Project Title

Examining the Feasibility and Effectiveness of Circuit Training in Patients with Traumatic Brain Injury (TBI)

Project Lead and Members

Project lead: Amelia Ho Chiu Yi

Project members: Ruth Ong Choo Li, Soh Yan Ming

Organisation(s) Involved

Tan Tock Seng Hospital Rehabilitation Centre

Healthcare Family Group Involved in this Project

Allied Health

Specialty or Discipline (if applicable)

Physiotherapy

Project Period

Start date: Dec 2020

Completed date: April 2021

Aims

This study examines the effectiveness of circuit training on balance, gait speed, endurance and energy expenditure of walking in patients after TBI.

Background

Relative to stroke patients, patients with traumatic brain injury (TBI) often present with behavioural and cognitive impairments, making the implementation of circuit class in such populations challenging.

Methods

A retrospective chart review of twelve inpatients with TBI who had undergone circuit training at TTSH Rehabilitation Centre - three Ranchos Level V, five Ranchos Level VI, and four Ranchos Level VII.

There were three circuit stations of ten minutes each, namely sit to stand, tandem walking, and treadmill training. Patients underwent training four days a week in a ratio of two staff to five patients.

Balance, gait speed, endurance and energy expenditure of walking were evaluated using the Berg Balance Scale (BBS), ten metre walk test (10MWT), six-minute walk test (6MWT), and Physiological Cost Index (PCI) respectively.

Results

All patients demonstrated statistically significant improvements in balance($p<0.005$), gait speed ($p<0.05$), and endurance ($p<0.005$). Five patients achieved the minimal clinically important difference (MCID) of six points for BBS, seven achieved the MCID of 0.16 metres per second for 10MWT, and seven achieved the MCID of 34.4 metres for 6MWT. A statistically significant improvement was also seen in PCI ($p<0.05$), with three patients achieving the MCID of 0.52 beats per metre.

Lessons Learnt

The presence of continual care and redesign of current work processes allows for improved therapy efficacy, time saving and ultimately cost savings.

Conclusion

Preliminary results support the feasibility of circuit training in TBI patients despite their cognitive and behavioural presentations. Further, this review illustrates the effectiveness of circuit training in improving balance, gait speed, endurance and energy expenditure in TBI patients, particularly Ranchos Level V and above.

Additional Information

This project attained the Merit award (Category: SHBC Best Poster Award (Allied Health)) at the Singapore Health & Biomedical Congress (SHBC) 2021

Project Category

Care & Process Redesign, Value Based Care, Productivity, Time Saving, Cost Saving, Manhour Saving

Keywords

Traumatic Brain Injury, Circuit Training, Functional Outcome

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Table 1: pre and post circuit outcome measures
Data are presented as median (interquartile range)

Outcome measure	Pre circuit	Post circuit	*p*-value	Effect size
Berg Balance Scale	43.5 (34.0 – 48.0)	50.5 (45.0 – 53.8)	0.002*	0.473
10-metre walk test (m/s)	0.735 (0.578 – 0.973)	0.975 (0.780 – 1.29)	0.050*	0.303
6-minute walk test (metres)	260 (211 – 296)	384 (287 – 454)	0.005*	0.433
Physiological Cost Index (bpm)	0.32 (0.258 – 0.710)	0.2 (0.130 – 0.333)	0.027*	0.450

Key: m/s: metre per second; bpm: beats per metre; IQR: interquartile range; *: $p < 0.05$.

DISCUSSION & CONCLUSION

Preliminary results support the feasibility of circuit training in TBI patients despite their cognitive and behavioural presentations. Further, this review illustrates the effectiveness of circuit training in improving balance, gait speed, endurance and energy expenditure in TBI patients, particularly Ranchos Level V and above.