00). Regarding the status of acupuncture therapy, 67 participants (33%) had received acupuncture therapy prior to enrollment in this study. Of these 67 participants, one was "currently receiving acupuncture therapy periodically", and 66 were "willing to receive the therapy if there was an opportunity". Moreover, 136 participants (67%) had "never received acupuncture therapy prior to enrollment in this study. Of these 136 participants, 133 were "willing to receive the therapy if there was an opportunity". Moreover, 136 participants, 133 were "willing to receive the therapy if there were an opportunity", and three were "unwilling to receive therapy in the future".

When asked about the presenteeism measures being encouraged at the workplace to deal with presenteeism,

142 participants (70%) responded that "no such measures were encouraged or practiced". However, presenteeism measures practiced at the workplace (multiple answers acceptable) included "mental health measures" (19%), "encouragement of exercise" (13%), "support for employees' dietary habits" (3%), "Health Keeper system (acupuncture, moxibustion, and massage provided by therapists employed by the company)", "smoking cessation programs" (3%), and "health classes" (1%). "Other measures" included the use of massage chairs, information supply via email, participation in a walking campaign (within the framework of the company's welfare benefits), health checkups, and "no measures".

The intervention group underwent a cumulative total of 150 sessions, including acupuncture therapy (Supplementary Table 1), from 37 acupuncturists who participated in this study belonging to the 37 facilities listed in Table 2.

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Characteristic	Total (n=203)	Additional presentism measures group (n=103)	Standard presentism measures group (n=100)	<i>p</i> -value
Age, yr	46 (36–51)	46 (37–51)	46 (36–51)	0.74
Male sex, n (%)	108 (53.2)	51 (49.5)	57 (57.0)	0.37
Years of service, yr	16 (6–26)	15 (7–26)	17 (6–25)	0.75
Occupation				
Clerical workers	98 (48.3)	52 (50.5)	46 (46.0)	0.60
Specialist professionals	53 (26.1)	27 (26.2)	26 (26.0)	
Administrative and managerial workers	16 (7.9)	8 (7.8)	8 (8.0)	
Service workers	15 (7.4)	7 (6.8)	8 (8.0)	
Sales workers	11 (5.4)	4 (3.9)	7 (7.0)	
Others <sup>a</sup>	10 (4.9)	5 (4.9)	5 (5.0)	
Total annual remuneration, JPY <sup>b</sup>	5,109,337	5,035,396	5,245,688	0.88
	(3,866,821–6,799,687)	(3,904,144–7,202,276)	(3,824,205–6,705,751)	
Experience of receiving acupuncture treatment				
Yes, n (%)	67 (33.0)	34 (33.0)	33 (33.0)	1.00
No, n (%)	136 (67.0)	69 (67.0)	67 (67.0)	
Company response and measures aimed at improving the				
presenteeism currently being practiced, n (%)				
Mental health measures <sup>c</sup>	39 (19.2)	19 (18.4)	20 (20.0)	0.78
Encouragement of exercise d	26 (12.8)	14 (13.6)	12 (12.0)	0.73
Support for employees' dietary habits e	7 (3.4)	4 (3.9)	3 (3.0)	0.73
"Health Keeper" system <sup>f</sup>	7 (3.4)	2 (1.9)	5 (5.0)	0.23
Smoking cessation program	6 (3.0)	3 (2.9)	3 (3.0)	0.97
Health class	2 (1.0)	0 (0.0)	2 (2.0)	0.15
Others <sup>g</sup>	5 (2.5)	1 (1.0)	4 (4.0)	0.16
No response or absence of measures practiced in the company	142 (70.0)	72 (69.9)	70 (70.0)	0.99
Presenteeism (WHO-HPQ)				
Absolute presenteeism <sup>h</sup>	50 (40-60)	50 (40-60)	50 (40-60)	0.49
Relative presenteeism <sup>i</sup>	0.75 (0.57-1.00)	0.75 (0.57-1.00)	0.71 (0.56–0.88)	0.40

<sup>†</sup>n (%), median (IQR: interquartile range).

