
The use of virtual reality exposure for the management of fear of falling and postural disorders among older adults: A preliminary study

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Résumé

Falling is a serious public health problem leading to psychological consequences as Fear Of Falling (FOF), postural and motor disorders. Many studies found a link between FOF and gait disorders. A decrease in stability, a backward disequilibrium and an increase of postural oscillations is often observed when older subjects expressed FOF (Adkin et al., 2002). Experimental research into the context of the emergence of FOF and its link with posture showed that FOF could be explained by motivational, cognitive, and sensorial models (Adkin & Carpenter, 2018). The complexity of this phenomenon makes FOF interventions difficult to develop and assess. There are some evidences that physical activity program (balance and strength exercises, and yoga interventions) (for review, Kendrick et al., 2014) may reduce FOF by improving strength, gait and balance. However, none of these programs have taken into account the causal factor on FOF.

Researchers suggest that FOF occurs when the old adult felt a threat which can further disrupt postural control leading to a fall (e.g., when placed on an elevated platform) (e.g., Zaback et al., 2019). Besides, it has been shown that, when exposed repeatedly to the source of fear, FOF and postural reactions are progressively attenuated (Johnson et al., 2019). However, the experimental situation proposed here is judged to be dangerous for older with balance deficits and risk of falls (Cleworth et al., 2012). Virtual Reality (VR) may offer a solution to this limitation while simulating real situations that trigger FOF.

The aim of this study is to identify the causal context of FOF development among elderly by comparing their reactional fear, subjective perception of stability and postural performance when exposed to two types of virtual situations: on showing a forward Translation (Tr) scene and the other a forward Tilt (Ti) scene simulating a fall. We support the hypothesis that exposure to (Ti) would induce more FOF than (Tr) scene and that repeated exposure to (Ti) would progressively decrease FOF resulting in postural behavior adaptation. The objective is to provide insights for specific rehabilitation program for FOF.

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It is a randomized cross-over study. Fifty-two older adults aged 65 and over will participate. All of them have a FOF with a score \geq to 23 on the Falls Efficacy Scale International questionnaire (Yardley et al., 2005).

VR session consists of a familiarization phase with the VR and 5 trials (T1, T2, T3, T4 and T5) with a 5-minute break in between. The first trial (T1) lasts 2 minutes and the next four (T2, T3, T4 and T5) last 5 minutes each. T1 consists of two successive exposures of one minute each: one exposure showing a forward Tilting environment (Ti) and another one showing a forward translational environment (Tr). The 4 other trials (T2, T3, T4 and T5) include 5 successive exposures of (Tr) or (Ti) scene. The alternation of (Tr) and (Ti) is carried out to obtain two conditions. The participants will be randomized to visualize one of them.

During the 5 trials, the subject will wear a VR HTC VIVE headset while standing on a Wii Balance Board in order to record Centre of Pressure (COP) position. After each exposure, the effect of each type of scene on FOF and subjective perception of stability will be evaluated through a scale ranging from 0 to 10 for FOF (Zaback et al., 2015) and another for stability perception (Schieppati et al., 1999).

The committee for the protection of individuals approved this experimental procedure which will be implemented during June.

Mots-Clés: Fear Of Falling, Virtual Reality, Postural Control, Elderly