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To cite this article: Muhammad Aliyu Abba , Olubukola A. Olaleye & Talhatu K. Hamzat (2020): Effects of over-ground walking and cognitive rehabilitation on cognition, brain-derived neurotrophic factor, participation and quality of life among stroke survivors: a study protocol, European Journal of Physiotherapy, DOI: [10.1080/21679169.2020.1808056](https://doi.org/10.1080/21679169.2020.1808056)

To link to this article: <https://doi.org/10.1080/21679169.2020.1808056>



Published online: 20 Aug 2020.



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Effects of over-ground walking and cognitive rehabilitation on cognition, brain-derived neurotrophic factor, participation and quality of life among stroke survivors: a study protocol

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ABSTRACT

Background: Cognitive rehabilitation (CR) is an important component of stroke rehabilitation. Most of the strategies used for this purpose are not readily affordable. This is the protocol of a trial to investigate the effects of over-ground walking (OGW) exercise and CR on cognitive function among stroke survivors.

Methods: This is a three-centre, single blind, randomised controlled trial (RCT). Fifty-seven stroke survivors with mild to moderate cognitive impairments will be recruited from three healthcare facilities and randomly assigned into three groups. Group A will receive moderate intensity OGW exercise. Group B will receive CR using an adapted cognitive intervention comprising an attention and a memory tasks. Group C will receive combine OGW and CR exercise. All interventions will be thrice weekly for 8 weeks. Outcomes to be assessed at baseline, 4th and 8th week of interventions are cognition, brain-derived neurotrophic factor (BDNF), quality of life and participation using Mini-Mental State Examination, Melsin brand ELISA kit, stroke-specific quality of life and London Handicap Scale, respectively. Friedman and Kruskal–Wallis tests will be used for within-group and between-group comparison of data.

Discussion: This trial is the first to examine the effect of OGW exercise on cognition and BDNF among stroke survivors.

ARTICLE HISTORY

Received 7 March 2020
Revised 25 June 2020
Accepted 4 August 2020
Published online 19 August 2020

KEYWORDS

Over-ground walking; cognition; attention; brain-derived neurotrophic factor; rehabilitation; stroke

Introduction

Stroke is one of the leading causes of adult disability worldwide and the second most common cause of cognitive impairment in neurology clinics [1,2]. Cognitive dysfunction of either multiple or single domain is highly associated with previous history of stroke [3,4]. Cognitive impairment after stroke or post-stroke cognitive impairment (PSCI) is the loss of abilities of cognition or impairment of functions of cognitive domains such as memory, thinking, problems solving and executive function following a stroke [3]. It occurs in about 30–70% of stroke population depending on regions of the world, race, age, gender, occupation and educational level [5,6] and is a major cause of disability and dependency [3]. Presentation of PSCI varies from focal neurological deficit to overall cognitive dysfunction [7]. It could however, improve through acute, sub-acute and chronic stages of stroke [8].

Early diagnosis and treatment of PSCI have been recommended in literature [9]. Hence, strategies to prevent or retard cognitive decline are important in stroke rehabilitation [10]. Given the limited success with pharmaceutical management of cognitive impairments, it has become necessary to

employ alternative treatment approaches for cognitive rehabilitation (CR) [11]. Treatment approaches that can be used in the rehabilitation of cognitive dysfunction are restorative, compensatory training and behavioural approaches [1]. Cawood et al. [9], opined that the management of cognitive impairments is the responsibility of occupational therapists. Other researchers have reported the role of physiotherapy in the management of PSCI [12–16]. Physiotherapists have used aerobic exercises in the management of PSCI with reported improvement in cognition among participants [12–15]. It has been suggested that the positive effects of aerobic exercise on cognition is brought about by increase blood flow to the brain and increase arousal level [17–19]. Aerobic exercise has also been reported to induce angiogenesis and neural cell proliferation [20,21]. Improvement in cognitive function following aerobic exercise is also linked to increase production and uptake of peripheral brain-derived neurotrophic factor (BDNF) [22]. BDNF is a type of neurotrophins [23], which mediates neuronal survival, development, function and synaptic plasticity in adults [24,25]. It induces long-term changes in synaptic composition, ion channels expression and neurotransmitter