



University of
Strathclyde
Engineering

Game development of a stability-based leaping activity for rehabilitative use

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BioMedEng25

What makes successful rehabilitation?

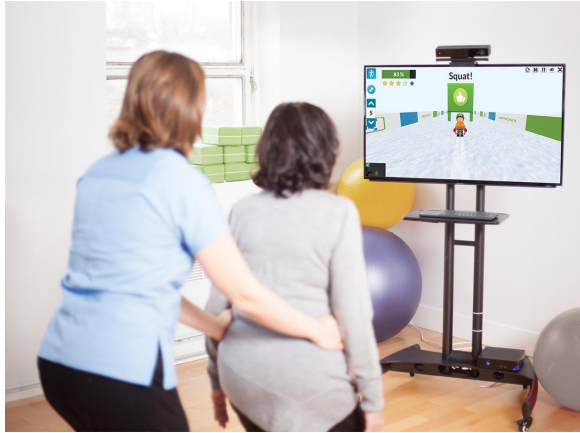
- Application of the principles of training
 - Progressive and varied practices¹
- Adherence^{2,3}

¹Conradsson et al. 2012. BMC Neurology, 12.

²Marshall et al. 2012. JSR. 21.

³Rosettini et al. 2020. Disability & Rehabilitation. 42

Why virtual reality?



Aim

To assess performance of a virtual reality leaping game by exploring the relationship between challenge and engagement for optimal rehabilitation progression.

Methods

Participants

Healthy,
able-bodied adults

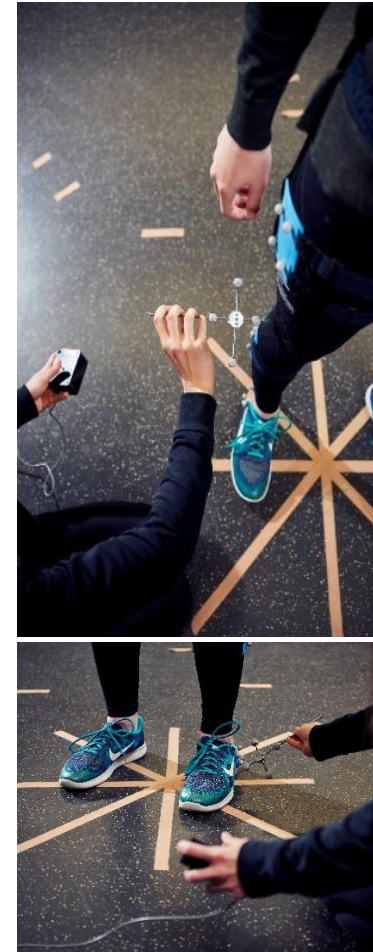
N=11

26±4 years old

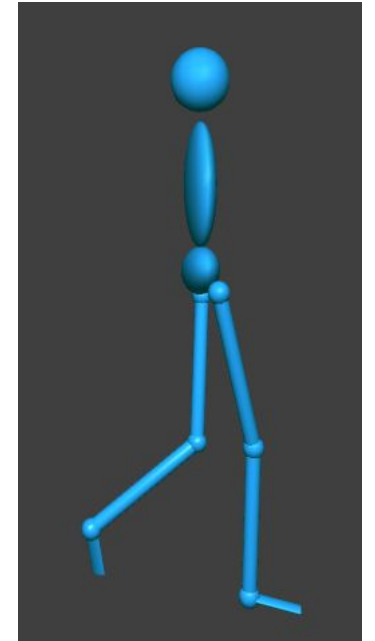
Cluster application



Calibration



Avatar Created



The Leap Game

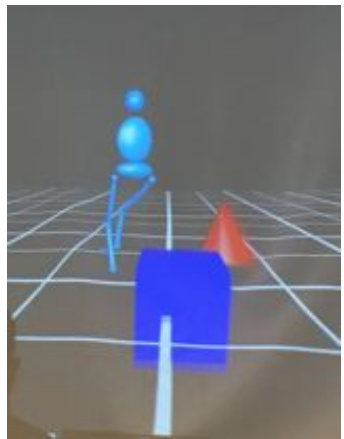
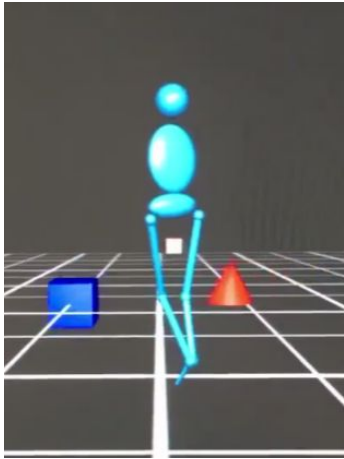


Table 1. Object states for each level during game play

Variable	Level 1	Level 2
Velocity	2m/s	4m/s
Distance from avatar	5m	10m
Object Size (equal width, depth, height)	0.5m ³	0.75m ³

