

Evaluating the effectiveness of gamification using CardioWall® on mood, participation, and balance in adults with chronic neurological conditions

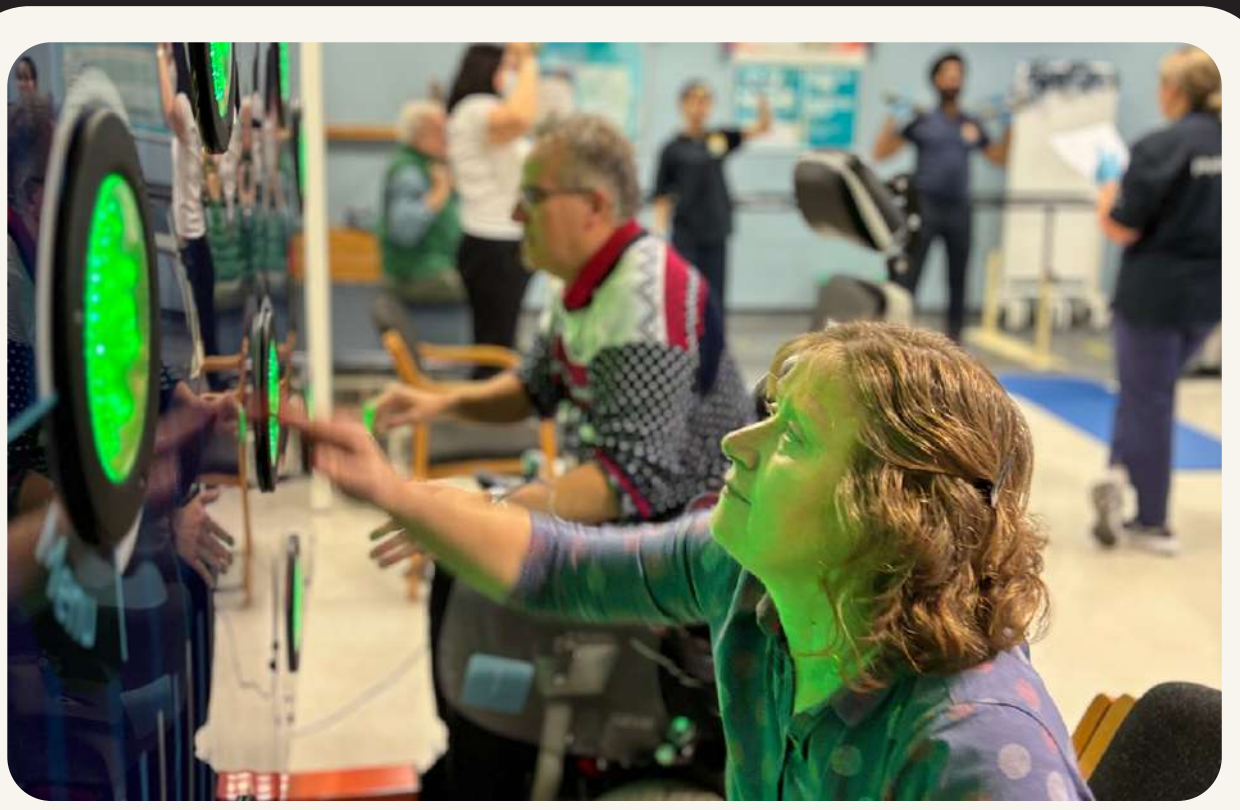


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Background

This study explores the challenges and benefits of using **physical activity interventions** with **emerging technology** for individuals with **chronic neurological conditions**. These conditions often lead to symptoms including **balance issues, fatigue, and mobility problems**. Exercise, particularly in group settings, can significantly improve **fitness, strength, and quality of life**; however, **motivation and engagement remain critical factors** for participation. This 12-Week **CardioWall Impact Study** at The Brightwell has shown that regular participation in exercise classes **incorporating the CardioWall** can have a range of physical, cognitive, and social benefits for people with chronic neurological conditions.



