شبكة المعلومات الجامعية

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بسم الله الرحمن الرحيم

HANAA ALY

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قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
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Effect of Balance Training Versus Stretching Relaxation Exercise in Memory and Spatial Cognition Enhancement on Healthy Adults

Thesis

Submitted in Partial Fulfillment for the Master Degree in Audio-Vestibular Medicine

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Ahmed Abd El-Hameed

List of Contents

List of Tables

Table No.	Title	Page No.

List of Figures

List of Figures Cont...

Fig. No.	Title	Page No.

List of Abbreviations

Abb.	Full term
BESS	Balance Error Scoring System
BVC	Boundary vector cell
COPD	Chronic Obstructive Pulmonary Disease
CRF	Cardiorespiratory fitness
EFs	Executive functions
ERP	Event-related potential
GOLD	Global Initiative on Obstructive Lung Disease
HD cell	Head direction cell
HPC	Hippocampus
LTM	Long Term Memory
MEC	Medial entorhinal cortex
MMF	Mismatch field
MMN	Mismatch negativity
MST	Medial superior temporal area
OED	Oxford English Dictionary
ParaHPC	Parahippocampal cortex
Parietal Ant	Parietal anterior cortex
PIVC	Parieto-insular vestibular cortex
PNF	Proprioceptive neuromuscular facilitation
PNS	Parasympathetic nervous system
RSP	Retrosplenial cortex
SNS	Sympathetic nervous system
SSC	Stretch-shortening cycles
STM	Short Term Memory

List of Abbreviations Cont...

Abb.	Full term
VIP	Ventral intraparietal area
WAIS	Wechsler Adult Intelligence Scale
WM	Working memory

INTRODUCTION

Physical exercise has been shown to improve cognitive functions. However, it is still unknown which type of exercise affects cognition. In the present study, we tested the hypothesis that a demanding balance training program improves memory and spatial cognition.

Developing methods to enhance neuroplasticity and cognitive functioning has become a major research interest of psychologists in the light of quickly advancing technologies and aging societies ***(Lindenberger, 2014).***

Among a large variety of behavioral interventions such as cognitive training programs and special nutrition, physical exercise programs have been suggested to improve cognition ***(Hötting and Röder, 2013; Erickson et al., 2015).***

Physical exercise over a course of several months has been shown to improve cognitive performance, including executive functions, speed of processing and memory. Moreover, aerobic exercise has been found to slow down gray matter volume loss in the hippocampus and frontal lobes ***(Kramer et al., 1999; Voelcker-Rehage et al., 2011).***

So far, most of the studies investigating the effects of physical exercise on cognitive functions have focused on aerobic training like running, walking and cycling. However, a recent meta-analysis on the effects of aerobic training on cognitive functions in older adults

concluded that there is still no clear evidence for a causal link between an increase in cardiorespiratory fitness and cognitive benefits ***(Young et al., 2015).***

Thus, cardiorespiratory fitness improvements following aerobic training might only be one of multiple factors mediating the positive effects of exercise on cognition This hypothesis is supported by recent reports suggesting beneficial effects of other types of exercise on cognitive functions For example, randomized controlled intervention studies employing coordination training ***(Voelcker-Rehage et al., 2011; Moreau et al., 2015).***

Moreover dancing reported positive effects on memory, selective attention, executive functions and spatial cognition compared to control groups ***(Kattenstroth et al., 2013).***

Physical exercise, regardless of its aerobic or anaerobic metabolic demands, provides a stimulus to vestibular, neuromuscular and proprioceptive systems. The perception of self-motion and balance is coded by vestibular detection of inertial motion, in conjunction with proprioceptive and visual signals ***(Angelaki and Cullen, 2008).***

Connections between vestibular nuclei and the cerebellum, hippocampus, as well as prefrontal and parietal cortices provide information for cognitive functions such as spatial functions, navigation and memory ***(Hitier et al., 2014).***

It has been speculated that an increased stimulation of the vestibular system during self-motion might be an essential mediator between physical exercise and cognitive functioning ***(Smith et al., 2010).***

However, data on the effects of balance training on cognitive functions as they are related to memory and spatial cognition are not clear , indeed , the goal of the present study is to test the hypothesis that a physical exercise program with high demands on the vestibular system could improve memory and spatial cognition.