Predictors of Treatment Gains in Clinical Gait and Balance Outcomes After Treadmill Oscillation Walking Training in Stroke

Wenxi Zhang[1], Jason Tsai[1], Keng-Hung Shen M.D., Ph.D.[1], Hao-Yuan Hsiao Ph.D.[1]
[1]Department of Kinesiology and Health Education, University of Texas at Austin

The University of Texas at Austin
Kinesiology and Health Education
College of Education

Introduction

Stroke often leads to long-term walking and balance impairments, reducing independence and quality of life[1].

Treadmill Oscillating Walking (TOW) training enhances weight shifting and balance through lateral surface movements. As a result, participants showed improvements in Berg Balance Scale **(BBS, 80%),** Dynamic Gait Index **(DGI, 93.3%),** Self-Selected Walking Speed **(SSWS, 80%),** and Fastest Walking Speed **(FWS, 86.7%)**.

However, individual responses varied, highlighting the need to identify **baseline predictors** and understand the **mechanisms driving treatment outcomes**[2].

Aim & Methods

15 individuals post stroke (59 ± 12 years, 7 females, average time post-stroke: 4.84 ± 4.82 yrs) completed 18 sessions TOW training over 6 weeks.

Pre- and post-training assessments included **balance** (BBS, DGI), **gait speed** (SSWS, FWS, 6-Minute Walking Distance [6MW]), and **strength** (bilateral isometric hip/knee torques, Rate of Force Development [RFD]).

Stepwise linear regression analysis was performed for both Aim 1 & 2.

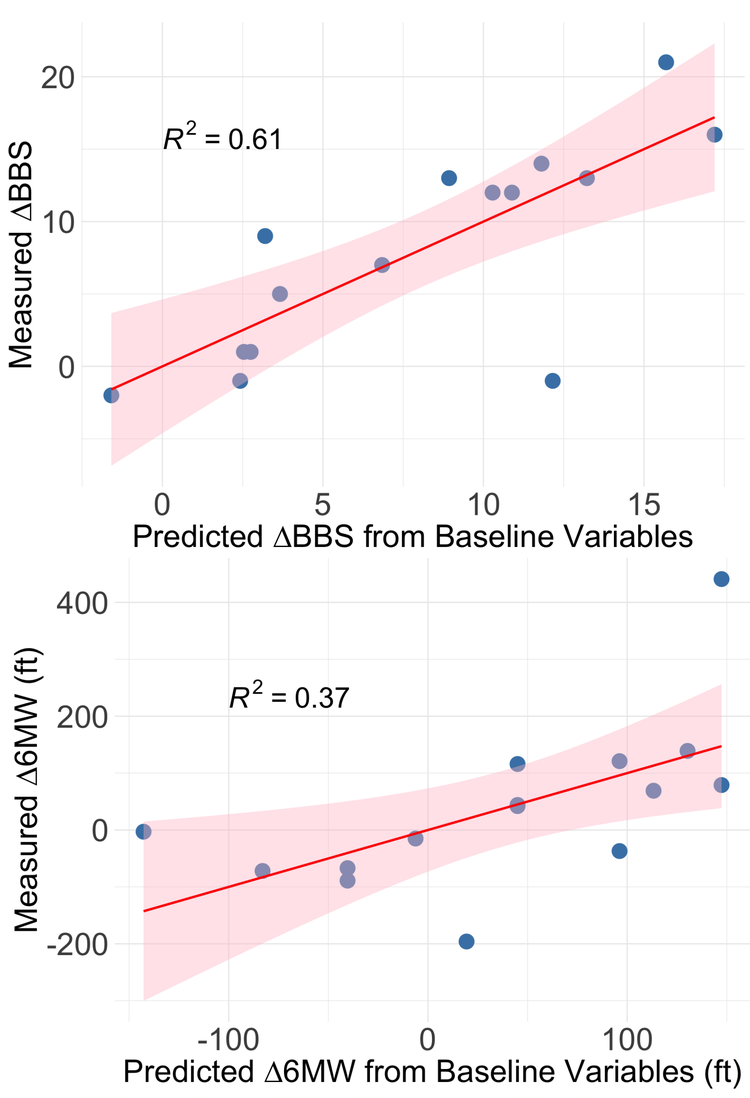
- **Aim 1:** Identifying baseline predictors of changes in clinical outcomes.
- **Candidate variables:** Age, sex, baseline BBS, DGI, 6MW, SSWS, FWS, bilateral maximal hip/knee torques, and RFDs
- **Aim 2:** Assessing if strength changes explain changes in clinical outcomes.
- **Candidate variables:** Changes in bilateral hip/knee torques and RFDs post-intervention

