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Short Commentary

Floor Maze Test: A Low Cost Tool to Evaluate Navigational Abilities and Detect Different Levels of Cognitive Disorders

Mariana Rocha Alves[1,2], Luciana Mendes Oliveira[1,2,4], and Renato Sobral Monteiro-Junior[1,2,3,4]*

[1]Research and Study Group of Neuroscience, Exercise, Health and Sport – GENESEs, State University of Montes Claros, Montes Claros, Minas Gerais, Brazil

[2]Post Graduation Program of Neurology-Neuroscience, Federal Fluminense University, Niterói, Rio de Janeiro, Brazil

[3]Post Graduation Program of Health Sciences, State University of Montes Claros, Montes Claros, Minas Gerais, Brazil

[4]Physical Education and Sport Department, State University of Montes Claros, Montes Claros, Minas Gerais, Brazil

***Corresponding Author:** Renato Sobral Monteiro-Junior, Research and Study Group of Neuroscience, Exercise, Health and Sport – GENESEs, State University of Montes Claros, Montes Claros, Minas Gerais, Brazil.

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Introduction

Cognitive disorders are the most characteristics of patients with dementia. Executive functions and memory are the main cognitive functions that present decline in these people mainly during activities requiring navigational abilities [1]. Brain structures as hippocampus, entorhinal cortex, prefrontal and parietal cortex form the basis of neural circuits involved in navigation [2,3]. Connections between place cells of hippocampus, dorsal pathway of parietal cortex and prefrontal cortex are involved in egocentric navigation while grid cells of entorhinal cortex and hippocampus, ventral pathway of parietal cortex and prefrontal cortex are required during alocentric navigation [2]. Although these neural circuits seem to be different they are recruited in navigation because the egocentric and alocentric abilities work simultaneously. Therefore, navigational abilities are important functions for everyone and may indicate risk of cognitive decline.

Assessments of cognitive abilities used in navigation should be similar to real world activities allowing a reliable measurement of these variables. In this context, the Floor Maze Test (FMT) has been used to evaluate cognitive functions related to navigational abilities which include spatial perception and orientation, attention, decision-making, mind flexibility and episodic memory. This tool was validated in 2008 by Sanders., *et al*. [4] and currently it has been used in clinical studies which have shown that FMT is able to detect different levels of cognitive disorders. Tangen., *et al*. [1] showed that patients with subjective cognitive impairment, mild cognitive impairment (MCI) and mild Alzheimer disease (AD) had worst performance in FMT accordingly with severity of impairment. Verghese., *et al*. [5] have shown that 10 seconds of increment in performance of FMT (immediate maze) is associated to 25% of incident MCI and 53% of motoric cognitive risk (MCR) while episodic memory (FMT – delayed maze) was associated to MCR. These findings show that FMT is an important reliable tool to predict pre-dementia features.

Floor Maze Test Procedure

Based on the Porteus Maze Extension VIII test, the Floor Maze test (FMT) (Figure 1) consists of a 7 x 10 feet ground maze made of white tape on a blue carpet [4]. Assessments are performed accordingly three domains: 1) planning time (PT), which is the time to plan the route to complete the maze; 2) immediate maze time (IMT), which is the time spent walking through the maze from entry to exit to it; and 3) delayed maze time (DMT), which is the time spent walking through the maze ten minutes after the initial performance (a second time) [1]. In addition to maze it is necessary a timer to record aforementioned tests [5].

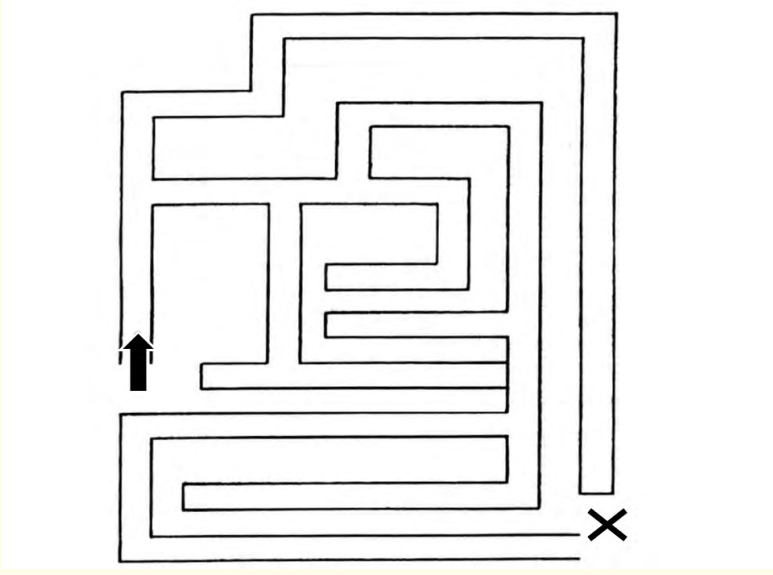

Figure 1: *Floor Maze Test. Arrow indicates the entry of maze while X indicates the exit. These markers are not shown in the original test but they were included in this figure to show where are the entry and exit.*

During the application of PT, the evaluator ask the subject to stay at the entrance of the maze and instructs him to find the exit of it while in IMT the subject is asked to walk on the maze up to exit [4]. The same procedure is repeated ten minutes later (DMT). It is not allowed to plan the way of maze in DMT. During the execution of both tests (IMT and DMT) the error of trajectories are recorded and the person is free to change his/her route. In the Verghese., *et al*. study (2017), the time of 15 seconds was stipulated for all participants in order to plan the way to be done [5]. However, in the original validation study of Sanders., *et al*. (2008) there was no time stipulated to do that (PT).

It is important to note that PT may be unable to measure exactly the capacity of planning in some persons. We applied FMT in institutionalized older adults and the majority of these individuals were not able to plan the route [6]. On the other hand, some of these persons told us that they planned the way from entrance to exit in a few seconds (e.g. three seconds) which is not enough to do that. Therefore, some caution is necessary to interpret the PT.

Final Comments

FMT have been widely used in different neuroscience fields as psychology and psychiatry. Currently it has shown to be reliable and useful to detect different levels of cognitive impairment and the probability of future cognitive decline and motoric cognitive risk. FMT is an easy low-cost tool and its use should be encouraged in clinical and research settings.

Conflict of Interest

None declared.

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