Physical activity patterns in workers with neck pain assessed using accelerometry and GPS

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1. Introduction

A general decrease in physical activity levels among subjects with work-related musculoskeletal disorders (MSD) have been reported in previous studies. However, little is known of the distribution of physical activity and sedentary behavior across a work day in subjects with and without MSD, and whether these patterns differ between work and leisure. Such information would support the development of targeted preventive strategies. Our aim was to characterize and compare physical activity patterns at work and during leisure time (spent at home or elsewhere) among matched office workers with and without neck pain.

2. Methods

Seventeen office workers (11f, 6m; mean age 41 (SD 11) years) with neck pain, and 17 office workers without neck pain matched on occupation, age and gender participated. Physical activity and sedentary behavior was monitored continuously for seven days in each subject using a tri-axial accelerometer (ActivPAL) worn on the thigh. During four consecutive work-days within this period, data from a global positioning system (GPS) detector installed on a smartphone were combined with information from a written diary to identify the location of the participants (work place, leisure "at home" or "elsewhere"). Differences between groups in mean physical activity levels stratified by location (excluding sleep) were tested using ANOVA. Time patterns of physical activity for each location were expressed using Exposure Variation Analysis (EVA), giving the percentage of time spent in bouts of different durations (<1min, 1-5min, 5-10min, 10-30min, 30-60min, >60min) of sitting/lying, standing, and walking.

3. Results

In both groups, the lowest activity levels occurred at work, showing a larger %time sitting/lying ($p<0.05$) and a smaller %time walking ($p<0.05$), particularly when compared with leisure time "elsewhere". The EVA (Fig. 1) showed that this difference appeared mainly for long bouts (30-60 and >60 min) of sitting/lying (leisure elsewhere<work) and for 5-10 and 10-30 min bouts of walking (leisure elsewhere>work). The decrease in %time spent sitting/lying when comparing "work" to leisure "elsewhere" was larger among workers without pain than with pain (interaction $p<0.05$), the major difference being that those with pain spent a larger %time in prolonged periods (>30 min) of sitting/lying (Fig.

2). We did not find any group differences in total time spent at these two locations.

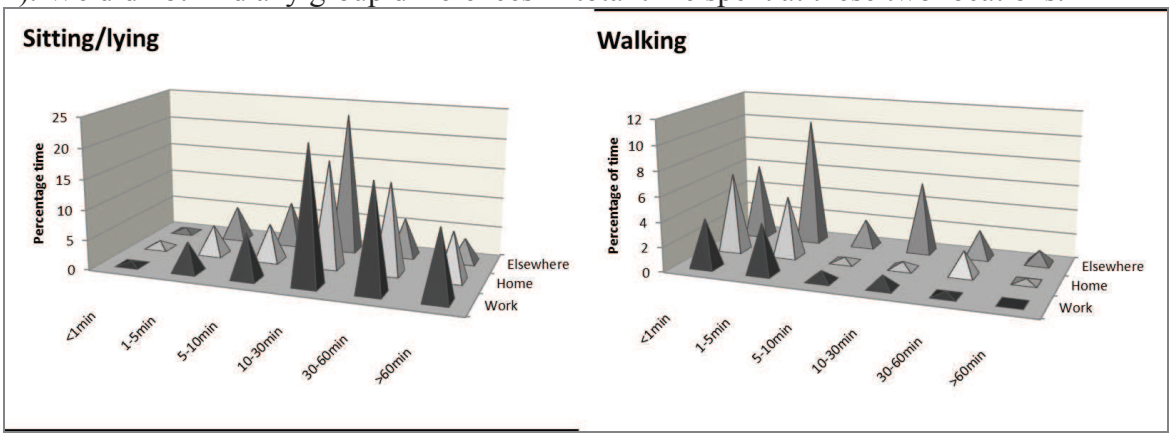

***Fig. 1**. EVA for all 34 office workers, showing %time in bouts of different durations of sitting/lying and walking, stratified by location.*

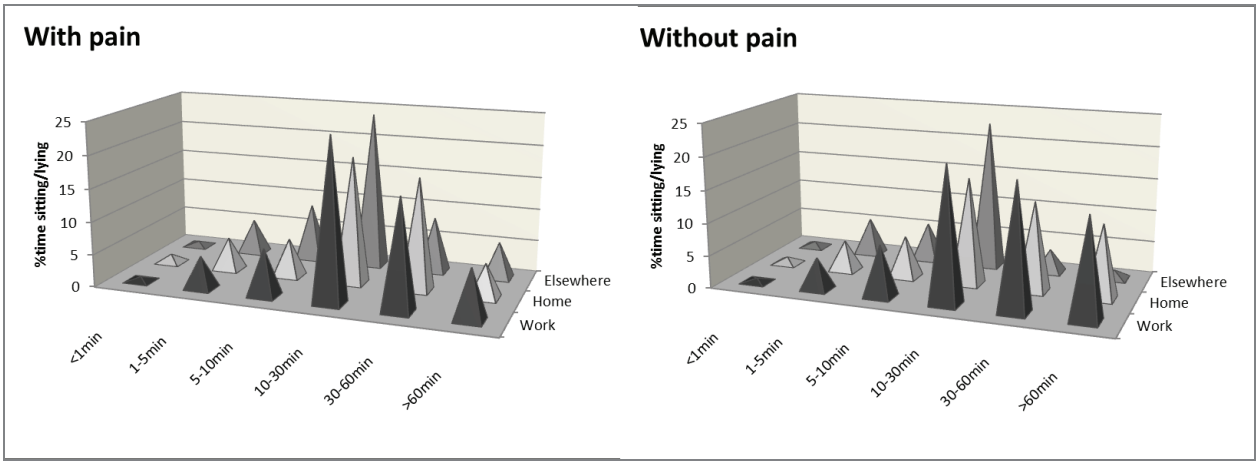

***Fig. 2**. EVA for office workers with and without neck pain, showing %time in bouts of different durations of sitting/lying stratified by location.*

4. Conclusion

Combining accelerometry and GPS allowed a detailed characterization of physical activity patterns stratified by location. We found that activity patterns differed between work and leisure "at home" and "elsewhere". We also identified some differences between office workers with and without neck pain, which need further investigation as to their possible relevance for health and well-being.