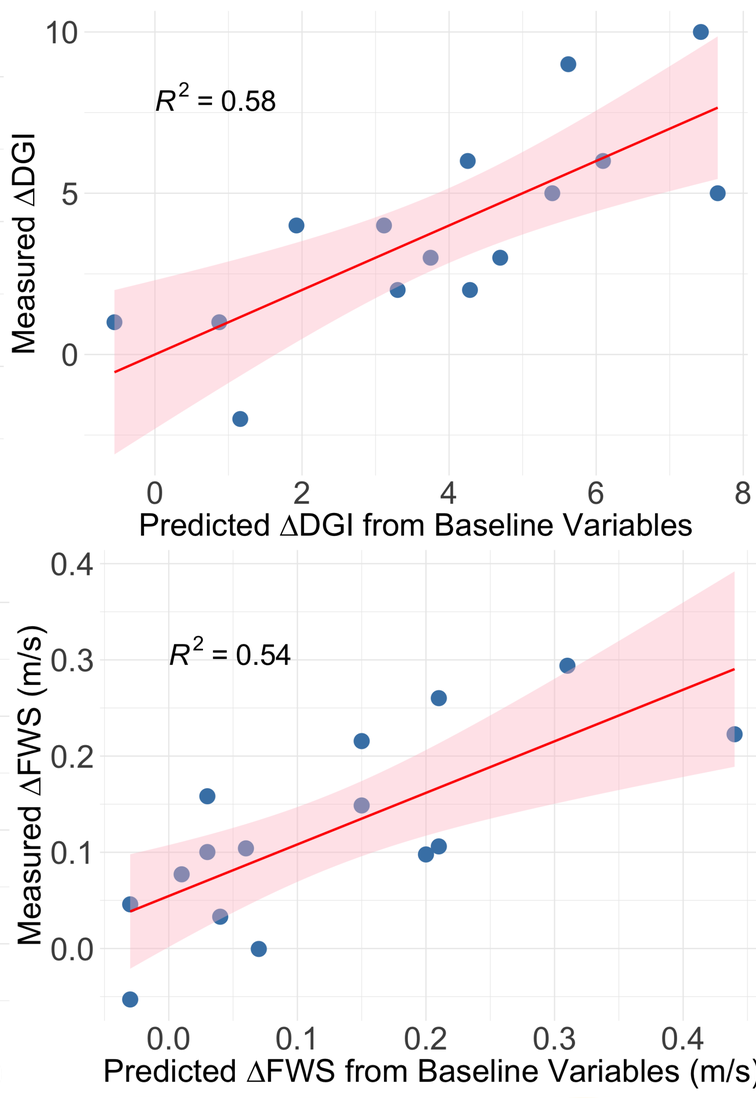
Results & Figures

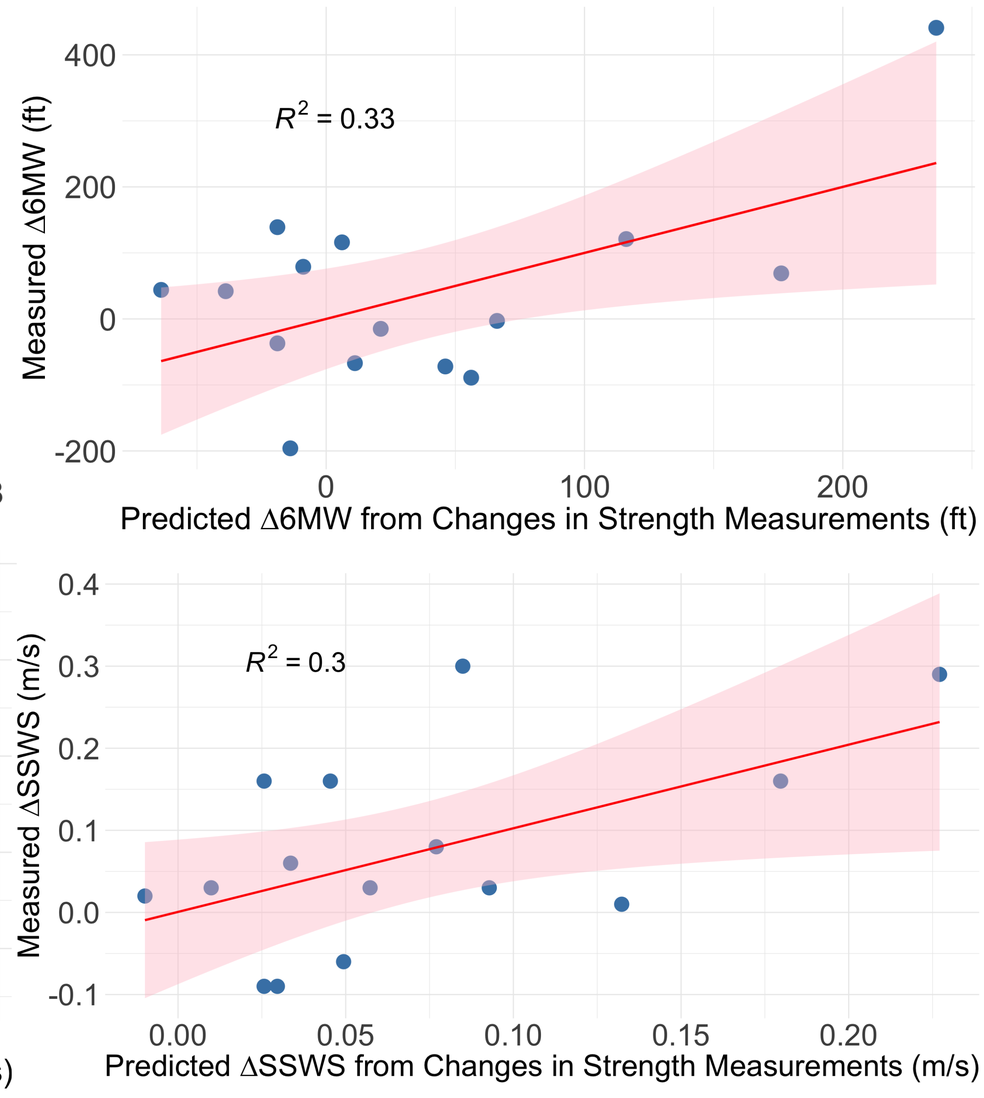


Dependent Variable	Predictor	Adjusted R^2	β	p-value
ΔBBS	**1.Baseline BBS** 2.Baseline SSWS	.546	-.91 .46	.003
ΔDGI	**1.Baseline DGI** 2.Baseline_6MW	.514	-1.06 .67	.005
Δ6MW	**1.Baseline BBS**	.317	.605	.017
ΔFWS	**1.Baseline BBS** 2.Baseline NP Knee Torque	.463	.72 -.52	.01

Dependent Variable	Predictor	Adjusted R^2	β	p-value
Δ6MW	**ΔParetic Hip Torque**	.280	.575	.025
ΔSSWS	**ΔParetic Hip Torque**	.253	.553	.032







Conclusion

Baseline BBS is the main predictor for ΔBBS, Δ6MW, and ΔFWS, emphasizing its importance in the future application of TOW intervention.

TOW training boosted balance performance in individuals with lower baseline balance scores and improved walking speed in those with better baseline balance scores.

Changes in paretic hip abductor torque after TOW predicts Δ6MW and ΔSSWS, highlighting the importance of targeting hip abductor strength in gait rehabilitation post stroke.

Acknowledgement

NIH 5R21HD107461

References

[1] Grau-Pellicer, M. (2019). *Topics in Stroke Rehabilitation*, *26*(5), 349–358.
[2] Dobkin, B. H. (2014). *Journal of rehabilitation research and development*, *51*(1), 39–50.