Safe and successful mobility maybe essential to maintain quality of life in independently living community-dwelling older adults. These are high functioning individuals who may encounter precarious situations during their community ambulation increasing their risk for falling and loss of mobility. Loss of mobility in these individuals may have a dramatic impact on their quality of life. Though there are many ways to measure balance and fall-risk in older adults, the Community Balance and Mobility (CB&M) assessment is shown to alleviate the ceiling effects and suggested to be a preferred assessment for balance and mobility in independently living community-dwelling older adults. It is important from a clinical perspective to determine if performance on such a challenging assessment like CB&M is related to having a higher quality of life.

PURPOSE: To assess how quality of life is related to mobility and balance performance in community-dwelling older adults.

METHODS: An ongoing study of 20 older adults (mean age: 74.1±6.4 years; 10 females) who were living independently in the community participated. Health-related quality of life was measured with 36-Item Short Form Health Survey (SF-36). SF-36 is a patient-reported survey measuring health status with subscales consisting of physical functioning, role limitations due to physical health, role limitations due to emotional problems, energy/fatigue, emotional well-being, social functioning, pain, and general health. Mobility and balance was measured with CB&M, a performance measure consisting of 13 challenging tasks evaluating mobility and balance performance. Correlation analysis was performed between SF-36 and CB&M scores.

RESULTS: The physical function subscale (r = 0.572; p = 0.008) and general health subscale (r = 0.520; p = 0.019) showed significant moderate positive correlations with mobility and balance performance, as assessed by the CB&M.

CONCLUSIONS: Community-dwelling older adults with a higher CB&M score attained higher scores on the SF-36 subscales, suggesting that, greater mobility and balance ability is associated with a higher quality of life in independently-living community-dwelling older adults. If dynamic balance can be improved or maintained in older adults, they are more likely to sustain a better health-related quality of life.

1815   Board #76   May 31 3:30 PM - 5:00 PM

Relationship between Cognition and Exercise Capability in Community-dwelling Older Adults

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(No relevant relationships reported)

Several studies found that both cognition and exercise capability (EC) were risk factors related to older adults' falls. However, there is limited information about the performance of cognition and EC in old adults.

PURPOSE: To investigate the relationship between components of cognition and EC in older adults.

METHOD: Sixty-six old adults (aged 65-80 yr., 31 males and 35 female s) volunteered performing a battery of four physical test (Hand force, 30-s chair-stand test, Eyes closed standing and The timed "Up & Go") evaluating EC. Four psychological tasks (Stroop task, N-back task, More_oddshifting task and working memory) were used to assess EF, and 2-Choice Reaction Time (CRT) to processing speed, dual task walking to attention. Person correlation coefficient (r) was used to determine the relationship between cognition and EC.

RESULT: Some low-to-moderate correlations were found between cognition and EC, which are summarized in the table below:

	Stroop task	N-back task	More_oddshifting task	Working memory	CRT	Dual task
Hand force,	.11	.10	.09	.11	-.16**	-.41*
30-s chair-stand test	.20*	.22	.18*	.18	-.26**	.25
Eyes closed standing	.32**	.19*	.29**	.12	-.15**	-.40*
The timed "Up & Go"	-.27**	-.21*	-.31**	-.25*	.39**	.24*

Note: *=p<.05, **=p<.01.

CONCLUSION: The cognition does have low-to-moderate relationship with some EC, which means that we may promote one through training another one.

1816   Board #77   May 31 3:30 PM - 5:00 PM

Greater Stance Time Variability is Associated with Lower Step Activity in Older Adults

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(No relevant relationships reported)

Previous research has shown that older adults with greater gait variability are at a higher risk for falling. Falls increase fear of falling and may subsequently result in mobility disability manifesting as decreased physical activity. Physical activity is commonly gauged from continuous step activity monitoring. While decreased step activity has been associated with impaired gait, the associations between gait variability and step activity are not understood.

PURPOSE: To examine the relationship between gait variability and step activity in older adults.

METHODS: Spatiotemporal gait parameters were recorded for 19 healthy older adults (mean age 74.5 ± 6.3 years; 9 males/ 10 females) walking at a normal walking speed across a GAITRite walkway for 5 trials. Step activity (# of steps) was collected using a research-grade step activity monitor for 7 consecutive days. Average number of steps for the 7 days was used. Coefficient of variation (defined as % of SD over mean) of gait speed, stride length, step width, swing time, stance time and double support time were calculated. Pearson's and Spearman's correlation coefficients were used based on normality to determine the relationship between gait variability and step activity.

RESULTS: Stance time variability showed significant moderate inverse correlation with step activity (rho = -0.482, p = 0.036). Swing time variability showed moderate inverse correlation with step activity with a trend towards significance (r = -0.451, p = 0.052). Variability of gait speed (rho = -0.349, p = 0.143), stride length (r = -0.3, p = 0.212), step width (rho = -0.088, p = 0.721), and double support time (rho = -0.249, p = 0.304) showed weak inverse but not significant correlation with step activity.

CONCLUSION: In general, gait variability seems to be inversely related to step activity in older adults meaning those with greater gait variability showed lower step activity. In particular, stance time variability has earlier shown to be critical in identifying older adults with mobility disability and those older adults at risk for future disability. Our finding of decreased step activity in those older adults with increased stance time variability suggests that step activity monitoring could provide surrogate and complimentary measures to identify mobility disability in older adults.