Study Design

Type: Quasi-Experimental Design
Duration: 12 weeks
Participants: 20 adults with chronic neurological conditions
Outcome Measures: **Modified Fatigue Impact Scale¹**
 Function in Sitting Scale/Berg Balance Scale²
 Health and Wellbeing Scale

Participants

Inclusion Criteria: Diagnosed with conditions including MS, Stroke, PD, ME; adequate upper limb and trunk control; cognitive ability to follow instructions; motivated to improve physical health.
Selection: All eligible attendees of the exercise class were invited to participate.

About The CardioWall

The CardioWall is an interactive activity wall with 9 lightpods that challenge speed, reaction, and coordination. Two games were used in the study:
Chaser - All lightpods light up green, except 1 red lightpod. Players seek the red lightpod and hit it out to gain 1 point, or -1 point for each incorrect green lightpod. Improves spatial awareness, reaction speed, and hand-eye coordination.
ClearOut - All lightpods light up, and players hit them out as quickly as possible. 1 point per lightpod. After all lightpods are 'cleared out', they light up again in a new colour. Tests reactions speed, hand-eye coordination, and agility.

Intervention

Sessions: Once a week, with additional home exercises.
Activities: **CardioWall:** 15 minutes per participant
 Exercise Bikes: 15 minutes
 Chair/Mat-Based Exercises: 15 minutes
 Upper Limb Dumbbells: 15 minutes

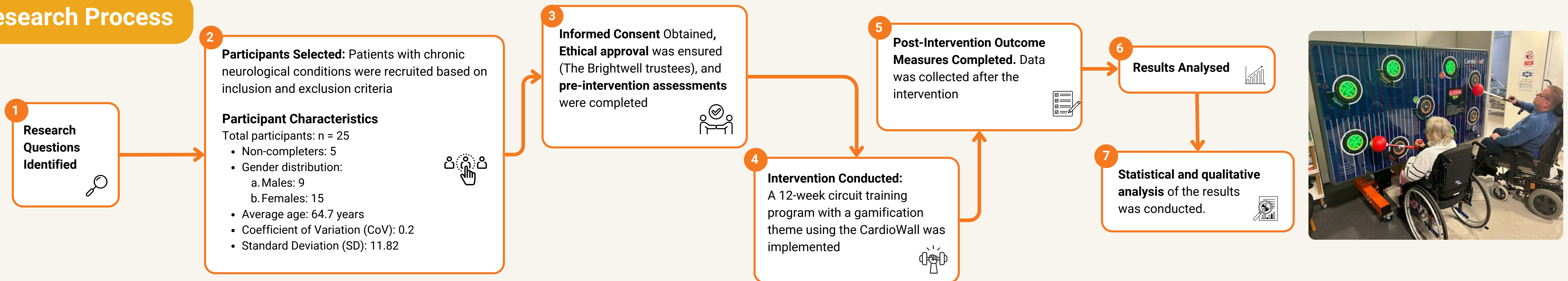
Method

Blinding: One therapist designed the plan; two therapists conducted pre and post assessments.
Data Handling: Anonymised data was analysed for changes in parameters.

“ I find the CardioWall really good cognitively and for my balance, with standing - I **don't actually realise I'm standing for so long** which is good. I've seen improvement in my **cognition, my balance, and definitely my peripheral vision** with the Chaser game.
- Sheila, Study Participant



