

Analysis of Brain Activity during Game-based Aerobic Exercise in Individuals with Spinal Cord Injury

Introduction

Aerobic exercise is important for people with spinal cord injury (SCI) to prevent secondary health conditions and maintain or improve their health and functions in activities of daily living. Its benefits are well documented for cognitive functions, however limited research has been conducted in this population. The purpose of this study was to analyse brain activity during game-based aerobic exercise in individuals with SCI.

Methodology

Thirteen adults with paraplegic SCI (ASIA Scale C-D) participated in this cross-sectional study that consisted of game-based and conventional modes of aerobic exercise, using a customized wheelchair treadmill (Wheely-X, Kangsters Inc., Seoul, Korea, 2024). A non-invasive neuroimaging device, functional near-infrared spectroscopy was used to measure brain activity based on hemodynamics in the prefrontal cortex (PFC) during aerobic exercise modes. A self-selected comfortable pace was determined at a mild-to-moderate intensity based on the Borg Rate of Perceived Exertion, which was later used to match exercise intensity. Participants completed 2-minute quiet sitting for baseline and alternated two modes of aerobic exercise for 2 minutes in random order, repeated twice with 2-minute rest in-between.

Results

A paired t-test revealed a significantly increased hemodynamic response in the frontopolar and dorsal lateral PFC regions during game based aerobic exercise as compared to conventional exercise.

Conclusions

Our findings can enhance understanding of neuronal responses to game-based aerobic exercise and provide scientific evidence that it can increase brain activity, which may be associated with improving cognitive functions in individuals with SCI.

References

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