

## CSM 2019 Poster Abstracts

**TITLE:** Multi-modal Physical Therapy in Hispanic Older Adults With Moderate Knee Osteoarthritis: A Pilot Study Evaluating Feasibility and Impact on Physical Performance

**AUTHORS (FIRST NAME, LAST NAME):** Amy Gladin<sup>1</sup>, Shiyun Zhu<sup>2</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** Hispanic Americans (HAs) experience more pain and mobility deficits associated with knee osteoarthritis(OA). The prevalence of both knee OA and older HA population are predicted to rise dramatically. The Agency for Research and Healthcare Quality has deemed HAs a priority population to work toward identifying and closing health care disparity gaps. There is moderate evidence that lower extremity strengthening, manual therapy and self-management training improve pain and physical performance in people with knee OA. There is sparse evidence evaluating physical therapy (PT) for HAs with knee OA. We propose a pilot prospective trial implementing a multimodal high intensity targeted strength training, manual therapy and self-management education intervention to evaluate feasibility and impact on physical performance and health related quality of life (HrQOL) in HAs with moderate knee OA. HAs receive total knee arthroplasty (TKA) at a reduced rate versus non-Hispanic Whites. If this trial is feasible and shows promise for effectiveness, it may warrant further testing as a prehabilitation program for HAs prior to TKA.

**Number of Subjects:** 20

**Materials/Methods:** We recruited Spanish speaking adults from Kaiser Permanente San Francisco. Participants attended 10 PT sessions over 8 weeks, then 4 weekly phone calls to evaluate for adherence to exercise. The intervention was led in Spanish and included progressive primarily open-chain quadricep and gluteal strengthening, progressive cycling, manual therapy and self-management training. Baseline and post testing outcomes were: isometric quadriceps strength, Timed up and go (TUG), six minute walk (6MW), five times sit to stand (5TSTS) and the Spanish version of the Western Ontario McMaster University Osteoarthritis Index (WOMAC). Feasibility was evaluated by measuring recruitment, retention and adherence to the clinic and home exercises.

**Results:** We recruited 20 adults and retained 75%. Participants were age 62.9 (8.01) and BMI was 30.3. All participants had radiographic knee OA KL 2-3 and 4 participants had KL-4. Average adherence to clinic visits was 71.2% and overall adherence to exercising 3 days/week was 3.65 (1.46) days per week (121%). TUG improved by -2.0 (4.21, p=.07) seconds and 6MW improved by 50.05 (100.3, p=.06) meters. Quadriceps and 5TSTS did not improve. HrQol/WOMAC improved significantly 15.89 (95% CI [5.32, 26.45], p<.05).

**Conclusions:** Multimodal physical therapy is feasible and demonstrates promise in improving physical performance and HRQol in a cohort of older HAs with moderate knee OA. The proposed intervention warrants further modification and testing to evaluate for effectiveness as a pre-habilitation treatment for HAs awaiting TKA.

**Clinical Relevance:** HAs are adherent to exercise, clinic visits and retention is good. Despite lack of improvement in quadriceps strength, gait endurance and HrQol improve after multimodal physical therapy.

## CSM 2019 Poster Abstracts

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**TITLE:** Usefulness of Lower Extremity Muscle Strength Thresholds for the Detection of Functionally Independent Older Adults at Risk for Mobility Disability

**AUTHORS (FIRST NAME, LAST NAME):** Moshe Marko<sup>1</sup>, Vicki LaFay<sup>2</sup>, Christopher G. Neville<sup>3</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** Many apparently independent older adults modify daily tasks.<sup>1</sup> Task modifications, a symptom of pre-clinical disability syndrome<sup>2</sup>, is a consistent, strong, independent predictor of future mobility disability.<sup>3</sup> Clinically intuitive, easily measured “biomarkers” associated with task modifications offer quantifiable treatment targets for prevention of age-related functional limitations.<sup>4,5</sup> The primary purposes of this study were: (1) examine net lower extremity (LE) muscle performance (NETforce) differences between people who modify daily task (TM) and those who do not (NTM), (2) identify functionally relevant isometric and isokinetic thresholds of NETforces below which daily task modifications are more prevalent. Two hypotheses were tested. First, LE isometric and isokinetic NETforces would be significantly decreased in the TM group.<sup>6</sup> Second, in a population of community-dwelling older adults living independently, specific isometric and isokinetic LE strength cutoff points could each provide an independent and accurate functionally relevant indicator of a need to modify daily tasks.<sup>7</sup>

**Number of Subjects:** Fifty-three male (21) and female (32) older adults ( $76.4 \pm 5.2$  years) living independently in the community.

**Materials/Methods:** Participants were tested for task modifications and leg strength. Task modifications were assessed using a previously described task modification score (“MOD”). Twenty-six of the participants were classified as task modifiers (TM), and 27 participants were classified as non-task modifiers (NTM). A net antigravity leg force in the sagittal plane (NETforce) was calculated by summing the normalized isometric and isokinetic torques from the hip extensors, knee extensors, and ankle plantar flexors.

**Results:** Compared with the NTM group, the TM group exhibited 30.0% and 33.5% reduction in lower-extremity isometric and isokinetic NETforces, respectively. Isometric and isokinetic NETforce thresholds for task modifications were  $\leq 4.24$  and  $2.77 \text{ N}^* \text{m/kg}$  body weight, respectively. The isometric and isokinetic models both yielded sensitivity and specificity values of 74.1% and 80.8%, respectively (positive likelihood ratio=3.852, 95% confidence interval=1.699–8.735; negative likelihood ratio=0.321, 95% confidence interval=0.167–0.618). Isometric and isokinetic NETforces were significantly associated with task modifications (OR=2.50 and 2.42, respectively).

**Conclusions:** Isometric and isokinetic NETforce thresholds provide quantifiable biomarkers that discriminate community-dwelling older adults who modify daily tasks from those who do not.

**Clinical Relevance:** Daily task modifications allow older adults to continue and function independently without a sense of physical difficulty. Observed task modification predicts future mobility disability in apparently healthy older adults. Both isometric and isokinetic NETforce cutoff points may be used as independent quantifiable biomarkers to identify older adults at high and low risk of future mobility limitation.

## CSM 2019 Poster Abstracts

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**TITLE:** The Impact of High-Intensity Resistance Training on Strength, Function and Quality of Life in Older Adults Who are Pre-Frail and Frail: A Pilot Study

**AUTHORS (FIRST NAME, LAST NAME):** Justin T. Mierzwicki<sup>1</sup>, Megan Arnst<sup>1</sup>, Alicia Illis<sup>1</sup>, Eric S. Linderman<sup>1</sup>, Zoe Martin<sup>1</sup>, Anne Swokel<sup>1</sup>, Mark Swokel<sup>2</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** Frailty is a geriatric syndrome characterized by declines in strength, muscle mass, slowness of movement, fatigue, low levels of physical activity and predisposes individuals to adverse health outcomes. 6.9% of the community-dwelling adult population over the age of 65 is frail and 46.6% are pre-frail. Most resistance training intervention studies to date have studied resistances of 60-80% of 1 repetition maximum (RM). The purpose of this study was to determine if training at 90-95% of 1 RM is safe and effective in the frail and pre-frail older adult population.

**Number of Subjects:** Number of Subjects: n=10, mean 87.9 yr (SD 4.795), Montreal Cognitive Assessment (MoCA) mean 18.9 (SD 5.195).

**Materials/Methods:** Participants recruited from a local continuing care community were screened utilizing Fried's Criteria. Seven pre-frail and 3 frail individuals met inclusion criteria and completed the study. Study participants met with the investigators 2 times per week for a 6 week intervention program consisting of: dynamic warm up; mini-squats and heel raises holding dumbbells; chest press, shoulder press, elbow flexion, leg press, knee extension and hamstring curls utilizing Keiser® pneumatic weight equipment; and a dynamic cool down. Resistances were set at 90-95% of 1 RM and were increased as participants were able to perform greater than 3-5 repetitions of an exercise or reported an RPE of less than 16/20. Pre and post-intervention assessments included 5 times sit to stand, 30 second chair rise, 10 meter gait speed, 1 RM for each stated exercise, and quality of life was assessed by the Rand SF-36.

**Results:** Statistically significant improvements were demonstrated utilizing the Wilcoxon Ranked Signs Test for 1 RM of each stated exercise ( $p < 0.002$ ) and gait speed ( $p < 0.05$ ). Three participants reduced their number of frailty indicators. No statistically significant changes were noted for 5 times sit to stand, 30 second chair rise or quality of life. There were no reports of injury or participant complaints during the study.

**Conclusions:** Results suggest that a high-intensity resistance training program performed 2 times per week with loads of 90-95% of 1 RM are safe and effective in increasing strength in the frail and pre-frail older adult population. The presence of cognitive impairment, as demonstrated by our participant's mean MoCA score, does not preclude individuals from participating in and benefiting from a high-intensity resistance training program.

**Clinical Relevance:** This pilot study adds to a growing body of knowledge supporting the use of high-intensity resistance training in individuals who are frail and have cognitive impairment. It suggests that in research and in practice, we may still be artificially limiting the amount of loading resistance prescribed to our patients. A larger, controlled trial is indicated in follow-up of this study.

## CSM 2019 Poster Abstracts

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**TITLE:** The Effects of Conservative Management in the Treatment of Hallux Valgus Deformity: A Systematic Review  
**AUTHORS (FIRST NAME, LAST NAME):** Janet Hakey-Brusgul<sup>1</sup>, Danielle B. Vittone<sup>1</sup>, James Breese<sup>1</sup>, Grace Jeong<sup>1</sup>, Jenson Little<sup>1</sup>, Loren Moffitt<sup>1</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** Hallux valgus (HV) is a common foot deformity seen in the general population with an increased prevalence in the elderly (35.7%). Hallux valgus is frequently accompanied by foot pain, functional disability, and bone deformity. Surgery is the most common approach in the management of HV but is not without complications. This systematic review examined the effects of conservative management in the treatment of HV deformity.

**Number of Subjects:** 280 pooled participants

**Materials/Methods:** The databases utilized in the search included: CINAHL, MEDLINE, Military & Government Collection, SPORTDiscus; Health Source: Nursing/Academic Edition; and Physiotherapy Evidence Database (PEDro). Articles were included if published from January 2007 to May 2017, were either Randomized Controlled Trial (RCT) or Quasi-experimental design (QED), published in English and related to non-surgical intervention. The search combinations were as follows: 'hallux valgus AND physical therapy', 'hallux valgus AND therapy', 'hallux valgus AND exercise', 'hallux valgus AND therapeutic exercise', 'hallux valgus AND conservative treatment', and 'hallux valgus AND manual therapy'. The Physiotherapy Evidence Database (PEDro) scale was utilized to assess the methodological quality of the articles included in this systematic review.

**Results:** Eight (5 RCTs and 3 QED) of the 346 articles screened met the eligibility criteria. The methodological quality of the studies ranged from 2 to 8 out of 10, with an average of 5, on the PEDro scale. Conservative interventions and outcome measures varied among the articles. Conservative interventions included: taping, toe separators, splinting, orthotics, mobilization, and exercise. The outcome measures utilized included: hallux valgus angle (HVA), foot function, range of motion (ROM), gait, pain, cross-sectional area (CSA) of the abductor hallucis and balance. Taping improved HVA, VAS, gait, and function. Conflicting results regarding dynamic balance were reported. Toe separators resulted in a decrease in pain and an increase in HVA and patient satisfaction. Function and ROM improvements in addition to reduction in pain and HVA were reported with splinting. Foot orthotics decreased HVA and increased CSA. Improvements in pain, function, and ROM were demonstrated following mobilization. Exercise resulted in a reduction of HVA, pain, and increased CSA.

**Conclusions:** There is limited research examining the effects of conservative management of HV. Based on the findings of our review, there appears to be some evidence to support conservative intervention for the management of HV. Future research is needed to determine appropriate conservative management of HV.

**Clinical Relevance:** Knowledge of the most effective conservative interventions will enable best-practice management of HV, and may prevent or delay the need for surgical intervention.

## CSM 2019 Poster Abstracts

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**TITLE:** Does High Intensity Aerobic Exercise Improve Postural Control for Older Adults?

**AUTHORS (FIRST NAME, LAST NAME):** Taylin E. Watson<sup>1</sup>, Mary-Catherine Wilson-Garcia<sup>1</sup>, Michael Salvatore<sup>1</sup>, Nicoleta Bugnariu<sup>2</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** While falls are a major source of disability in the aging population, walking has been linked to reduced risk of falls for older adults.<sup>1-2</sup> Treadmill walking has even been shown to positively impact muscle-strengthening, motor control, and balance.<sup>3</sup> The purpose of this investigation was to determine if a high intensity aerobic exercise program can improve postural control in older adults.

**Number of Subjects:** To date 10 subjects between 51 and 71 years old, 7 females and 3 males have participated, enrollment is ongoing. Subjects were sedentary but otherwise healthy without any restrictions for exercise.

**Materials/Methods:** Participants completed 36, 1-hour exercise sessions, 3 times a week over 3-4 months, consisting of 40 min fast pace walk/jog, with a 10 min warm-up and cool down. A high intensity at minimum 80% max heart rate was aimed for as long as possible in each session, and intensity was progressively increased during training. Postural control was assessed at baseline (V1), mid-point during exercise training (V2) and at the end of exercise training (V3) using a dynamic balance task. A V-GAIT dual-belt treadmill was used to create surface perturbations and a 12-camera Motion Analysis system collected body kinematics. Backward surface translation perturbations inducing a forward loss of balance were presented randomly at two levels (2 m/s<sup>2</sup> and 5 m/s<sup>2</sup>). Primary outcome measures were: maximum Center of Pressure – Center of Mass (COP-COM) distance during the first compensatory step and reaction time for initiating the first compensatory step. Paired samples t tests with significance set at p<0.05 were used for analysis.

**Results:** Preliminary results show that maximum COP-COM distance during the first compensatory step increased significantly from an average of 9.87 ± 1.70 cm to 19.92 ± 2.40 cm as the level of perturbation increased. The reaction time for initiating the first compensatory step in response to the slowest perturbation decreased significantly between V1 (608 ± 63 ms) and V3 (543 ± 17 ms), with a similar trend but no significant change in response to the fastest perturbation.

**Conclusions:** Larger COP-COM distances during the first compensatory step are indicative of a robust postural control.<sup>4</sup> A high intensity aerobic consisting of walking/jogging exercise on a treadmill improved the reaction time for initiating the first compensatory step in response to balance perturbations by an average of 50 ms, which is clinically meaningful for preventing a fall.

**Clinical Relevance:** As therapists strive to keep older adults physically active, choices of exercise programs that are feasible and can provide both cardiovascular and postural control benefits, are needed since older adults who are more physically active have a decreased fall rate.<sup>1-2</sup> Emerging evidence suggests that high intensity aerobic exercise including fast walking/jogging can improve postural control in older adults.<sup>5</sup> Physical therapists should consider incorporating high intensity aerobic training for older adults with poor postural control to increase quality of life and decrease risk of falls.

## CSM 2019 Poster Abstracts

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**TITLE:** The Effects of a Positional Feedback Device on Rollator Walker Use

**AUTHORS (FIRST NAME, LAST NAME):** Kurt Jackson<sup>1</sup>, Kimberly E. Bigelow<sup>2</sup>, Courtney L. Golembiewski<sup>2</sup>, Timothy Reissman<sup>2</sup>, Harold Merriman<sup>1</sup>, John Shultz<sup>2</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** Improper walker use that includes a forward-leaning posture and pushing the walker too far forward is common among rollator walker users. Maintaining a closer distance to the walker during ambulation may improve stability and upper extremity force production necessary for fall prevention. The purpose of this study was to evaluate the effects of a newly developed walker mounted positional feedback device on user position, upper extremity kinematics and posture.

**Number of Subjects:** 14 older adults (9 women, 5 men; mean age=87.54±4.90, range=77 - 94 years) who were regular rollator walker users.

**Materials/Methods:** A position monitor device was designed to encourage walker users to ambulate 10% closer to their walker using visual feedback. The effects of feedback on user position were measured using an ultrasonic distance sensor in the device, while user kinematics and posture we measured using wearable wireless inertial sensors during both simple and complex walking conditions.

**Results:** Participants were able to attend to the device and maintain a closer position to their walker during both simple (mean=-11.4 cm, P<0.001) and complex (mean= -15.0 cm, P<0.001) walking conditions. The primary method of walker position correction was achieved through a reduction in shoulder flexion. Only small and variable changes in trunk and cervical postures were observed.

**Conclusions:** When using a position feedback device, rollator walker users were able to maintain a closer position to their walker primarily by reducing shoulder flexion while only small changes in trunk posture were observed. Additional research on the long-term and carry-over effects of this device are needed.

**Clinical Relevance:** A walker mounted position feedback device may provide clinicians with a novel method for improving walker training and use in both clinical and community settings.

## CSM 2019 Poster Abstracts

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**TITLE:** Acute Effects of Walking Poles on Gait and Pain in Older Adults With Chronic Low Back Pain

**AUTHORS (FIRST NAME, LAST NAME):** Sydney Eastman<sup>1</sup>, Bradley W. Willis<sup>2</sup>, Carmen Abbott<sup>3</sup>, Roxana C. Martinez<sup>4</sup>, Erin A. Dannecker<sup>1</sup>, Stephen Sayers<sup>1</sup>, Evan L. Prost<sup>1</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** Low back pain is experienced by 80% of adults in the United States, with 5-10% developing chronic low back pain (CLBP) after three months of symptoms. Walking programs can reduce the impact of CLBP, but initiation may be difficult due to physical impairments. Recently, the use of walking poles (WP) to improve pain and function in those with CLBP has been suggested, though short and long-term effects are inconclusive across a paucity of studies. Therefore, investigations examining acute effects of WP on those with CLBP are warranted, offering valuable information on early intervention expectations. Our purpose was to examine acute effects of WP on gait speed, ambulation distance, and discomfort in older adults with CLBP. We hypothesized that acute effects of WP use in those with CLPB include (1) a slower gait speed and distance due to initiating a novel assistive device and motor task, and (2) a decrease in pain.

