Physical activity, sitting time and work-related musculoskeletal disorders in computer workers

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ABSTRACT

The aim of this study was to determine PA, sitting time at work and WMSDs in computer workers. We conducted a preliminary cross-sectional study in twenty-one computer workers. Participants age were between 22 to 45 years and were also excluded if they could not stand at work. The online Self-Report Questionnaire on Computer Work-related Expose (OSCWE) was used to assess symptoms of WMSDs during the last 12 months and sitting time at work. Thai Physical Activity Guideline (TPAG) questionnaire was also used to determine physical activity levels and calculate energy expenditure. Twenty-one participants completed the questionnaires. Twenty-eight percent of participants had neck and shoulder WMSDs. Twenty-three percent of participants had PA in level 1 and level 3 defined by TPAG. Energy expenditure of PA and sitting time at work for participants without WMSDs were 1431.48±1721.17 kcal/week and 5.94±1.91 hr/day, respectively. While the above parameters in the WMSDs group were 1324.52±1125.64 kcal/week and 6.83±2.05 hr/day, respectively. Participants without WMSDs had more PA and less sitting time at work than ones who had WMSDs. Although, participants had less PA and more sitting time at work also tended to have WMSDs. Future study should increase the number of subjects to explore the relationship between PA, sitting time at work and WMSDs. Decreasing sitting time at work can also prevent WMSDs in computer workers. Therefore, PA and sitting time at work should be concerned in workplaces.

Keywords: Physical activity, Sitting time, Work-related musculoskeletal disorders, Computer workers

1. Introduction

Most of the computer workers have sedentary behavior and low physical activity (PA) (Biernat, 2010; Jans, Proper, & Hildebrandt, 2007; Parry & Straker, 2013; Puig-Ribera et al., 2015). They spend many hours per day using computers and prolonged sitting (Norashikin and Zainudin, 2014). Computer workers are known to have a high risk of WMSDs. WMSDs are an injury or disorder of the muscles, tendons, nerves, joints, cartilage, and spinal discs caused by work. Common symptoms are pain, aching, stiffness, fatigue, discomfort, tingling, generally appearing in the neck, shoulder, upper back, chest, elbow, wrist/hand, lower back, abdomen, hip, knee and ankle ("Canadian Centre for Occupational Health and Safety"). These symptoms lead to the decreases of work effectiveness and quality of life (Puig-Ribera et al., 2015; Wu et al., 2012). This leads to high medical costs. There are many factors related to WMSDs as work-related, work environment, physical health, psychosocial and individual (Klussmann, 2008; Wahlstrom, 2005). Besides, PA and sitting time at work are one of the factors.

Previous studies reported that people who had low PA and sat for a long time at work had a high risk for WMSDs (Bjorck-van Dijken, Fjellman-Wiklund, & Hildingsson, 2008; Holth, 2008; Yasobant & Rajkumar, 2015). Increasing PA and decreasing sitting time could improve functions of the body such as increase metabolism system and cognition and reduce stress and pain (Bergman et al., 2015). In contrast, few studies found that people had high PA also had a high risk for WMSDs (Auvinen et al., 2007; Heneweer, Vanhees, & Picavet, 2009). However, the results of the previous studies are still not clear. Thus, the aim of this study was to determine PA, sitting time at work and WMSDs in computer workers.
2. Method

We conducted a preliminary cross-sectional study in twenty-one computer workers from the Faculty of Physical Therapy, Mahidol University. The subjects were selected by convenience sampling. Participants age were between 22 to 45 years. Participants were excluded if they were confined to a wheelchair or could not independently stand at work. Autoimmune conditions and pregnancy were also excluded.

The online Self-Report Questionnaire on Computer Work-related Expose (OSCWE) (Mekhora et al., 2014) was used to assess symptoms of WMSDs during the last 12 months and sitting time at work. OSCWE consisted 5parts with questions as personal (10items), work-related (14item), work environment (1item), physical health (4items) and psychosocial factors (4items). It consumes 25 minutes to fill out. WMSDs during the last 12 months were in part of physical health. Subjects were defined to have WMSDs if they checked at least one of eleven body pain areas on a body chart. Sitting time at work was in part of work-related. OSCWE was available to evaluate at www.pt.mahidol.ac.th/project/oscwe.

Thai Physical Activity Guideline (TPAG) questionnaire (Jalayondeja et al., 2015) was also used to determine physical activity levels and calculate energy expenditure and total time of physical activity. TPAG questionnaire consisted 3 parts. Part 1 was physical activity at least 10 minutes or regularly during the last 7 days in vigorous intensity, part 2 was physical activity at least 10 minutes or regularly during the last 7 days in moderate intensity and part 3 was total hours per week to spend in sitting and sleeping time. The level of physical activity reported by participants was converted into the metabolic equivalent task (MET) × min × frequency × weight × week-1 for energy expenditure (kcal/week). They were classified into level 0 to level 5:

- Level 0 (the sedentary lifestyle I): participants who had no moderate-vigorous physical activity.
- Level 1 (the sedentary lifestyle II): participants who have the following criteria: a) do vigorous and/or moderate intensity activity < 10 minutes/time or moderate intensity activity ≤ 150 minutes/week or b) do vigorous intensity activity < 75 minutes/week.
- Level 2 (the active lifestyle I): participants who have the following criteria: a) do vigorous and/or moderate intensity activity ≥ 10 minutes/time and moderate intensity activity ≥ 150 minutes/week or b) vigorous intensity activity ≥ 75 minutes/week or c) energy consumption ≥ 500 kcal-week.
- Level 3 (the active lifestyle II): participants who following criteria: a) do vigorous and/or moderate intensity activity ≥ 10 minutes/time and moderate intensity activity ≥ 300 minutes/week or b) vigorous intensity activity ≥ 150 minutes/week or c) energy consumption ≥ 1,000 - 1,499 kcal/week.
- Level 4 (the active lifestyle III): participants who following criteria: a) do vigorous and/or moderate intensity activity ≥ 10 minutes/time and moderate intensity activity ≥ 450 minutes/week or b) vigorous intensity activity ≥ 225 minutes/week or c) energy consumption ≥ 1,500 - 2,000 kcal/week.
- Level 5 (vigorous lifestyle): participants who have the following criteria: a) do vigorous and/or moderate intensity activity ≥ 10 minutes/time and moderate intensity activity ≥ 600 minutes/week or b) vigorous intensity activity ≥ 300 minutes/week or c) energy consumption ≥ 2,000 kcal/week.

