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# VIRTUAL REALITY AS A TREATMENT APPROACH FOR OLDER WOMEN WITH MIXED URINARY INCONTINENCE: A FEASIBILITY STUDY

Hypothesis / aims of study

Virtual reality rehabilitation (VRR) combines dynamic functional exercises and video gaming to enhance motivation and increase participation (1), a treatment approach used increasingly with the elderly (2). The primary objective was to evaluate the feasibility of using VRR to treat mixed urinary incontinence (UI) in women 65 years and older. The secondary objective was to evaluate the impact of the VRR pelvic floor muscle (PFM) training program on PFM function.

Study design, materials and methods

The study employed a quasi-experimental, pre-test, post-test design. Twenty-four community-dwelling women were recruited from a bank of potential participants operated by a research centre. To be included in the study, the women had to be 65 or older, live at home, be ambulatory, understand French or English (verbal and written instruction), suffer from mixed UI and, at a minimum, experience urinary leakage secondary to urgency, physical exertion, coughing or sneezing more than twice a week in the 3 months prior to the evaluation. Mixed UI was determined by an affirmative answer to questions 3 and 4 on the Urogenital Distress Inventory (UDI) (3). Participant's eligibility was assessed with a standardised questionnaire completed during a telephone interview.

Each woman participated in two pre-intervention evaluations (pre1 & pre2), a 12-week PFM/VRR training programme and one post-intervention evaluation (post). The first two evaluations were conducted 2 weeks apart to ensure consistency in the incontinence and PFM measures prior to the intervention. All three evaluations were done by the same experienced physiotherapist.

The 12-week intervention was delivered to groups of eight participants in a weekly 60-minute exercise class under the supervision of another experienced physiotherapist. Each session comprised a 10-minute education period on UI, a 30-minute session of static PFM training in different positions, and 20 minutes of VRR training using a free open-source software dance game, StepMania. Participants were also given a 20-minute PFM exercise programme to do at home five days a week. Class attendance and a daily exercise diary were used to record adherence. Exercises of increasing difficulty (to maximise strength resistance training) were introduced incrementally every four weeks in each component: the PFM and VRR class exercises and the home exercises. Stimuli in the dance game were five songs, without lyrics, synchronized to dance steps. Songs were paired with visual cues on how to dance each music track. A sequence of scrolling arrows, which moved upwards, cued each move in the four cardinal positions; the participant had to make the indicated step, on the dance mat, when the relevant arrow reached the top of the screen. PFM contractions were represented by a red dot incorporated into the sequence of arrows.

Feasibility was defined, hence evaluated, as 1) a participant's rates of participation and completion of the 12-week PFM/VRR programme, including the home exercise component. Responsiveness of UI symptoms was defined as a change in the severity of incontinence using the UDI short form (UDI-6), the 72-hour urinary diary and the 1-hour pad test with standardized bladder volume. The short form International Consultation on Incontinence Questionnaire (ICIQ-UI) and the Incontinence Impact Questionnaire (IIQ) were also used to identify the impact on participants' quality of life (QoL). The impact of the intervention on PFM function was assessed by the Laycock's PERFECT 6-point scale (0-5).

Data from the questionnaires and 72-hour diary were normally distributed, thus each outcome measure for the three evaluations (pre1&2 and post) was compared using repeated measures analysis of variance (ANOVAs). Data for the pad test and PERFECT scores (for the three evaluations) were not normally distributed, hence, were compared using non-parametric repeated measures comparisons.

Results

Twenty-four participants completed the study; only one participant was unable to complete the physical part of the post-intervention evaluation, due to an acute ankle injury. The twenty-four participants had the following means (SD): age 70.5 (3.6) years, body mass index of 25.9 (3.6) kg/m$^2$, hysterectomy 0.7 (0.5) and pregnancy 1.7 (1.4), including 1.3 (1.3) vaginal deliveries, 0.1 (0.3) Caesarean sections.

The majority of participants complied with the study demands in terms of attendance at the weekly treatment sessions (91%), adherence to the home exercise program (92%) and completion of the three (pre1&2 and post) evaluations (96%). The assessments and intervention were well tolerated, with an attrition rate of 4% (i.e., 1 subject – due to ankle injury) in the physical part of the assessment. Responsiveness to the PFM/VRR programme is presented in Table I.

Table I: UI PFM/VRR evaluation outcomes using repeated-measures ANOVA (n=24)

| Outcomes | Pre1[1] Mean and SD | Pre2[2] Mean and SD | Post[3] Mean and SD | p-value |
|---|---|---|---|---|
| UDI-6 | 47.05 ± 15.47 | 42.01 ± 14.16 | 19.79 ± 11.14 | $P^{1-2}$=0.448 $P^{2-3}$=0.000* $P^{1-3}$=0.000* |
| 72-h Urinary Diary | 8.62 ± 3.01 | 7.88 ± 2.64 | 6.79 ± 2.10 | $P^{1-2}$=0.060 $P^{2-3}$=0.008* |

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|---|---|---|---|---|
| (mean voiding/day) | | | | $P^{1-3}=0.000^{*}$ |
| 72-h Urinary Diary (mean UI/day) | 1.51 ± 1.34 | 1.19 ± 1.13 | 0.51± 0.49 | $P^{1-2}=0.151$ $P^{2-3}=0.010^{*}$ $P^{1-3}=0.001^{*}$ |
| Short form ICIQ-UI | 11.13 ± 3.35 | 10.21 ± 3.77 | 5.00 ± 3.47 | $P^{1-2}=0.871$ $P^{2-3}=0.000^{*}$ $P^{1-3}=0.000^{*}$ |
| IIQ | 70.44 ± 39.83 | 58.64 ± 48.38 | 24.62 ± 33.14 | $P^{1-2}=0.205$ $P^{2-3}=0.007^{*}$ $P^{1-3}=0.000^{*}$ |

* Significant level was established at p≤0.05

- Applying a p<0.017 Bonferroni adjustment, among participants with a bladder volume >300ml, the pad test changed significantly between pre1-post (n=13, p=0.008) and pre2-post (n=13, p=0.005), but not between pre1-pre2 (n=14, p=0.313).
- Applying a p<0.017 Bonferroni adjustment, the P (power) and the T (timing, n=16) of the PERFECT scores changed significantly between pre1-post (p=0.000[n=23]/0,003) and pre2-post (p=0.000[n=21]/0.014), but not between pre1-pre2 (p=0.739[n=23]/0.180).
- On a scale of 0 (not satisfied) to 10 (very satisfied), the mean appreciation score for the VRR component was 9.8 (±0.5); 91% of the participants were satisfied with the overall PFM/VRR treatment and would not seek other treatment.

Finally, post-study participant focus groups identified the VRR component, which incorporated a functional training approach, as a “pleasant activity”; one perceived as a reward at the end of the PFM exercise class. Participants viewed the VRR component as a dynamic exercise programme and relevant to the performance of activities of daily living (ADLs). It was also identified as a facilitator in terms of their adherence: regular attendance at the weekly classes.

Interpretation of results

This feasibility study demonstrated that women, aged 65 and over, with mixed UI are good candidates for a PFM/VRR programme and are capable of complying with study demands. The PFM/VRR programme was also effective in reducing UI symptoms, enhancing QoL and improving PFM strength and coordination. Indeed, the addition of a VRR component may also improve adherence to PFM rehabilitation.

Concluding message

A combined PFM/VRR is an acceptable functional training approach for older women with mixed UI. This new intervention should be assessed in terms of effectiveness and adherence through a randomized controlled trial in comparison to the conventional PFM rehabilitation approaches.

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