**Number of Subjects:** n=12

**Materials/Methods:** Twelve community dwelling older adults (8 females, 4 males), average age  $69.8 \pm 8.8$  years, reporting  $\geq$  three months of low back pain participated. Investigators provided 15 minutes of WP instruction and practice prior to testing. Participants completed two trials of the 6-minute walk test (6MWT) to examine changes in distance. This was performed in an interior hallway, with and without WP in a randomized order. Participants reported pain during the 6MWT using the Numeric Rating Scale. Gait speed (m/sec) was calculated over a 6-meter distance, beginning 15 meters from the starting point of the 6MWT to ensure coordinated arm and leg motion while using WP. A five-minute rest between trials was implemented. Wilcoxon signed-rank test was used to examine differences in repeated measures, with statistical significance accepted at  $p \leq 0.05$ .

**Results:** Acute effects of WP included slower gait speed ( $Z = -2.35$ ,  $p = 0.02$ ) and a strong trend toward less distance during the 6MWT ( $Z = -1.92$ ,  $p = 0.06$ ). No differences in reported low back pain were seen ( $Z = -1.34$ ,  $p = 0.18$ ).

**Conclusions:** Our findings confirm our initial hypothesis that WP use in those with CLBP results in an initial decrease in gait speed and distance. We believe this is likely due to the novelty of the equipment and movement pattern. No acute differences were seen in pain when using WP, rejecting our secondary hypothesis. Therefore, acute effects of WP on pain and gait parameters in those with CLBP is limited, with potential benefits being more long-term. Such outcomes warrant follow-up at six weeks or greater of ongoing WP training and use, re-evaluating outcomes to determine minimum training dose to achieve potential benefits.

**Clinical Relevance:** This study suggests that 15 minutes of training may be insufficient for clients to achieve early improvements in gait efficiency when unfamiliar with WP. Also, a single training and practice session of WP is unlikely to provide acute relief of CLBP symptoms. This underscores the value of early education and expectation management when initiating a walking program using WP to reduce the impact of CLBP in older adults.

## CSM 2019 Poster Abstracts

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**TITLE:** Steady ON: Outcomes of Physical Therapist-Led Community-Based Fall Risk Screening

**AUTHORS (FIRST NAME, LAST NAME):** Kelsey Doe<sup>1</sup>, Lee Karlsson<sup>1</sup>, Meghan Gerry<sup>1</sup>, Brooke Moore<sup>1</sup>, Mariana Wingood<sup>2</sup>, Mindy O. Renfro<sup>3</sup>, Nancy M. Gell<sup>4</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** Falls among older adults are a leading cause of injury and increased physical, social and medical costs. Fall risk screening is a means to identify risk and target interventions as appropriate. Research to better characterize response and adherence to fall risk screening recommendations is needed. This study characterizes risk-reducing actions after community-based fall risk screenings.

**Number of Subjects:** 123

**Materials/Methods:** Participants were recruited during 22 physical therapist-led community-based fall risk screenings related to the 2017 Fall Prevention Awareness Day. Baseline questionnaires collected demographics and screening results, while baseline, one-month, and five-month follow-up measured risk-reduction actions and worry about falling. Descriptive statistics and logistic regression analyses characterized risk-reducing actions and assessed outcome differences by baseline fall risk level.

**Results:** One-hundred-twenty-three participants enrolled at baseline, and 104 (85%) responded at both one- and five-month follow-up. By one month, 50.0% of participants had adopted at least one fall risk-reducing action, which increased to 64.9% by five months. The top two new actions at one and five months were starting strength, balance or Tai Chi exercise (19.2%; 31.6%) and attending a fall prevention class (13.5%; 18.4%). By five months, 45.3% shared screening results with a healthcare provider. Baseline fear of falling was 51.2%, which increased slightly but not significantly at one and five months (57.7%; 58.7%) ( $p=0.33$ ;  $p=0.26$ ). There was no significant association between risk level (low, moderate, high) and adopting a new behavior change at one or five months ( $p=0.85$ ;  $p=0.10$ ). However, dichotomized fall risk level (low, moderate/high) was significantly associated with adopting a new behavior change at five months ( $p=0.04$ ). Odds of adopting a fall risk-reduction strategy increased with higher education (OR 2.5, 95% CI: 1.0-6.0) and moderate/high fall risk (OR 3.0, 95% CI: 1.3-7.2) in a logistic regression model adjusted by age and sex.

**Conclusions:** Our results indicate a majority of older adults adopt fall risk-reduction strategies after community-based screenings. Moderate/high fall risk level increased the odds of adopting these strategies, which is consistent with previous findings that individuals at higher risk are more likely to change. Further research is needed to understand why all participants did not adopt risk-reducing behaviors. Considerations when interpreting results include a self-selected study population and no control group.

**Clinical Relevance:** These findings demonstrate the value of low-cost physical therapist-led community-based screenings to foster evidence-based behavior changes for fall prevention.

## CSM 2019 Poster Abstracts

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**TITLE:** Performance of Mental Tasks Negatively Affects Postural Control and May Lead to Increased Fall Risk

**AUTHORS (FIRST NAME, LAST NAME):** Christopher Towler<sup>1</sup>, George Fulk<sup>1</sup>, Ali Boolani<sup>1</sup>, Trang Vo<sup>2</sup>, Brandon Wong<sup>2</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** It is estimated that approximately 66% of unintentional injury and death in the elderly population is attributable to falls and over 45% of older adults over the age of 75 experience a fall annually. Recent studies show that higher level cognitive function is required for safe day-to-day mobility, and a decline in cognitive abilities, specifically executive function, has been associated with increased risk of falling. A common reason for impaired cognitive function in older adults is cognitive fatigue, characterized by feelings of tiredness and lack of energy. The objective of this study was to assess changes in functional balance tests that assess fall risk after the performance of mental tasks.

**Number of Subjects:** 11 older adults recruited from a rural community. (Males=4, Females=7, Age=62.8±4.6 years)

**Materials/Methods:** Using a crossover-design, older adults were recruited from the community and were assigned to a random allocation of days where they performed fall risk assessments prior to and after the completion of mental tasks or days where they were allowed to relax in between the completion of fall risk assessments. The fall risk assessments performed were the 30 second chair stand test, TUG, and Berg Balance Test (BBT). A Mann-Whitney U was used to assess differences in fall risks and a Friedman's rank test was used to assess changes in mood (energy, fatigue, confusion, depression, anger, anxiety, total mood disturbance, physical energy, physical fatigue, mental energy and mental fatigue).

**Results:** Analysis yielded statistically significant declines in feelings of energy ( $p=0.003$ ) and mental energy ( $p=0.015$ ) and an increase in feelings of confusion ( $p=0.001$ ) and total mood disturbance ( $p<0.001$ ) for participants on days that they performed cognitive tasks. No other significant mood changes were noted. A statistically significant decrease in the BBT ( $p<0.001$ ) was noted for participants on days when they completed mental tasks compared to days when they did not. Seven out of 11 participants noted a decline in BBT scores on the experimental day however, only three out of the 11 participants experienced a clinically meaningful decrease ( $\geq 4$ ) from their pre-testing scores.

On control day 6 out of 11 participants noted an increase in BBT scores however, no subjects experienced a clinically meaningful increase in BBT. No statistically significant differences were noted between or within groups for the TUG and 30 second chair stand test.

**Conclusions:** Performance of mental tasks reduces feelings of energy and increases negative moods, which may lead to a decline in functional balance as noted in the decrease in BBT scores. Further research must be conducted to better understand the impact of mental fatigue and the role it plays in falls risk in older adults.

**Clinical Relevance:** It is important to consider the impact of recent performance of mental tasks when attempting to mitigate fall risk of patients with balance deficits as increasing mental activity may negatively impact functional balance. However, the mechanism of this change is not yet known.

## CSM 2019 Poster Abstracts

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**TITLE:** A Comparison of Two Cognitive Tasks on The Timed Up and Go (Tug) Assessment in Healthy Older Adults  
**AUTHORS (FIRST NAME, LAST NAME):** Elizabeth Dannenbaum<sup>1</sup>, Hannah-Marie Corrigan<sup>3</sup>, Mandeep Padma<sup>3</sup>, Emily Snell<sup>3</sup>, Megan Vincelli<sup>3</sup>, Claire Perez<sup>4</sup>, Rachel Kizony<sup>2</sup>, Joyce Fung<sup>4</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** Balance and postural control often decline with age. The Timed Up and Go (TUG) and the Cognitive Timed Up and Go (cogTUG) are commonly used to evaluate mobility and cognitive-mobility interference in the elderly. The mathematical task of serial subtractions by 3 is often used as the cognitive load, but a serial letter recall task can be considered as an alternative (ALTcogTUG). The primary aim of this study was to compare the outcomes of two cognitive tasks on mobility (TUG and cogTUG) in older adults.

**Number of Subjects:** Three age groups (60-69 years (n=23), 70-79 years (n=23) and 80-89 years (n=20)) of healthy community-dwelling people participated in this study.

**Materials/Methods:** Subjects performed first the TUG followed by two cognitive tasks as single tasks. They then performed the dual task of TUG simultaneously with each of the cognitive tasks randomly assigned, followed by repeating the single TUG again. Other than the conventional cognitive task of serially subtracting 3 from 90-100, a 1-back auditory letter task was employed. In the latter, letters were given sequentially and subjects respond with “yes” or “no” if the new letter is the same or different from the previous letter, respectively. The outcomes recorded were time for mobility measures (TUG and cogTUG) and accuracy for cognitive measures (serial subtraction and 1-back letter recall).

**Results:** Significant main effects due to age ( $F_{2,63}=8.735; p=0.0001$ ) and task ( $F_{2,62}=41.209; p=0.0001$ ) were found for both TUG and cogTUG. Post-hoc comparisons showed significant differences between the oldest group (80s) with the 60s ( $p_{TUG}=0.001; p_{cogTUG}=0.006; p_{ALTcogTUG}=0.0001$ ) and 70s ( $p_{TUG}=0.029; p_{cogTUG}=0.030; p_{ALTcogTUG}=0.009$ ) but not between the two latter groups. There were no significant differences between the time to complete the two dual tasks in the 70s and 80s. There was a marked interference on mobility due to adding either of the cognitive tasks in all subjects. With serial subtraction, the mean difference between single and dual tasks on TUG was 53%, and with 1-back letter recall, 40%. Mobility has less interference on cognitive outcomes, such that the accuracy decreased by only 3% with serial subtraction and 7% with 1-back letter recall.

**Conclusions:** The decline of mobility (increased TUG time with age) is an expected finding. The addition of a cognitive task while performing TUG (cogTUG) has a major interference on movement time without losing much of the accuracy demanded by the cognitive task, suggesting a prioritization of cognitive over motor performance. The cost on motor performance was larger than the conventionally accepted value of 10% difference as the normal cut-off value.

**Clinical Relevance:** Interactions between cognitive and motor functions should be considered for gait assessment and rehabilitation in physical therapy. While the serial subtraction task is commonly used as a cognitive load, the alternative 1-back letter recall task is comparable. It is relatively simple and applicable especially for individuals who are anxious or unable with mental arithmetic.

## CSM 2019 Poster Abstracts

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**TITLE:** Staging Sarcopenia in Older African Americans: Muscle Mass Estimates Using Muscle Quality, Grip Strength, and Body Size

**AUTHORS (FIRST NAME, LAST NAME):** Michael Harris-Love<sup>1</sup>, Brian M. Hoover<sup>1</sup>, Valerie McIntosh<sup>1</sup>, Tomas I. Gonzales<sup>1</sup>, Frank Liu<sup>2</sup>, June Yang<sup>3</sup>, Leela Chacko<sup>3</sup>, Saritha Kondapaneni<sup>4</sup>, Anthony G. Conner<sup>4</sup>, Marc R. Blackman<sup>5</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** Age-related changes in contractile tissue are known to negatively affect muscle mass, composition, and strength. The purpose of this study was to determine if 3 clinical assessments could be used to estimate lean body mass (LBM) and identify older adults with sarcopenia: 1) diagnostic ultrasound (US), 2) handgrip dynamometry (HGD), and 3) body mass index (BMI). We hypothesized that a model incorporating these clinical measures would provide valid ( $R^2 > .70$ ) predicted values of LBM derived from dual-energy X-ray absorptiometry (DXA).

**Number of Subjects:** Study participants were 38 community-dwelling African American (AA) adults (31 men, 7 women; age,  $69.3 \pm 3.9$  years; BMI,  $29.6 \pm 5.2$ ) enrolled at a VA medical center.

**Materials/Methods:** The dominant arm was used for middle deltoid US scans and HGD testing. Muscle thickness (MT) was measured and tissue quality was estimated via grayscale histogram analysis of deltoid echogenicity (echo). BMI was calculated and reference standard values for LBM were obtained via DXA (appendicular lean mass, aLM/ht<sup>2</sup>). Criterion values for low LBM in AA men and women were  $<7.96$  kg/m<sup>2</sup> and  $<7.06$  kg/m<sup>2</sup>, respectively. Multiple regression analyses were used for predictive modeling of LBM and reviewed for model integrity. Receiver operator curve (ROC) analysis was used to assess the diagnostic utility of the model, and independent t-tests were used to examine the discriminative validity of the model. Regression covariates were used to adjust for participant sex, and Levene's test was used to address inequality of variances associated with the low proportion of women in the sample.

**Results:** LBM (mean $\pm$ SD) was  $9.21 \pm 1.39$  kg/m<sup>2</sup> for men and  $7.97 \pm .74$  kg/m<sup>2</sup> for women, with 25% of each subgroup attaining the criterion for low LBM. HGD values were  $36.9 \pm 9.4$  kg and  $25.1 \pm 4.6$  kg, deltoid MT measures were  $28.7 \pm 5.1$  mm and  $24.2 \pm 6.4$  mm, and deltoid echo measures were  $56.8 \pm 14.9$  and  $69.3 \pm 8.4$  for men and women, respectively. In the pooled sample analyses adjusted for sex, deltoid MT ( $p < .001$ ) and echo ( $p < .03$ ) significantly differed based on the low LBM criterion. The selected clinical predictor variables yielded a viable LBM model ( $r = .91$ , adj.  $R^2 = .81$ ,  $F = 41.4$ ,  $SE = .59$ ,  $p < .0001$ ) with the largest influence attributed to BMI ( $\beta = .74$ ) followed by comparable contributions from deltoid echo and HGD ( $\beta = -.23$  and  $.28$ ). ROC area was .87 (95% CI: .73-1.0,  $p = .005$ ). The LBM difference between those with and without sarcopenia was 2.45 kg/m<sup>2</sup> per DXA ( $p < .001$ ), and 1.60 kg/m<sup>2</sup> per the model ( $p = .002$ ).

**Conclusions:** A viable model for DXA LBM estimates using clinical measures was created for this sample of older AA adults. A model using BMI, grip strength, and a single ultrasound measure discriminated between participants with and without sarcopenia.

**Clinical Relevance:** Physical therapists can use US and common clinical measures to identify and stage sarcopenia without patient exposure to imaging modalities that require ionizing radiation. Further model development requires cross-validation in larger samples balanced for sex and age.

## CSM 2019 Poster Abstracts

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**TITLE:** Concurrent Diabetic Peripheral Neuropathy(DPN) and Benign Paroxysmal Positional Vertigo(BPPV) Increases Fall Risk

**AUTHORS (FIRST NAME, LAST NAME):** Denise Schmidt<sup>1</sup>, Chia-Cheng Lin<sup>2</sup>, Stacey A. Meardon<sup>3</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** The prevalence of vestibular dysfunction is higher in participants with diabetes (DM)-related complications, such as DPN.<sup>1,2</sup> Up to 46% of subjects with DM are reported to have BPPV, which has been linked to the metabolic stress DM places on the otolith organs.<sup>3</sup> Evaluation of balance and postural control in patients with multiple risk factors for increasing fall risk is critical due to the likelihood of increased mortality.<sup>4-6</sup> Understanding compounding factors affecting elderly DM patients is essential to clinical practice to effectively evaluate patient's fall risk and associated injury. We hypothesize that people with DPN+BPPV have worse balance/gait performance compared to people with DPN only.

**Number of Subjects:** 22

**Materials/Methods:** 10 healthy older adults (7 females/3 males; mean age:  $72 \pm 4$  y.o.) and twelve people with DPN. 5 people (3 females/2 males; mean age:  $63 \pm 10$  yo.) with DPN had positive Dix-hallpike or roll test. 7 people (4 females/3 males; mean age:  $67 \pm 10$  yo.) had negative Dix-hallpike or roll test. All participants passed a general neurological screening to rule out possible neurological disorder other than DPN. Tactile sensation(TS) and vibration threshold(VT) were measured in 6 sites of foot and lateral and medial ankle. All subjects completed Activities Balanced Confidence Scale (ABC), Dynamic Gait Index (DGI), Functional Gait Index (FGA) and Sensory Organization Test (SOT) to assess gait and balance performance. One-way ANOVA test was used to compare the healthy older adults, people with DPN+BPPV, and people with DPN only. The Bonferroni correction was used in the post-hoc analysis. The  $\alpha$  level set as 0.017.