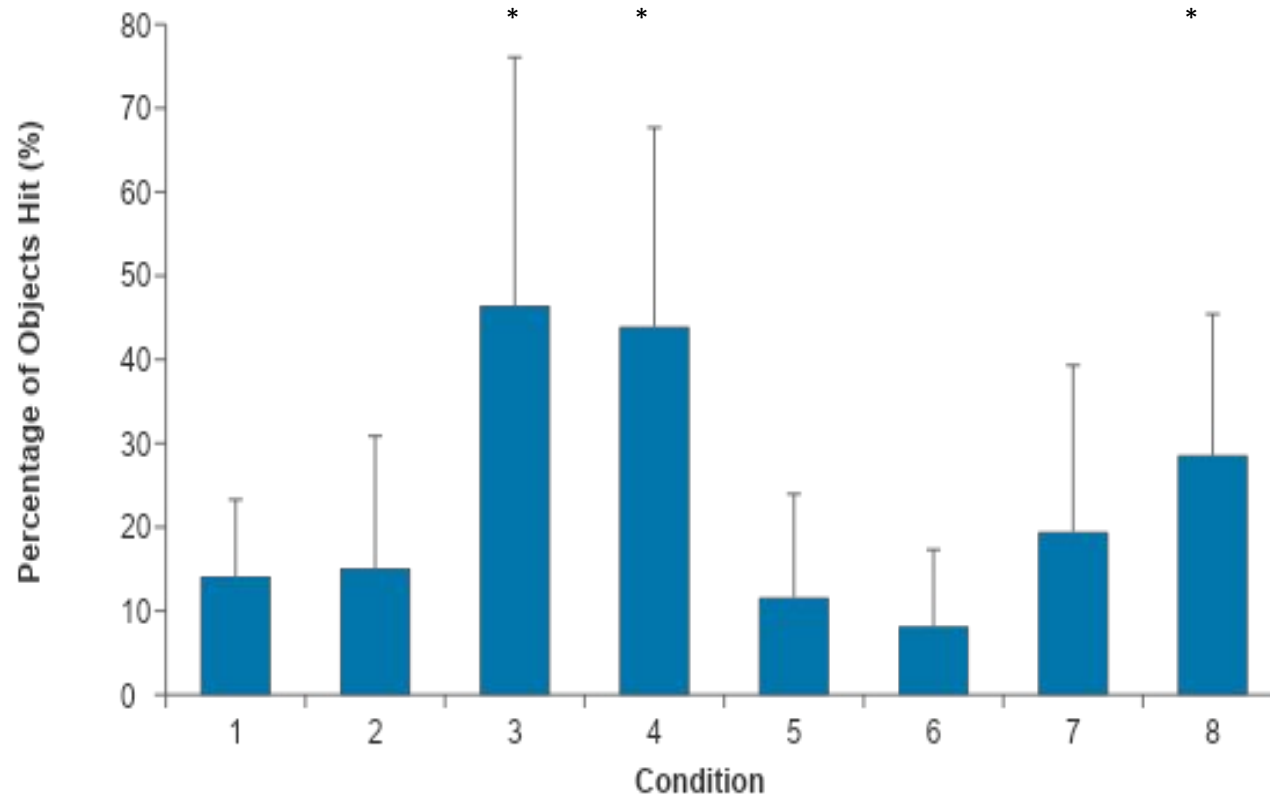
Table 2. Conditions for each game

Condition	1	2	3	4	5	6	7	8
Velocity	Slower	Slower	Slower	Slower	Faster	Faster	Faster	Faster
Distance from avatar	Closer	Farther	Closer	Farther	Closer	Farther	Closer	Farther
Object Size (equal width, depth, height)	Smaller	Larger	Larger	Larger	Smaller	Smaller	Larger	Larger

