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Assessing Dynamic Postural Control During Exergaming in Older Adults: a Probabilistic Approach

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Abstract

Digital games controlled by body movements (exergames) have been proposed as a way to improve postural control among older adults. Exergames are meant to be played at home in an unsupervised way. However, only few studies have investigated the effect of unsupervised home-exergaming on postural control. Moreover, suitable methods to dynamically assess postural control during exergaming are still scarce. Dynamic postural control (DPC) assessment could be used to provide both meaningful feedback and automatic adjustment of exergame difficulty. These features could potentially foster unsupervised exergaming at home and improve the effectiveness of exergames as tools to improve balance control. The main aim of this study is to investigate the effect of six weeks of unsupervised home-exergaming on DPC as assessed by a recently developed probabilistic model. High probability values suggest 'deteriorated' postural control, whereas low probability values suggest 'good' postural control. In a pilot study, ten healthy older adults (average 77.9, SD 7.2 years) played an ice-skating exergame at home half an hour per day, three times a week during six weeks. The intervention effect on DPC was assessed using exergaming trials recorded by Kinect at baseline and every other week. Visualization of the results suggests that the probabilistic model is suitable for real-time DPC assessment. Moreover, linear mixed model analysis and parametric bootstrapping suggest a significant intervention effect on DPC. In conclusion, these results suggest that unsupervised exergaming for improving DPC among older adults is indeed feasible and that probabilistic models could be a new approach to assess DPC.

Keywords: unsupervised home exergaming, assessment of dynamic postural control, probabilistic models, curvature and speed of body movements.

1. Introduction

Maintaining good postural control in the population older than 60 years is an essential skill to prevent falls. Falls can cause severe injuries, disability, and in the worst case death [1]. In addition, with advancing

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