**Results:** There were significant differences among groups in SOT ( $F(2,19)=18.10, p<.01$ ), DGI ( $F(2,19)=6.23, p<.01$ ), FGA ( $F(2,19)=13.77, p<.01$ ) and ABC score ( $F(2,19)=21.52, p<.01$ ). Post-hoc analysis revealed people with DPN+BPPV had lower SOT composite scores (25%) and ABC scores (33%) ( $p<.01$ ) compared to people with DPN only and lower SOT composite scores (34%), DGI (21%), FGA (34%) and ABC scores (42%) ( $p<.01$ ) compared to healthy older adults. The people with DPN had lower FGA scores (18%) ( $p<.01$ ) compared with health older adults. No statistical differences between people with DPN and were observed for the DGI, and TS and VT on eight different sites on people with DPN and people with DPN+BPPV.

**Conclusions:** Participants with concurrent DPN+BPPV performed significantly worse on computerized balance testing compared to healthy older adults and people with DPN only. Additionally, functional gait deficits placed individual with DPN+BPPV at higher fall risk. Further research should investigate if canalith repositioning maneuver can improve balance performance in people with DPN+BPPV, reducing fall risk.

**Clinical Relevance:** Screening DM patients for DPN by assessing sensation and assessing for concurrent BPPV may help to reduce fall risk. The combined risk of falls associated with BPPV and DPN may have substantial effects on patients' mobility, and ultimately increasing risk of mortality associated with falls.

## CSM 2019 Poster Abstracts

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**TITLE:** Effect of a Student-Led Balance Program on Falls Risk In Long Term Care Residents: A Pilot Study

**AUTHORS (FIRST NAME, LAST NAME):** Willow Henry<sup>1</sup>, Sara Markot<sup>1</sup>, Kayla Brown<sup>1</sup>, Katherine Weldon<sup>1</sup>, Taylor Hughes<sup>1</sup>, Victoria Bedwell<sup>1</sup>

**ABSTRACT BODY:**

**Background & Purpose:** The incidence of falls in long term care is twice that of community dwelling elders. The purpose of this pilot study was to determine the feasibility of a student-implemented balance program to decrease falls risk in long term care residents. Logistics of the program implementation, such as days per week, faculty to student ratio, and student to resident ratio were also considered.

**Hypothesis:** Following the completion of a 30-session Otago balance program implemented by student physical therapists, fall risk in long term care residents will be reduced.

**Case Description:** Five long term care resident participants with varying co-morbidities, fall risk, and functional abilities were enrolled in the Otago Exercise Program held for ten weeks, three days each week, for a duration of 45- 75 minutes, totaling 30 sessions. Each participant worked one-one-one with a student physical therapist. The students were supervised by a faculty member who served as their clinical instructor for the duration of the program. Each participant's fall risk was assessed prior to intervention, at midterm, and following the 30 sessions of intervention using the following outcome **measures:** Falls Efficacy Scale- International (FES-I), Functional Reach Test (FRT), Timed Up and Go Test (TUG), Five Time Sit to Stand Test, and Thirty Second Sit to Stand Test. The Global Deterioration Scale was used for cognitive assessment to determine each participant's ability to participate in testing.

**Outcomes:** Data analysis was limited by the small sample size, and further study is needed with a larger sample size to determine if fall risk meaningfully decreased after the 30 session program. Comparison graphs were used to show change from initial to final testing. TUG test showed a 32.46% decrease in the time to completion from initial to final testing. FRT results indicated a 117.60% increase in distance across all subjects from initial to final testing. The FES-I results indicated a 16.09% decrease in scores across all subjects that participated in this measure from initial to final testing. Five Time Sit to Stand demonstrated a decrease in time needed to complete the test. Results from the Thirty Second Sit to Stand indicate increased repetitions for two out of three of those able to complete the test. The first five weeks of the program had the largest impact on change for all assessments.

**Discussion:** From this pilot study, it could be concluded that a student led Otago Exercise Program may decrease falls risk in long term care residents; however further study is needed with a larger sample size to validate the hypothesis. A student physical therapist implemented balance program for long term care residents is feasible to provide no-cost falls management intervention for an at risk population. Program logistics, such as frequency, duration, faculty to student ratio, and student to resident ratio also require additional investigation.

## CSM 2019 Poster Abstracts

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**TITLE:** Validity and Reliability of an Instrumented Clinical Measure of Lower Extremity Power in Older Adults

**AUTHORS (FIRST NAME, LAST NAME):** Michael A. Tevald<sup>1</sup>, Julie Bowers<sup>1</sup>, Jaclyn Feffer<sup>1</sup>, Alex Hwang<sup>1</sup>, David Lerman<sup>1</sup>, Natalia Susul<sup>1</sup>, David Toback<sup>1</sup>, Marty Eastlack<sup>1</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** Muscle power is an essential component of functional ability in older adults. With age, muscle power declines more rapidly than strength and is a stronger predictor of functional ability. The assessment of power typically requires equipment that is large and expensive, limiting clinical feasibility. The TENDO power analyzer (TENDO Sports Machines, Trencin, Slovak Republic), a commercially available device, has the potential to be a portable and affordable means of measuring muscle power in clinical practice. The purpose of this study was to determine test-retest reliability and construct validity of the use of the TENDO to measure lower extremity power produced during the performance of functional tasks in older adults.

**Number of Subjects:** 16 (9F, 7M) community-dwelling older adults 83 (SD 5) years.

**Materials/Methods:** The study consisted of 2 sessions separated by a minimum of 1 week. In both sessions, peak power during sit-to-stand, step-up, and vertical jump was assessed using the TENDO and simultaneously calculated from the vertical ground reaction force obtained by force plates. Muscle power during a leg press was assessed using an isokinetic dynamometer (Primus RS, BTE) at 30, 40, and 50% of body mass. In addition, usual and fast gait speed over 4 meters, timed up and go, short physical performance battery, and stair climb power test were performed. Across-session reliability of the TENDO-derived measures was quantified using the ICC(2, 1). Construct validity was evaluated by determining the correlation between the TENDO-derived measures and those from the 1) force-plate, 2) isokinetic dynamometer, and 3) clinical performance tests.

**Results:** Reliability for TENDO-derived peak power was high for sit to stand (ICC=.92), moderate for step-up (ICC=.67), and poor for vertical jump (ICC=.06). TENDO-derived peak power during sit to stand was strongly correlated with power determined from the force-plate ( $r=.73$ ;  $p=.003$ ) isokinetic dynamometer ( $r=.69$  for 30% of body mass;  $p=.003$ ), but not with age, BMI, or clinical performance tests.

**Conclusions:** TENDO-derived peak power during sit to stand demonstrates adequate reliability and validity for clinical practice. The lack of association with clinical performance tests suggests that peak power provides additional information, over and above that provided by commonly used clinical tests.

**Clinical Relevance:** Lower extremity muscle power is a critical determinant of physical function and commonly impaired in older adults. Accurate assessment of muscle power is important for determining the degree of impairment and measuring change in response to treatment. The TENDO power analyzer provides a practical and affordable means of assessing lower extremity muscle power in the clinic. Future studies utilizing larger sample sizes and different clinical populations should be conducted to further analyze the full potential of the TENDO device in measuring power in a clinical setting.

## CSM 2019 Poster Abstracts

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**TITLE:** The Walking Speed Questionnaire and Gait Testing Protocol in Older Adults

**AUTHORS (FIRST NAME, LAST NAME):** Linda Denney<sup>1</sup>, Laura Z. Gras<sup>3</sup>, Jill E. Mayer<sup>3</sup>, Shannon McClain<sup>1</sup>, Victoria Williams<sup>1</sup>, Patricia S. Pohl<sup>2</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** Gait speed is a common standardized examination tool used by physical therapists. In clinic or home setting, acquisition of gait speed may be limited by the lack of set up time and available space. A Walking Speed Questionnaire (WSQ), created to estimate gait speed in older adults, predicts measured gait speed using 4 questions.<sup>1</sup> In this study, gait speed was measured over 4.57 m with instructions to walk “comfortably fast” and as if crossing a street. Acceleration and deceleration distance was not provided. Differences in testing protocol can affect results.<sup>2,3,4</sup> Walking starts tend to lead to faster gait speeds as does instructions to walk fast.<sup>5</sup> The purpose of our study was to compare gait velocity estimated from the WSQ to standing and walking starts and different commonly used instructions for healthy older adults.

**Number of Subjects:** 20 (10 from each site) adults 60+ yrs old independent household ambulators; no assistive device.

**Materials/Methods:** Participants completed the WSQ followed by 2 trials of each condition, sequentially, over ground and on an instrumented gait mat (gait mat data not presented). Order of the testing surface and conditions were randomized. All trials on one surface were completed before switching surfaces. There were 6 conditions based on 2 starting locations and 3 sets of instructions. In the standing start, participants walked from the start line to a finish line 6 m away, crossing over a line at 4 m. In the walking start, participants walked from 2 m before the start line to the finish line. In both instances, the time to walk from the start line to the 4-m mark was measured using a stopwatch.

Instructions included walking at your usual pace, as fast as you can without falling or feeling unsafe, and as if crossing a street. Velocity was calculated from the WSQ using the published formula. The fastest speed for each condition was used for analysis. A within-subject Analysis of Variance for the 7 conditions was conducted using the Greenhouse- Geisser for repeated measures. Post-hoc analyses focused on the WSQ velocity.

**Results:** Average age, 76 yrs(9.6); 16 female. There was a significant effect of condition,  $p=0.000$ . Average gait speed (WSQ) was 1.15 m/s (0.17). This was not different than that from 2 of the 6 conditions, i.e., standing start, usual pace at 1.18 m/s (0.24) and walking start, usual pace at 1.23 m/s (0.27). The WSQ gait speed was significantly slower than the other conditions, i.e., standing start, fast pace at 1.62 m/s (0.28); walking start, fast pace at 1.71 m/s (0.39); standing start, street crossing at 1.37 m/s (0.24), and walking start, street crossing at 1.46 m/s (0.31).

**Conclusions:** Estimated gait velocity from the WSQ tends to be less than speed at usual pace with a standing or walking start but is not significantly different. Instructions to walk fast or cross a street produce faster velocities regardless of start position, and these velocities are significantly higher than the WSQ.

**Clinical Relevance:** The WSQ can determine a reasonable approximation of usual gait speed in older adults when time and space are limited.

## CSM 2019 Poster Abstracts

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**TITLE:** Breaking Down Barriers to the Utilization of Standardized Tests and Outcome Measures in Acute Care Physical Therapist Practice: An Observational Longitudinal Study

**AUTHORS (FIRST NAME, LAST NAME):** Brian McDonnell<sup>1</sup>, Shannon M. Stillwell<sup>2</sup>, Shelby Hart<sup>1</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** The purpose of this research report was to assess the effectiveness of a quality improvement (QI) effort involving the implementation of a series of interventions aimed at increasing both use and interpretation of standardized tests and outcome measures (STOM) by physical therapists (PTs) practicing in acute care.

**Number of Subjects:** Over the course of implementation of this QI effort, there were 24 to 34 full-time physical therapists working in the inpatient rehabilitation department at Beth Israel Deaconess Medical Center (BIDMC), a level-1 trauma center in Boston, Massachusetts. Across all 5 data collection periods, a total of 963 patient evaluations were examined, with a similar number of evaluations occurring during each data collection period. The median age of the patients for whom evaluations were performed across all data collection periods was 69 years.

**Materials/Methods:** Over the course of 2 years seven knowledge translation (KT) strategies were implemented. A committee composed of therapists with varying levels of experience and with a variety of clinical interests created a group of 10 STOM that would be appropriate for use in the acute care setting and applicable to most diagnostic groups at BIDMC. Many of the STOM contributed to the evaluation of hospitalized elders including the Confusion assessment method-ICU and Comfortable Walking Speed. Additional KT strategies included the creation of electronic health record templates, interactive educational sessions, support of opinion leaders and laminated pocket cards.

**Results:** A statistically significant increase in both the use (from 16% to 100%) and interpretation (4.5% to 53.8%) of STOM was observed following the implementation of KT strategies. The increase was sustained at all three subsequent measurement periods.

**Conclusions:** Implementation of KT strategies was associated with an increase in the frequency of use and interpretation of STOM. Similar QI efforts should be considered feasible in any acute care physical therapy department and potentially other settings as well.

**Clinical Relevance:** The use of STOM has been suggested to improve patient care because they contribute to an evidence-based approach to clinical decision making, allow PTs to quantify observations and compare patient status between examination periods, facilitate communication and continuity of care for patients transitioning from one healthcare setting to another, increase efficiency of practice, help patients to recognize improvements in a quantifiable manner, and facilitate reimbursement under Medicare mandates for functional reporting of percentage impairment.

STOM also help to identify and quantify impairments of body functions and structures, activity limitations, and participation restrictions. Despite these benefits, STOM have not been consistently implemented as part of most physical therapists' evaluations of elders. Targeted KT strategies can be successful in promoting the application of research evidence into clinical decision making.

## CSM 2019 Poster Abstracts

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**TITLE:** Clinical Outcomes of Outpatient Physical Therapy for Aging Adults With Spine Problems

**AUTHORS (FIRST NAME, LAST NAME):** Rosanna Gelaz<sup>2</sup>, Greg W. Hartley<sup>1</sup>, Kathryn E. Roach<sup>1</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** There has been an overall increase in Medicare beneficiaries with cervical and lumbar conditions within the past decade. Back pain has been linked to increased health care use, socioeconomic disadvantage and psychosocial disparities in Medicare recipients, and is the most common reason Medicare recipients use outpatient PT (OPPT). Physical therapy is increasingly advocated for persistent pain. Little is known about how aging adults with spine problems respond to OPPT. The purpose of this study was to compare the response to OPPT of patients with spine (SC) vs other orthopedic conditions (OC) including joint replacements and fractures.

**Number of Subjects:** 79

**Materials/Methods:** Physical therapists at 2 outpatient rehabilitation facilities recorded G-code severity modifiers (SM), gait speed, and Limitation in Mobility Activities Test (LIMAT) scores at initial evaluation (IE) and discharge (DC). The 7 levels of SM's were recoded as ordinal variables ranging from 0 to 6 (0=0% impaired, 6=100% impaired) The LIMAT is an outcome measure consisting of 26 transfer and mobility items scored by 'degree of difficulty' and 'level of assistance.' Higher scores imply greater activity limitations. Data were entered into a de-identified spreadsheet.

Change scores were calculated by subtracting DC scores from IE scores. Separate correlation coefficients were calculated for each group to examine the relationship between change in SM and other factors.

**Results:** Subjects were 70.51% Hispanic, 14% Anglo, and 8% African American, with 77.22% female and 22.78% male. SC and OC groups were similar in age (74.3 v 74.9) and initial SM (3 v 3) but differed on initial LIMAT scores (39.1 v 48.8) and gait speed (.96 v .83). Both groups improved one level in SM, and this change was correlated with initial SM ( $r=0.62$ ,  $p<.005$ ). There was a stronger relationship between number of visits and change in SM in the SC group ( $r=.38$ ,  $p=.049$ ) v OC group ( $r=.30$ ,  $p=.045$ ). LIMAT scores in the SC group improved less than the OC group (14.46 v 26.12,  $p=0.003$ ). However, the correlation between number of visits and change in LIMAT was stronger for the SC v OC ( $r=.39$ ,  $p=.04$  v  $r=.3$ ,  $p=.04$ ). The number of visits was unrelated to initial SM (SC  $r=.05$ , OC  $r=.1$ ) but it was related to the DC SM in the SC group ( $r=-.37$ ,  $p=.05$ ) but not in the OC group ( $r=-.1$ ,  $p=.53$ ).

**Conclusions:** The SM improved similarly for SC and OC. This suggests that, even though they initially had less severe mobility limitations, patients with SC benefited from OP PT as much as those with OC. The number of PT visits were associated with DC SM in patients with SC but not in patients with OC. This suggests that the dose of PT is particularly important in the SC group.

**Clinical Relevance:** Pain and other contextual factors may play a greater role in response to physical therapy in aging adults with SC than those with OC's. Achieving a change in SM level may require more visits in aging adults with SC's. This may impact decision making related to frequency of services provided to this group.

## CSM 2019 Poster Abstracts

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**TITLE:** Caring for Aging Nurses: A Pilot Study of Practices in the Hospital

**AUTHORS (FIRST NAME, LAST NAME):** Sarah E. Luna<sup>1</sup>, Sarah Salazar<sup>1</sup>, Allie Schlafman<sup>1</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** Individuals are remaining in the workforce past traditional retirement age, and they are at risk for age-associated physical and cognitive changes. Injuries among older adult workers can be prevented by anticipating these changes, allowing older adults to remain in the workplace. Older workers are especially valuable in health care, and retaining experienced nurses saves on total compensation cost to the facility. In 2015, 50% of the full time registered nurses in the U.S were over age 50, and the healthcare system cannot afford to lose half of the nurse workforce due to the inability to perform their duties. Guidelines for musculoskeletal safety in older workers have been published; however, it is not clear if they are being implemented by occupational health departments in hospital systems. This pilot study aims to: 1) determine if the published guidelines for occupational health staff or any similar guidelines have been implemented into practice in a local hospital system as reported by (a) occupational health staff and (b) the hospital nursing staff over age 50; 2) explore occupational health staff and bedside nurses' perceptions, current practices, barriers, and suggestions for keeping older nurses in the workplace for as long as they need or want to work.

**Number of Subjects:** 18 nurses over age 50 and 10 occupational health department staff members.

**Materials/Methods:** Occupational health department staff and nurses over 50 in a private hospital system were anonymously surveyed on workplace safety practices. The survey was developed by the authors based on previously published best practice guidelines for older workers, and participants were asked to indicate their level of agreement on whether or not each practice was being used at the facility. Each group was also asked open-ended questions about suggestions to improve the health of older nurses.

