THE EFFECT OF EXERTION LEVEL ON ACTIVATION PATTERNS AND VARIABILITY OF TRUNK MUSCLES DURING MULTIDIRECTIONAL ISOMETRIC ACTIVITIES

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INTRODUCTION

Few studies have investigated trunk muscle activation patterns in multidirectional exertions with different moment magnitudes [1]. Signal-dependent noise seen in motor activities predicts higher levels of EMG variability in higher levels of exertions [2]. The objective of this study was to evaluate trunk muscle activation patterns in varying directions and moment magnitudes during an isometric task, and to investigate the effects of angle and level of isometric exertion on the EMG variability of trunk muscles during an end-point matching task in upright posture.

METHODS

Twelve asymptomatic subjects were participated in the study. The EMG activity of ten selected trunk muscles was collected in the three seconds end-point matching tasks in 8 angles and 3 levels of exertion. Trunk muscle activation patterns were examined using EMG polar plots (tuning curves) and measuring preferred direction (mean vector direction) and the index of spatial focus. The effect of exertion level of these measures was investigated by Rao test. The effects of angle and level of exertion on the EMG variability of trunk muscles were tested by analysis of variance with repeated measures design.

RESULTS AND DISCUSSION

No significant difference in EMG tuning curves, preferred direction and the index of spatial focus was found for each muscle studied across exertion levels ($P>0.05$). The index of spatial focus of most muscles studied was not changed with increasing moment magnitude. EMG variability of trunk muscles were significantly affected by angle and level of exertion and their interaction effect ($P<0.001$). Consistent activation patterns of trunk muscles were found among subjects. The index of spatial focus indicated that probably no shift to a higher co-contraction strategy has been adapted with increasing moment magnitude. The results suggested that increased EMG variability of trunk muscles in asymmetric exertions may be associated with lower trunk controllability (or higher tracking error) during combined exertions that reported in previous studies [3].

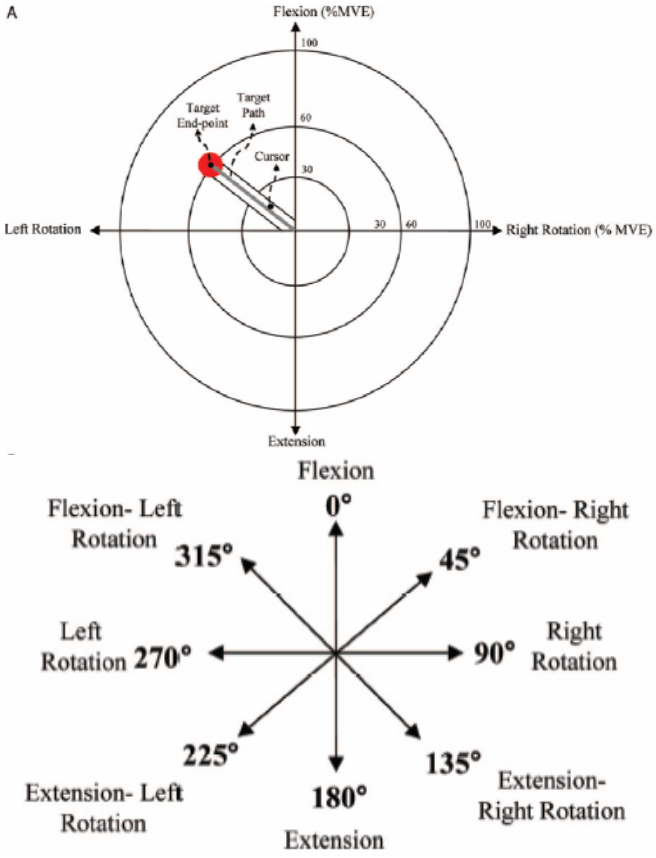

Figure 1: The basic scheme of the trunk isometric moment tracking system.

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