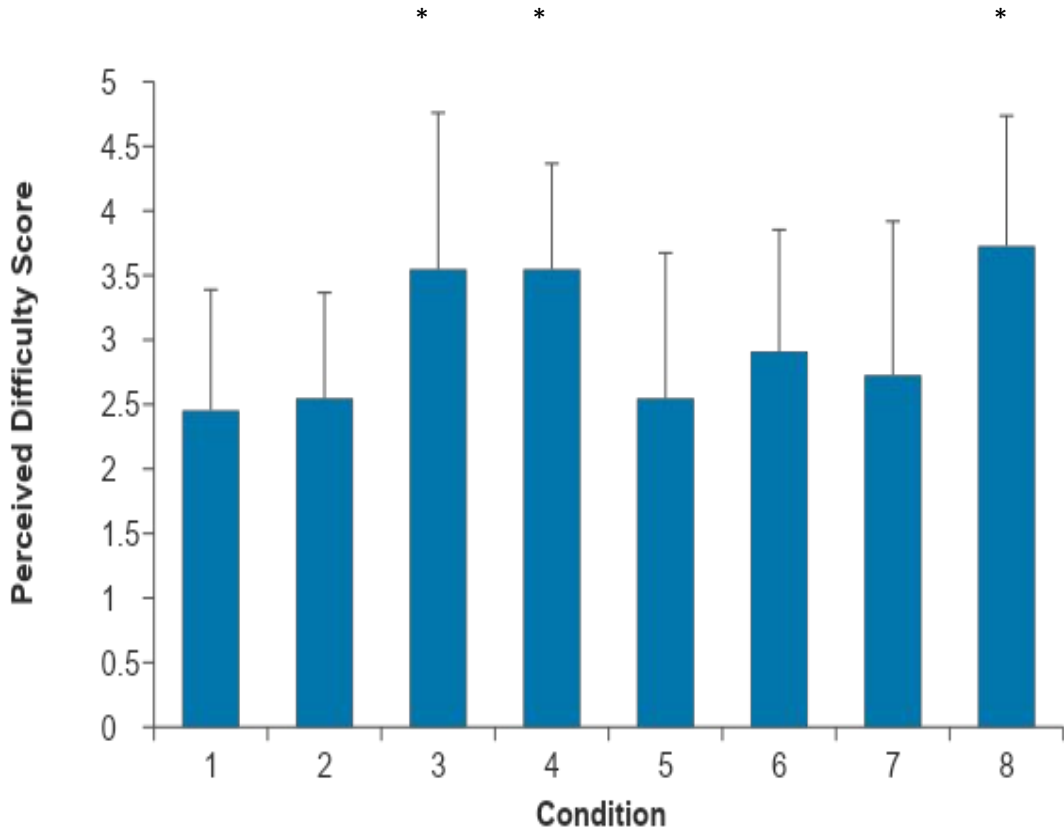
Slower: 2m/s; Faster: 4m/s; Closer: 5m; Farther: 10m; Smaller: 0.5m³; Larger: 0.75 m³

Results

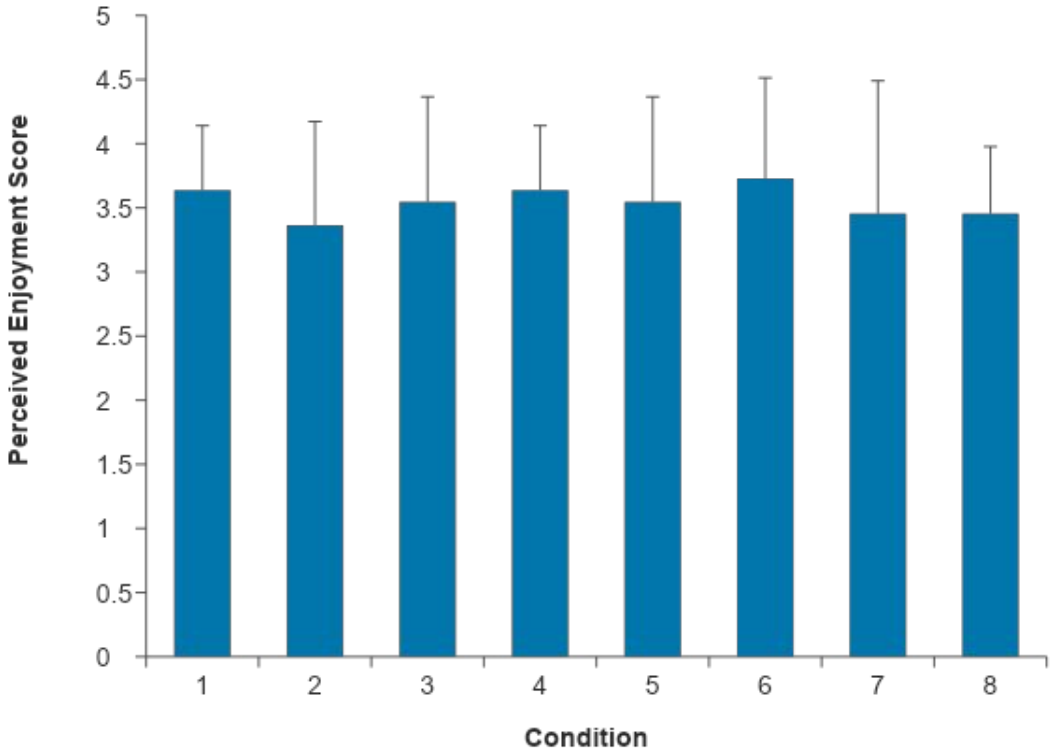
Percentage of objects hit



Perceived difficulty score



Perceived enjoyment score



Discussion

Conditions 3, 4 and 8 resulted in highest scores ($p < 0.05$) and were also perceived the most difficult ($p = 0.01$).

Conditions 6, 4 and 1 were reported as the most enjoyable.



Increasing object size was the most difficult manipulation.

Object velocity was the manipulation reported as most enjoyable.

Condition	1	3	4	6	8
Velocity	Slower	Slower	Slower	Faster	Faster
Distance from avatar	Closer	Closer	Farther	Farther	Farther
Object Size (equal width, depth, height)	Smaller	Larger	Larger	Smaller	Larger

Slower: 2m/s; Faster: 4m/s; Closer: 5m; Farther: 10m; Smaller: 0.5m³; Larger: 0.75 m³

Final thoughts and future directions

- Establish validity for clinical populations who require stability-based rehabilitation.
- Exploration of more clinically-accessible technology.



Thanks for listening!

Any questions?



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