**Results:** There were statistically significant differences in the nurses' responses when compared to those of the occupational health department staff. The occupational health department staff averaged more responses in agreement that recommended guidelines are in practice in the hospital system while the nurses averaged more responses in disagreement.

**Conclusions:** In this pilot study, occupational health nurses reported that many of the evidence-based guidelines previously published are being utilized to keep nurses over 50 healthy; however, nurses in this facility were not in agreement. More research is indicated at multiple facilities to determine if the differences between nursing staff and occupational health staff perceptions are generalizable to the nursing profession or if they are unique to this hospital system.

**Clinical Relevance:** There may be opportunity to promote awareness and utilization of existing occupational health strategies, as well as implement additional practices to maximize the health of nurses over 50. Experts in musculoskeletal injuries and ergonomics must play a role developing best practice guidelines for keeping older nurses in clinical practice for as long as they need or want to work.

## CSM 2019 Poster Abstracts

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**TITLE:** Objective Mobility Measures Strengthen Current Assessments for Identifying Fall Risk in Older Adults

**AUTHORS (FIRST NAME, LAST NAME):** Michael Vannostrand<sup>1</sup>, David Levitskiy<sup>2</sup>, Andrew Brindle<sup>2</sup>, Christopher G. Neville<sup>1</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** Each year over two million older adults are treated in emergency departments for fall injuries. One out of every five falls results in serious injuries with medical costs of over fifty billion dollars in 2015 alone. The American Geriatric society and the Centers for Disease Control and Prevention recommend annual fall risk screenings but integrating these into clinical practice is a challenge. Inertial sensors may help overcome challenges by providing a cost-effective option that improves reliability and adds objective measurement to current fall risk assessments.

Therefore, the purpose of this study is to determine if objective measures of mobility (acceleration and rate of turning) can be used to identify fall risk in older adults.

**Number of Subjects:** sixty-six.

**Materials/Methods:** Older adults consented and completed a battery of both static and dynamic mobility tests to assess balance, functional strength, and gait while wearing an inertial sensor (ClearEdge Inertial sensor, Quadrant Biosciences, Syracuse NY). Additionally, subjects completed an objective functional mobility screening (Task Modification Scale (TMS)), a Mini Mental Status Exam (MMSE), Fall Efficacy Scale (FES), and the Activities-specific Balance Confidence Scale (ABC), along with computerized neurocognitive tests to assess mental status and self-reported balance confidence. Subjects were classified by TMS score based on functional mobility into a low, medium, and high-risk groups for analysis. A stepwise linear regression was used to identify metrics that contributed to group assignment. Next, the diagnostic utility of these metrics were examined by calculating the area under the curve (ROC analysis).

**Results:** Metrics between groups on both static and dynamic balance tests were significantly different when measured with the inertial sensor. A total of ten metrics gathered from TUG tests, gait tests, sit to stands, and an objective retrieval task were found significant predictors of group assignment. The largest differences between groups were seen during the timed-up-and-go (TUG) test on max turning speed (effect size 0.30 between low-medium, 0.42 between medium-high, 0.56 low-high). Area under the ROC curve was 0.85 between the high and medium risk groups when using objective data collected from different dynamic balance tests and improved to 0.95 when the ABC scale was included in the analysis.

**Conclusions:** The results show that objective measures on functional tests can provide added insight to fall risk in older adults. Additionally, measures of turning speed and acceleration during movement could be valuable metrics to objectively measure both static and dynamic balance tests typically used in fall risk assessment for older adults.

**Clinical Relevance:** As annual fall risk screenings continue to be integrated into clinical practices, effective ways to classify patients at risk for falls will be paramount. Utilizing area under the ROC curve analysis to classify patients based on dynamic balance tests would be advantageous to clinicians to ensure proper care and interventions.

## CSM 2019 Poster Abstracts

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**TITLE:** Hand Movement Rate Enhanced During Dual Task Performance in Older Adults

**AUTHORS (FIRST NAME, LAST NAME):** Angela R. Merlo<sup>1</sup>, Katie N. Samuels<sup>1</sup>, Megan C. Begley<sup>1</sup>, Amanda Sweig<sup>1</sup>, Patricia S. Pohl<sup>1</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** For older adults, the performance of two activities simultaneously, known as dual task performance, can adversely affect performance in one or both of the tasks. For example, older adults walk slower when speaking compared to walking without speaking (Pohl et al., 2011a). There is, however, a paucity of research in dual task control during upper limb movements. Some have reported that older adults slow the rate of upper limb performance when completing a cognitive task (Voelcker-Rehage et al., 2006). Similarly, older adults compromised the accuracy of a pursuit rotor-tracking task when it was combined with a speaking task (Kemper et al., 2011b). Faster hand movements in dual task conditions have, however, been reported in some populations, such as individuals who have experienced a stroke in UE arm movement of the less affected side when paired with walking (Pohl et al., 2011b). The purpose of this study was to examine dual task effects on upper limb movement speed for older adults.

**Number of Subjects:** Participants included 14 community-dwelling right-handed adults able to ambulate independently without an assistive device with an average age of 65.5 (6.2) years.

**Materials/Methods:** Participants performed activities including a figure 8 walking task, wrist movements with each upper limb to audibly sound a hand-held noisemaker, serial subtractions by threes from a random number less than 100, and speaking in response to a question such as, "Tell me about a favorite vacation". Each task was completed for 20 s as a single task and then activities were performed simultaneously as pairs. The order of the dual task activities was randomized. Participants were instructed to perform activities at a comfortable pace. There were no instructions to prioritize one task or the other. Data included the distance walked, and the number of wrist movements, serial subtractions, and words spoken. Single and dual task performance was compared using paired t-tests.

**Results:** Average baseline wrist movement counts of 32.4 for the right and 35.2 for the left significantly increased with each dual task activity,  $p < 0.05$ . The left wrist count increased to 45.0 when walking the figure 8, 39.8 with counting, and 42.4 with speaking. Performance in the second activity was unchanged except the distance walked as a single task of 22.8 feet significantly increased to 23.7 feet when moving the left hand,  $p < 0.05$ .

**Conclusions:** Typically, dual task performance is associated with a decrease in performance in one or both activities. Upper limb movements may not follow this pattern. In this study, adding a secondary task enhanced the speed of wrist movements in healthy older adults.

**Clinical Relevance:** Dual task activities may offer an opportunity to facilitate the speed of upper limb movements in healthy older adults. It is not known if a similar effect can be obtained with various clinical populations.

## CSM 2019 Poster Abstracts

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**TITLE:** Can Selected Functional Assessments Predict Prospective Falls In Community-Dwelling Older Adults?

**AUTHORS (FIRST NAME, LAST NAME):** Lauren E. Graham<sup>2</sup>, Allison O'Halloran<sup>2</sup>, Trishia Yada<sup>2</sup>, Jane Freund<sup>2</sup>, Chitra Balasubramanian<sup>1</sup>, Srikant Vallabhajosula<sup>2</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** Falls are multifactorial and research shows functional tests like Community Balance and Mobility assessment (CB&M) and Timed Up and Go (TUG) are capable of retrospectively classifying older adults who are at fall-risk. Our purpose was to compare the predictive capability of CB&M, TUG, and Stair Climb Power Test (SCPT) to identify fallers in the next 6 months among community-dwelling older adults (CDOA).

**Number of Subjects:** 28 CDOA (mean age:  $74.3 \pm 6.4$  years; 14 females)

**Materials/Methods:** The CB&M consists of 13 challenging tasks evaluating mobility and balance, and has shown to alleviate the measurement ceiling effect seen in CDOA. The SCPT determines the time and power used to ascend and descend stairs as fast as possible. TUG is a commonly used measure of mobility. Participants self-reported falls using a monthly falls log for 6 months after their initial testing. Diagnostic capability of predicting a future faller was assessed using area under the Receiver Operating Characteristics curve (AUC) for each measure. An area closer to 1 was deemed as excellent and an area  $\leq 0.6$  was deemed unacceptable for diagnostic accuracy. In addition, independent samples t-test was done to compare CB&M, SCPT and TUG scores between fallers and non-fallers.

**Results:** 12 participants reported falls and 16 participants experienced no falls. The AUC for CB&M (0.423), TUG (0.426), stair ascent time (0.420), stair descent time (0.386), and stair ascent power (0.597) did not have acceptable diagnostic accuracy. The stair descent power (0.631) had poor (defined as  $0.6 < \text{AUC} \leq 0.7$ ) diagnostic accuracy. None of the functional tests significantly differentiated fallers from non-fallers. Mean scores are as follows: CB&M (Fallers:  $46.3 \pm 16.2$ , Non-fallers:  $52.5 \pm 17.5$ ;  $p=0.344$ ), stair ascent time/step (Fallers:  $0.58 \pm 0.2s$ , Non-fallers:  $0.65 \pm 0.3s$ ,  $p=0.490$ ), stair descent time/step (Fallers:  $0.68 \pm 0.5s$ , Non-fallers:  $0.68 \pm 0.3s$ ,  $p=0.324$ ), stair ascent power/step (Fallers:  $235.4 \pm 61.7\text{Nm/s}$ , Non-fallers:  $221.1 \pm 91.6\text{Nm/s}$ ,  $p=0.657$ ), stair descent power/step (Fallers:  $234.5 \pm 87.7\text{Nm/s}$ , Non-fallers:  $204.4 \pm 67.7\text{Nm/s}$ ,  $p=0.324$ ) and TUG (Fallers:  $8.5 \pm 1.9s$ , Non-fallers:  $8.4 \pm 1.5s$ ,  $p=0.956$ ).

**Conclusions:** The CB&M, TUG and SCPT did not show acceptable diagnostic accuracy to predict future falls in the next 6 months. These functional tests have earlier shown to retrospectively classify older adults at risk; however, our results showed that they were unable to prospectively predict fallers. Our results should be validated with a large sample.

**Clinical Relevance:** The results of this study show that even though prior research has shown that the CB&M, TUG, and SCPT can discriminate retrospective fallers from non-fallers these assessments were unable to predict future fallers. High functioning CDOA can be at risk for future falls but may be under-examined due to their ability to participate in higher level activity. To help identify the probability of falling in CDOA, it could be beneficial to have a cluster of assessments that can help identify an individual as potential to be a future fall risk.

## CSM 2019 Poster Abstracts

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**TITLE:** How Do Walkers and Canes Influence Outcome Measures?

**AUTHORS (FIRST NAME, LAST NAME):** Stephen A. Antos<sup>1</sup>, Margaret Danilovich<sup>2</sup>, Konrad P. Kording<sup>3</sup>, Keith E. Gordon<sup>2</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** The number of older adults who use a walker or cane is increasing, and physical therapists (PTs) play a critical role in device fitting, training, and recommendations. Physical therapists frequently instruct their patients to use the same device during outcomes testing to maximize measurement reliability, assuming that a walker or cane influences performance. However, the actual effect of using a walker or cane is unclear. We hypothesized that older adults with relatively worse outcome measure scores would benefit (improved score) from their walker or cane, whereas older adults with relatively better scores would be hindered.

**Number of Subjects:** Older adults (n=14, females=5, age=81.5+9.2) from an adult day center who used a walker or cane, and could walk at least 10 meters without their device or physical assistance. We included individuals with cognitive impairments.

**Materials/Methods:** Participants completed the 10 Meter Walk Test (10MWT), 6 Minute Walk Test (6MWT), and Timed Up and Go (TUG) with and without their walker or cane on five separate days. For each outcome measure, we compared participants' scores with versus without their walker or cane. We fit unadjusted linear regressions for each outcome measure, where the independent variable was score without a device, and the dependent variable was change in score when using a device. We also fit adjusted linear regressions, controlling for age, sex, and cognition.

**Results:** Participants with relatively worse scores without their device tended to benefit from their walker or cane, while participants with better scores without their device tended to be hindered by their walker or cane. All coefficients in the unadjusted regressions were statistically significant ( $p < 0.001$ ):  $\Delta 10\text{MWT (m/s)} = 0.17 - 0.29$  (10MWT score with no device)  $\Delta 6\text{MWT (m)} = 88 - 0.41$  (6MWT score with no device)  $\Delta \text{TUG (s)} = 9.3 - 0.40$  (TUG score with no device). For example, on the 10MWT, our regression predicts an older adult with a gait speed of 1.0 m/s without a device will have a gait speed of 0.88 m/s with a device (decrease of 0.12 m/s). Our regression also predicts that an older adult with a 6MWT distance of 0 m without a device will have a 6MWT distance of 88 m with their device.

**Conclusions:** Walkers and canes can increase or decrease an older adult's 10MWT, 6MWT, and TUG scores. These effects can be large enough to change the clinical interpretation of an individual's score. Physical therapists can use our findings to predict whether an older adult's score will increase or decrease on the 10MWT, 6MWT, or TUG when given a walker or cane.

**Clinical Relevance:** Our findings support the clinical rationale that PTs should instruct patients to use the same device during repeated outcomes testing to maximize measurement reliability. If a walker or cane improves 10MWT, 6MWT, or TUG scores, PTs can use these measurements to justify device recommendations. Conversely, if a walker or cane restricts mobility, PTs should provide further justification when recommending a device (e.g. preventing falls). Restrictive effects of walkers and canes may help explain why device adherence is sub-optimal.

## CSM 2019 Poster Abstracts

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**TITLE:** Aging-Related Decrements in The Timed Up and Go (Tug) Test When Combined With a Visual Stimulation  
**AUTHORS (FIRST NAME, LAST NAME):** Rania Almajid<sup>1</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** The Timed Up and Go (TUG) test is a clinical assessment tool that has been shown to be limited in identifying the risk of fall in older adults. Scholars attempted to add a cognitive load or a motor task to increase its sensitivity; however, it still lacks the ability to identify balance problems that are essential to maintain postural control. Aging is associated with a decrease efficiency in weighting sensory systems, decreased postural stability during visually manipulated conditions, and increased reliance on vision. Therefore, we aim to determine the influence of manipulating the visual system through the use of a head mounted display (HMD) with and without presentation of an augmented virtual scene during the activities of TUG test – sit-to-stand, walk, turn, and stand-to-sit. Specifically, we explored two hypotheses: [1] all adults will show more decrements while wearing the HMD with visual stimulus compared to wearing the HMD without visual stimulus, [2] older adults will show more decrements compared to younger adults.

**Number of Subjects:** 38

**Materials/Methods:** Using the HMD (Oculus Rift Development Kit 2<sup>TM</sup>) a virtual scene displaying bright dots (i.e. “snow-flakes”) that rotate in pitch up or down directions was overlaid on top of the veridical scene, i.e. augmented reality (Fig1). Twelve younger adults (6 males, age  $25.9 \pm 3.9$ ) and sixteen older adults (8 males, age  $69.0 \pm 4.4$ ) completed the following four conditions: (1) TUG, (2) TUG with HMD with no augmented virtual scene ( $TUG_{HMD}$ ), (3) TUG with HMD with pitch up rotated virtual scene ( $TUG_{PU}$ ), and (4) TUG with HMD with pitch down rotated virtual scene ( $TUG_{PD}$ ). Motor performance was evaluated using six Trigno<sup>TM</sup> wireless motion sensors (Delsys Inc.) that were placed on the sternum, lumbar, both wrists and shanks. The dependent variables included turning cadence, gait speed, peak trunk velocity (PTV), and acceleration range of sit-to-stand and stand-to-sit.

**Results:** When wearing the HMD, regardless of the presence of a visual stimulus, all adults showed significant decrease in turning cadence, gait speed, PTV around mediolateral (ML), vertical, and anteroposterior (AP) axes (all  $p < 0.05$ ). With the addition of visual stimulation, adults tend to decrease their PTV around the ML axis in walking and AP acceleration range in sit-to-stand (both  $p = 0.01$ ). Specifically, addition of a visual stimulation in a pitch up rotation caused a decreased in the vertical acceleration on sit-to-stand ( $p = 0.002$ ). Older adults showed significant decreased in the PTV around the AP axis in turning ( $p = 0.03$ ).

**Conclusions:** Wearing the HMD has an impact on TUG kinematics that should be accounted for in clinical research. Assessment of trunk kinematics in turning could be of great interest to assess the risk of fall in older adults.

**Clinical Relevance:** Understanding sensory reweighting abilities via manipulating the visual system of young and old adults could improve interventions used for balance training through sensory experience training.

## CSM 2019 Poster Abstracts

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**TITLE:** Exploring Physical Health, Mobility, and Physical Activity Behaviors of Older Adults Living in a Master-Planned Community: A Mixed Methods Study Using the Social Ecological Model Framework

**AUTHORS (FIRST NAME, LAST NAME):** Jill Haladay<sup>1</sup>, Ramon Nieves<sup>1</sup>, Su-I Hou<sup>1</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** Mobility limitation in the community-dwelling older adult is a complex public health concern. Using the social-ecological model framework, this study employed a mixed methods approach to explore the extent of convergence between qualitative and quantitative measures of physical health, mobility, and physical activity behaviors of older adults living in a master-planned community (MPC) in comparison to those in a traditional community.

**Number of Subjects:** 70

**Materials/Methods:** This convergent parallel mixed methods design included quantitative data from a survey of older adults, aged 65+, who participated in one of two healthy aging programs in Florida (n=70) and qualitative data from semi-structured interviews of a subset of those participants (n=9). Both types of data were integrated to provide a more textured understanding of the influence of the built environment. Spearman's R<sup>2</sup> was used to investigate relationships based on place of residence.