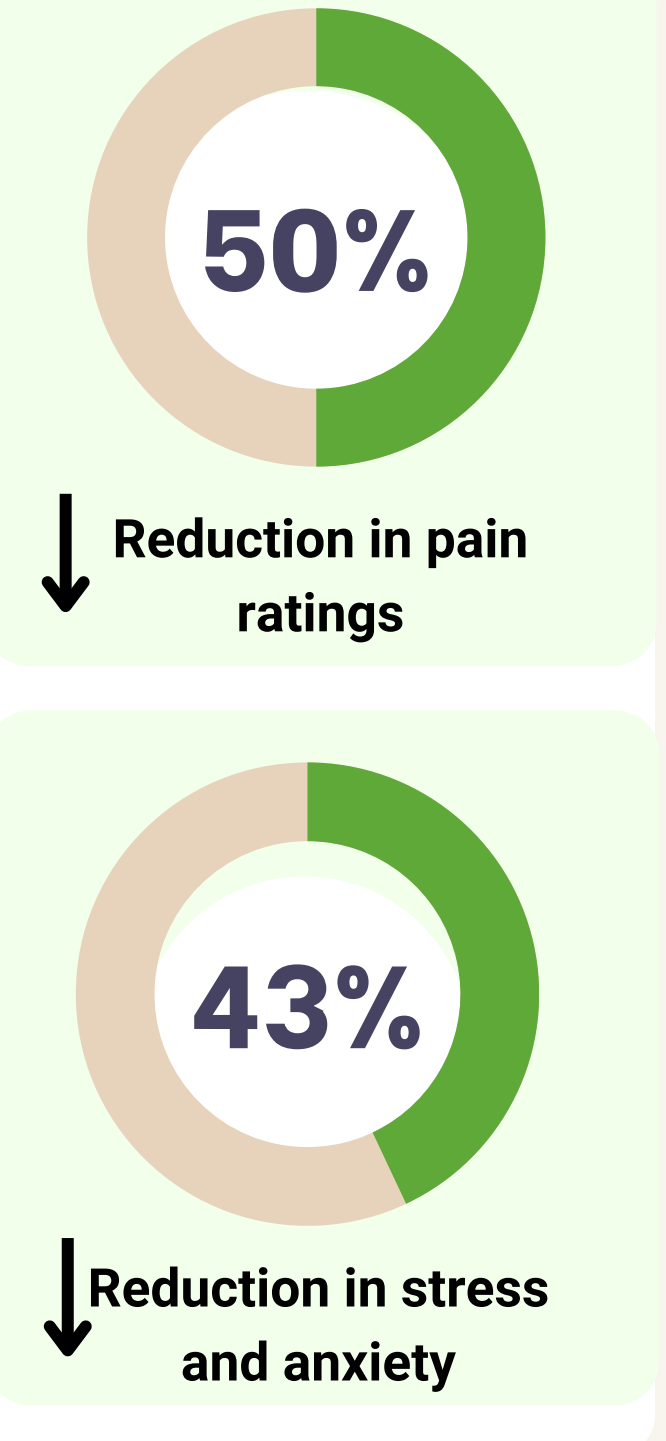
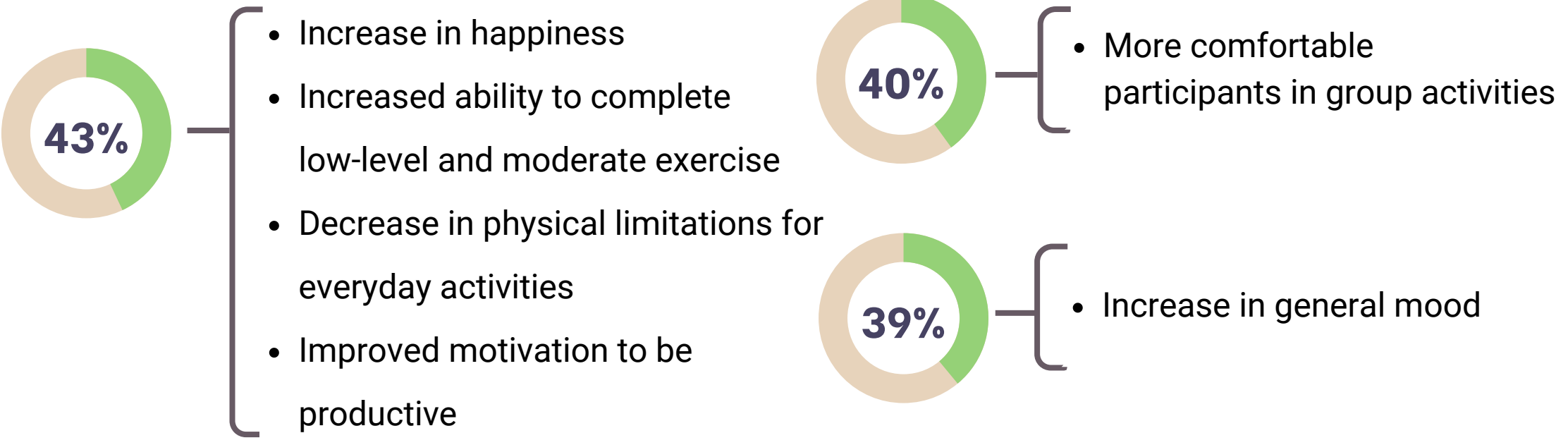
Research Process



