

Khoo, Yvonne J-Lyn, van Schaik, Paul, MacSween, Alasdair, Dixon, John and Martin, Denis (2010) The acceptance and experience of virtual-reality-enhanced exercise in older people. In: American College of Sports Medicine (ACSM) 57th Annual Meeting, 2-5 June 2010, Baltimore, MD, US. (Unpublished)

Downloaded from: <http://insight.cumbria.ac.uk/id/eprint/4861/>

Usage of any items from the University of Cumbria's institutional repository 'Insight' must conform to the following fair usage guidelines.

Any item and its associated metadata held in the University of Cumbria's institutional repository Insight (unless stated otherwise on the metadata record) may be copied, displayed or performed, and stored in line with the JISC fair dealing guidelines (available [here](#)) for educational and not-for-profit activities

provided that

- the authors, title and full bibliographic details of the item are cited clearly when any part of the work is referred to verbally or in the written form
- a hyperlink/URL to the original Insight record of that item is included in any citations of the work
- the content is not changed in any way
- all files required for usage of the item are kept together with the main item file.

You may not

- sell any part of an item
- refer to any part of an item without citation
- amend any item or contextualise it in a way that will impugn the creator's reputation
- remove or alter the copyright statement on an item.

The full policy can be found [here](#).

Alternatively contact the University of Cumbria Repository Editor by emailing insight@cumbria.ac.uk.

The acceptance and experience of virtual-reality-enhanced exercise in older people

Khoo, Y.JL.¹, van Schaik, P.², MacSween, A.¹, Dixon, J.¹ and Martin, D¹.

¹School of Health and Social Care, ²School of Social Sciences and Law, Teesside University.

Email: H8085063@tees.ac.uk

ABSTRACT

This study investigated how older people perceive and experience virtual-reality-enhanced exercise. Data comprised variables of technology acceptance, flow experience, and perceived rate of physical exertion and subjective mental effort. Participants recruited from community-based exercise groups took part in six 40-minute VR exercise sessions over three weeks. Behavioral intention and other acceptance measures demonstrated a sustainable increase over time. A substantial improvement was also found in flow variables and in both perceived mental and physical effort after the program. Results show that positive responses in the VR exercise experience were retained throughout all six sessions. These findings support an expectation that after using VR technology for exercise, older people from this population are very likely to use it in the future.

INTRODUCTION

VR assimilated into exercise has potential to improve exercise experience. Older people are aware of the numerous health benefits arising from exercise but most do not exercise regularly. Given the previous evidence of advantages from VR supported physical activity programmes in different groups, the question if older people accept exercising in a virtual environment is of particular relevance. Degree of acceptance may have important implications for future use and concordance to VR-enhanced exercise programmes.

METHODS

28 healthy men and women (mean age 65.2, SD 8, range 50-85) participated in six 40-minute VR exercise sessions over three weeks. Each session comprised five interactive IREX™ games repeated three times per session (Fig.1). Outcome measures comprise: 1) acceptance variables using the Modified Technology Acceptance Questionnaire; 2) flow state of exercising using the Flow State Scale²; 3) perceived physical exertion via the Borg RPE³; 4) subjective mental effort via the SMEQ⁴; and 5) an overall evaluation using an open ended question at the end of every session. Batterham and Hopkins' approach of using magnitude-based-inferences was applied to estimate the likelihood of any clinical effects of the outcome measures.

RESULTS

Table 1 presents the means and standard deviations of the primary measure, behavioral intention (BI).

Outcome measure	T0 (initial)	T1 (Session 1)	T6 (Session 6)
BI	4.70 (1.26)	5.42 (1.55)	5.69 (1.68)

Table 2 presents the summary of t test, confidence intervals and clinical inference⁵ for behavioral intention (BI).

Outcome measure	Mean change (T0 to T6)	Minimum magnitude of change (0.5SD)	Expressed outcome with 95% CI		t(27)	p	d	Chance (as a percentage) that the true value of the effect statistic is		
			LL	UL				Beneficial or substantially positive	Negligible or trivial	Harmful or substantially negative
Behavioral intention (BI)	0.99	0.63	0.40	1.60	3.47	0.002	0.65	88.8	11.2	0.0