<sup>a</sup> Transport and machine operation workers (n=5), construction and mining workers (n=2), manufacturing process workers (n=2), and workers not classified by occupation (n=1).

<sup>b</sup>100 JPY is equivalent to 0.9040 U.S. dollars as of June 22, 2021.

<sup>c</sup> Mental health education, checks, etc.

<sup>d</sup> Gymnastics at work, use of affiliated sports clubs and gyms, sporting events, etc.

<sup>e</sup> Providing health menus for company meals, providing information on improving eating habits, etc.

<sup>f</sup> Recruitment of acupuncture and masseurs working in the company.

<sup>g</sup> Massage chair, information by email, participating in the company's welfare system called the walking campaign, and medical checkup.

<sup>h</sup> 0–100: Own work performance over the last 28 d. The higher the score, the higher the work performance, that is, the lower the tendency for presentism. <sup>i</sup> 0.25–1.00: Own work performance over the last 28 d compared with colleagues. The higher the score, the higher the work performance, that is, the less likely one is to be present.

WHO-HPQ: WHO Health and Work Performance Questionnaire; JPY: Japanese yen.

Table 3 shows treatments including acupuncture therapy per session in the intervention group. The health issues reported as having the greatest impact on job performance at the time of receiving acupuncture therapy were neck disorders (64%), back disorders (16%), depression, anxiety, or emotional disorders (5%), insomnia (5%), stomach or bowel disorders (2%), allergy (1%), diabetes (1%), and ocular impairment (1%). There were no cases in which the acupuncturists stopped acupuncture therapy and recommended treatment at a medical institution, or sought a physician's determination on whether or not the acupuncture therapy should be performed. In the partici-

Characteristic	Sub-investigators (acupuncturists) (n=37)
Age, yr <sup>†</sup>	$52.4 \pm 11.9$
Male sex, n (%)	28 (75.7)
Clinical experience of the acupuncturists, yr, median (IQR)	16.0 (6.0–30.0)
Qualifications, other than that of acupuncture therapy, under the jurisdiction	
of the Ministry of Health, Labour and Welfare	
Moxibustion therapists, n (%)	35 (94.6)
Anma, massage, and shiatsu practitioners, n (%)	15 (40.5)
Judo therapist, n (%)	2 (0.5)
Physical therapist, n (%)	1 (0.3)
Others <sup>a</sup> , n (%)	3 (0.8)

### Table 2. Characteristics of sub-investigators (acupuncturists)

 $^\dagger Plus-minus$  values are means  $\pm$  SD.

<sup>a</sup>This included one long-term care welfare worker, one dental technician, and one long-term care support specialist. IQR: interquartile range; SD: standard deviation.

	Total number of treatments (n=150)
Health issues <sup>a</sup>	
Neck disorders, n (%)	96 (64.0)
Back disorders, n (%)	24 (16.0)
Depression, anxiety, or emotional disorders, n (%)	8 (5.3)
Insomnia, n (%)	8 (5.3)
Stomach or bowel disorders, n (%)	3 (2.0)
Allergy, n (%)	2 (1.3)
Diabetes, n (%)	2 (1.3)
Ocular impairment, n (%)	2 (1.3)
Arthritis, n (%)	1 (0.7)
Migraines/chronic headaches, n (%)	1 (0.7)
Menstrual pain or irregular menstruation, menopausal symptoms, n (%)	1 (0.7)
Other, n (%)	2 (1.3)
The intensity of the health issue <sup>a</sup>	
Pre-intervention, median (IQR)	8.0 (7.0–9.0)
Post-intervention, median (IQR)	6.0 (4.0–7.0)
Difference (post-intervention-pre-intervention), median (IQR)	-2.0 (-3.0-0.0)
Duration of acupuncture therapy effect (days), median (IQR)	3.0 (2.0-7.0)
Satisfaction with acupuncture therapy, median (IQR)	8.0 (7.0–9.0)
Adverse events after the intervention <sup>b</sup>	
No adverse event, n (%)	110 (73.3)
Drowsiness, n (%)	22 (14.7)
Malaise, n (%)	18 (12.0)
Pain at the therapy-applied site, n (%)	9 (6.0)
Fatigue, n (%)	4 (2.7)
Exacerbation of existing symptoms, n (%)	1 (0.7)
Bleeding, n (%)	1 (0.7)
Hematoma, n (%)	1 (0.7)
Other, n (%)	1 (0.7)
Sick feeling, n (%)	0 (0.0)
Nausea, n (%)	0 (0.0)
Cost of acupuncture therapy (JPY), median (IQR)	5,000 (4,000-6,820)