Outcome and Discussion

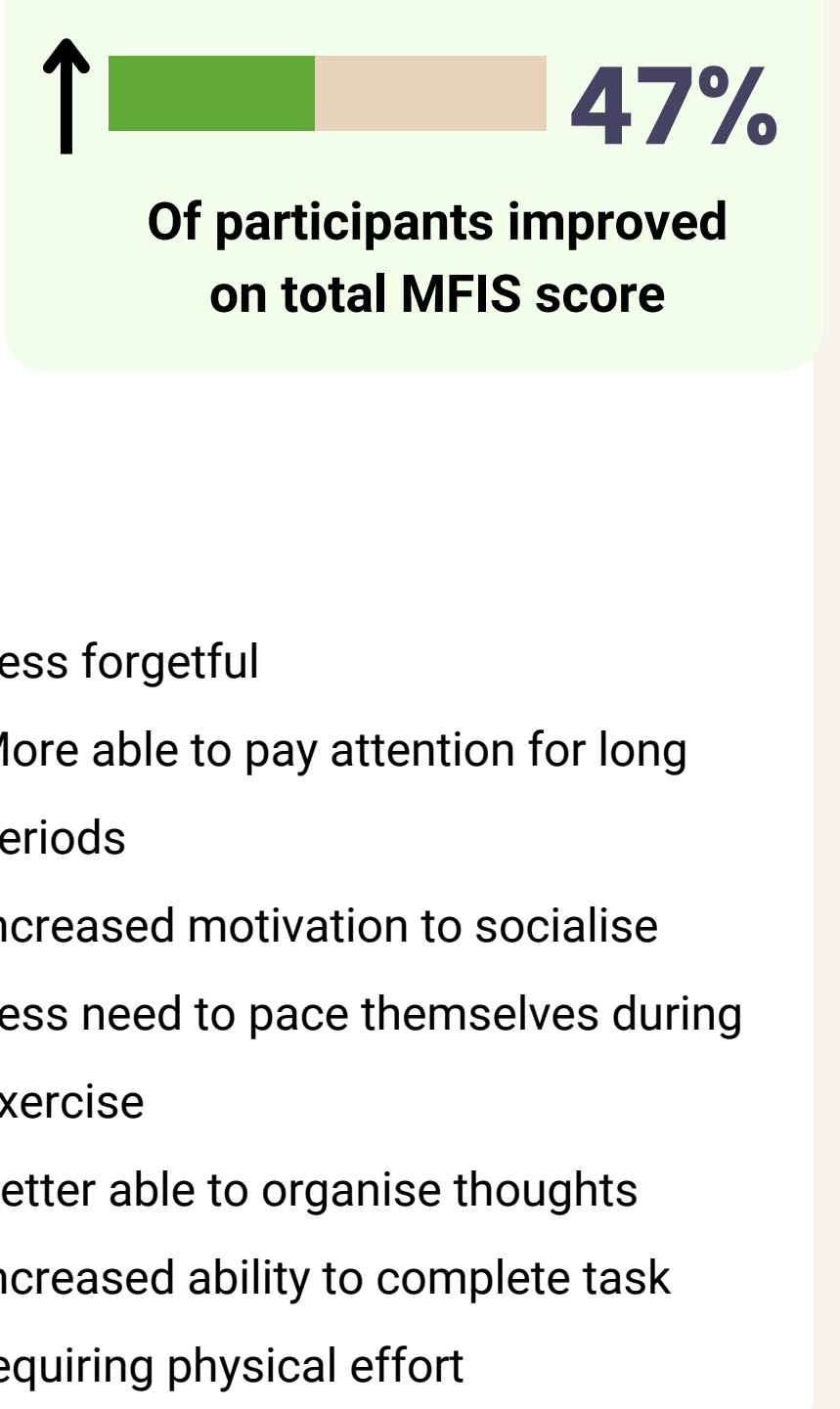