Fig. 1: A model performing a lunge during a session

Outcome measure	T0 (initial)	T1 (Session 1)	T6 (Session 6)	Outcome measure	T0 (initial)	T1 (Session 1)	T6 (Session 6)
PE	4.31 (1.22)	5.52 (1.31)	5.61 (1.59)	CONT		3.63 (0.90)	3.85 (0.78)
EE	4.22 (1.05)	5.54 (0.97)	5.92 (0.99)	FDBK		3.79 (0.69)	4.14 (0.58)
SI	4.16 (1.67)	4.93 (1.46)	5.18 (1.75)	ACT		3.60 (0.80)	3.86 (0.67)
FC	4.73 (1.25)	6.14 (1.10)	6.25 (0.75)	TRAN		3.68 (0.68)	3.86 (0.88)
SE	4.29 (1.16)	5.07 (1.16)	5.63 (0.89)	LOSS		3.74 (0.63)	4.49 (0.44)
ENJY		4.12 (0.48)	4.41 (0.71)	BORG		11.48 (1.49)	12.61 (1.26)
GOAL		3.82 (0.50)	4.34 (0.65)	SMEQ		57.89 (11.67)	59.27 (14.75)
CHAL		3.98 (0.70)	4.14 (0.65)				
CONC		3.93 (0.69)	4.21 (0.48)				

Not applicable.

Table 3 presents the means and standard deviations of the other outcome measures.

Outcome measure	Mean change (T0 to T6)	Minimum magnitude of change (0.5SD)	Expressed outcome with 95% CI	t(27)	p	d	Chance (as a percentage) that the true value of the effect statistic is		
			LL	UL			Beneficial or substantially positive	Negligible or trivial	Harmful or substantially negative
Performance expectancy (PE)	1.20*	0.63	0.40	1.76	4.34	<0.001	99.9	0.0	0.0
Effort expectancy (EE)	1.30*	0.63	0.40	2.00	5.97	<0.001	100.0	0.0	0.0
Behavioral intention (BI)	0.99*	0.63	0.40	1.60	3.47	<0.001	88.8	11.2	0.0
Flow state (FS)	1.01*	0.63	0.40	1.62	3.50	<0.001	89.0	11.0	0.0
Self-efficacy (SE)	0.84*	0.42	0.42	0.84	2.00	0.033	75.0	25.0	0.0
Perceived exertion (PE)	1.34*	0.67	0.40	1.88	3.81	<0.001	98.0	1.0	1.0
Subjective mental effort (SMEQ)	2.29*	1.15	0.90	2.29	5.01	<0.001	99.9	0.0	0.0
Flow (FS)	0.97*	0.49	0.25	0.72	2.00	0.033	75.0	25.0	0.0
Challenge and skills balance (CSB)	0.39	0.35	0.00	0.78	1.00	0.326	50.0	50.0	0.0
Control over task (COT)	0.49	0.35	0.00	0.98	1.52	0.038	66.7	33.3	0.0
Perceived control (PC)	0.11	0.46	0.34	0.52	0.24	0.818	47.5	47.5	4.0
Unpleasant feedback (UF)	0.00	0.35	0.00	0.00	0.00	1.000	50.0	50.0	0.0
Autonomous learning (AL)	0.00	0.40	0.00	0.00	0.00	1.000	50.0	50.0	0.0
Transmission of flow (TF)	0.00	0.34	0.00	0.00	0.00	1.000	50.0	50.0	0.0
Overall self-efficacy (OSE)	0.97	0.52	0.45	1.09	2.00	<0.001	75.0	25.0	0.0
Perceived physical exertion (PPE)	1.33	0.66	0.40	2.26	4.00	<0.001	87.5	12.5	0.0
Perceived mental effort (PME)	1.40*	0.68	0.40	2.00	4.00	<0.001	93.8	6.2	0.0

*T0 to T6. **T1 to T6.

Table 4 presents the summary of t tests, confidence intervals and clinical inference⁵ for the other outcome measures.

REFERENCES

- Venkatesh V, Morris MG, Davis GB, Davis FD. User acceptance of information technology: Toward a unified view. MIS Quarterly. 2003;27:425-478.
- Jackson SA, Marsh HW. Development of validation of a scale to measure optimal experience: The flow state scale. Journal of Sport & Exercise Psychology. 1996;18:17-35.
- Borg G. Perceived exertion as an indicator of somatic stress. Scandinavian Journal of Rehabilitation Medicine. 1970;2:92-98.
- Zijlstra FRH. Efficiency in work behavior. A design approach for modern tools.[dissertation]. Delft, The Netherlands: Delft University Press; Delft University of Technology; 1993.
- Batterham AM, Hopkins WG. Making meaningful inferences about magnitudes. Sports Science. 2005;9:6-13.