**Results:** Quantitative results suggested that mobility was related to place of residence based on measures of cardiovascular endurance (R<sup>2</sup>=-0.46), satisfaction with strength (R<sup>2</sup>=-0.40), ability to get out and about (R<sup>2</sup>=-0.36) and ability to have one's independence (R<sup>2</sup>=-0.33). A moderate correlation also existed between place of residence and outlook/outcome variables quality of life (R<sup>2</sup>=-0.40) and easier time caring for self than previously (R<sup>2</sup>=-0.52). Despite this, place of residence only had a weak correlation with physical activity behaviors (R<sup>2</sup>=-0.26) and no significant difference was found in group proportions meeting ACSM physical activity recommendations (60.00% versus 37.50%). Qualitative results suggested that personal and external motivation (20.65% and 30.43% of total codes, respectively) were significant factors associated with physical activity behaviors, even for those who had constraints such as health conditions. Participants expressed the value of social interaction within the community but social interaction did not necessarily include group-based physical activity. Qualitative and quantitative findings converged at the intrapersonal level but diverged at the community level.

**Conclusions:** MPC residents appear to enjoy better physical health and mobility while demonstrating high personal motivation and a sense of being young at heart. However, while the built environment impacted physical activity motivation and leisure behaviors, it did not positively impact physical activity behaviors nor percentage achieving ACSM recommendations.

**Clinical Relevance:** This mixed methods study provides a more complete understanding of the influence of the built environment on physical activity behaviors that could influence mobility in community-dwelling older adults.

## CSM 2019 Poster Abstracts

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**TITLE:** Factors Associated With Heart Failure, Myocardial Infarct, and Chronic Obstructive Pulmonary Disorder Readmissions Differ for Patients With Dementia

**AUTHORS (FIRST NAME, LAST NAME):** Sara Knox<sup>1</sup>, Maxwell E. Cutty<sup>1</sup>, Joshua Sun<sup>1</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** Hospital readmissions are recognized as a key quality metric in health care reform, with significant financial and resource implications.<sup>1-3</sup> Prior research suggests that strategies to decrease readmissions should be tailored to high-risk patients.<sup>4,5</sup> Older adults diagnosed with dementia have hospitalization rates three times greater than older adults without dementia, are more likely to have multiple hospitalizations, have longer hospital stays, and have a greater risk of hospitalization associated mortality.<sup>6,7</sup> Cognitive impairments and communication barriers complicate care for older adults with dementia and may increase risk of readmission.<sup>8,9</sup> The Hospital Readmission and Reduction Program<sup>10</sup> is imposing financial penalties on hospitals who have excessive readmission rates for key diagnoses including myocardial infarct (MI), heart failure (HF), and chronic obstructive pulmonary disease (COPD). The purpose of this study was to investigate differences in readmission rates and associated patient and hospital factors of older adults with dementia hospitalized for MI, HF, and COPD.

**Number of Subjects:** This was a retrospective, correlational study of secondary data from inpatient discharge records. A nationally representative sample of discharge records (MI, 218,538; HF, 380,665; COPD, 380,665) was extracted from the 2013 Nationwide Readmission Database available from the Agency for Healthcare Research and Quality's (AHRQ) Healthcare Utilization Project (HCUP).

**Materials/Methods:** A frequency rate was calculated to the hundredth degree to determine the readmission rates for (a) the entire sample, (b) older adults without dementia, and (c) older adults with dementia for MI, HF, PNA, and COPD. Bivariate analyses, using a chi square test and t-tests, was calculated to compare readmission rates and patient and hospital associated factors of older adults with and without dementia with primary discharge diagnoses of MI, HF, and COPD.

**Results:** Significant differences were found ( $p < .001$ ) when comparing patient characteristics of older adults with and without dementia who were readmitted. Across all three diagnoses, older adults with dementia had readmission rates 7-10% higher, were at least 5 years older, experienced more hospitalizations, and were more often discharged to skilled nursing facilities than older adults without dementia. Costs associated with hospitalizations were higher for older adults with dementia who were hospitalized for COPD but lower for older adults with dementia hospitalized for HF or MI. No clinically meaningful differences were found for hospital associated factors.

**Conclusions:** Classifying older adults with dementia as a high-risk sub-group for pneumonia readmissions is supported by the findings of this study.

**Clinical Relevance:** Development of strategies to reduce readmissions that are tailored to individuals with dementia should be considered. Failure to address this critical issue will promulgate unwarranted stress on our healthcare system, patients, and families.

## CSM 2019 Poster Abstracts

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**TITLE:** What Makes Us Walk: Predictors of Gait Speed in Community-Dwelling Older Adults

**AUTHORS (FIRST NAME, LAST NAME):** Ashleigh Trapuzzano<sup>1</sup>, Sara Chizmar<sup>1</sup>, Lauren Haffke<sup>1</sup>, Nicole Dawson<sup>1</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** Comfortable and fast gait speeds have demonstrated predictive value for health-related outcomes including functional capacity,<sup>1</sup> falls,<sup>2</sup> and mortality rates.<sup>2</sup> Proposed mechanisms influencing gait speed include physical performance measures<sup>3,4</sup> and cognition,<sup>5,6</sup> however, few studies have investigated the interplay of these domains. Understanding if shared variance exists between strength, balance, and specific cognitive domains can guide clinical treatment when gait speed deficits are present. The purpose of this study was to identify unique predictors of comfortable and fast gait speed in community-dwelling older adults using physical performance measures and cognitive measures of executive function and processing speed.

**Number of Subjects:** 66 community-dwelling older adults (mean age 80.57 (SD 8.1), 71% female).

**Materials/Methods:** Participants completed the following assessments: Mini Mental State Examination, 30 Second Chair Stand (30-SCS), Functional Reach (FR), Trail Making Test Part-B (TMT-B), clock-drawing test (CDT), Flanker Task, reaction time, Digit Symbol Substitution Test (DSST), and gait speed (comfortable and fast) using the GAITRite® system. Hierarchical linear regression was used to determine the relationship of both comfortable and fast gait speeds with functional performance (30-SCS and FR) and cognition (DSST, CDT, and Flanker effect). Cognitive domains in the final model were based on Pearson correlation values <0.001 and collinearity statistics.

**Results:** Functional performance measures (Model 1) explained 44.8% and 38.2% of the variance (adjusted  $r^2$ ) in comfortable and fast gait speed, respectively. Cognition significantly contributed additional variance in Model 2 (comfortable: F change=3.34,  $p=.04$ ; fast: F change=3.782,  $p=.03$ ). Unique predictors of comfortable gait speed in Model 2 included 30-SCS ( $B=1.86$ ,  $p<0.001$ ), FR ( $B=3.37$ ,  $p=0.005$ ), and Flanker effect ( $B=-0.02$ ,  $p=0.05$ ). Unique predictors of fast gait speed in Model 2 included 30-SCS ( $B=2.61$ ,  $p<0.001$ ), FR ( $B=3.58$ ,  $p=0.04$ ), and DSST ( $B=0.95$ ,  $p=0.01$ ).

**Conclusions:** Lower extremity strength and balance are independently predictive of both comfortable and fast gait speed. Executive function and cognitive inhibition, as assessed by the Flanker effect, predicted comfortable gait speed, while processing speed, as assessed by the DSST, predicted fast gait speed. These results corroborate previous literature that examined functional and cognitive domains individually.

**Clinical Relevance:** Gait speed is a versatile tool for clinicians to use to predict outcomes such as fall risk, function, and mortality and as such, it is helpful to know what variables can improve it. This study suggests that both comfortable and fast gait speed are predicted by strength and balance, two variables easily targeted by the physical therapist. The cognitive variables that contribute emphasize the importance of interprofessional care for patients who have deficits in their gait speed. Understanding that these are key variables allows clinicians to better optimize and personalize rehabilitative care.

## CSM 2019 Poster Abstracts

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**TITLE:** Lower Quarter Y-Balance Test in Healthy Older Men

**AUTHORS (FIRST NAME, LAST NAME):** Karen Blackburn<sup>1</sup>, Ryan Molinaro<sup>1</sup>, Haley Becker<sup>1</sup>, Srikant Vallabhajosula<sup>1</sup>, Jane Freund<sup>2</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** There are no known Lower Quarter Y-Balance Test (LQ-YBT) typical values for males aged 65-80. The relationship between LQ-YBT, and clinical balance and gait assessments is also unknown for this population. Our purpose was to determine the typical values for LQ-YBT in healthy men aged 65-80 years and determine how performance on this test is related to other measures of balance and gait.

**Number of Subjects:** 25 healthy males with mean age of 70.16 ( $\pm 5.05$  years)

**Materials/Methods:** In one session each participant had bilateral ankle dorsiflexion measured and completed the Falls Efficacy Scale-I (FES-I), Lower Extremity Functional Scale (LEFS), two trials of each 10 Meter Walk Test (forward self-selected, backward, and forward fast), single leg stance (SLS) and the LQ-YBT. For the LQ-YBT while maintaining a single-limb stance, the participant pushed the reach indicator in the anterior (ANT), posteromedial (PM), or posterolateral (PL) direction and returned to the starting position under control. The mean reach scores from 3 valid trials in each direction were recorded and normalized as a % of leg length. A composite (COMP) score was computed as the three-direction sum, divided by three times the leg length and multiplied by 100. Pearson correlation coefficients were used to determine the relationship between LQ-YBT scores, and other functional tests and questionnaires.

**Results:** For healthy men 65-80, on the left leg, the group averages for typical ANT, PM, PL and composite scores were 56.27%, 90.4%, 81.96% and 76.21% respectively. On the right leg, the group averages for typical ANT, PM and PL were 55.17%, 88.33%, 81.57% and 75% respectively. There was a significant correlation between FFGS, BGS, SLS, and LQ-YBT scores. Additionally, there was a significant correlation between ankle DF ROM and the ANT reach score of the LQ-YBT. There was a moderate significant correlation between LQ-YBT composite score on both sides and gait speed in fast condition (both sides:  $r=0.49$ ;  $P=.012$ ), Same Side SLS (SSLS) (Right:  $r=0.46$ ,  $P=0.021$ ; Left:  $r=0.56$ ,  $P=.003$ ). Composite score on right side was also significantly moderately correlated with backward gait speed ( $r=0.43$ ;  $P=.029$ ). Correlations between composite scores on both sides and other variables were weak and non-significant.

**Conclusions:** Correlations between LQ-YBT, SLS and fast and backward gait speed indicate LQ-YBT may be a clinically useful measure for assessing dynamic balance in men aged 65-80. Identifying the typical values of the LQ-YBT for healthy men aged 65-80 increases the clinical utility of the test.

**Clinical Relevance:** The Lower Quarter-Y Balance Test (LQ-YBT) is a test of dynamic motor control at the limits of stability in single-leg stance, which requires lower extremity stability, strength, flexibility, and proprioception. The Lower Quarter Y-Balance Test (LQ-YBT), which has been primarily used in young athletic adults, may be an appropriate and challenging test for healthy older adults. Clinicians can use the typical data as a reference point when testing men in this age group.

## CSM 2019 Poster Abstracts

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**TITLE:** Dual-Task Performance is Related to a Neurophysiological Measure of Plasticity in Individuals With Memory Disorders

**AUTHORS (FIRST NAME, LAST NAME):** Jordyn Rice<sup>1</sup>, Daniel Corp<sup>2</sup>, Alessandra Swarowsky<sup>3</sup>, Joyce Gomes-Osman<sup>4</sup>

**ABSTRACT BODY:**

**Background & Purpose:** Successful aging requires the nervous system to adjust and adapt to a multitude of environmental demands. Given that falls are a major source of accident related injury in the elderly, the adaptability of motor and cognitive systems allows older adults to safely navigate their environment. This adaptability can be measured by appropriate allocation of attention and effort to the performance of dual-task behaviors, such as walking while performing a mental task. In neurophysiological studies, 'adaptability' within the nervous system can be also be measured non-invasively by using transcranial magnetic stimulation (TMS). Theta-burst stimulation of the motor cortex using TMS induces a modulation of motor evoked potentials (MEPs) that can be used to assess plasticity (i.e., adaptability) within intracortical circuits. It is not clear if adaptability assessed via dual-task performance is related to adaptability measured neurophysiologically (i.e., TMS plasticity). Given the evidence supporting that individuals with memory disorders demonstrate alterations in both dual-task performance and responses in TMS plasticity, the aim of this study is to explore whether these two phenomena are related.

**Case Description:** We enrolled 6 individuals with diagnoses of mild cognitive impairment (MCI) and mild Alzheimer's Disease (AD) aged 71 to 87 years (5 female), with a mean score on the Montreal Cognitive Assessment (MoCA) of  $17.6 \pm 6$ . Inclusion criteria were: ability to walk independently, sufficient comprehension of study procedures and no contraindications to TMS. Exclusion criteria were: neurologic or psychiatric conditions compromising study participation and any unstable or uncontrolled medical condition.

**Outcomes:** Participants engaged in a single study visit. For the plasticity assessment, intermittent theta-burst was applied to the primary motor cortex, and pre and post MEP responses were recorded from the first dorsal interosseous muscle. Plasticity was quantified by computing the percent change in the amplitude of MEPs from baseline to post theta-burst at various intervals with T10 used as the primary outcome. Dual-task walking was assessed using a 90-sec walk while performing a cognitive task (serial 7-subtractions) and the accuracy was computed.

Half of the participants exhibited facilitation of MEPs at T10, and the other half demonstrated a suppression of MEPs at T10. Individuals with facilitation at T10 also demonstrated greater accuracy during the dual-task walking assessment (85%, 89% and 92% correct), while individuals who showed suppression at T10 had poorer accuracy (0%, 25% and 67% correct). An exploratory analysis revealed a non-significant moderate correlation between modulation of MEPs at T10 and dual-task accuracy ( $r^2=0.52$ ,  $p=0.1$ ).

**Discussion:** Although the generalizability of these results is limited by the small sample, they provide preliminary evidence suggesting a link between adaptability measured by dual-task walking and by a TMS plasticity assessment in individuals with memory disorders.

## CSM 2019 Poster Abstracts

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**TITLE:** Association of Stair Negotiation With Fear of Falling, Balance, and Mobility in Older Adults

**AUTHORS (FIRST NAME, LAST NAME):** Allison O'Halloran<sup>1</sup>, Lauren E. Graham<sup>1</sup>, Trishia Yada<sup>1</sup>, Dawn Saracino<sup>2</sup>, Jane Freund<sup>3</sup>, Chitra Balasubramanian<sup>2</sup>, Srikant Vallabhajosula<sup>3</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** Those who have fallen, or who have had a fear of falling may tend to avoid activities that would challenge balance, like stair negotiation. Stair negotiation is the leading cause of non-fatal injuries in older adults in the U.S. However, the ability to safely negotiate stairs is an essential indicator of functional independence in older adults. This is especially true for descending stairs which requires eccentric control of the body. The components of functional mobility that are most highly associated with stair descent speed are still unclear. The purpose of this study was to investigate variables that are related with stair descent ability in healthy older adults and those at high fall risk.

**Number of Subjects:** 20 healthy older adults (66-86 years) and 19 older adults at high fall risk (65-85 years) participated. High fall risk was defined using American Geriatrics Society guidelines as at least 1 fall within the last 6 months, 2 falls within the last year, or self-perceived difficulty with walking and/or balance.

**Materials/Methods:** Fear of falling was measured using the 14-item Falls Efficacy Scale-International (FES-I) questionnaire. Balance and mobility was assessed by the Community Balance and Mobility Scale (CB&M), that detects high-level balance and mobility skills required for successful community ambulation. Stair negotiation was assessed with Stair Climb Power Test, using measurement of stair descent time. Correlation tests were performed between descending stair time and FES-I scores and with CB&M scores. Simple linear regression was performed using CB&M and FES-I scores as predictors for stair descent times.

**Results:** CB&M had a strong significant negative correlation with stair descent time in healthy older adults ( $r=-0.747$ ,  $p<.001$ ) and a moderate significant negative correlation in high fall risk older adults ( $r=-.670$ ,  $p=.002$ ). FES-I had a moderate significant positive correlation with descending stair time in healthy older adults ( $r=.604$ ,  $p=.017$ ) and a strong significant positive correlation in high fall risk older adults ( $r=.747$ ,  $p=.001$ ). CB&M and FES-I explained 50.1% of stair descent time for all participants.

**Conclusions:** Fear of falling, balance, and mobility performance seemed to be strongly related to descending stairs irrespective of the fall risk level among older adults. Combined, fear of falling, balance, and mobility performance could impact stair negotiation in high fall risk older adults. Factors such as muscle strength/power and vision may account for the remaining variation in stair negotiation ability of older adults.

**Clinical Relevance:** The results of this study suggest reasons for limited ability for stair negotiation, such as fear of falling and balance limitations in both healthy older adults and those at a high fall risk. Therefore, interventions for older adults that focus on doing activities of daily living like using stairs, may incorporate techniques to reduce fear of falling and included high-level balance and mobility skills.

## CSM 2019 Poster Abstracts

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**TITLE:** Determining AM-PAC “6-Clicks” Cutoff Scores Based on Patient Age to Predict Discharge Destination Following Elective Joint Replacement

**AUTHORS (FIRST NAME, LAST NAME):** Dana Maida<sup>1</sup>, Barbara R. Wagner<sup>1</sup>, Heidi S. Bockelkamp<sup>2</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** The changing healthcare environment has decreased hospital stay for patients undergoing total joint replacement (TJR), and circumstances unique to older adults often impact their ability to directly return home.

