

PURPOSE: The aim was to identify if the sensitivity of the BBS, FAB, TUG, and ABC, changed as a function of age group (60-79 vs. 80-100) for retrospective falls.

METHODS: Forty-six community-dwelling older adults (mean age 79.1±10.2 years) were recruited from multiple facilities and asked how many times they had fallen in the past six months. Next, the ABC, TUG, BBS, and FAB were administered in random order to assess the participants' fear of falling, mobility, and balance. Logistic regression was used to determine the discriminative power of these tests related to falls. Logistic regression models had a binary outcome of self-reported history of at least one fall versus no falls. Receiver operating characteristics (ROC) curves were calculated, as well as the corresponding area under the curve (AUC). Specificity and sensitivity were calculated by age group (60-79 and 80-100).

RESULTS: While the ABC, TUG, BBS, and FAB were significantly correlated with each other, their ability to discriminate fallers from non-fallers was poor (AUC = 0.366, 0.554, 0.426, and 0.437, respectively). Most models were better suited to determine non-fallers as opposed to fallers, indicated by a larger specificity than sensitivity. For all outcome measures, the sensitivity was 25.0% for 60-79 years and 37.7% for 80-100 years. The specificity was 100.0% for all outcome measures for 60-79 years, and was ≤68.8% for 80-100 years.

CONCLUSIONS: Sensitivity, while poor in both age groups, was greater in the older group. Based on the present data we suggest pairing these tools with other measures to reliably assess and provide a total fall risk prediction.

2946 Board #11 June 3, 2:00 PM - 3:30 PM

Supervised Exercise Leads to Improved Reactions, Balance and Reduced Falls Risk in Older Adults with Type 2 Diabetes

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(No relationships reported)

Older persons with type 2 diabetes (T2DM) often exhibit declines in muscle strength, balance and gait control which can lead to increased likelihood of suffering a fall. Supervised exercise incorporating aspects of balance control is one obvious intervention that can be employed to improve posture and strength and, ideally, reduce the risk of falling in these individuals.

PURPOSE: To assess the impact of 12 weeks of supervised balance and exercise on falls risk, lower limb strength, reaction time and balance in a group of older adults with T2DM.

METHODS: Thirty older individuals with T2DM (mean age 68.0±4.9 yrs, 10 males, 20 females) participated. Balance was assessed using a force platform with subjects standing on a foam surface with eyes open (3 trials). Reaction time (RT) was assessed for the hand (10 trials). Falls risk was measured using the Physiological Profile Assessment, a validated tool including tests of vision, sensation, posture, and leg strength. Values from each test were combined to provide an overall risk score (range -2 to +4) with higher scores denoting greater falls risk. After initial assessment, all subjects participated in a 12-week thrice-weekly supervised exercise training program before being reassessed on the same tests post-training. Training sessions (40 min each) consisted of lower limb stretches followed by a lower limb, abdominal, and lower back exercises.

RESULTS: Following 12 weeks of training, T2DM adults showed significant increases in knee extension strength (pre: 33.7 kg; post: 38.2 kg, $p<0.05$), faster hand RT (pre: 275.6±8.9 ms; post: 258.2±10.7 ms, $p<0.05$), and decreased postural motion (pre: 32.5±4.5 cm; post: 24.1±6.2 cm, $p<0.05$). These changes resulted in an overall significant decline in falls risk score (pre: 0.59±0.12; post: 0.33±0.14, $p<0.05$). A nonsignificant trend towards reduced average number of falls was also found (pre: 0.33; post: 0.16, $p=0.12$).

CONCLUSION: Overall, 12 weeks of supervised exercise training led to a reduction in falls risk for older adults with T2DM, based on improvements in a wide range of physiological measures, including increased lower limb strength, improved balance control and faster reaction times. Supervised balance training can safely be used as an intervention to lower falls risk in older adults with T2DM.

2947 Board #12 June 3, 2:00 PM - 3:30 PM

A Validation of the Fullerton Advanced Balance Scale in High Functioning Older Adults

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(No relationships reported)

The Fullerton Advanced Balance Scale (FAB) is a commonly used assessment for predicting fall risk in high functioning older adults. While it has been shown to be a reliable and valid tool in clinical and therapy settings, a comparison with laboratory measures of balance capable of detecting subtle differences in balance ability has not been conducted. This shortcoming with the current FAB scale allows the possibility of a ceiling effect in the capability to identify balance deficits in high functioning older adults.

PURPOSE: This study investigates whether a ceiling effect exists within the FAB, and specifically investigates the validity of the FAB assessment as a method for detecting subtle balance deficits in highly functioning older adults.

METHODS: 33 community living older adults (age: 62.97 ± 7.14 years) were assessed using the short form of the FAB. While performing the single leg balance test participants were scored 1 through 4 based on observed errors. Simultaneously, center of pressure (COP) movement was recorded using a plantar pressure pad. COP sway, velocity, and variability were quantified using the pressure data. A one way ANOVA was used to examine differences in COP metrics between FAB groups. A k-means cluster analysis was used to separate participants into 4 groups based on COP sway. Ability of the FAB to detect subtle differences in balance was quantified by examining the percent agreement between grouping based on COP sway and grouping based on FAB scores.

RESULTS: Average COP sway was significantly different between FAB groups, with participants who score a 4 demonstrating less sway (6.21 ± 3.08 cm) than those who scored a 1 (13.30 ± 4.56 cm, $p = 0.001$) or a 2 (13.19 ± 2.95 cm, $p = 0.001$). However, there were no differences between FAB groups 1 and 2. The kappa statistic indicated poor agreement between the groups based on COP sway and groups based on FAB scores (Kappa = .210).

