

Abstract

Title

Differential effects of type of keyboard playing task and tempo on surface EMG amplitudes of forearm muscles

Authors

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Abstract

This study examined differences in surface EMG of forearm muscles during individuated and sequential keyboard playing among healthy adults. The results showed different types of finger movements were involved in different types of keyboard playing at different tempi. The results support keyboard playing as an effective intervention for improving fine motor skills.

Keywords

Electromyography; Keyboard playing task; Individuated finger movement; Sequential finger movement; Tempo

Paper description

Specific and intensive repetition of finger movements effectively mediate the activation of corresponding muscle and brain areas, which leads to changes in functional muscular activities and cortical organization (Neistadt, 1994). Keyboard playing as highly controlled finger movements involves multiple and complex motor movements (Furuya & Altenmüller, 2013; Goebel & Palmer, 2013; Zatsiorsky Li, & Latash, 1998). Previous studies have demonstrated that keyboard playing-based training leads to improvement of manual function and accuracy of motor movements (Rojo et al., 2011; Schneider, Schönle, Altenmüller, & Münte, 2007). Significant changes in fine motor skills and related brain activation of individuals with brain injury have also been reported after keyboard playing training (Rojo et al., 2011). Despite increasing interest in keyboard playing as a strategy for repetitive finger exercises in fine motor skill development and hand rehabilitation, comparative analysis of task-specific finger movements relevant to keyboard playing has been less extensive. Research indicates that different patterns and amplitudes of muscular activation are generated depending on the types of finger movements elicited by a multitude of sequences or combinations of keystrokes (Bella & Palmer, 2011; Furuya, Flanders, & Soechting, 2011). Still, no conclusive guidelines for determining the level of finger movements for incorporation into keyboard-based interventions have been presented.

Therefore, this study examined whether there were differences in surface EMG activity levels of forearm muscles associated with different keyboard playing tasks. Results demonstrated higher muscle activity with sequential keyboard playing in a random pattern compared to individuated playing or sequential playing in a successive pattern. Also, the speed of finger movements was found to affect muscle activity levels, demonstrating that faster tempo elicited significantly greater muscle activity than self-paced tempo. The results inform our understanding of the type of finger movements involved in different types of keyboard playing at different tempi. This helps to consider the efficacy and fatigue level of keyboard playing tasks when being used as an intervention for amateur pianists or individuals with impaired fine motor skills.

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