Research previously presented by these authors identified statistically significant correlations among age, discharge (D/C) destination, and scores using the Boston University Activity Measure for Post-Acute Care “6-Clicks” Inpatient Short Forms (6-Clicks), and determined the physical therapy (PT) 6-Clicks cutoff score at initial evaluation (IE) as 13.5/24. The purpose of this study was to determine if PT and OT 6-Clicks cutoff scores to predict discharge to home were different in patients age 65 and older when compared to patients younger than 65 years (y/o).

**Number of Subjects:** 839

**Materials/Methods:** Researchers reviewed 839 charts of persons who underwent elective total hip, knee, and shoulder replacements at a local hospital June 2013-February 2015. Data collected included age, PT and occupational therapy (OT) IE 6-Clicks scores, and D/C destination. The data was entered into Statistical Package for Social Sciences (SPSS) and analyzed using Crosstabs (age, D/C destination, and 6-Clicks), ROC Curve analysis, and MEDCALC diagnostic test evaluation.

**Results:** Subject breakdown by age: <65 y/o 352 (41.6%) and >65 y/o 494 (58.4%) ranging from 29-91 y/o (avg. =65.76). ROC curve analysis and MEDCALC tests revealed cutoff scores providing the best accuracy for determining D/C destination to home to be: <65 y/o PT 13.5/24 [Sensitivity 67.54, Specificity 74.36%, Positive Predictive Value (PPV) 83.70%, Negative Predictive Value (NPV) 54.04], OT 17.5/24 [Sensitivity 67.98%, Specificity 56.41%, PPV 75.24%, NPV 47.48]; >65 y/o PT 13.5/24 [Sensitivity 67.28, Specificity 64.72%, PPV 48.66%, NPV 79.72], OT 17.5/24 [Sensitivity 63.19%, Specificity 52.15%, PPV 39.77%, NPV 73.91]. Area under the curve: PT <65 y/o=.756 and >65 y/o =.715, both indicating fair discrimination; OT <65 y/o=.668 and >65 y/o = .603, both indicating poor discrimination.

**Conclusions:** Based on the findings of this study, 6-Click cutoff scores were not impacted by age for PT (13.5/24) or OT (17.5/24) when predicting discharge to home. For PT, each group score was also equal to the cutoff score of the previous analyses of the broad sample. Although an OT cutoff score was determined, statistical analyses suggests that the 6-Click tool may more accurately predict discharge for PT versus OT. Future research should address whether type of TJR impacts cutoff score compared to age and investigation of older age cutoff scores (e.g. 75 y/o).

**Clinical Relevance:** Older adults are likely to portray characteristics, such as comorbidities and lack of social support, preventing discharge to home following TJR. When determining cutoff scores to predict D/C destination, it is important to acknowledge the impact such factors may have, therefore possibly requiring a separate score based on age.

## CSM 2019 Poster Abstracts

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**TITLE:** Using Preferred and Fast Walking to Determine Fall Risk in Low and High Functioning Community Dwelling Older Adults

**AUTHORS (FIRST NAME, LAST NAME):** Peggy R. Trueblood<sup>1</sup>, Leslie Zarrinkhameh<sup>1</sup>, Cheryl J. Hickey<sup>1</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** Few studies separate high and low functioning community dwelling older adults (CDOA) when reporting cutoff scores to predict falls. This may result in a ceiling effect when predicting fall risk in the healthy independent CDOA. The purpose of this study was to determine how well the 30 foot walk preferred and fast gait speeds can predict fall risk in high vs low functioning CDOA defined by the Composite Physical Function (CPF) Scale. Subjects were categorized as low-functioning if they scored less than 13/24 and high-functioning if they scored greater than or equal to 13/24 on the CPF. A secondary aim was to compare cutoff times (in secs) for fall risk using preferred and fast gait times during the 30 foot walk in each group.

**Number of Subjects:** 273 subjects participated with a mean age of 77+7.4 yrs; 46% reported a previous fall; 82% were male; 198 classified high-functioning; 75 classified low-functioning.

**Materials/Methods:** Subjects were timed while walking 30 feet at their preferred and fast speeds within a 50-foot walkway. Subjects classified as high-functioning were tested using the Fullerton Advanced Balance (FAB) Scale. Subjects classified low-functioning were tested using the Berg Balance Scale (BBS). For each group, fall risk was determined using the respective cutoff score for each balance test (25/40 and 45/56, respectively). Baseline group characteristics were compared using an independent t test. Receiver operating characteristic (ROC) curves were calculated to determine how well preferred and fast walking times during the 30 foot walk predicted fall risk using the FAB or BBS in each group. ROC curves were also calculated using reported fall history with groups combined.

**Results:** No differences in mean age were found between groups. Number of medications, chronic diseases, reported falls and preferred and fast walking times were statistically higher in the low-functioning group. Preferred and fast walk times had poor predictability as a single group for fall risk using reported falls (area=.63 and .62 respectively). When groups were analyzed separately, both preferred and fast walk times had fair to good predictability for BBS or FAB fall risk scores (area=.81, .84, .76, .76 respectively). In the low-functioning group, a time of 12 secs (0.77 m/s) during preferred walking provided 83% Sn and 71% Sp, whereas a time of 10 secs (0.91m/s) during fast walking provided 69% Sn and 81% Sp. In the high-functioning group a score of 8 secs (1.1 m/sec) during preferred walking provided 75% Sn and 70% Sp whereas a score of 6 secs (1.8 m/sec) during fast walking provided 75% Sn and 64% Sp.

**Conclusions:** The 30 foot walk test is a quick, easy screen for assessing fall risk in a direct access environment. It has fair to good predictability for FAB and BBS fall risk scores. Therefore, when screening for fall risk, this test could be performed as an independent predictor of fall risk.

**Clinical Relevance:** The findings of our study include more stringent gait speed values for community dwellers than current published gait speed values.

## CSM 2019 Poster Abstracts

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**TITLE:** Development of a Theory-based Mobile Health Physical Activity Intervention for Knee Osteoarthritis

**AUTHORS (FIRST NAME, LAST NAME):** Deepak Kumar<sup>1</sup>, Jessica Kramer<sup>2</sup>, Bona Lee<sup>1</sup>, Jiten Patel<sup>1</sup>, Alex Geronimo<sup>1</sup>, Belinda Borrelli<sup>3</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** Reduction in walking activity is related with increased risk of early mortality in people with knee osteoarthritis (OA). Previous in-person behavioral physical activity (PA) interventions failed to show sustained improvement and have limited scalability. Combining theory-based interventions with scalability of mobile health (mHealth) could be a strong approach. Our objective was to develop a mHealth-delivered SCT-based (Social Cognitive Theory) PA intervention for people with knee OA using a patient-centered iterative approach.

**Number of Subjects:** 34

**Materials/Methods:** Individuals with knee pain (n=34, Age=63.8±7.7 years; BMI=28.8±4.6 kg/m<sup>2</sup>; Male:Female=11:23; 29% African American, 62% White, 9% other) completed a survey on technology use and Knee injury and Osteoarthritis Outcome Scale (KOOS). From this group, those who did not meet PA guidelines and owned a smartphone (n=23) participated in focus groups (4 groups, 5-8/group). The purpose was to understand – (a) barriers to PA, (b) attitudes toward PA guidelines (150 minutes of moderate intensity activity/week or walking 6000 steps/day), and (c) preferences for components of an SCT-based mHealth intervention (rated on a 1-9 scale similar to Delphi technique).

**Results:** KOOS scores were 61.7±16.9 (symptoms), 56.1±16.8 (pain), and 61.2±20.7 (ADL). Among device owners, 79%, 82%, and 76% were somewhat/very comfortable using a smartphone, tablet, and personal computer respectively. Only 21% had used an activity tracker and 59% of non-users were willing to use trackers.

In focus groups, participants identified pain, fear, depressive symptoms, weight, and sleep problems as intrinsic barriers to PA. Extrinsic barriers included landscape, exercise partners, weather, cost, and safety. Participants found guidelines for PA unrealistic, disconnected from familiar metrics (e.g., how to convert steps to distance), and unattainable. Self-identified PA goals were preferred; goals included those related to ADLs and weight, distance vs. step based goals, and improving mood and pain. Modes and ranges for ratings for SCT constructs were as follows- outcome expectations (i.e. feedback on activity, symptoms)=9 (3-9), observational learning (i.e. social support)=9 (1-9), self-efficacy (i.e. individual goal setting)=9 (5-9), motivation (i.e. motivational messaging) =9 (1-9), reinforcements (i.e. gamified incentives)=1 (1-9), and behavioral capability (i.e. instructional videos)=9 (6-9).

**Conclusions:** In older adults with moderate knee pain and disability, majority of those who own computing devices feel comfortable using these devices. Activity tracker use was low but willingness to use was seen. Results shed light on barriers to PA and highlight the need for mHealth interventions that are individualized, and address mood and pain. Ratings for various components of the mHealth intervention provide insights into patient preferences.

**Clinical Relevance:** These results can guide the development of SCT-based mHealth PA interventions that are likely to be accepted and adopted by older adults with knee pain.

## CSM 2019 Poster Abstracts

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**TITLE:** The Effects of Interactive Metronome Training on Gait, Balance and Cognitive Function in Older Adults

**AUTHORS (FIRST NAME, LAST NAME):** Georganna G. Gaines<sup>1</sup>, Katherine A. Sullivan<sup>1</sup>, Amy G. McMillan<sup>1</sup>, Leonard Trujillo<sup>2</sup>, Chia-Cheng Lin<sup>1</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** Older adults are at an increased risk of falls with the potential for serious injuries. Falls in the elderly often occur due to poor balance, decreased cognition, and poor motor planning. In recent years, Interactive Metronome (IM) has been studied in various populations to examine its effects on improving cognitive and balance performance. IM is thought to target areas of the brain such as the basal ganglia and R parietal cortex, which work together in motor actions, timing, and attention. The purpose of this study was to examine the effects of IM on balance and cognitive tasks associated with motor planning in elderly adults.

**Number of Subjects:** Seven community-dwelling older adults ( $75 \pm 5$  y.o.) were recruited for this study.

**Materials/Methods:** All participants completed two balance and cognitive assessment visits (pre- and post-) and nine IM training sessions in addition to pre- and post- long-form IM assessments. Balance outcomes included Dynamic Gait Index (DGI), Functional Gait Assessment (FGA), Sensory Organization Test (SOT), The Activities-specific Balance Confidence Scale (ABC), and Falls Self-Efficacy Scale (FES-I). Cognitive measurements included d2 Test of Attention, Computerized Stroop Test and Shift Attention Test. The results of these outcome measurements were blinded to the IM training providers.

**Results:** The preliminary results showed no significant difference between pre- and post- DGI (22/24 vs 22/24), FGA (25/30 vs. 25/30), FES-I ( $21 \pm 7$  vs  $22 \pm 8$ ), ABC ( $91 \pm 15\%$  vs  $91 \pm 17\%$ ) and SOT ( $62 \pm 12$  vs.  $67 \pm 9$ ) measurements ( $p > 0.05$ ). However, the subjects significantly improved reaction times in Stroop test (158 ms faster) and Shifting Attention test (80 ms faster) ( $p < 0.05$ ).

**Conclusions:** The elderly adults in this study appeared to benefit from IM training to improve cognitive performance. We did not find any improvement in balance performance due to the ceiling effect. Further research is needed to examine the effects of intensive IM training in older adults with balance deficits to improve balance performance.

**Clinical Relevance:** By understanding the cognitive and physical changes associated with IM training, we can use IM as an intervention to decrease risk of falls in individuals with gait, balance, or cognitive impairments.

## CSM 2019 Poster Abstracts

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**TITLE:** Can Backward Walking Speed Serve as A Mobility Assessment in Older Adults Who Live Independently in The Community?

**AUTHORS (FIRST NAME, LAST NAME):** Logan Taulbee<sup>1</sup>, Dawn Saracino<sup>1</sup>, Julia Wright<sup>1</sup>, Allison O'Halloran<sup>2</sup>, Trishia Yada<sup>2</sup>, Lauren E. Graham<sup>2</sup>, Jane Freund<sup>2</sup>, Srikant Vallabhajosula<sup>2</sup>, Chitra Balasubramanian<sup>1</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** Previous research showed that backward walking speed (BWS) is more impaired in older adults compared to forward walking speed (FWS). The purpose of this study was to preliminarily investigate construct validity of the BWS in independently-living community dwelling older adults (CDOA). First, BWS was compared between CDOA who were fallers and non-fallers. Second, BWS performance was correlated to other clinical outcomes. Third, two assessment methods for BWS were compared.

**Number of Subjects:** 21 healthy older adults ( $74.8 \pm 7.1$  years) and 20 older adults at fall risk ( $73.8 \pm 6.7$  years).

**Materials/Methods:** Self-selected forward walking speed (FWS) and BWS were collected over the GAITRite walkway. BWS was additionally measured using a stop watch on a 3-meter track. A faller was categorized based on the American Geriatrics Society guidelines as an older adult who has had at least 2 falls in the past 1 year or 1 fall in the last 6 months or has self-perceived balance or gait issues. Constructs chosen to validate BWS included fear of falling (measured using Falls Efficacy Scale questionnaire, FES), lower-extremity power (measured using the Stair Climb Power test that included both ascent (ASC) and descent (DSC) power, mobility performance (measured using Timed Up and Go, TUG) and high-level balance performance (measured using Community Balance and Mobility test, CB&M).

**Results:** BWS was significantly different ( $p=0.00$ ) between fallers ( $0.70 \pm 0.23$  m/s) and non-fallers ( $0.94 \pm 0.24$  m/s) and more impaired than FWS in both fallers and non-fallers. BWS was significantly ( $p<0.01$ ) correlated with CB&M ( $r=0.74$ ), FES ( $r=-0.73$ ), ASC Power ( $r=0.62$ ), DSC Power ( $r=0.59$ ), and TUG ( $r=-0.58$ ). BWS measured on the GAITRite was significantly correlated with BWS measured by a stop watch on a 3-meter track ( $r=0.88$ ,  $p<0.00$ ).

**Conclusions:** Our results agree and extend the findings from previous research. BWS discriminated fallers from non-fallers in CDOA and is more impaired than FWS confirming results from previous research. Additionally, we demonstrated preliminary construct validity of the BWS since slower BWS was related to poorer performance on clinical assessments of mobility and balance used specifically for the CDOA. Lastly, while we found that the two assessment methods for BWS were correlated, stronger correlation (i.e.,  $r>0.95$ ) is expected for assessments to show agreement.

**Clinical Relevance:** While clinical assessments are reported to have a ceiling effect in CDOA, these individuals are also shown to encounter precarious situations during their community ambulation increasing their risk for falling and loss of mobility. BWS, a simple and quick assessment, may have the ability to serve as a quick screen to unmask mobility deficits and help justify further detailed assessment even in higher-functioning older adults such as the CDOA. Future prospective studies are required to establish cut-off scores that can be used for screening purposes. Research should also establish the appropriate walkway length to measure BWS for standardization in clinical practice.

## CSM 2019 Poster Abstracts

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**TITLE:** Implementation of High Intensity Stepping in a Skilled Nursing Facility

**AUTHORS (FIRST NAME, LAST NAME):** Patrick Hennessy<sup>1</sup>, Patricia L. Scheets<sup>2</sup>, Michael C. Billings<sup>2</sup>

**ABSTRACT BODY:**

**Background & Purpose:** Recent evidence suggests that the amount and intensity of stepping practice are important factors contributing to improvement in walking speed and distance in individuals post stroke.<sup>1,2,3,4</sup> In older adults, there are numerous changes to physiologic systems that contribute to a decline in physical function and performance, with high potential for benefit from appropriately prescribed stepping practice. A therapy plan of care prioritizing both large amounts of stepping practice and higher cardiovascular intensities presents a shift in practice patterns from what has been observed in traditional rehabilitation,<sup>5</sup> suggesting the need for specific knowledge translation strategies to successfully incorporate this intervention into the clinical environment. This case study outlines a quality improvement project focused on implementing high intensity stepping training (HIT)<sup>6</sup> by using the knowledge to action (KTA) cycle<sup>7</sup> as a guiding framework. Additionally, the feasibility and efficacy of HIT in older adults in a skilled nursing facility is reported on.

**Case Description:** During a three-month period, 30 older adults (mean age=83) across multiple diagnoses (11 complex medical, 13 orthopedic, 6 neurologic) in the facility received HIT (outlined specifically in protocol used by Holleran et al)<sup>6</sup> as part of physical therapy care. Specific training parameters, including frequency of delivery (days/week), time spent actively stepping, heart rate and perceived exertion (Borg RPE),<sup>8</sup> and number of tasks practiced each session were tracked. All patients underwent a weekly standardized outcome assessment.

Additionally, measures of therapist adherence, changes in attitudes and beliefs (evidence-based practice attitudes scale<sup>9</sup> and implementation leadership scale),<sup>10</sup> balancing process measures (time, supervision, and productivity costs), and informal interviews were utilized to demonstrate the effectiveness of knowledge translation strategies and therapists' perceived effectiveness of the program.

**Outcomes:** Significant changes were seen in gait speed ( $.57 \pm .35$  m/s), five times sit to stand ( $9.74 \pm 7.64$ ), six-minute walk test ( $418 \pm 232$  ft), and grip strength (14% age-norm). Patients with severe cognitive deficits (St Louis University Mental Status exam<sup>10</sup>) had comparable changes in walking speed and endurance to patients with minimal or no impairment. 28/30 patients discharged above household ambulation speed and 15/30 at full community ambulation speed. Therapist adherence to enrollment and documentation standards was >95% during the study period, with decrease to 88.4% 12 weeks post, and 54.6% one-year post. 5/7 therapists report improved satisfaction with care and link patient outcomes to the HIT program.

