The Effects of a Walking Intervention on Depressive Feelings and Social Adaptation in Healthy Workers

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Abstract: The effects of walking on mental health problems among healthy Japanese workers are not fully understood. In the present study, we investigated the effects of a four-week walking program on the psychological functioning of a nonclinical sample of healthy workers in Japan. A total of 606 healthy subjects were enrolled in the study and were evaluated by the Zung Self-rating Depression Scale (SDS) and the Social Adaptation Self-evaluation Scale (SASS) both before and after the walking program. The subjects were divided into an exercising group and a non-exercising group. There were significant differences in the SDS and SASS scores between the exercising and the non-exercising groups. Following the walking program, the non-exercising group’s SDS scores decreased and their SASS scores increased compared to before the walking program. In contrast, the SDS and SASS scores of the exercising group did not change. These results suggest that subjects who exercise regularly experience fewer depressive feelings and exhibit better social adaptation in the workplace than those who do not exercise. The walking program improved depressive feelings and social adaptation in the non-exercising group.

Key words: walking, mental health, depression, social adaptation, healthy worker.

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adaptation [7]. An association between depression and impaired social function has long been recognized, and it is acknowledged that recovery from depression requires not only the resolution of depressive symptoms but also an improvement of the individual’s personal relationships in social situations [8, 9].

It has been reported that walking can lead to substantial improvements in the mood of patients with major depressive disorders [10]. However, the effect of walking on mental health problems among healthy Japanese workers is not fully understood. We therefore hypothesized that the intervention of walking could have a beneficial effect on depressive feelings and social adaptation in healthy Japanese workers. To confirm this hypothesis, we investigated the relationship between a walking intervention and the mental status or social adaptations in healthy Japanese workers before and after participation in a four-week walking program.

**Methods**

**Subjects and procedures**

We explained the effects of walking on physical and mental wellness, and described the four-week walking program through meetings and leaflets presented to the 1,193 healthy workers included in this study, excluding workers who were on medical leave. We recommended 30 minutes of walking per day without regulating either the distance or speed in the walking program period. In November 2008, 587 of these 1193 subjects did not wish to participate, and the remaining 606 subjects (508 males and 98 females; age, mean ± SD = 41.02 ± 8.16 years) agreed to participate in the walking program. The 606 subjects were divided into an exercising group (n = 151) and a non-exercising group (n = 455) based on responses to a questionnaire [14]. Subjects who had the habit of exercising for at least 20 minutes twice per week were included in the exercising group, while those who did not have exercise habits for at least 20 minutes twice per week were included in the non-exercising group. The members of the exercising group did not stop their regular exercise during this walking program study (Fig.1). All the participants used a pedometer. Participants were divided into five-person groups, and each group recorded their total steps, competing against each other, during the study period.

All the participants were evaluated by the Zung Self-rating Depression Scale (SDS) and the Social Adaptation Self-evaluation Scale (SASS) both before and after the walking program. In addition, to rule out any psychiatric disorders, all the participants were screened by the Structured Clinical Interview for DSM-IV-TR Disorders (SCID) [11–13]. None of the participants had psychiatric disorders. This study was approved by the Ethics Committee of the University of Occupational and Environmental Health. All the participants gave their written informed consent to participate in the study.

Fig. 1. Walking program study flow chart.
**SDS**

The SDS is a 20-question self-rating measure to assess depressive symptoms in adults over the previous week. The advantages of the SDS include its ease of administration and its brevity [11]. The SDS shows good psychometric properties as a screening tool for depression, and has been used to assess outcomes in response to treatment in a wide range of research. The SDS has been also widely used to assess depressed feelings in the general population [15–17].

**SASS**

Social behaviors have been shown to exert a strong influence on determining acceptance and rejection between strangers and friends [18]. Deficits in social skills (e.g., lack of smiling, sad facial expression, avoidance of eye contact, monotonic speech, and lack of verbal responses) have been shown to be common among those with low levels of social contact and in depressed patients [19, 20]. These sorts of behavior were found to result in social rejection by strangers and friends [21]. Such behavioral traits have also been suggested to play an important role in the etiology and maintenance of depressive symptoms. Thus, in the etiology of depressive disorders, social adaptation skills are considered important for adjustment to the workplace. Bosc et al. demonstrated that social motivation could be measured by the Social Adaptation Self-evaluation Scale (SASS), a 20-item self-report questionnaire [12]. The SASS has been shown to possess adequate psychometric properties and good internal consistency. Dubini et al. found that depressed patients reported lower SASS scores than did healthy volunteers [22]. Furthermore, depressed patients have been found to generally have less social support. The Japanese version of the SASS was produced by Goto et al., who confirmed that the translated instrument was suitable for evaluating social adaptation in the Japanese population [23]. The SASS has also been validated and found to be easy to use and sensitive to changes in different social functioning areas [24, 25]. We have recently reported that a significant negative correlation was obtained between SASS and the Stress and Arousal Check List (SACL), which assesses job stress in healthy workers. Thus, we considered that some healthy workers can work even if they have poor social adaptation [6, 26].