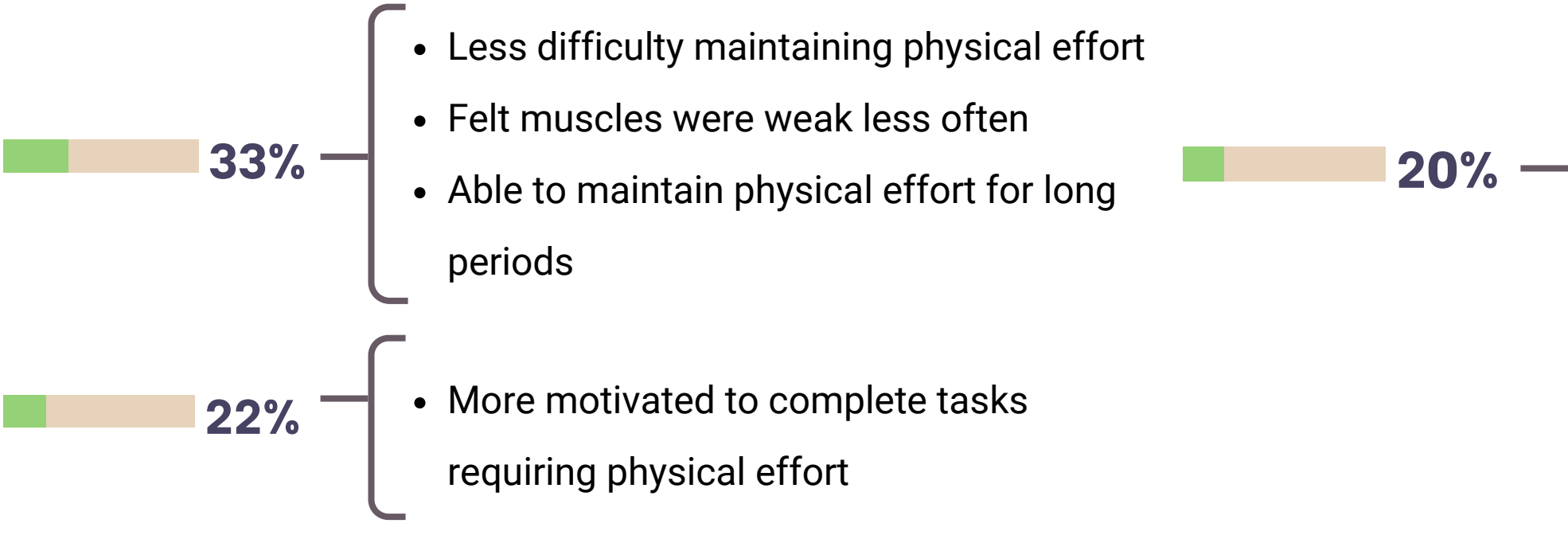
Health and Wellbeing