**Discussion:** Therapists adopted significant practice changes through implementation strategies within the KTA framework, although the model relied on 1:1 mentorship. HIT was demonstrated to be safe, feasible, and effective in the SNF setting with no adverse events. Further research is needed to determine specific candidates for HIT across older adults.

## CSM 2019 Poster Abstracts

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**TITLE:** Breast Cancer-Related Impairments and Referral Priorities for Older Breast Cancer Survivors

**AUTHORS (FIRST NAME, LAST NAME):** Ann Marie Flores<sup>1</sup>, Amador Rosales<sup>1</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** This preliminary report describes older ( $\geq$ age 65) breast cancer (BC) survivors (BCS) patterns of BC-related impairments (impairments) and their oncology specialists (OS) physical therapy (PT) referral priorities.

**Number of Subjects:** We have recruited 49 BCS and 31 OS.

**Materials/Methods:** Using computer assisted telephone interviews we have conducted separate, one-time, observational surveys of BCS and OS.

Impairments queried on both surveys include: pain, fatigue, skin sensation changes (upper arm, hands/feet), shoulder range of motion, muscle weakness, abnormal posture, lymphedema diagnosis by physician, lymphedema signs/symptoms (breast, chest, upper back, axilla, and/or upper extremity edema); skin texture and color changes [hardness, hemosiderin staining]; heaviness/fullness).

The BCS survey also queried sociodemographics, medical history, and OS contact information. The OS included impairment priorities for PT referral and oncology specialty.

This study has been approved by Northwestern University's IRB. We use descriptive statistics, percent agreement and chi-square analysis ( $p < .05$ ) to describe whether relationships exist between impairments and PT referral priorities.

**Results:** On average, BCS were diagnosed with BC 4 years ago; are 71.21 years old (s.d. 4.90), white (91%), non-Hispanic (100%); have 3.02 (s.d. 1.95) medical comorbidities and household incomes  $\geq$ \$60k; 67% had lumpectomy and radiation, respectively; 28% chemotherapy; 63% lymph node removal by sentinel lymph node biopsy or axillary lymph node dissection; reconstruction with natural tissue (6%) or implant (12%). All are female. Physicians comprise 90% of our OS (31% medical oncology; 28% surgical oncology; 24% radiation oncology; 7% primary care), the remainder are oncology nurse practitioners, physician assistants or oncology nurses. The top 3 impairments among BCS are (in descending order): pain (56%), fatigue (56%) and limited shoulder range of motion on the involved side (47%). PT referral priorities by OS are, in descending order: lymphedema diagnosis (94%), limited shoulder range of motion (56%) and pain (31.3%). There was no agreement between percentages of impairments and PT referral priorities. No significant correlations were found between impairments and OS PT referral priorities.

**Conclusions:** Our preliminary findings suggest a mismatch between impairments and referral priorities for PT. While lymphedema among our BCS is sizable (22%) other impairments (i.e. pain, fatigue, shoulder range of motion, muscle weakness, skin sensation changes) were reported by BCS with much higher frequency. More research is needed to uncover the reasons for mismatch and PT referral priorities.

**Clinical Relevance:** This study may help inform patient and collegial education efforts on expectations, clinical pathways and overcoming barriers for effective PT referral and treatment of BCS. Our results may also help guide development of BC-related "pre-hab" PT programming for delivering targeted care for older BCS aimed at reducing impairments and BC-related disability.

## CSM 2019 Poster Abstracts

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**TITLE:** Are Timed Up and Go Norms Different for Older Adults Who Meet Recommended Levels of Aerobic and/or Resistance Exercise?

**AUTHORS (FIRST NAME, LAST NAME):** Kianna Witherspoon<sup>2</sup>, Claire Hildebrand<sup>3</sup>, Mackenzie Borrowman<sup>2</sup>, Brittani Sullivan<sup>2</sup>, Kailey Trieger<sup>2</sup>, Charity Johansson<sup>1</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** The Timed Up and Go (TUG) test(1) is widely used to assess functional mobility of healthy adults(2-6). Although normative values often serve as standards for community-dwelling adults, they are often developed without regard to subjects' activity levels. The American College of Sports Medicine (ACSM) recommends that older adults engage in resistance exercises at least 2-3 days in addition to 150 minutes of cardiorespiratory activity every week(7), yet data indicate that many community-dwelling older adults are largely sedentary(8). Are current TUG norms adequate guides for healthy aging? We compared TUG performance of older adults who met ACSM aerobic exercise recommendations and those who met both aerobic and resistance exercise recommendations with existing norms, hypothesizing that older adults who engaged in the recommended levels of aerobic and resistance exercise would perform better on the TUG than their age groups' existing norms (9).

**Number of Subjects:** Of 70 active older adults recruited from the community, 20 met ACSM recommendations for both aerobic and resistance exercise and 29 met aerobic recommendations alone.

**Materials/Methods:** Participants aged 60-85 were instructed to perform the TUG as quickly as they safely could. They also wore an activPAL® activity monitor for 1 week. Aerobic activity was derived from monitor data using activPal® software and the CDC's classification of moderate-intensity activity as 3-6 METs. Resistance exercise at least 2xwk was determined by self-report.

**Results:** Participants in their 60s and 70s who met only the aerobic activity recommendations outperformed the age-related norms ( $p=0.000$  and  $0.005$  respectively). Those who met both the aerobic and resistance exercise recommendations also exceeded their age-related norms ( $p=0.000$  and  $0.015$  respectively.) For participants in their 80s, aerobic activity alone did not result in significantly better performance than their norms ( $p=0.074$ ), but aerobic activity plus resistance exercise did ( $p=0.15$ ). In no age group was there a significant performance difference between the aerobic and the aerobic plus resistance groups.

**Conclusions:** Current TUG norms for healthy community-dwelling older adults do not represent performance of older adults who engage in recommended levels of cardiorespiratory exercise. For people in their 80s, engaging in aerobic exercise alone was not sufficient to result in significantly better TUG scores but combining resistance and aerobic exercise was.

**Clinical Relevance:** As physical performance measures such as the TUG are increasingly used to assess wellness in older adults, normative reference data need to reflect activity levels recommended for healthy aging. Recent research has shown that healthy older adults require higher intensities of physical activity to limit frailty with age(10). Further studies are needed with larger numbers of subjects, especially among the very old, and objective assessments of resistance exercise.

## CSM 2019 Poster Abstracts

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**TITLE:** The Impact of Aerobic and Neuromotor Exercise on Five-Times Sit-to-Stand Test in Older Adults

**AUTHORS (FIRST NAME, LAST NAME):** Mackenzie Borrowman<sup>1</sup>, Brittani Sullivan<sup>2</sup>, Claire Hildebrand<sup>2</sup>, Kianna Witherspoon<sup>3</sup>, Kailey Trieger<sup>3</sup>, Charity Johansson<sup>2</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** The Five-Times Sit-to-Stand (FTSTS) is a common measure of functional mobility in older adults,<sup>1,2</sup> but normative values typically have not taken into account participants' activity levels.<sup>3</sup> Although many apparently healthy community-dwelling older adults lead sedentary lives,<sup>4</sup> the American College of Sports Medicine (ACSM) recommends that older adults engage in at least 150 minutes of moderate-intensity cardiorespiratory exercise weekly, along with 2 or more days of resistance exercise and of neuromotor exercise.<sup>5</sup> This study compares FTSTS performance of older adults who engage in the recommended levels of aerobic exercise and those who also meet the ACSM recommendations for neuromotor exercise with existing FTSTS norms.<sup>6</sup> The FTSTS, previously thought to reflect primarily lower extremity strength,<sup>7</sup> has been found to be influenced by other aspects of balance and mobility.<sup>8</sup> Therefore, we hypothesized that older adults who performed neuromotor exercises in addition to aerobic exercise would perform better on the FTSTS than the existing norms and better than those who performed only aerobic exercise.

**Number of Subjects:** 70 older adults were recruited from community fitness centers and yoga classes. Of these, 26 people in the 60-79 year age range met the ACSM-recommended level of aerobic exercise. 16 of those also reported engaging in neuromotor exercise (yoga, Pilates, tai chi) at least 2x/wk.

**Materials/Methods:** As part of a larger fitness assessment, subjects performed the FTSTS following standard procedures. All subjects also wore an activity monitor (activPal®) for 1 week. Aerobic activity was quantified using activPal®'s software conversion of activity to MET values and the Center for Disease Control's classification of moderate activity as 3-6 METs. Groups' performances were compared using two-tailed t-tests.

**Results:** Subjects who engaged in both aerobic and neuromotor exercise at the recommended level performed better than their age groups' norms ( $p=0.000$  for subjects in their 60s and  $p=0.020$  for subjects in their 70s). Those who met the aerobic recommendations but did not report neuromotor exercise also performed better than their community-dwelling norms ( $p=0.001$  for subjects in their 60s and  $p=0.000$  for subjects in their 70s). No significant difference in FTSTS performance was found between subjects who met both the aerobic and neuromuscular exercise recommendations and those who met only the aerobic recommendations ( $p=.158$ ).

**Conclusions:** Older adults' aerobic activity at the ACSM-recommended level resulted in FTSTS performance significantly greater than their corresponding community-dwelling norms, but the combination of aerobic and neuromotor exercise did not result in FTSTS improvement over aerobic alone.

**Clinical Relevance:** Current FTSTS norms do not reflect the performance of older adults who engage in aerobic exercise at the recommended level. No additive value of neuromotor exercise was demonstrated in FTSTS performance, although further studies are encouraged to examine the effect of types and dosage of neuromotor activity on FTSTS scores.

## CSM 2019 Poster Abstracts

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**TITLE:** Establishing Fullerton Advanced Balance Scale Norms for Active Older Adults

**AUTHORS (FIRST NAME, LAST NAME):** Charity Johansson<sup>1</sup>, Kailey Trieiger<sup>2</sup>, Claire Hildebrand<sup>2</sup>, Mackenzie Borrowman<sup>2</sup>, Kianna Witherspoon<sup>2</sup>, Brittani Sullivan<sup>2</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** The 10-item Fullerton Advanced Balance scale (FAB) measures balance in functionally independent older adults, avoiding the ceiling effect exhibited by other balance assessment tools(1). Although its reliability and validity have been documented(2,3,1) and cut-offs have been established for the prediction of fall risk(1, 4), no norms have been established for the FAB. The purpose of this study was to develop preliminary FAB normative data for older adults. Because functional norms are often used prescriptively, we included data from participants who demonstrated healthy activity levels consistent with the American College of Sports Medicine (ACSM) aerobic activity guidelines(5).

**Number of Subjects:** Older adults in the southeastern US who reported being physically active were recruited from the community. Of the 62 who volunteered, 54 were found to meet the ACSM recommendation of at least 150 minutes of moderate-intensity aerobic exercise per week. The subjects, 34 women and 18 men, ranged in age from 50 to 93 years, with a mean age of 71.

**Materials/Methods:** Following IRB approval, participants completed the FAB as part of a multi-component fitness test. The FAB was conducted using standard procedures under the supervision of a licensed physical therapist. To quantify their activity levels, participants also wore an activity monitor (activPal® PAL Technologies) on the thigh for 1 week.

Compliance with ACSM aerobic activity guidelines was determined using activPal®'s software conversion of activity to MET values and the Center for Disease Control's classification of moderate activity as 3-6 METs.

**Results:** Subjects' FAB scores ranged from 29 to 40 out of a possible 40 points. FAB scores for women were: ages 50-59 (n=5) 39.2, 60-69 (n=15) 37.5, 70-79 (n=13) 36.8, and 80-89 (n=3) 33.0. FAB scores for men were: ages 60-69 (n=4) 37.0, 70-79 (n=7) 36.0, 80-89 (n=6) 35.2, and 90-99 (n=1) 30.0.

**Conclusions:** Participants' scores were well above the documented fall-predictive cut-off scores of 25/40(3) and 22/40(4). As expected, scores also decreased progressively with each decade of age, consistent with other functional balance measure norms(6).

**Clinical Relevance:** The FAB is useful for identifying balance problems as well as contributing to overall assessment of ability in higher functioning older adults(1). Normative reference values for the FAB are lacking, however. A previous study(7) compared FAB scores of active and sedentary older adults, but the results are of marginal usefulness in establishing norms, as the age range of older adults was limited to 40 to 60 years and participants' activity levels were categorized broadly and identified only by self-report. This study offers preliminary age- and gender-stratified reference data based on the performance of healthily active older adults which enhances the usefulness of the FAB as part of a larger fitness assessment, particularly as related to goal-setting and wellness criteria for older adults.

## CSM 2019 Poster Abstracts

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**TITLE:** Single-Leg Stance Times In Active Older Adults Who Meet Recommended Neuromotor Exercise Guidelines Compared To Those Who Do Not

**AUTHORS (FIRST NAME, LAST NAME):** Claire Hildebrand<sup>2</sup>, Kailey Trieger<sup>3</sup>, Kianna Witherspoon<sup>3</sup>, Mackenzie Borrowman<sup>2</sup>, Brittani Sullivan<sup>2</sup>, Charity Johansson<sup>1</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** The American College of Sports Medicine (ACSM) recommends that, in addition to aerobic exercise, older adults engage in neuromotor activities that involve balance, agility, and coordination at least 2-3 times a week(1). Garber et al. conclude, however, that more research is needed to determine the effectiveness of different types and amounts of exercise(1). Little is known about the effect that frequency of neuromotor exercise has on physical performance outcomes(2,3). Single-leg stance (SLS) is a simple test of static balance that is commonly used in health-related fitness assessments(4,5). This study compared the effect on SLS of performing neuromotor exercise 1 day a week and 2 or more days a week as an adjunct to aerobic exercise. We hypothesized that older adults who engaged in neuromotor exercise at the ACSM-recommended levels would perform better on the SLS than those who did not.

**Number of Subjects:** Of 70 physically active adults recruited from the local community, 59 (18 men, 41 women, ages 50-93) met ACSM guidelines for cardiorespiratory exercise. Of the 59, 16 reported engaging in neuromotor exercise (yoga, tai chi, Pilates) at least 2xwk(2+NM), 12 reported neuromotor exercise 1xwk(1xNM), and 31 reported no regular neuromotor exercise(0xNM).

**Materials/Methods:** Subjects completed a fitness assessment including SLS. Participants were instructed to maintain the SLS position with eyes open and arms across the chest as long as possible up to 2 min. Timing was stopped before 2 min. if the participant could not maintain the position. Participants performed the test once on each leg; the better score was used for analysis. Aerobic activity level was determined using a week of activity monitor (activPal®) data, the Center for Disease Control's classification of moderate activity as 3-6 METs, and activPal®'s software conversion of activity to METs. SLS times of the 0xNM, 1xNM, and 2+NM groups were compared using a one-way ANOVA.

**Results:** Active older adults who met the ACSM neuromotor exercise guidelines performed better on SLS than those who did not. Mean SLS times were: 0xNM=42.3 sec, 1xNM=57.3 sec, and 2+NM=84.7 sec. SLS performance of the 2+NM group was significantly greater than that of the 0xNM group ( $p=0.003$ ). Mean SLS performance increased with frequency (0xNM<1xNM and 1xNM<2+NM) but differences did not reach statistical significance ( $p=0.498$  and  $p=0.163$  respectively).

**Conclusions:** Our findings suggest that engaging in the ACSM-recommended level of neuromotor exercise along with aerobic exercise results in significant improvement on SLS performance.

**Clinical Relevance:** Identifying effective amounts and types of exercise for older adults is essential in promoting wellness. Although aerobic exercise variables have been widely studied, empirical data regarding neuromotor activities is notably lacking. Additional study is needed to explore the effects of neuromotor exercise variables on a variety of physical performance measures.

## CSM 2019 Poster Abstracts

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**TITLE:** Investigating the Effects of the Otago Program Among Individuals With Dementia

**AUTHORS (FIRST NAME, LAST NAME):** Lise McCarthy<sup>2</sup>, Ashleigh Trapuzzano<sup>1</sup>, Nicole Dawson<sup>1</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** Older adults with dementia are at a higher risk for falls and functional decline compared to cognitively intact older adults.<sup>1,2</sup> Exercise programs that target the modifiable physical risk factors are effective in reducing fall risk and improving functional performance outcomes in cognitively intact older adults.<sup>3,4</sup> Investigation of whether these results translate to individuals with dementia is limited, however, programs that incorporate balance and strength training show similar effects.<sup>5</sup> The Otago Exercise Program (OEP) is a home-based program that has shown success in reducing fall incidence and improving balance, functional mobility, lower extremity strength,<sup>6,7</sup> however, few studies have investigated its efficacy in older adults with cognitive impairment. The purpose of this retrospective study is to showcase significant performance improvements upon implementation of the OEP in people living with dementia.

**Number of Subjects:** 34 older adults with dementia (mean age 88.3 years; 62% female; mean Mini-Cog 1.76).

**Materials/Methods:** 34 participants completed the following functional assessments: Four-Stage Balance Test, Timed Up & Go, 30 second Chair Stand Test, and the Tinetti Gait and Balance. Assessments were completed by a trained physical therapist at baseline and an average of 4.79 (2.29) visits later, with a mean of 1.74 (0.79) months between assessment dates. The OEP exercises were individually tailored and progressed based on performance as recommended by the program protocol. Visits included a gentle warm-up, lower extremity strengthening exercises for major muscle groups using ankle weights, and functional balance exercises. Additionally, patients were encouraged to walk at home at least 30 minutes per day for 5 days per week.

**Results:** A paired samples t-test revealed significant differences in scores for the Four-Stage Balance Test ( $p < 0.001$ ), the Timed Up & Go ( $p = 0.002$ ), and the Tinetti Gait and Balance ( $p = 0.002$ ). The 30 second Chair Stand Test did not reveal significant improvements ( $p = 0.11$ ).

