Duke University School of Medicine

Doctor of Physical Therapy

The Efficacy of Treadmill Training on Balance Dysfunction in Individuals with Chronic Stroke: A Systematic Review

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Background

- *Stroke* is a leading cause of long-term disability worldwide.
- Historically, treadmill exercise interventions for chronic stroke have been gait-specific.
- ***Reverse transfer*** states that repetitive practice of walking tasks improves non-walking functional tasks (i.e. balance).
- Limited research has addressed the efficacy of task-specific **locomotor training on balance dysfunction.**

http://www.living4aihealthyheart.com/s-what-happens-during-a-stroke/

Purpose

To determine the effect of treadmill training (TT) interventions on balance dysfunction in individuals with chronic stroke.

Methods

- A systematic literature search of PubMed, EMBASE and CINAHL was performed. Eligible trials were published between 2007 and 2016.
- Methodological quality was assessed using PEDro criteria.

Inclusion Criteria:

a) individuals with stroke;
b) effects of TT were used and compared to controls;
c) outcomes included ≥ 1 of the following: postural control/instability or deficits in balance;
d) randomized control trial (RCT) methodology;
e) article in English.

Exclusion Criteria:

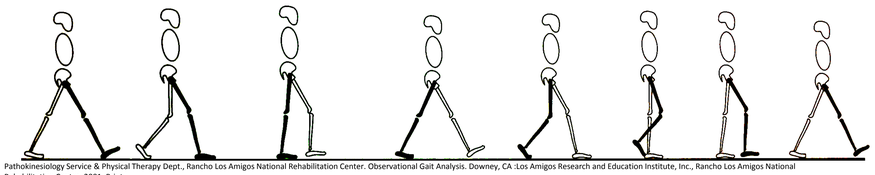
a) participants < 18 years old;
b) Stroke onset within six months;
c) statistical analyses not performed for within and/or between group comparisons.

Results

- Eight studies were included in the qualitative analysis.
- Seven RCTs deemed *higher quality* (PEDro, 2015)
- 275 individuals; mean age: 54.8 yrs; onset: 6.3-70 mos
- Studies differed in TT implementation and use of adjunctive treatments.
- **TT was as effective as conventional physical therapy treatment in improving balance measures**.

Article	Intervention		Balance Outcome Measure	Results (p<0.05)
	Experimental Group	Control Group		
Chen et al, 2014	Circular belt TT, general exercise	TT, general exercise	BBS, LOS	⊙◆★ ★
Cho et al, 2015	TT with FES on GM + TA or TA only	TT	BBS	⊙★
Choi et al, 2015	Cognitive motor dual-task with random auditory cue	TT	Sway velocity	⊙◆★
Globas et al, 2012	TT	Conventional PT	BBS	★
Hwang et al, 2015	TT with tilt-sensor FES and WalkAide System	TT with tilt-sensor FES and WalkAide System in "off" position	BBS	⊙◆★
Kang et al, 2016	Nordic TT	TT	BBS	⊙◆★
Kim et al, 2011	TT	Lower extremity strengthening	BBS	⊙◆
	Both received NDT and FES for study duration			
Kim et al, 2015	TT eyes-closed on Gait Trainer	TT eyes-closed on Gait Trainer	LOS	⊙◆★
	Both received conventional PT for duration			

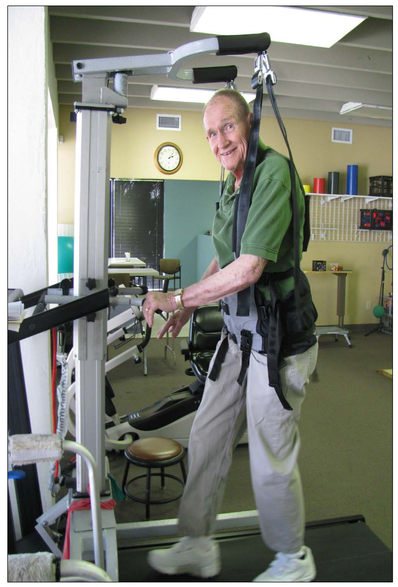
Note: BBS = Berg Balance Scale; LOS = measures of Limits of Stability; TTFES = TT with functional electrical stimulation; GM = gluteus maximus; TA = tibialis anterior;
Results Interpretation: ⊙Experimental group p < 0.05, ◆ Control group p< 0.05, ★Intergroup p< 0.05

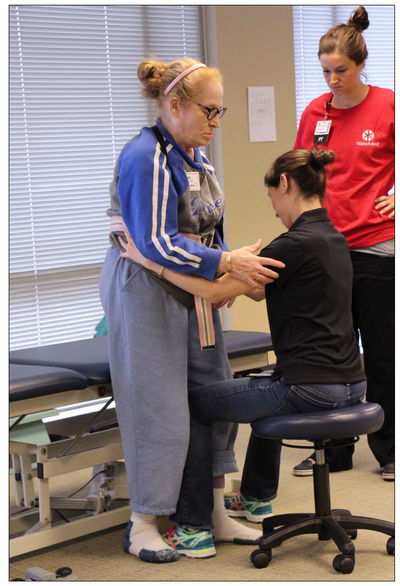


Pathokinesiology Service & Physical Therapy Dept., Rancho Los Amigos National Rehabilitation Center. Observational Gait Analysis. Downey, CA :Los Amigos Research and Education Institute, Inc., Rancho Los Amigos National Rehabilitation Center, 2001. Print.

Conclusions

- Moderate evidence exists in favor of TT interventions in balance and stroke rehabilitation programs.
- With TT, training intensity may be a more critical factor than specificity of training.
- Arm swing amplitude, cognitive demand & motor unit recruitment may be used to increase intensity.
- Critical parameters for "reverse transfer" of TT interventions have not yet been defined.





https://swanrehab.wordpress.com/category/stroke-rehabilitation/

Clinical Relevance

- Improvements in objective balance measures exist as "off-label" benefits to gait-specific TT.
- Clinicians utilizing TT should incorporate objective measures of balance to assess for skill transference.

Acknowledgements / References

We would like to thank Leila Ledbetter, MLIS for her assistance in developing the search strategy and Chad Cook, PT, PhD, MBA, FAAOMPT for his expertise and assistance in directing our research methodology.

Hornby, T.G., Straube, D.S., Kinnaird, C.R, et al. Importance of specificity, amount, and intensity of locomotor training to improve ambulatory function in patients post-stroke. *Topics in Stroke Rehabilitation.* 2011; 18(4):293-307.