- General Mood and Happiness** - Participants reported an overall improvement in mood and happiness in their daily lives.
- Exercise and Physical Activity** - Participants are finding it easier to stay active and daily tasks are more manageable.
- Pain and Comfort** - Participants are experiencing less pain, and more confidence in group exercise.
- Mental and Emotional Wellbeing** - Participants have noted improved mental alertness and confidence in self and abilities (29%), and confidence socialising with others (30%). Participants are feeling less stressed and anxious, and more motivated.



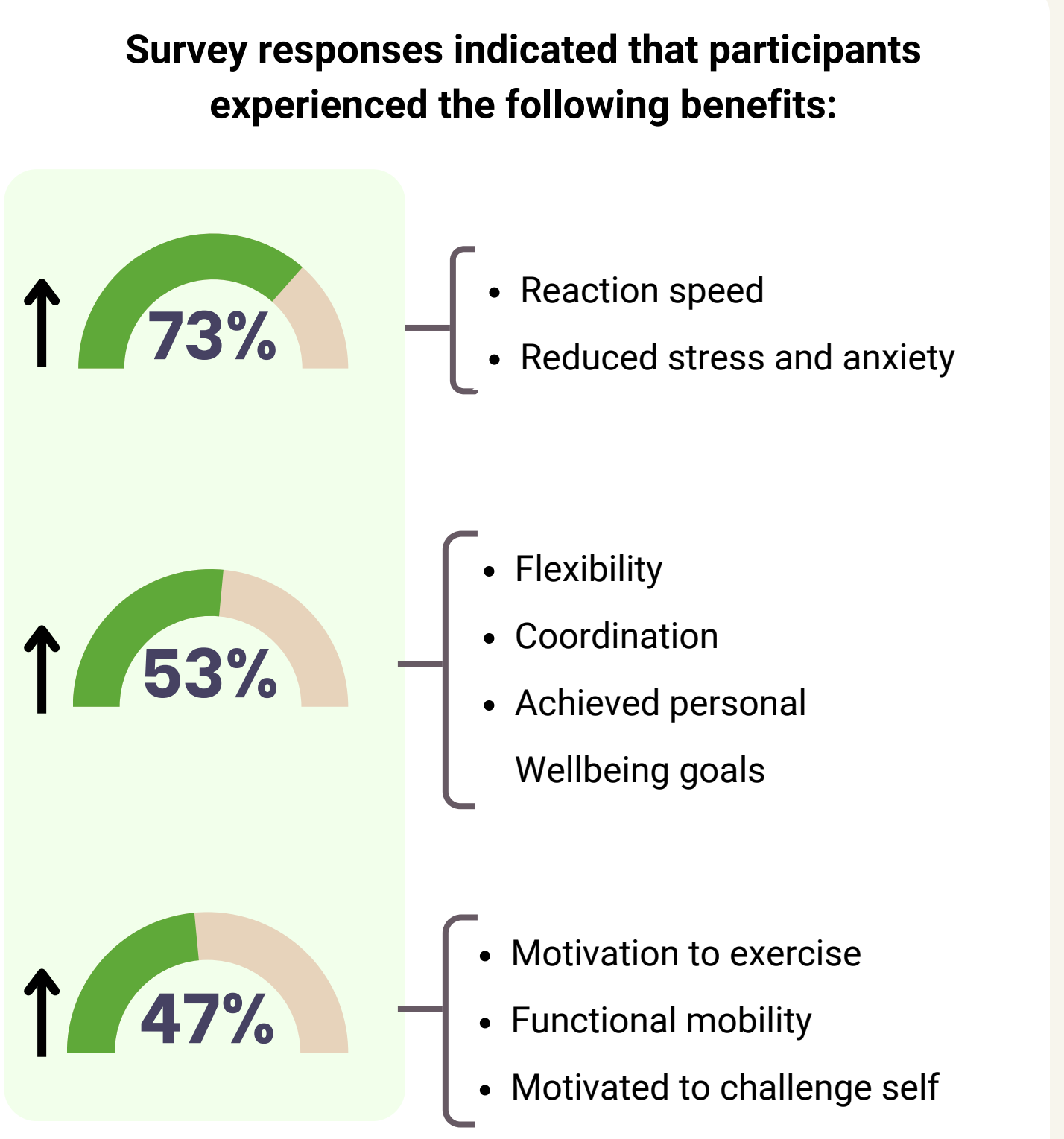
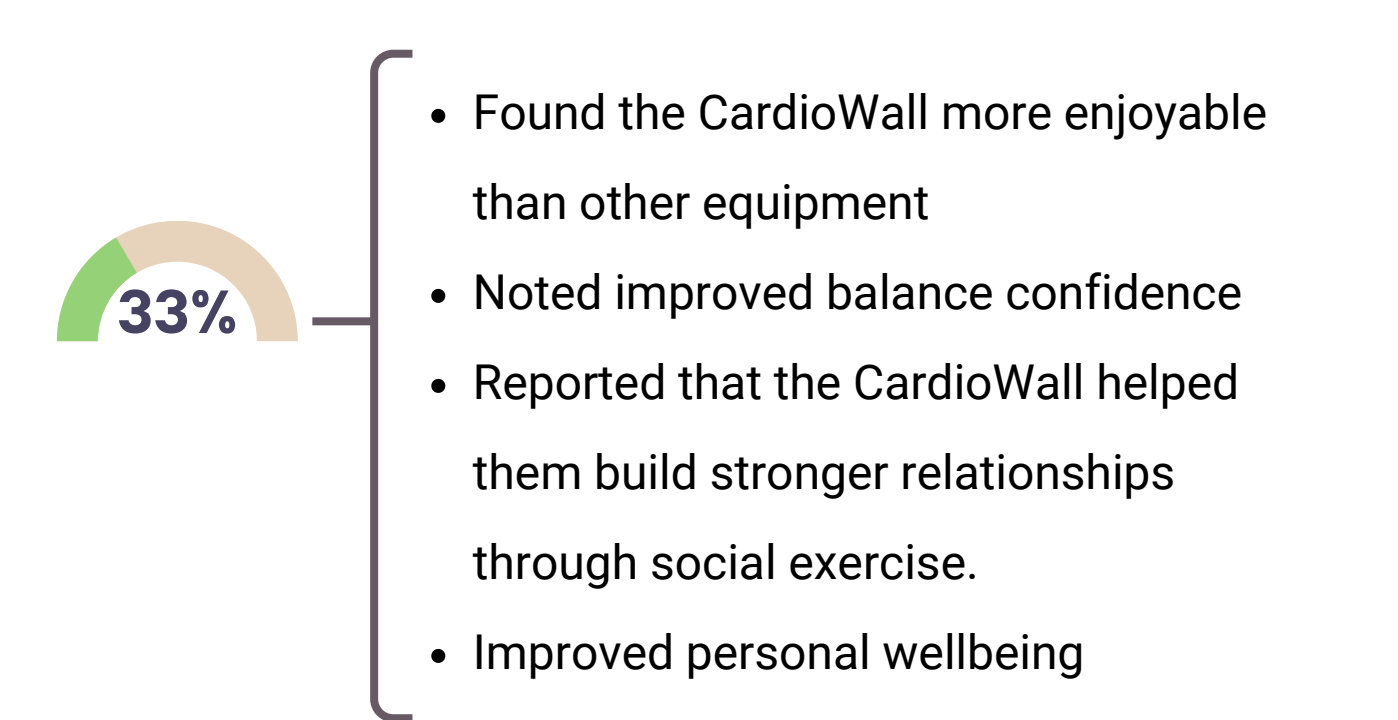
Modified Fatigue Impact Scale