**Conclusions:** The OEP significantly improved balance and functional mobility in individuals with dementia over an average of 1.74 months. Lower extremity strength as assessed by the 30 second Chair Stand Test did not show significant improvements, however, the impact of the OEP on strength may not be revealed until a greater number of visits are completed.

**Clinical Relevance:** The OEP can potentially be used for people with dementia to improve performance outcomes such as balance and functional mobility. Clinically meaningful outcome measures that are commonly used by rehabilitation professionals can be used to demonstrate improvements in this population. More research is needed to evaluate this program with individuals with dementia. Future research directions and implications will be thoroughly outlined.

## CSM 2019 Poster Abstracts

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**TITLE:** The Impact of the Movement to Music Program on Functional Mobility and Balance in Older Adults With Dementia: A Case Study

**AUTHORS (FIRST NAME, LAST NAME):** jill beals<sup>1</sup>, Kelsey Huhn<sup>1</sup>, Gabrielle Kallin<sup>1</sup>, Nicole Dawson<sup>1</sup>

**ABSTRACT BODY:**

**Background & Purpose:** The impact of dementia demands a response to not only assist with prevention and a cure, but also to assist in the management of symptoms related to this progressive disease. There is no cure for dementia and little evidence that current medication regimens effectively halt the progression of the illness; therefore, there is a need for efficacious non-pharmacological interventions. Previous research demonstrates support for both therapeutic exercise and dance-based interventions methods to improve functional mobility of individuals with dementia. The purpose of this study is to examine the impact of a Movement to Music (M2M) program on balance & functional mobility in two older adults with dementia. The researchers hypothesize that participants in the M2M intervention will demonstrate improvements in functional mobility & balance.

**Case Description:** Two community dwelling members of the local Brain Fitness Clubs were chosen from a larger study to highlight their participation in the M2M program. Participant 1 was an 82-year old male diagnosed of mild cognitive impairment (MCI) with a Montreal Cognitive Assessment (MOCA) score of 26 out of 30. Participant 2 was a 90-year old male with a diagnosis of MCI and a MOCA score of 22 out of 30. The M2M Program consisted of a twice weekly group dance program lasting approximately 45 minutes that is led by a professional dance instructor. The program has a warm up followed by a variety of choreographed movements designed to challenge postural stability.

**Outcomes:** Each participant completed a pre- and post-assessment 6 months later including comfortable and fast gait speed via the 8-foot walk test, lower extremity via 30-second chair stand test, balance via the modified Berg Balance Scale, functional mobility via the timed-up-and-go (TUG) test, and balance confidence via the Activities Balance Confidence (ABC) Scale. Participant 1 demonstrated improvements in 5 out of the 6 outcome measures (strength, functional mobility, balance, balance confidence, and comfortable gait speed). These improvements met the established minimal detectable change for comfortable gait speed. Participant 2 improved in 4 out of 6 outcome measures (comfortable and fast gait speed, functional mobility, and balance confidence) while exceeding the minimal detectable change values for fast gait speed.

**Discussion:** This case series highlights Movement to Music, an innovative group dance intervention incorporating dual-task components, dynamic direction changes, and upper extremity movement with walking. With these components, improvements in functional outcomes would be expected. This program could be an exciting new activity to assist individuals with dementia to maintain and even improve physical performance, which is crucial to maximize functional independence. Further research is needed to investigate the M2M program and its potential benefit on this patient population.

## CSM 2019 Poster Abstracts

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**TITLE:** Effectiveness of A Physical Therapy Intervention on Postural and Functional Measures in Individuals With Hyperkyphosis Over 50 Years Old

**AUTHORS (FIRST NAME, LAST NAME):** Kirby J. Capps<sup>1</sup>, Lynne Hughes<sup>2</sup>, Rebecca Galloway<sup>2</sup>, Adrianna Laprea<sup>3</sup>, Rodney Welsh<sup>4</sup>, Jose D. Rojas<sup>5</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** People over the age of 50 have increased risk of hyperkyphosis at the thoracic spine. Physical therapy interventions for the treatment of hyperkyphosis include strengthening, postural alignment, stretching, and mobility and are typically studied over two to twenty-four months. The purpose of this study is to determine manual therapy and therapeutic exercise benefits over a condensed 4-week time period while investigating 2 hypotheses: [1] a physical therapy intervention will have a positive impact on posture as measured by kyphotic index, supine block test, and height measures; and [2] clinically relevant outcome measures will capture the functional improvements of patients being treated with hyperkyphosis.

**Number of Subjects:** 6

**Materials/Methods:** Five females and one male with mean age of 68.5 years old (SD±11.21) and mean weight of 159.5 lbs. (SD±22.47) participated in this study. They received physical therapy intervention three times per week for four weeks with sessions of thirty minutes to one hour. Interventions included manual therapy of the spine and surrounding joints and therapeutic exercises to strengthen postural muscles. Data was collected on 1<sup>st</sup>, 6<sup>th</sup>, and 12<sup>th</sup> visits including: height, weight, timed up and go, functional reach, short physical performance battery, 2-minute walk test, patient specific functional scale, flexicurve, and block test. Descriptive statistics and paired t-test were used to analyze the data.

**Results:** After 4 weeks of intervention, mean kyphotic index (TW/TL\*100) decreased significantly from 15.7 to 13.3 (paired t=3.02, p=0.03). Mean height pre and post-intervention was 159.3 cm and 160 cm respectively (paired t=-2.5, p=0.05). Supine block test for forward head also showed significant improvement from mean 4.6 cm pre and 3.2 cm post-intervention (paired t=3.8, p=0.01). Functional outcome measures trended in a positive direction with two reaching statistically significant change: patient specific functional scale (paired t=-6.5, p=0.001) and 2-minute walk test (paired t=-4.30, p=0.008).

**Conclusions:** These results indicate that the physical therapy intervention of manual therapy and therapeutic exercises have a positive impact on posture. Additionally, positive trends in functional outcome measures were achieved. The results of this study indicate a 4-week program provides sufficient time to achieve significant changes in postural measures.

**Clinical Relevance:** Hyperkyphosis can cause functional limitations and musculoskeletal changes. The measures utilized in this study are available to use clinically with patients who have hyperkyphosis. An intervention of manual therapy and therapeutic exercises may be used over a 4-week period of time to gain improvements in posture and function. Future research with a larger sample size is needed to determine if changes are clinically meaningful.

## CSM 2019 Poster Abstracts

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**TITLE:** Lower Extremity Power and Physical Function in Older Adults With and Without Hip Fracture

**AUTHORS (FIRST NAME, LAST NAME):** Marty Eastlack<sup>1</sup>, Michael A. Tevald<sup>1</sup>, Kathleen K. Mangione<sup>1</sup>, Marcus P. Besser<sup>2</sup>, Rebecca L. Craik<sup>3</sup>, Rebecca Fluta<sup>1</sup>, Nicole E. Rotunno<sup>1</sup>, Olivia Shaffer<sup>1</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** Lower extremity power (LEP) has been shown to be more closely associated with function in older adults than strength (muscle torque). Little is known, however, about the relationship between LEP and performance during sit to stand (STS) transfers and gait in persons after hip fracture. The purposes of this study were to 1) compare LEP, STS loading rate, STS time and usual gait speed (GS) between persons after hip fracture and a matched sample, and 2) explore the contribution of LEP to functional tasks (STS transfer and GS).

**Number of Subjects:** 17 subjects post hip fracture and 13 sex, age and BMI matched participants were recruited from retirement communities. There were 4 men in each group. Average time from fracture to testing =7.9 months (range=6-9.5). The post-hip fracture participants were part of a larger study of post-fracture rehabilitation.

**Materials/Methods:** Average LEP was assessed isokinetically (Primus, BTE, Baltimore Maryland) in each limb during a unilateral leg press maneuver at 30, 40, and 50% of body weight (BW) and the summed LEP at each load was reported. STS was performed on force plates, and the vertical ground reaction force was used to determine loading rate (rate at which the load was transferred from the buttocks to the feet) and STS time (initiation of the STS to quiet standing). GS over 4 meters was measured using the GaitMatII. Groups were compared using independent samples t- test (summed LEP & GS) or Mann-Whitney U tests for skewed variables (loading rate and STS time). The contribution of LEP to functional performance was determined using bivariate Pearson correlations and multiple regression models.

**Results:** Summed LEP at all loads and STS loading rates were lower, while STS time and GS were slower, in individuals post-hip fracture. Age and LEP at 30% had the highest bivariate associations with both functional measures, and therefore were entered into the multiple regression models. Age and LEP at 30% BW together accounted for 30% of the variance in STS time and 43% of the variance in GS. As age was not different between groups, when age was removed from the model, LEP accounted for 25% of the variance in STS time and 54% in UGS.

**Conclusions:** Deficits in LEP persist in individuals post hip fracture as compared to a matched cohort, even following participation in an extended rehabilitation intervention.

**Clinical Relevance:** This LEP deficit is important as it impacts the performance of basic functional tasks, such as rising from a chair (STS) and walking at usual speed (GS), the latter of which is a predictor of numerous health outcomes. These results suggest that training LEP may improve chair rise and walking performance and result in better participation as defined in the International Classification of Function model.

## CSM 2019 Poster Abstracts

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TITLE: Internal Carotid Artery Stenosis in a Patient Referred to a Physical Therapist for Dizziness

AUTHORS (FIRST NAME, LAST NAME): Ryan Boggs<sup>1</sup>, Michael D. Ross<sup>1</sup>

### ABSTRACT BODY:

**Background & Purpose:** It is important for physical therapists to be highly efficient in recognizing signs and symptoms of potentially serious medical conditions that can cause dizziness and appropriately refer to another health care practitioner when indicated. The purpose of this report is to describe the clinical decision-making process for a patient diagnosed with severe stenosis of the internal carotid arteries after being referred to a physical therapist for the treatment of persistent dizziness.

**Case Description:** The patient was a 79 year-old man who was referred to a physical therapist for the treatment of persistent intermittent dizziness by his primary care physician. The patient's dizziness began 6 months prior insidiously; it was worsening over time and now interfered with activities of daily living. More specifically, the patient was no longer able to negotiate stairs without the use of handrails, dress himself without taking rest breaks, and ambulate in the community without complaints of increasing dizziness. The patient denied numbness or tingling in his extremities, difficulty maintaining balance with walking, or muscle weakness, dysphagia, drop attacks, diplopia, or dysarthria. The patient's past medical history included hypertension and depression. At the time of the physical therapist's initial evaluation, the patient had no complaints of dizziness at rest, his blood pressure was 126/62, and he was independent with ambulation. Cervical range of motion was moderately restricted in all motions and his dizziness was elicited with changes in head position, especially cervical rotation in standing and supine. The patient's neurological examination was unremarkable. Due to positional complaints of dizziness, a Dix-Hallpike test was used to screen for benign paroxysmal positional vertigo, which was positive for symptoms reproduction; however, no nystagmus was noted. The patient also became diaphoretic and exhibited significant discoloration of his face during the test. The patient was returned to the sitting position and was closely monitored, and his symptoms returned to baseline.

**Outcomes:** Carotid duplex ultrasonography demonstrated stenosis of both the proximal left and right internal carotid arteries, with stenosis in the range of 50 to 69 percent bilaterally and slightly worse on the left. Magnetic resonance angiography revealed near complete occlusion of the left internal carotid artery at its origin. On the right side, there was narrowing of the right internal carotid artery correlating to a stenosis of 80 percent. The vertebral arteries were unremarkable bilaterally. The patient subsequently underwent a left internal carotid endarterectomy with resolution of symptoms and a return to all activities of daily living.

**Discussion:** Carotid artery stenosis, although frequently asymptomatic until severe, may manifest as complaints of dizziness that may mimic peripheral vestibular dysfunction. Appropriate and prudent practitioner screening and referral is necessary if clinical symptoms suggestive of vascular compromise are present.

## CSM 2019 Poster Abstracts

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**TITLE:** Electroskip™ Auditory Biofeedback in a Patient With Parkinson's Disease: A Case Report

**AUTHORS (FIRST NAME, LAST NAME):** Garrett Szydowski<sup>1</sup>, James O'Neil<sup>2</sup>, Jon Mrowczynski<sup>2</sup>, Michael D. Ross<sup>1</sup>

**ABSTRACT BODY:**

**Background & Purpose:** Numerous authors have proposed the benefits of audio, music and dance therapies for patients with Parkinson's Disease. The purpose of this case study was to explore the possible beneficial effects of a rehabilitation program with an audio-biofeedback technology called Electroskip™ in a patient with moderate Parkinson's disease.

**Case Description:** The patient was a 61 year old man with moderate Parkinson's disease (Hoehn & Yahr stage III) who had progressive episodes of freezing of gait. The patient completed a 6-week rehabilitation program (18 individual 45-minute sessions) focused on functional tasks, balance and gait training using Electroskip™ technology. Electroskip™ is a wireless, wearable device that sends a discrete real-time generative audio-biofeedback signal when the user steps on either the heel or toe force sensors positioned under the insoles. Additionally, a self-generated metronomic sound adjusts in tempo based upon the speed of the walker.

**Outcomes:** The outcome measures for gait and balance included the Timed "Up & Go" Test (TUG), Freezing of Gait Questionnaire (FOGQ), the Modified Parkinson's Activity Scale (mPAS) and the Berg Balance Scale (BBS). No adverse events occurred during the rehabilitation program. On day 1, the TUG improved from 53 s to 39 s with the use of Electroskip™ technology. At 6 weeks, the TUG was 25 s and 23 s with and without the use of Electroskip™ technology, respectively. For the FOGQ, the score was 14 on day 1 and it remained at 14 at 3 and 6 weeks without Electroskip™ technology; with the use of Electroskip™ technology, the FOGQ decreased to 6 at 3 and 6 weeks. For the mPAS, the score was 19 on day 1, 23 at 3 weeks and 21.5 at 6 weeks without Electroskip™ technology; with the use of Electroskip™ technology, the mPAS increased to 23 on day 1 and at 3 weeks, and 23.5 at 6 weeks. The BBS improved from 39 on day 1 to 48.5 at week 6; Electroskip™ technology was not used during assessment with the BBS.

**Discussion:** The results of this case report suggest that a rehabilitation program focused on functional tasks, balance and gait training using Electroskip™ technology may be beneficial for improving gait and balance in a patient with moderate Parkinson's disease. Future work is needed to determine the effectiveness of Electroskip™ technology by means of randomized controlled trials.

## CSM 2019 Poster Abstracts

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**TITLE:** Factor Structure and Item-level Psychometrics of the Frenchay Activity Index among Older Adults With Gait and Balance Deficits

**AUTHORS (FIRST NAME, LAST NAME):** Pallavi Sood<sup>1</sup>

**ABSTRACT BODY:**

**Purpose/Hypothesis:** Frenchay Activity Index (FAI) is a self-reported IADL scale developed by Holbrook and Skilbeck.<sup>1</sup> It was created to assess participation in patients who had suffered a stroke,<sup>1</sup> although other studies have validated this scale among other populations such as individuals with lower limb amputation,<sup>2</sup> spinal cord injuries,<sup>3</sup> venous ulcers,<sup>4</sup> traumatic limb injury,<sup>5</sup> young adults with disabilities,<sup>6</sup> and community dwelling older adult populations.<sup>6-11</sup> To our knowledge, there is no evidence supporting the use of this scale to assess participation in community dwelling older adults with gait and balance deficits. It is important to validate FAI for community dwelling older adults with gait and balance deficits as this population have history of falls or are at risk of falling predisposing them to falls associated complications.<sup>12-14</sup> Additionally, there is lack of agreement in existing literature on number of possible factors for FAI. Therefore, this study examines the factor structure and item-level psychometrics of the Frenchay Activity index (FAI) when used to measure participation in a group of community dwelling older adults with gait and balance deficits.

**Number of Subjects:** 147 community dwelling older Veterans with prior history of falls or at high risk for falling due to multiple risk factors were identified using retrospective chart reviews.

**Materials/Methods:** Data analysis was conducted using EFA (Exploratory Factor Analysis), CFA (Confirmatory Factor Analysis), and Rasch partial credit model to determine factor structure and item-level psychometric properties of the FAI.

**Results:** CFA failed to confirm unidimensionality of the scale. EFA identified two salient factors: domestic chores and work/leisure (both subscales met fit criteria: CFI>.95, TLI>.95, RMSEA >0.05, SRMR<1.0). The FAI 4-point rating scale did not meet Linacre's 3 essential criteria and was collapsed into a 3-point rating scale to improve the response distribution. The domestic chores and work/leisure subscales showed satisfactory Rasch fit statistics (Outfit/Infit MnSq 0.6-1.4, zstd <2) for all items except for two items driving car/ bus travel (Infit MnSq=1.22, Z score=1.80, Outfit MnSq=1.64, Z score=2.80) and Walking outside>15 minutes (Infit MnSq=1.41, Z score=3.40, Outfit MnSq=1.85, Z score=3.10). Cronbach's alpha for both subscales was within acceptable range ( $\geq 0.70$ ).

**Conclusions:** Our findings suggest the FAI is a psychometrically acceptable IADL scale that measures complex everyday participation in domestic chores and work/leisure activities for community dwelling older Veterans with gait and balance deficits.

**Clinical Relevance:** An overarching goal of a clinician in the rehabilitation setting is to restore function, and to maximize social participation. In order to do so, IADL scales such as domestic chores and work/leisure scale scales can be incorporated in treatment planning to evaluate and monitor IADLS for community dwelling older adults with gait and balance deficits.