**Statistical analysis**

To compare the baseline characteristics of the SDS and SASS, Student’s t-test was used to assess differences between age and sex in the exercising and non-exercising group. A paired t-test was also used to examine differences in the SDS and SASS scores before and after the walking program. ANOVA was used to determine the interaction of the effects of exercise habits and the walking program. All statistical analyses were carried out using SAS version 9.1.

**Results**

Characteristics of the participants are presented in Table 1. Age and sex had no significant interaction effects on the aims of study. The exercising group took significantly more steps than the non-exercising group during the walking program period ($P < 0.0001$). All participants completed the program.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Exercising group</th>
<th>Non Exercising group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men</td>
<td>Women</td>
</tr>
<tr>
<td>Number</td>
<td>127</td>
<td>24</td>
</tr>
<tr>
<td>Age (mean ± SD)</td>
<td>40.8 ± 9.8</td>
<td>46.8 ± 11.7</td>
</tr>
<tr>
<td>Mean steps in the walking program / day (mean ± SD)</td>
<td>12565.0 ± 5399.8</td>
<td>12452.0 ± 4197.2</td>
</tr>
<tr>
<td>Working pattern (shift work /non shift work)</td>
<td>45 / 82</td>
<td>4 / 20</td>
</tr>
</tbody>
</table>

SD: standard deviation
ANOVA of the SDS and SASS results revealed significant differences between the two groups. At baseline, before starting the walking program, the SDS scores in the exercising group (mean ± SD = 34.7 ± 9.35) were significantly lower than those in the non-exercising group (38.6 ± 7.80, P < 0.001) (Fig. 2A). The baseline SASS scores (38.1 ± 6.07) in the exercising group were significantly higher than those in the non-exercising group (35.0 ± 6.98) (Fig. 2B). The SDS scores of the non-exercising group significantly decreased (37.2 ± 8.0, P = 0.045) (Fig. 2A), and their SASS scores significantly increased (36.1 ± 7.1, P = 0.012) (Fig. 2B) after the walking program. On the other hand, the SDS and the SASS scores (SDS; 34.9 ± 8.3, SASS; 37.9 ± 5.7) of the exercising group did not change before and after the walking program. ANOVA revealed no significant interaction effect between exercise habits and the walking program. The exercising group’s scores were significantly higher in the baseline SASS sub-items 1, 3, 4, 5, 8, 9, 10, 11, 12, 14, 15, 16, and 18 than those in the non-exercising group. The scores in the SASS sub-items 3, 5, 6, 7, 9, 10, 12, 14, 15, and 16 were significantly higher in the non-exercising group after the walking program compared to before the program (Table 2).

**Fig. 2.** A. Changes in zung self-rating Depression Scale (SDS) scores for the exercising and the non-exercising groups: the baseline SDS scores in the exercising group (mean ± SD) were significantly lower than those in the non-exercising group (P < 0.001). The SDS scores in the non-exercising group decreased significantly after the walking program. *: P = 0.045, B. Changes in Social Adaptation Self-evaluation Scale (SASS) scores for the exercising and the non-exercising groups: the baseline SASS scores in the exercising group (mean ± SD) were significantly higher than those in the non-exercising group (P < 0.001). The SASS scores in the non-exercising group increased significantly after the walking program. **: P = 0.012, ———: exercising groups, ———: non-exercising groups.
Discussion

The most important findings in the present study were that the SDS scores significantly decreased and the SASS scores significantly increased in the non-exercising group after the walking program compared to baseline. These results suggest that a walking program can relieve feelings of depression and improve social adaptation in workers with regular fitness habits. Also, workers who have regular fitness habits not only feel less depressed and have higher self-esteem, but they are also more eager to be in contact with other people and to participate in social activities that might be associated with improving their mood. To the best of our knowledge, this is the first report demonstrating that walking exercise influences both depressive feelings and social adaptation. Using meta-analyses, Guszkowska has reported the positive effects of exercise on emotional states, including anxiety, depression, and mood disorders, in healthy people and in clinical populations, regardless of age and sex [27]. Another study demonstrated that exercise and social contact both result in significant reductions in the total and the psychological subscale of the Beck Depression Inventory (BDI) [28]. These results indicate that short term exercise has a broader effect than control conditions in reducing symptoms of depression in moderately depressed elderly populations, but the precise mecha-