Shapiro-Wilk test was used to test normal distribution. For descriptive data, normal distribution data were reported in mean and SD values and non-distribution data were reported in median and interquartile range values. SPSS statistic software, version 22.0 was used for analyzing the data. This study was approved by Mahidol University Institutional Review Board COA No.MU-CIRB 2016/052.0804.

3. Results

Twenty-one computer workers completed the questionnaires. Demographics data as age, weight, height, BMI, total work experiences and sitting time at work were showed in Table 1. They were 14 females (66.7%) and 7 men (33.3%).

| Table 1. Demographic characteristics of all participants (N=21) |
|---------------------------------|-----------------|--------|
| Characteristics                 | Mean         | SD     |
| Age (year)                     | 33.38        | 4.72   |
| Weight (kg)                    | 65.19        | 13.94  |
| Height (cm)                    | 162.24       | 8.44   |
| BMI (kg/m²)                    | 24.83        | 4.47   |
| Total years of work experience (year) | 5.33    | 0.26   |
| Sitting time at work (hr/day)  | 6.36         | 1.98   |

*BMI: Body Mass Index
3.1 Prevalence of WMSDs

Ten of 21 participants (47.6%) had WMSDs during the last 12 months. Areas of body parts most commonly found were neck (28.57%), shoulder (28.57%), upper back (19.05%) and lower back (19.05%), respectively. Participants had symptoms in hip (9.52%), ankle (9.52%), knee (4.76%), chest (4.76%), and wrist/hand (4.76%).

3.2 PA and sitting time at work vs. WMSDs

We calculated PA in term energy expenditure. Mean of energy expenditure of PA and sitting time at work for participants without WMSDs were 1431.48±1721.17 kcal/week and 5.94±1.91 hr/day, respectively. While the above parameters in the WMSDs group were 1324.52±1125.64 kcal/week and 6.83±2.05 hr/day, respectively.

3.3 Energy expenditure, sitting time at work, and WMSDs

Most participants had PA in level 1 and level 3 defined by TPAG. Sitting time at work were the most in PA level 2 and level 5 groups and the least sitting time was in the PA level 4 group. WMSDs during the last 12 months were classified by levels of PA from TPAG and were showed in number and percentage. Participants with PA level 4 had the greatest rate of WMSDs. Besides, participants without WMSDs commonly found in PA level 2 and 5 groups (Table 2).

4. Discussion

TPAG is a new questionnaire for assessing PA and its validity was proved to be moderate (R = 0.751, p<0.05) by comparison with The International Physical Activity Questionnaires (IPAQ). OSCWE is the online self-report questionnaire to assess risk factors related WMSDs in computer workers. Its validity and internal consistency were tested to be moderate to high (Mekhora et al., 2014).

Forty-seven percent of participants had WMSDs. This percentage is lower than that of the results of the previous study (Janwantanakul et al., 2008). This present study showed the most common body parts found in WMSDs were neck and shoulders which consistent with previous studies (Janwantanakul et al., 2008; Wu et al., 2012). This may be because job characteristics of computer workers usually are prolonged using of computers, sitting at work in the static positions and poor postures of neck and shoulder.

These findings showed participants had low PA and high sitting time at work tend to have WMSDs. However, this preliminary study was done in rather small number of subjects. Higher number of participants will be explored.

5. Conclusion

These findings indicated that computer workers who had low PA and high sitting time at work tend to have WMSDs. It might lead to decrease work effectiveness and impair quality of life. Decreasing sitting time at work might prevent WMSDs in computer workers. Therefore, PA and sitting time at work should be concerned in workplaces.

Table 2. Energy expenditure, sitting time at work, and WMSDs by levels of PA

<table>
<thead>
<tr>
<th>Levels of PA</th>
<th>N</th>
<th>Energy expenditure (kcal/week)</th>
<th>Sitting time at work (hr/day)</th>
<th>Without WMSDs</th>
<th>With WMSDs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mean</td>
<td>SD</td>
<td>mean</td>
<td>SD</td>
<td>N</td>
</tr>
<tr>
<td>Level 0</td>
<td>2</td>
<td>0</td>
<td>0</td>
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<td>1.20</td>
</tr>
<tr>
<td>Level 1</td>
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<td>137.59</td>
<td>6.60</td>
<td>1.52</td>
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<td>Level 2</td>
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<td>258.60</td>
<td>6.67</td>
<td>2.52</td>
</tr>
<tr>
<td>Level 3</td>
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<td>1.37</td>
</tr>
<tr>
<td>Level 4</td>
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<td>2057.78</td>
<td>425.32</td>
<td>5.67</td>
<td>0.58</td>
</tr>
<tr>
<td>Level 5</td>
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<td>4020.65</td>
<td>1819.19</td>
<td>6.67</td>
<td>4.73</td>
</tr>
</tbody>
</table>

*WMSDs: Work-related musculoskeletal disorders, PA: Physical activity
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References


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