

# Neurology

## Poster Presentations

### **32539: The Fukuda Stepping Test is influenced by stepping height and by a concurrent cognitive task**

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**Background/Rationale:** The Fukuda Stepping Test (FST) is used to assess patients with vestibular disorders. It consists in stepping in place without vision for 50 steps. The FST outcome is likely influenced by the height at which the knees are lifted and by distractions, but these effects have not yet been established.

**Research Objectives:** To compare the FST outcome (unperceived linear and angular body displacements) between comfortable and high stepping, and to determine the influence of a concurrent cognitive task on the FST outcome in healthy participants.

**Relevance:** Specific instructions regarding knee height and careful control of distractions may be needed when patients perform the FST to ensure unbiased results.

**Methods:** This study is a repeated measures within-subject design. Sixteen healthy participants (mean 22 years; 12 women and 4 men) performed the FST under 4 conditions: at comfortable stepping height (approx. 45° hip flexion) and at high stepping (approx. 90° hip flexion) with or without a concurrent continuous digit counting task. Antero-posterior (A-P), medio-lateral (M-L) and rotational body displacements were recorded with a 3-D motion analysis system (Vicon512™). Comparisons among conditions were made with the Friedman test and Wilcoxon Signed Rank tests.

**Results:** A-P and M-L displacements were significantly larger at high than at comfortable stepping height ( $p < .0125$ ). A-P displacements were significantly smaller with the concurrent cognitive task than without ( $p < .0125$ ). No significant difference among condition was found for body rotation.

**Conclusion:** Stepping height and a concurrent cognitive task were found to influence linear body displacements during the 50-step FST.



## 38508: Manual wheelchair users gradually face fewer challenges in postural stability and control with increasing rolling resistance while maintaining a rear-wheel wheelie

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**Background:** Teaching manual wheelchair users to perform and maintain wheelchair wheelies over surfaces of progressively decreasing rolling resistances is expected to facilitate the acquisition of this advanced wheelchair skill in clinical practice. However, limited scientific evidence supports this clinical approach.

**Purpose:** To compare postural stability and control requirements when maintaining a stationary wheelie on surfaces having different rolling resistances.

**Relevance:** This study will provide the first evidence to confirm or not the relevance of this clinical approach by physiotherapists to facilitate skill acquisition.

**Methods:** Eighteen manual wheelchair users with a spinal cord injury randomly performed and maintained four 30-second wheelies on four surfaces having different rolling resistances: natural hard floor (NAT), low-density foam (LOW), moderate-density foam (MOD), and rear wheels blocked by wooden blocks (HIGH). A large instrumented force plate was used to continuously record the centre of pressure. To quantify postural stability, time- and frequency-domain centre of pressure measures were computed and compared across all four rolling resistances.

**Results:** All resultant time-domain measures confirmed increased postural stability from NAT to LOW and from MOD to HIGH rolling resistances. Most time-domain measures confirmed a shift in postural control from an anticipatory to a predominantly reactive strategy, especially from NAT to LOW and from MOD to HIGH rolling resistances.

**Conclusion:** Blocking the rear wheels is recommended when physiotherapists first teach this advanced wheelchair skill to manual wheelchair users. Rapid progression on foam and natural surfaces is advocated to refine learning and enhance proper postural control strategies.

## 38990: Pilates as a Primary Treatment Modality in a Patient with a Glioma: A Case Study

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**Background/rationale:** Pilates has been used effectively in improving balance, coordination and core stability however its utilization in a clinical setting remains limited. The purpose of this case study was to explore the effectiveness of Pilates when used as the sole modality for a patient with a glioma.

**Research Question:** What are the effects of using Classical Pilates as a treatment modality in improving balance, function and quality of life, for a patient with a Glioma?

**Relevance:** Pilates as a modality can improve balance and function for neurological patients. It promotes active participation; empowering the patient rather than relying on passive treatment techniques to improve their function and/or decrease pain.

**Methods:** 43yo male with a Glioma was enrolled in a 3-month program comprising 20 x 1hr Pilates sessions. The Berg Balance Scale (BBS) and FACT-G (Version 4) were administered pre- and post-intervention. Video/ photography was used to compare quality and precision of specific movements prior to and throughout the study.

**Results:** BBS Score improved from 26/56 at baseline to 43/56 in the final session. FACT-G Score improved from 39 to 49. Quality, coordination of movements and core strength also improved.

**Conclusion:** Pilates as a primary treatment modality resulted in improvements in balance, coordination, core strength, and quality of life. Further investigation on its use with neurological patients should be explored.

## 39081: Understanding the causes of step length changes after repeated exposure to a split-belt treadmill gait protocol post-stroke: a pilot study

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**Background:** Step length (SL) asymmetry post-stroke is considered as particularly resistant to conventional gait therapy. The use of a split-belt treadmill with asymmetrical belt speeds revealed promising effects when the short step is trained on the faster belt.

**Purpose:** This pilot study investigated the feasibility and effects of repeated exposure to split-belt treadmill walking on gait ability and biomechanics post-stroke.

**Relevance:** Preliminary data are required to support the relevance of large-scale randomized clinical trials. This study allowed better understanding of the immediate and medium-term effects of repeated split-belt treadmill walking.

**Methods:** Twelve individuals with a first cerebral stroke presenting initial SL asymmetry (ratio=1.10-2.05; 10 males; mean age 52 (SD 9.3 years); mean time post-stroke 23 (SD 24.7 months); 9 left-sided stroke) were included. They were trained during 6 sessions of split-belt treadmill walking using an error-augmentation protocol. Clinical and 3D laboratory outcomes allowed the assessment of training effects.

