Home-based virtual reality training after stroke; preliminary data of a telerehabilitation feasibility randomized controlled trial

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Background

Virtual reality training (VRT) allows patients to interact with a virtual environment using computer software and hardware. VRT is enjoyable and may encourage greater repetition of therapeutic exercises. Several recent systematic reviews have concluded that VRT can produce recovery of standing balance, gait and overall function which is equal to, or better than, conventional forms of rehabilitation [1-5].

Most patients with stroke can benefit from ongoing therapy after discharge from hospital-based rehabilitation. Barriers to accessing community-based rehabilitation include availability, cost, transportation difficulties and inclement weather. Home-based VRT is convenient, inexpensive and motivating; therefore it may be an ideal tool to motivate stroke patients to continue performing rehabilitative exercise after discharge from hospital-based rehabilitation.

Our objective is to assess the feasibility of home-based VRT for stroke patients after discharge from hospital-based rehabilitation.

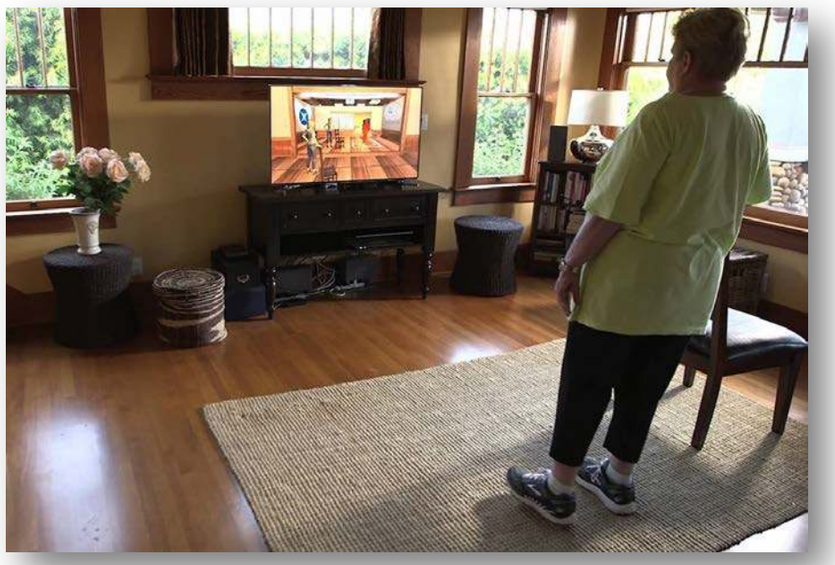
Methods

20 stroke patients who can stand for at least 2 minutes and are soon to be discharged from hospital-based rehabilitation are being recruited and randomly assigned to VRT or iPad app groups.

VRT is provided using the Jintronix (Montreal, QC) platform coupled with a Dell Alienware computer and a Kinect motion-tracking camera. VRT games and exercises intended to challenge standing balance, gait and reaching are selected, based on the participant's ability. Changes to participants' programs can be made on-line.

iPad apps which challenge upper extremity fine motor skills (writing, pinching, swiping) and cognitive function (memory, sequencing and planning, attention) are selected from the App Store.

A research therapist visits each participant to train and install VRT or the iPad into the home. Participants in both groups are requested to do 30 minutes of exercise daily, 5 days a week, for 6 weeks. All participants are contacted by phone or email at least once a week to check on their progress and make adjustments to their program. Participants are provided with log books to record their day-to-day thoughts about the study. At the end of 6 weeks, participants and their study partners attend a 10-20 minute interview to provide further feedback on their experience with VRT or iPad apps.



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Results

Participants (to date)

	Virtual Reality Training	iPad
Sex	7 ♂, 1 ♀	5 ♂, 2 ♀
Age	61 (47 – 82)	60 (24 – 88)
Type of stroke	6 ischemic	7 ischemic
Days since stroke	82 (37 – 165)	108 (21 – 179)*

* 1 outlier 556 days post-stroke

Feasibility Outcomes

- The VRT system, with modifications, fit in every participant's home (although some situations were cramped).
- All participants except 1 (VRT) were able to learn VRT or iPad apps and progress; some learned more slowly than others.
- There were some technical issues with VRT (keyboard, camera position, camera not tracking well) and iPad (use of stylus).

- Most participants enjoyed VRT and iPad apps, although some became bored over time (more with the VRT) .
- Most participants found VRT and iPad apps motivating and encouraging, especially those using the iPad. They appreciated the structure and continuity provided by the program. Some would have preferred to do it within a group environment. Some appreciated that they could do their exercise any time, any day.
- Several participants were frustrated by the scoring and feedback given by the VRT system.
- Several participants believed that VRT and iPad apps are complementary to traditional therapy.
- Most believed that VRT and iPad apps contributed to their recovery.
- Many would continue VRT and iPad apps if they were available.
- There were no serious adverse effects.

Conclusions

VRT and iPad apps can be a motivational and potentially helpful way to provide home-based rehabilitative exercise after stroke.

A patient's abilities, aptitudes, interests and rehabilitation goals should be taken into account when choosing the right platform and activities.

Advances in technology should be directed to making the systems more user-friendly (improved Kinect camera tracking, for example).

References

[1] Corbetta D et al. J Physiother 2015;61:117-124
[2] Darekar A J et al. Neuroeng Rehabil 2015;12:46
[3] Laver KE et al. Cochrane Database Syst Rev 2017;CD008349
[4] Li Z et al. Clin Rehabil 2016;30:432-440
[5] De Rooij IJM et al. Phys Ther 2016;96:1905-1918

Acknowledgements

This work was supported by a grant from the Bruyère Academic Medical Organization and by a generous personal donation from Tony & Elizabeth Graham. We thank the staff of the stroke rehabilitation program at Élisabeth Bruyère Hospital, all of our participants and our many volunteers.

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