

Objective(s): To compare the forces required to start and stop a manual wheelchair at different speeds with and without a powered mobility add-on (i.e., a SmartDrive).

Design: Cross-over.

Setting: Rehab research laboratory.

Participants: 20 able-bodied adults.

Interventions: Participants wheeled on a treadmill using a manual wheelchair with and without a Smart drive attached at 3.5 and 6km/hr.

Main Outcome Measure(s): Stopping distance, peak braking force as measured using a Smartwheel while wheeling on a treadmill at two speeds (3.5 and 6 km/hr). Peak force and speed for first push on level grounds for soft, medium and hard pushes.

Results: Participants had significantly shorter stopping distances using a SmartDrive ($p < 0.0001$). Participants also used significantly less force to reach a full stop at both speeds ($p < 0.02$). Participants used significantly greater force and reached higher peak velocities without the SmartDrive on first pushes. There was also a significant gender effect on push strength: males used greater forces and reached higher speeds compared to females with and without the SmartDrive.

Conclusions: We hypothesized that the added weight and power of the SmartDrive would cause participants to have longer stopping distances, however the opposite results were shown. The added mass of the device may help individuals stop quicker and with less force. Contrastingly, participants were able to achieve faster speeds with a single push without the SmartDrive, which may be due to the additional rolling resistance of the drive wheel. Therefore, the SmartDrive may be a viable option for wheelchair users before committing to a power wheelchair.

Key Words: Wheelchair, SCI, Power assist technology, Biomechanics

Disclosure(s): The authors have nothing to disclose. SmartDrive was purchased through a grant; it was not provided by the company.

Research Poster 4112

Effects of Volitional Spine Stabilization on Lifting Task in Recurrent Low Back Pain Population

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Objective(s): To examine the influence of volitional preemptive abdominal contraction (VPAC) and recurrent low back pain (rLBP) on pelvic and trunk mechanics, as well as neuromuscular control, during a symmetric lift task.

Design: crossover mixed design.

Setting: University Biomechanics Laboratory.

Participants: Thirty-seven healthy and 35 rLBP volunteer.

Interventions: A VPAC.

Main Outcome Measure(s): Dependent variables included 3D trunk, pelvic, and hip joint angle and EMG linear envelop magnitude for lower extremity and trunk muscles during symmetric weighted box lifting trials with and without VPAC to a 1 meter height table.

Results: The VPAC altered joint kinematic and muscle activity in rLBP and healthy individuals during symmetric lifting. A significant two-way interaction effect was observed for the semitendinosus activity in final position. The VPAC increased external oblique (EO) muscle activity, reduced erector spinae (ES), reduced multifidus muscles activity at initial position, reduced multifidus muscle activity at final position, greater trunk flexion angle, greater trunk side flexion angle, decrease pelvis obliquity angle at final position, and greater hip flexion angle at initial position. Recurrent LBP subjects presented reduced EO, gluteus maximus, and greater multifidus muscles activity at initial position, reduced EO, greater ES muscle activity and greater pelvis posterior tilt angle at final position.

Conclusions: Our results provide evidence that a VPAC strategy that is initiated during symmetric lifting decreases exposure to biomechanical factors that can contribute to lumbar spine injury. Incorporating VPAC during dynamic stressful activities appears to help improve sensorimotor control and facilitate positioning of the lower extremity and the pelvis, while protecting the lumbar spine. Clinicians can use this information

when designing neuromuscular control training programs for people who have rLBP to improve lower extremity and spine control and spine stability thus potentially decreasing injury risk.

Key Words: Low back pain, Muscles, Spine, Clinical biomechanics

Disclosure(s): None Disclosed.

Research Poster 4115

Whole Body Vibration on Quality of Life in Spinal Cord Injury: Single Subject Research Design

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Objective(s): To explore the effects of regular use of whole body vibration (WBV) on function and quality of life in people with spinal cord injury (SCI). We hypothesized that spasticity, bowel management, pain measures, balance, and walking/wheeling would be improved following a five-week intervention involving weekly sessions of WBV.

Design: This study used a single subject research design (SSRD), A-B-A-B model.

Setting: University rehab research lab.

Participants: Both participants had a chronic SCI, experienced spasticity, used a wheelchair for daily mobility, and were able to use the vibrating platform either standing or in their wheelchair. Participant #1 was a 38 yr. old male with an incomplete C7 injury while participant #2 was a 46 yr. old female with a complete T5 injury.

Interventions: WBV exposures of 45 seconds in duration 2-3 times per week for 5 weeks. Vibrations were between 30-50 Hz with a maximum of 15 minutes of vibration per session. These were repeated during the B phases of the study.

Main Outcome Measure(s): Spasticity (Spinal Cord Injury Spasticity Evaluation Tool, Penn Spasm Frequency Scale), Walking/Wheeling (Six Minute Push/Walk Test, Timed Up and Go test), Balance (Berg Balance Test), Pain (Brief Pain Inventory), and Neurogenic Bowel Function (Neurogenic Bowel Dysfunction Score).

Results: WBV intervention for 5 weeks resulted in statistically significant improvements in spasticity, walking, and balance for both B phases for participant #1, while there was no improvement for participant #2 for any outcome measure.

Conclusions: WBV has the potential to improve spasticity and which may improve quality of life measures in SCI subjects. Further research is necessary determine who it might work for and who it would not.

Key Words: Spinal cord injury, Vibration, Spasticity

Disclosure(s): None Disclosed.

Research Poster 4117

Developing a Measure of Evidence-Informed Professional Thinking

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Objective(s): To develop a measure of the habits of mind and activities related to evidence-informed clinical thinking for occupation, physical, speech, and other therapies.

Design: Survey with psychometric analyses. An extensive literature review and panel of experts identified a set of 158 items. Rasch analysis was used to analyze the data in order to assess the dimensionality and interval-level structure of items, that is, to choose and calibrate items to construct an optimal measure. The identified person measures were used to assess the relationship to criterion items.

Setting: Clinics nationwide.

Participants: 107 occupational therapists, physical therapists, speech and language pathologists, and clinical social workers.

Interventions: N.A.

Main Outcome Measure(s): Psychometrically valid, equal-interval measure of evidence informed professional thinking constructed using Rasch analysis, with additional analysis of correlations with criteria including knowledge of evidence-based practice, behaviors, and years of experience.