Table 2. Means and SD of SASS sub-item scores

<table>
<thead>
<tr>
<th>Statement</th>
<th>Before</th>
<th>After</th>
<th>Before versus after</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Exercising group</td>
<td>Non-exercising group</td>
<td>Exercising group</td>
</tr>
<tr>
<td></td>
<td>score</td>
<td>SD</td>
<td>score</td>
</tr>
<tr>
<td>1. Job interest</td>
<td>2.14</td>
<td>0.73</td>
<td>2.00</td>
</tr>
<tr>
<td>2. House work interest</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Work enjoyment</td>
<td>1.86</td>
<td>0.77</td>
<td>1.68</td>
</tr>
<tr>
<td>4. Interest in hobbies</td>
<td>2.42</td>
<td>0.60</td>
<td>2.09</td>
</tr>
<tr>
<td>5. Quality of spare time</td>
<td>2.16</td>
<td>0.71</td>
<td>1.75</td>
</tr>
<tr>
<td>6. Family seeking behavior</td>
<td>2.03</td>
<td>0.70</td>
<td>1.99</td>
</tr>
<tr>
<td>7. Family relationship quality</td>
<td>2.21</td>
<td>0.70</td>
<td>2.11</td>
</tr>
<tr>
<td>8. Gregariousness</td>
<td>2.06</td>
<td>0.61</td>
<td>1.84</td>
</tr>
<tr>
<td>9. Relationship seeking behavior</td>
<td>1.59</td>
<td>0.73</td>
<td>1.36</td>
</tr>
<tr>
<td>10. External relationship quality</td>
<td>1.87</td>
<td>0.59</td>
<td>1.67</td>
</tr>
<tr>
<td>11. External relationship appreciation</td>
<td>1.96</td>
<td>0.62</td>
<td>1.82</td>
</tr>
<tr>
<td>12. Social attractiveness</td>
<td>1.81</td>
<td>0.51</td>
<td>1.65</td>
</tr>
<tr>
<td>13. Social compliance</td>
<td>2.42</td>
<td>0.53</td>
<td>2.36</td>
</tr>
<tr>
<td>14. Community involvement</td>
<td>1.41</td>
<td>0.95</td>
<td>0.93</td>
</tr>
<tr>
<td>15. Social inquisitiveness</td>
<td>1.89</td>
<td>0.65</td>
<td>1.69</td>
</tr>
<tr>
<td>16. Intellectual interest</td>
<td>1.85</td>
<td>0.82</td>
<td>1.70</td>
</tr>
<tr>
<td>17. Communication difficulties</td>
<td>1.63</td>
<td>0.71</td>
<td>1.58</td>
</tr>
<tr>
<td>18. Rejection sensitivity</td>
<td>2.33</td>
<td>0.69</td>
<td>2.20</td>
</tr>
<tr>
<td>19. Vainness</td>
<td>1.35</td>
<td>0.75</td>
<td>1.45</td>
</tr>
<tr>
<td>20. Difficulties in coping with resources</td>
<td>1.75</td>
<td>0.78</td>
<td>1.72</td>
</tr>
<tr>
<td>21. Control of surroundings</td>
<td>1.46</td>
<td>0.63</td>
<td>1.45</td>
</tr>
</tbody>
</table>

*a*: Exercising group versus Non-exercising group, *b*: Exercising group versus Exercising group, *c*: Non-exercising group versus Non-exercising group, *: P < 0.05, SD: standard deviation, SASS: Social Adaptation Self-evaluation Scale
nisms by which exercise influences emotional states remain unknown. The influence of exercise on blood levels of BDNF are well established [29]. The results of this study suggest that daily exercising contributes to a good mental condition, and the non-exercising subjects showed significant improvement in their mental condition by starting and continuing to exercise.

The participants without a regular fitness routine had improvements in social adaptation. It is plausible that subjects who have depressive feelings are prone to withdraw from their social contacts, since it has been shown that depressed patients tend to interpret social information in a negative way, feeling rejected and therefore avoiding social interaction [30]. Recently, we reported that the optimal SASS score cut off point was between 25 and 26 [31]. The mean scores in the exercising and the non-exercising groups at baseline were 38.1 and 35.0, respectively, meaning that most of the participants in the present study were adapted to their daily social living. We speculated that joining the walking program with other employees might prevent them from feeling socially isolated in the workplace.

A limitation of this study is that, for ethical reasons, we could not obtain explanations for why some workers did not participate in this study. Also, we could not analyze a repeated randomized clinical trial (RCT). Another limitation is that we could not consider information about confounding factors such as working time, job type, job title, and various personality characteristics. Further investigation will ideally involve a RCT.

Conclusion

The four-week walking program improved depressive feelings and social adaptation in healthy Japanese workers who did not have regular fitness habits.

Acknowledgements

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Disclosure of conflicts of interest

The authors have no conflicts of interest to declare.

References


健康な勤労者におけるウォーキングの抑うつおよび社会適応の改善効果

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要 旨：労働者のうつ病対策は重要な課題である。健康な日本人労働者において、ウォーキングによるメンタルヘルス不調への予防効果は明らかではない。本研究では、企業において、労働者のうつ病予防対策として、ウォーキングの有用性を検討した。事前に運動習慣を確認した上で、606人の勤労者を対象に、4週間のウォーキングプログラム実施をした。結果、ウォーキングプログラム実施前のSDSは、運動習慣有群（有群）では運動習慣無群（無群）に比して低く（P<0.001）。SASSは、有群は無群に比して高かった（P<0.001）。実施後は、有群のSDS、SASSは変化しなかったが、無群のSDSは低下し、SASSは上昇した。有群は、無群に比べ抑うつ度が低く社会適応度が高い。無群で、ウォーキングプログラム実施により抑うつ度が改善し社会適応度が増加した。

キーワード：ウォーキング、メンタルヘルス、うつ病、社会適応、勤労者。

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