Table 3. Detail of treatments including acupuncture therapy per session in the intervention group

<sup>a</sup> The greatest impact on job performance at the time of receiving acupuncture therapy.

<sup>b</sup> Multiple answers.

IQR: interquartile range, JPY: Japanese yen.

pants' self-assessment on the efficacy of the intervention (including acupuncture therapy), the intensity of the health issue having the greatest impact on job performance (0: absent to 10: most intense) significantly decreased from pre-intervention (median 8.0 [IQR, 7.0-9.0]) to post-intervention (median 6.0 [IQR, 4.0-7.0]; p<0.001). Moreover, this efficacy remained constant for a median of 3.0 (IOR, 2.0-7.0) d, and the median degree of satisfaction (0=most unsatisfied to 10=most satisfied) was 8.0 (IQR, 7.0-9.0). In the analysis of adverse events after the intervention (including acupuncture therapy), no adverse event occurred after 110 (73%) of the 150 sessions of intervention. The adverse events post-intervention included drowsiness (15%), malaise (12%), pain at the therapy-applied site (6%), fatigue (3%), exacerbation of existing symptoms (0.7%), bleeding (0.7%), and hematoma (0.7%). No participants complained of a sick feeling or nausea.

Table 4 shows the results of the intergroup comparison of the outcomes. In the intervention group, the median number of sessions was 1.0 (IQR, 1.0–2.0), median total cost was 7,000 (IQR, 6,000–9,000), and median cashback was 7,000 (IQR, 6,000–8,000). The relative presenteeism score (a major outcome measure) was significantly higher in the intervention group (median 1.00 [IQR, 0.86–1.00]) than in the control group (median 1.00 [IQR, 0.76–1.00]; effect size [r]=0.15, p=0.03). For confirmation, a test of independence was also conducted, adjusting for the effect of baseline values, and a significant (p=0.045) association was found between relative presenteeism values and groups after the intervention.

The presenteeism cost per worker in the control group was JPY 60,655 (95% CI: 44,441–76,870), and that in the intervention group was JPY 40,055 (95% CI: 26,114–53,996); cashback per worker of JPY 6,483 (95% CI: 6,080–6,887) and monthly remuneration per worker of 14,117 JPY were expected from the intervention group (cashback; Fig. 2).

## Discussion

Financial aid (up to 8,000 JPY cashback for four wk) was provided to office workers who were aware of presenteeism (due to neck and shoulder stiffness and low back pain) to cover the expenses of acupuncture therapy. The workers received a median of 1.0 therapy session during the four-wk observation period, with a cashback of 7,000 (median) JPY. This finding suggests that financial aid can partially compensate for enterprises' losses due to presenteeism by saving 14,117 JPY per worker (60,655 JPY

in the control group and 40,055 JPY in the intervention group, with a cashback of 6,483 JPY). Consistent with a previous domestic study<sup>17)</sup>, the incidence of adverse events from the intervention was very low. Moreover, the adverse events were mild if acupuncture therapy was provided by qualified acupuncturists.

