

# Rehabilitation of the psychomotor consequences of elderly fallers: A pilot study to evaluate the feasibility and tolerability of virtual reality training using a user-centered designed serious game.

Pierre Wagnier, Paul-Emile Fauquet, Samuel Benveniste, Pierre Jouvelot, Anne-Sophie Rigaud, Gilles Kemoun, Frédéric Bloch

## ► To cite this version:

Pierre Wagnier, Paul-Emile Fauquet, Samuel Benveniste, Pierre Jouvelot, Anne-Sophie Rigaud, et al.. Rehabilitation of the psychomotor consequences of elderly fallers: A pilot study to evaluate the feasibility and tolerability of virtual reality training using a user-centered designed serious game.. The 10th World Conference of Gerontechnology (ISG 2016), Sep 2016, Nice, France. 10.4017/gt.2016.15.s.714.00 . hal-01410205

HAL Id: hal-01410205

<https://hal-mines-paristech.archives-ouvertes.fr/hal-01410205>

Submitted on 6 Dec 2016

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

P. WARGNIER, P.E. FAUQUET, S. BENVENISTE, P. JOUVELOT, A.S. RIGAUD, G. KEMOUN, F. BLOCH. **Rehabilitation of the psychomotor consequences of elderly fallers: A pilot study to evaluate the feasibility and tolerability of virtual reality training using a user-centered designed serious game.** *Gerontechnology* 15(suppl):....s; doi:10.4017/gt.2016.15.s.714.00

**Purpose:** A fall can lead to serious psychological consequences<sup>1</sup>. These symptoms can develop into Fear of Falling (FoF) with behavioural disorders comparable to Post Traumatic Stress Disorder (PTSD). Virtual reality training (VRT) could be seen as a worthwhile therapeutic approach for this syndrome since it has been shown to be useful to improve combat-related PTSD<sup>2</sup>. Our aim was to test the feasibility and acceptability of our VRT system, Virtual Promenade, developed to treat elderly adults showing arguments for post-fall PTSD. **Method:** We built a prototype VRT system in which subjects navigate through a non-immersive virtual environment while seated on a chair with a moving seat that reproduces the movement of the hips during walking<sup>3</sup>. For this study, elderly subjects were selected among inpatients of our university hospital, hospitalised for specific rehabilitation work. Patients over 75 years old with a high score at the Fall Efficacy Scale (FES<sup>4</sup>) were included. Each patient benefited from pre- and post-test assessments and 2 to 3 sessions of Virtual Promenade using the virtual environment associated to the moving seat. **Results and Discussion:** 8 subjects participated to the study, with mean age of 88.9±5.9 years and mean FES of 36.5±13.8 at pre-test time. Our system achieved good usability and acceptance for our participants, who all had mild or moderate cognitive impairment (mean MMSE=20.9±3.7), and we did not find any particular obstacle to the feasibility of our intervention. We also found that FES was not a reliable measure of fear of falling for this type of subjects. We therefore cannot conclude on the therapeutic effects of the system. In our future work, we plan on experimenting with immersive VRT, using a head-mounted display, to enrich the virtual environments to offer more stressful situations. VRT offers potential as rehabilitation technique for elderly subjects with post-fall PTSD. The next step will be to design a randomized controlled trial in order to compare the efficacy of our Virtual Promenade versus standard rehabilitation techniques in this population.

## References

1. Moore DS, Ellis R. Measurement of fall-related psychological constructs among independent-living older adults: a review of the research literature. *Aging and Mental Health* 2008;12(6):684-99; doi:10.1080/13607860802148855
2. Bloch F, Rigaud AS, Kemoun G. Virtual Reality Exposure Therapy in posttraumatic stress disorder: A brief review to open new opportunities for post-fall syndrome in elderly subjects. *European Geriatric Medicine* 2013;4(6):427-430; doi:10.1016/j.eurger.2013.10.005
3. Marivan K, Bouilly C, Benveniste S, Reingewirtz S, Rigaud AS, Kemoun G, Bloch F. Rehabilitation of the psychomotor consequences of falling in an elderly population: A pilot study to evaluate feasibility and tolerability of virtual reality training. *Technology and Health Care* 2016;24(2):169-175; doi:10.3233/THC-151114
4. Tinetti ME, Richman D, Powell L. Falls efficacy as a measure of fear of falling. *Journal of Gerontology* 1990;45(6):239-243; doi:10.1093/geronj/45.6.P239

Keywords: mobility, falls, virtual reality training, psychomotor consequences.

Address: Department of Gerontology, Hôpital Broca (AP-HP), Paris, France

E: frederic.bloch@aphp.fr

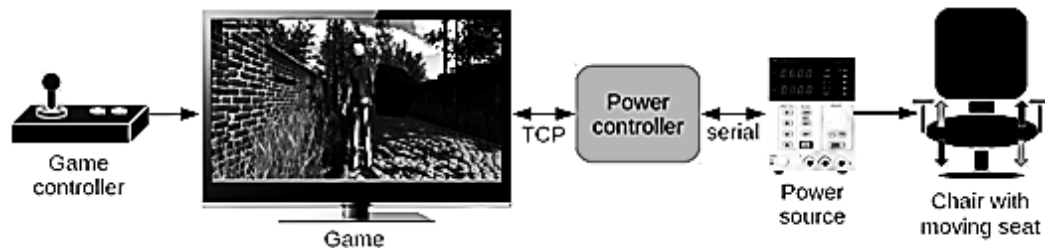


Figure 1. The prototype of the Virtual Promenade system