- Improvements**
- 47% of participants improved on the Modified Fatigue Impact Scale, with a reduced score following the study. Specific benefits include better motivation to exercise and socialise, mental clarity, and improved ability during physical activity.
- Maintained**
- Alertness was maintained at 60%, clear thinking at 53%, clumsiness and coordination at 47%, and forgetfulness at 47%.

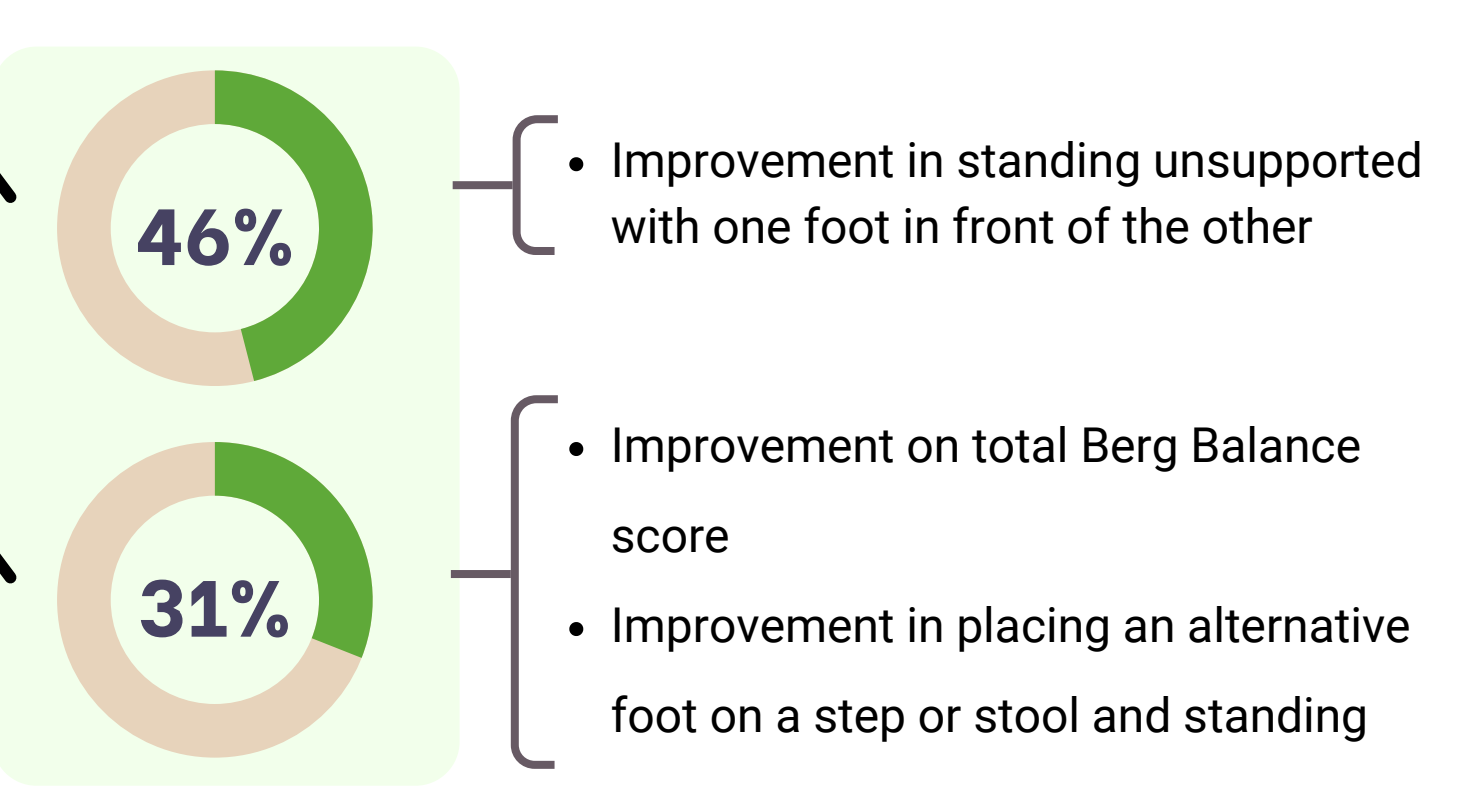


CardioWall Survey

- Improvements Using the CardioWall**
- Participants reported a range of benefits from using the CardioWall regularly during The Brightwell exercise classes.
- Additional Benefits of the CardioWall**
- 27% of participants feel the CardioWall helped them achieve physical health goals, whilst improving strength.
 - 20% of participants are more encouraged to participate in group activities, and feel more independent.



Berg Balance Scale (Non-seated Participants)



“ The main benefits would be that people love the interaction, people love to have fun, and that's how they see it. That's what I like about it because sometimes when you ask people to do any exercise, they're like "It's going to be tiring", but when I ask people to do the CardioWall, they're up for it and say "Yes, I want to have a go!". - Amrik Sidhu, Lead Neuro-Physiotherapist

Conclusion

This pilot study provided valuable insights into the **effectiveness of combining traditional exercises with gamification** using the **CardioWall**. **Participants reported a reduction in pain, stress and anxiety, and Modified Fatigue Impact Scores improved (lowered)**, as well as **improved balance**. This indicates a better ability to cope with day-to-day symptoms of neurological conditions, and a more positive outlook. **Continuous rehabilitation** is crucial for maintaining **health and wellbeing** in individuals with **neurological conditions**. Future studies should explore **increasing the frequency of CardioWall sessions** to enhance outcomes.



References

1. Modified Fatigue Impact Scale (MFIS), National MS Society, 2024.
2. Berg Balance Testing, National Library of Medicine, 2023.
3. National Institute for Health and Care Excellence (NICE), Rehabilitation for Chronic Neurological Disorders, NICE Guideline Scope, 2021.
4. Oxford Academic, Management of Patients with Chronic Neurological Problems in the Community, 2020.
5. BMJ, Stroke Rehabilitation in Adults: Summary of Updated NICE Guidance, 2019.
6. Journal of NeuroEngineering and Rehabilitation, Rehabilitation Technologies and Interventions for Individuals with Spinal Cord Injury, 2020.
7. Journal of NeuroEngineering and Rehabilitation, Factors that Influence the Adoption of Rehabilitation Technologies, 2021.
8. Neurological Sciences, New Approaches to Recovery After Stroke, 2022.

Credits
Project supported by Alex Reynolds (Physio Assistant), Lauren Iles (Physio Assistant), and Harry Stevens (Co-CEO at Rugged Interactive).