An intervention program combining ergonomics and motor control training can effectively change physical job exposures and perceived exertion

Grace Szeto\textsuperscript{a}, Leung Kim Hung\textsuperscript{b}, Chun Lung Billy So\textsuperscript{a}, Man Ha Tsang\textsuperscript{a}, Rufina Lau\textsuperscript{a}, Yanfei Xie\textsuperscript{a}, Dai Jie\textsuperscript{a}

\textsuperscript{a}Department of Rehabilitation Sciences, The Hong Kong Polytechnic University, Hong Kong SAR, China
\textsuperscript{b}Department of Orthopaedics & Traumatology, Chinese University of Hong Kong, Hong Kong SAR, China.

1. Introduction

Work-related neck and upper limb musculoskeletal disorders (WRNULD) are common health problems reported by workers in many different occupations. Previous research tended to focus more on office workers and ergonomic interventions mainly involved changing the office or computer furniture. In contrast, clinicians such as physiotherapists would teach postural exercises to improve patients’ postures which may not be transformed into work habits. The “Ergomotor” approach emphasizes on combining the two aspects of ergonomics applications and motor control training. It is hypothesized that this approach will have a more sustainable effect on the workers’ health.

2. Methods

A randomized controlled trial is being conducted at present comparing the effects of two interventions – the “ergomotor” intervention and conventional physiotherapy. Participants must have more than 3 months’ history of work-related neck and shoulder pain and they can be from different occupations. Following the baseline assessment using various subjective and objective measurement tools, they were randomly assigned to either Ergomotor Group or Control Group. The procedures were clearly explained to the participants and informed consent was obtained prior to their involvement in the study.

Ergomotor interventions are designed specifically for the workers based on the detailed evaluation of their job demands. The intervention sessions were conducted in the laboratory at the local university, and participants were instructed on how to perform simulated work tasks (e.g. typing on a computer or lifting boxes), while maintaining balanced and appropriate motor control in their neck and shoulder regions. It is a 12 week program, and surface electromyography (EMG) was applied on their upper and lower trapezius muscles as a form of visual biofeedback while they performed these simulated work tasks. The focus of the EMG biofeedback training was on relaxing the upper trapezius and activating the lower trapezius while participants performed different types of upper limb functional tasks. They were also asked to keep a logbook on the exercises performed at work and at home.

Control Group participants received physiotherapy treatment for the same 12 weeks’ duration and their treatment consisted of manual therapy, ultrasound and electrical stimulation to relieve their neck and shoulder pain. Standard stretching exercises and basic ergonomic advice (e.g. how to adjust screen height and chair height) were also taught to these participants.

The Job-related Physical Demands (JRPD) is used as the main instrument to identify physical risk factors involving both sedentary office job tasks as well as manual handling tasks (Dane et al, 2002). The responses are categorized in terms of time spent per day in these tasks or postures, and the JRPD 24 item checklist can have a maximum score of 60. In addition, for those tasks or postures reported for more than 4 hours daily exposure, the participants were asked to give a rating of perceived exertion (RPE) from 0 to 10, with 1 being minimal/mild exertion, and 10 being maximal/extreme exertion. These 2 variables were compared at pre- and post-intervention periods.

3. Results

There are 59 subjects who have completed the intervention program and the pre-post assessment, with 33 subjects in the Ergomotor (EM) Group and 26 subjects in the Control Group. The pre-post JRPD total scores and the RPE scores are summarized in Table 1. While both groups showed significant improvement in terms of JRPD total score and RPE scores, the EM Group showed greater extents of change for both variables. This is most apparent for the RPE scores as EM Group showed a major reduction in the group mean from 23.61 to 10.42, suggesting that the participants felt much less exhausted from the prolonged work tasks of more than 4 hours per day. This result suggests that the training program was effective in producing a significant change in their work postures and work habits. The result can have a significant impact on their
overall musculoskeletal health, as workers would not feel so tired in the repetitive or prolonged work tasks that they performed daily.

4. Discussion

The present study describes an innovative approach that emphasizes the correction of spinal posture and training of posture-stabilising muscles such as the upper trapezi and lower trapezi. These muscles work as antagonists and past research has demonstrated the presence of altered muscle recruitment with increased upper trapezius and decreased lower trapezius activity being critical mechanisms contributing to work-related neck and upper limb disorders. The present study shows that it is important to make these motor control exercises to be relevant and applicable to the work nature of the individual. In addition, the study utilizes real-time surface EMG as a form of visual biofeedback while individuals perform a variety of static and dynamic functional tasks. This is a novel approach and there is potential for wider applications in using surface EMG as a biofeedback intervention for training workers both in the laboratory as well as in the workplace.

| Table 1. A comparison of the JRPD and RPE scores for Ergomotor and Control Groups |
|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
|                                | Mean (sd)                       | Statistical analysis            |
|                                | Ergomotor Group (n=33)          | Control Group (n=26)            | Ergomotor Group (n=33)          | Control Group (n=26)            |
| JRPD total score (Pre-Intervention) | 37.82 (16.72)                   | t=2.056, p=.048*                | t=2.796, p=.010*                |
| JRPD total score (Post-intervention) | 33.33 (14.66)                   |                                |                                |
| JRPD_RPE score (Pre-Intervention) | 23.61 (19.33)                   | t=4.568, p<.001**               | t=2.146, p=.042*                |
| JRPD_RPE score (Post-Intervention) | 10.42 (11.38)                   |                                |                                |

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References