CONCLUSIONS: Results suggest that the FAB scale lacks the sensitivity to detect subtle balance changes in high functioning older adults. Further investigations are necessary to construct a sensitive balance scale which is both clinically useful but does not produce a ceiling effect when assessing high functioning older adults.

2948 Board #13 June 3, 2:00 PM - 3:30 PM

Differences in Trailing Limb Response Between Falls and Recoveries Following a Laboratory-Induced Slip

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Walking is commonly promoted as a way to increase physical activity among older adults. However, walking includes an inherent risk of slips and falls. When a slip occurs upon heel strike, a trailing (non-slipping) limb response is often required to recover balance. A better understanding of the trailing limb response characteristics that are associated with falls and recoveries could lead to training interventions to improve these responses, and reduce the risk of falls from a slip.

PURPOSE: To identify differences in trailing limb responses between falls and recoveries following laboratory-induced slips.

METHODS: Seventy-two adults were exposed to an unexpected slip by walking over a slippery surface. Each slip outcome was characterized as a fall or recovery based upon the force applied to a safety harness. Thirty-two slips were excluded from analysis because the slip distance was <20 cm (eliciting minimal trailing limb response), or because the outcome could not be unambiguously characterized as a fall or recovery.

RESULTS: Of the 40 slips investigated, subjects used one of two trailing limb responses: a forefoot/toe-down (FT) response, where the forefoot or toe of the trailing foot contacted the floor posterior to the slipping foot; or a flat-foot (FF) response, where the entire sole of the trailing foot contacted the floor closer to the slipping foot than during the FT response. The trailing limb response influenced the type of fall experienced. Of 21 subjects who attempted FT responses, 7 fell straight down, 2 fell laterally, and 12 recovered. These falls exhibited 48% longer anteroposterior (AP) flight distance of the trailing foot ($p=0.018$), and 15% longer AP distance between heels at touch down of the trailing foot compared to recoveries ($p=0.037$). Lateral falls did not appear to result from a deficient trailing limb response. Of 19 subjects who attempted FF responses, 4 fell backwards and 15 recovered. These falls did not differ from recoveries in any response parameters ($p>0.05$).

CONCLUSIONS: The FT response resulted in no backward falls, and exhibited differences in potentially modifiable response parameters between falls and recoveries. As such, training a FT response among older adults may help reduce risk of hip fracture associated with backward falls.

2949 Board #14 June 3, 2:00 PM - 3:30 PM

Comparison of Mayo Clinic and ActiGraph GT3X+ Step Detection Algorithms in Older Adults

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ActiGraph GT3X+ (AG) activity monitors (AMs) are the most widely used research AMs. However, large discrepancies between them and with other research-grade pedometers are reported. We developed and validated an algorithm which accurately detects posture, transitions, and steps. Comparisons between our algorithm and AG could provide new insights on inaccuracy causes.

PURPOSE: To compare the performances of the AG normal (NR), low frequency extension (LFE), and our Mayo Clinic (MC) algorithms.

METHODS: 16 older adults (31% male, 78±8 yrs) wore 3 AG AMs on the waist and ankles to record acceleration data at 100 Hz for slow, normal and fast-paced walking lab trials and for 4 days in free-living. IRB approved the protocol and informed consent was obtained. Steps were detected from acceleration data using MC, NR, and LFE algorithms with 15 s epochs. Lab-based validities were evaluated by comparison to video.

RESULTS: Lab data showed >90% median agreement with video using LFE and MC algorithms with <1% difference between them (Fig 1). Larger differences between LFE and MC step counts were observed in free-living (Fig 1). 96 and 99% of MC steps, and 74 and 85% of LFE steps with waist and ankle AMs were accounted for when comparing 15 s epochs with both MC and LFE detected steps. 67 and 92% of MC steps, and 85 and 97% of NR steps with waist and ankle AMs were accounted for when comparing epochs with both MC and NR detected steps. Remaining LFE and NR steps occurred when the MC algorithm detected transitions, and no activity (Fig 1).

CONCLUSIONS: The data suggest that many inaccuracies using NR and LFE algorithms are due to the absence of postural detection and oversensitivity of the LFE algorithm, and support the ankle as the most accurate AM location.

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Concurrent Validity of GAITrite and Zeno Walkway Systems

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The GAITrite (CIR Systems Inc. Sparta, NJ) and Zeno Walkway (ProtoKinetics LLC. Havertown, PA) are electronic, pressure sensitive walkways used to measure spatiotemporal parameters of gait. GAITrite has been used extensively to measure gait characteristics of several populations including older adults. Recently developed, the Zeno Walkway has a non-carpeted and wider surface area than GAITrite and allows for uninterrupted, multiple walks across the mat. However, little information exists on the validity of Zeno Walkway to measure gait among older adults.

PURPOSE: To determine concurrent validity of the Zeno and GAITrite walkways in healthy older adults.

METHODS: Thirty healthy adults (mean age 74.7, SDV 6.44; 11 males) completed 5 walks each at normal and fast walking speeds across both walkways. The intraclass coefficient ICC (2,5) was determined for spatiotemporal gait parameters (listed in Table 1) to determine concurrent validity.

RESULTS: See Table 1.

CONCLUSION: The concurrent validity of Zeno and the GAITrite systems was generally moderate to strong, and greater for the fast condition. Lower correlations may be related to differences in the walkways (dimensions and surface), methods of collection or analysis.

Table 1. ICC (2,5) values for spatiotemporal gait parameters at each speed.

Dependent Variable	Normal Speed Condition	Fast Speed Condition
Step Length (cm.)	0.892	0.921
Stride Length (cm.)	0.899	0.919
Gait Speed (cm./sec.)	0.721	0.960
Stance Time (sec.)	0.636	0.752
Cadence (steps/min.)	0.495	0.827
Single Support (%)	0.868	0.909