**Results:** The training resulted in a reduction in SL asymmetry during walking over ground retained over one-month post-training ( $p=0.002$ ) with improvement in gait speed ( $p=0.009$ ). Changes in joint moments were particularly pronounced on the side trained on the fast belt and reached significance when comparing pre-training to follow-up data ( $p\leq 0.037$ ). No changes were significant in average muscle activity with high inter-participant variability.

**Conclusion:** Improvement in SL symmetry is achieved by a variety of biomechanical and muscle activity changes in a group of individuals post-stroke. The side trained on the fast belt, and more specifically the plantarflexors, seem to be among the important underlying causes to SL symmetry improvements.

### **39114: A starting point to optimize physical activity implementation in the management of Multiple Sclerosis**

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**Background/Rationale:** Physical activity (PA) is the most important non-pharmaceutical intervention for persons with Multiple Sclerosis (PwMS). Less than 20% of PwMS engage in sufficient amounts of PA to accrue health benefits. PA promotion is effectively supported when combined with behaviour change strategies (BCS). However, this is not routinely done and perhaps attributed to health care professionals' (HCP) lack of understanding and confidence in applying BCS.

**Purpose/Research Objectives:** To increase our understanding of current practice and perspectives of Saskatchewan HCP with respect to their use of BCS to promote PA among PwMS.

**Relevance:** Physiotherapists are optimally positioned to facilitate PA for PwMS. Future interventions based on the current needs and perspectives of HCP will enhance applicability, minimizing knowledge-practice gaps and maximizing clinical implementation.

**Methods:** Semi-structured focus groups were conducted with physical and occupational therapists, nurses and physicians (n=31) working with PwMS in Saskatchewan. Inductive thematic analysis, triangulation and member checking were used. Data were coded individually by three researchers, who then collaboratively developed themes.

**Results:** Five main themes were established - 1) Prescribing, promoting and impacting wellness with PA; 2) Coordinating communication and continuity in practice; 3) Time, access and relevant care; 4) Underserved population, and 5) Reconciling perspective, theory and practice. These themes highlight the current limitations and priorities of participants.

**Conclusions:** HCP want more information on applying BCS and value PA, but due to acute and reactive health care system environments, cannot prioritize this in practice. Systems-level change is needed to support consistent and effective use of BCS for PA promotion for PwMS.

### **39130: The effects of a 12-week strength training program on skeletal muscle impairments and physical limitations in men with myotonic dystrophy type 1**

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**Background/rationale:** Myotonic dystrophy type 1 (DM1) is a genetic multisystemic degenerative disease and represents the most prevalent myopathy in adults. Skeletal muscles are particularly affected, as demonstrated by muscle weakness and atrophy experienced by affected people, which limit their social participation.

**Purpose/research objectives:** The aim of this project is to determine the effects of a 12-week strength training program on skeletal muscle impairments and physical limitations in men with DM1.

**Relevance:** Strength training has been shown to be safe in this population, but it remains unknown if it can trigger muscle hypertrophy process, thus slowing or reversing the significant muscle impairments that characterize this disease.

**Methods:** In this before-after study, a 12-week strength training program (twice a week) of 6 to 8 maximal repetitions (RM) of five different lower limb exercises was completed by 11 men with DM1. The evaluation included: 10 meter walk test (comfortable and maximal speed), 30 second sit-to-stand test, quantitative muscle strength assessment of knee extensors muscle group, 1-RM test for all exercises and an interview about perceived changes.

**Results:** Results showed significant maximal muscle strength increases as well as improvement in all functional tests ( $p < 0.05$ ). Patients also reported many positive changes after the training program such as an improved confidence in their legs and that they had ceased falling.

**Conclusion:** Many positive changes have resulted from this training program showing that a well standardized strength training is an efficient and promising treatment option to reduce skeletal muscle impairments and physical limitations in people with DM1.

### **39172: Effects of gait perturbation training on dynamic balance in individuals with moderate-to-severe traumatic brain injury**

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**Background:** Individuals with traumatic brain injury often present with balance problems associated with a decrease in their social participation. An innovative approach consists in the use of perturbations on a split-belt treadmill to improve dynamic balance.

**Purpose:** Quantify the effects of a training program including perturbations on a split-belt treadmill on dynamic balance, walking speed, balance confidence and social participation in individuals with traumatic brain injury in social integration rehabilitation phase or at a chronic stage.

**Relevance:** This promising approach (1) has not been quantified or formally assessed and is not used clinically in social integration rehabilitation phase.

**Methodology:** Seven individuals with moderate-to-severe traumatic brain injury participated in six training sessions on a split-belt treadmill with self-perturbations (head movements, turns, cognitive task) and unexpected perturbations (stop-and-go, speed increase or decrease of one treadmill belt). The Mini-BESTest, Community Balance & Mobility Scale, comfortable and fast

walking speed, Reintegration to Normal Living Index and Activity-Specific Balance Confidence Scale were measured twice before and after the intervention.

**Results:** Preliminary results indicate a statistically significant improvement of 2.1 (1.5)/28 at the Mini-BESTest and 7.0 (6.9)/96 at the Community Balance and Mobility Scale. No significant change in speed, balance confidence and social participation were observed. A learning effect was observed between the two pre-intervention assessments.

**Conclusions:** This approach seems promising in balance reeducation with individuals with moderate-to-severe traumatic brain injury.

**Reference:** (1) Mansfield A et al. Does perturbation-based balance training prevent falls? Systematic review and meta-analysis of preliminary randomized controlled trials. *Phys Ther* 2015 May;95(5):700-9.