In contrast, the difference in the relative presenteeism score (a major outcome measure) was small (effect size [r]=0.15) between the groups. In this study, financial aid was set at a maximum of 8,000 JPY in four wk. The intervention group received one to two acupuncture therapy sessions, and the effect of each therapy session, including acupuncture, lasted approximately three d. Therefore, we suggest that the response period to acupuncture therapy exposure is within six d, which was less than a quarter of the observation period. Accordingly, further research is needed to validate more effective intervention methods, duration, and frequency.

## Limitation and future directions

First, the WHO-HPQ<sup>14, 15)</sup> used in this study to assess economic losses from presenteeism was affected by the following: (1) the method for conversion of losses into money has not yet been established, (2) the period of investigation (four wk) in this study was shorter than that of loss estimation (one yr), (3) objectivity is compromised when a self-report questionnaire is used, and (4) the presence of a reverse causal relationship between health status and presenteeism cannot be ruled out<sup>18, 19)</sup>. These biases need to be considered while interpreting the study results.

Second, the 203 patients were not randomly sampled from the population but were selected based on the knowledge that they might receive acupuncture; this may have limited the generalizability of the findings. The intervention methods for this study were designed using a pragmatic approach, which could be immediately adopted by enterprises of any scale or field and their workers. More specifically, the intervention group participants were instructed to book a therapy session with an acupuncturist from a list of study acupuncturists, who were instructed to provide services in their usual manner without providing any details of the intervention (including acupuncture therapy). Therefore, we cannot disregard the possibility that the efficacy of acupuncture can be affected by the knowledge and skill levels of individual acupuncturists; further, it is difficult to extrapolate the benefits and harms noted in this study to other acupuncturists. Acupuncture therapy is not recommended for some types of health issues or discomforts. Xue et al. reported that the clinical efficacy of acupuncture

Table 7. I I finally and secondary outcomes of cach grou	rimary and secondary outcomes of each grou	itcomes of	secondary	Primary and	Table 4.
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Number of sessions, median (IQR)     1.0 (1.0-2.0)     -       The statel work of summation theorem (IDV) median (IOP)     7.000 (C.000, 0.000)	_
The total and $f$ around the density (IDV) and $i$ or (IOD) 7.000 (C 000, 0.000)	_
The total cost of acupuncture therapy (JPY), median (IQK) $(0.000-9,000)$ –	
Cashback of acupuncture therapy (JPY), median (IQR) 7,000 (6,000–8,000) –	_
Absenteeism, median (IOR)	
Absenteeism by chronic condition (d) $0(0-0)$ $0(0-0)$ $0.3$	.33
Presenteeism median (IOR)	
Absolute presenteeism score $60(50-70)$ $60(40-70)$ $0.1$	.13
Relative presenteeism score         1.00 (0.86–1.00)         1.00 (0.76–1.00)         0.00	.03
Relative presenteeism score category, n (%)	
0.95–1.00 71 (68.9) 54 (54.0) 0.0	.045 <sup>b</sup>
0.85-0.94 11 (10.7) 13 (13.0)	
0.75–0.84 5 (4.9) 11 (11.0)	
0.65-0.75 11 (10.7) 13 (13.0)	
0.55–0.64 0 (0.0) 0 (0.0)	
0.45-0.54 3 (2.9) 5 (5.0)	
0.35-0.44 2 (1.9) 3 (3.0)	
0.26–0.34 0 (0.0) 1 (1.0)	
0.25 0 (0.0) 0 (0.0)	
Self-reported primary chronic health conditions, n (%)	
Neck disorders 43 (41.7) 45 (45.0) 0.6	.64
Back disorders 14 (13.6) 13 (13.0) 0.9	.90
Allergy 10 (9.7) 5 (5.0) 0.2	.20
Insomnia 7 (6.8) 10 (10.0) 0.4	.41
Migraines/chronic headaches 7 (6.8) 4 (4.0) 0.3	.38
Depression, anxiety, or emotional disorders 5 (4.9) 6 (6.0) 0.7	.72
Optical impairment $5(4.9)$ $4(4.0)$ $0.5$	.52
Stomach or bowel disorders $3(2.9)$ $5(5.0)$ $0.3$	.34
Arthritis 2 (1.9) 2 (2.0) 0.6	.68
Skin diseases 1 (1.0) 2 (2.0) 0.4	.49
Asthma 0 (0.0) 1 (1.0) 0.4	.49
None 2 (1.9) 2 (2.0) 0.6	.68
Others <sup>a</sup> 4 (3.9) 1 (1.0) 0.1	.19
Corporate response and measures aimed at improving presenteeism implemented	
No response or absence of measures practiced in the company $82.(85.4)$ $70.(70.0)$ 0.2	23
No response of absence of measures practiced in the company $80(63.4)$ $79(19.0)$ $0.2$ Encouragement of evercice $10(0.7)$ $12(12.0)$ $0.4$	.23
Encouragement of excluse $10(9.7)$ $12(12.0)$ $0.0$ Mental health measures $5(4.0)$ $5(5.0)$ $0.4$	.00
Internal learning $3 (4.7)$ $3 (5.0)$ $0.0$ "Haplth Kapper" system $2 (1.0)$ $5 (5.0)$ $0.0$	21
Inclusion Support for employees' dietary habits $2(1.9)$ $3(3.0)$ $0.2$ Support for employees' dietary habits $2(1.0)$ $2(2.0)$ $0.4$	.21
Smoking cessation program $0(0.0)$ $1(1.0)$ $0.4$	.00

IQR: interquartile range; JPY: Japanese yen.

<sup>a</sup> Diabetes, hearing impairment, heart or circulator.

<sup>b</sup> The relative presenteeism values were stratified into nine categories as in the allocation, and the Mantel–Haenszel test for trend was used to adjust for the effect of initial values and to test for independence.



Fig. 2. Monthly remuneration per worker expected from financial aid (up to 8,000 JPY cashback for four wk).

The presenteeism cost per worker in the control group was JPY 60,655, and that in the intervention group was JPY 40,055; cashback per worker of JPY 6,483 and monthly remuneration per worker of 14,117 JPY were expected from the intervention group (cashback). JPY: Japanese yen.

therapy increases gradually with the number of therapy sessions among allergic rhinitis patients, and it may take >28 d before clinical efficacy is observed<sup>20)</sup>. Therefore, it is possible that the duration and frequency of these therapy sessions were not appropriate. To improve the generalizability of our findings in the future, it would be desirable to develop a joint research project with acupuncturists with a certain level of knowledge and skills and conduct standardized acupuncture therapy for each health issue.

## Conclusion

Financial aid (up to 8,000 JPY cashback for four wk) was provided to office workers who were aware of their status of presenteeism (owing to neck and shoulder stiffness and low back pain) to cover the expenses of acupuncture therapy. The workers received 1.0 (median) sessions of therapy during the four-wk observation period, with a cashback of 7,000 (median) JPY. Financial aid for acupuncture therapy may help compensate for losses incurred by enterprises in the form of 14,117 JPY per worker a month.

To the best of our knowledge, this is the first study to examine the effect of the acupuncture therapy on presenteeism using a pragmatic multicenter randomized controlled trial and a cost-benefit analysis. We hope that future studies that overcome the limitations of this study will be conducted to create stronger evidence on the benefits of financial assistance for acupuncture to combat presenteeism in the occupational health field.

## Disclosures

Approval of the Research Protocol: This study received approval from the Teikyo Heisei University Ethics Committee (30-049). Informed Consent: Participants who met the eligibility criteria for this study provided informed consent before participation. Registry and the Registration No. of the Study/Trial: Information regarding this clinical study was registered in advance with the UMIN Clinical Study Trials Registry System (ID: UMIN000035321). Conflict of Interest: The conflicts of interest related to this study were checked and judged acceptable by the Teikyo Heisei University Conflicts of Interest Committee (Acceptance No. 30-089).

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