1817   Board #78   May 31 3:30 PM - 5:00 PM

Elevated Bmi Impairs Balance Among Older Adults With Vestibular Disorders

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(No relevant relationships reported)

Each year, more than 2.5 million geriatric patients are admitted to emergency departments for fall-related injuries. Identifying variables that predict fall risk may help manage this problem. Physical activity and body composition are potential predictors. The average elderly fall risk patient walks <2,200 steps per day and is commonly advised to minimize physical activity owing to elevated risk of injury. Limiting exposure can be effective in the short term but the chronic anthropometric consequences may exacerbate risk in the future.

PURPOSE: To evaluate the effect of body mass index (BMI) on balance in geriatric patients who are at risk of falling.

METHODS: We enrolled 24 patients (12 men, 12 women) with a diagnosed vestibular disorder who were ≥65 years of age. Patients were excluded if they had a history of injury precluding participation or currently participated in an exercise program. We collected demographic, anthropometric, and balance data at baseline. Balance was assessed using a CSMi HUMAC System Balance Board. After baseline testing, subjects were randomized to either a fatigue intervention (modified Bruce treadmill protocol) or a mild walking intervention (2 mph, 0% incline, 4 minutes). Following exercise, patients repeated the balance assessment. Linear regression tested the effects of age, sex, obesity, and group assignment on the change in balance score.

RESULTS: The regression model explained 78% of the variance in the change in balance score (p<0.001). Holding all other predictors constant, performing the fatigue protocol associated with a greater loss of balance (3.9 percentage points; p=0.044); for each 1-point increase in BMI, patients experienced an additional loss of 0.7 percentage points. When evaluating obesity as a binary variable, being classified as obese associated with a loss in balance of 5.0 percentage points (p=0.011).

CONCLUSIONS: The relationship between fall risk and level of activity is complex. In our sample, obesity associated with a greater deterioration of balance following physical activity. When patients who are at risk of falling are advised to avoid physical activity, that advice may result in chronic compromise of balance, elevating the risk of future falls. Conversely, exercise performed in a safe, controlled environment may have therapeutic potential.

1818   Board #79   May 31 3:30 PM - 5:00 PM

The Effect of Mental Fatigue on Postural Stability in Young and Older Women

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(No relevant relationships reported)

Allocation of attentional resources is required for maintaining postural stability. Fewer attentional resources are available for balance control when individuals perform a dual task paradigm involving concurrent performance of a cognitive task. However, these effects have not been studied under conditions of mental fatigue.

PURPOSE To determine if mental fatigue influences postural stability and if there are age differences in stability in response to mental fatigue.

METHODS Center of pressure (COP) displacement in response to standing platform perturbations was recorded at the beginning and end of 20 minutes of the psychomotor vigilance task (PVT; mental fatigue condition) and 20 minutes of watching a nature video (control condition) in 16 young (22.4 ± 3.72 years) and 16 older females (72.6 ± 6.50 years). The PVT is a sustained attention task that induces mental fatigue, as indicated by increases in reaction time (RT) to visual stimuli.

RESULTS Older adults had a significantly longer RT (325.17 ± 30.90 ms) than young (287.95 ± 29.53 ms) at baseline (p=0.002). Both groups had significantly longer RTs by the end of the PVT task (young 11% increase, p=0.002; older 7% increase, p=0.03), indicating the presence of mental fatigue in the mental fatigue condition. Older adults had a significantly larger anterior-posterior (AP) COP displacement (7.37 ± 0.75 cm) than young adults (5.77± 1.67 cm) at baseline (p =0.001). Nine young and 8 old adults had increases of 0.7-54% in AP COP displacement after the mental fatigue condition. However, there was no significant main effect of condition (p=0.12) nor an interaction of age and condition (p = 0.85) for the percent change in AP COP from the beginning to the end of the session.

CONCLUSION These results indicate that although postural control and reaction time performance was worse in older than young at baseline, there was no significant effect of mental fatigue on postural stability in either group.

1819   Board #80   May 31 3:30 PM - 5:00 PM

Electrical Nerve Stimulation Elicits Intensity-dependent Changes in Force Steadiness in Young and Older Adults

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(No relevant relationships reported)

When individuals attempt to match a submaximal target force by performing a steady isometric contraction, the fluctuations in force are often quantified as force steadiness (coefficient of variation [CV] for force) to provide an index of the neural drive to muscle.

PURPOSE: To compare force steadiness of the wrist extensors during evoked and voluntary submaximal contractions in young and older adults.

METHODS: Thirteen young (5 men, 25 ± 4 yrs) and 12 older (7 men, 78 ± 5 yrs) adults participated in a 1-hr protocol that involved maximal voluntary contractions (MVCs) and voluntary and evoked isometric contractions to match a 10% MVC target force. Force steadiness during the voluntary contraction was compared with that evoked by wide, high-frequency (1 ms pulses at 100 Hz) and narrow, low-frequency (0.2 ms pulses at 50 Hz) neuromuscular electrical stimulation (NMES), and a voluntary contraction with superimposed submotor transcutaneous electrical stimulation (TENS). CV for force was compared between age groups with unpaired t-tests and within age groups by paired t-tests.

RESULTS: CV for force was less for young adults (1.82 ± 0.43%) than older adults (2.80 ± 1.08%) during the voluntary contraction with the wrist extensors (p<0.03). Force steadiness did not differ between age groups during the evoked contractions. However, older adults were steadier during both types of NMES (wide: 2.01 ± 0.67%, p<0.04; narrow: 1.69 ± 0.62%, p<0.02) than during the voluntary contractions (2.80 ± 1.08%). Concurrent TENS did not influence force steadiness for older adults, but young adults were less steady during TENS (2.41 ± 1.02%, p<0.03) than during the voluntary contraction by itself (1.82 ± 0.43%).

CONCLUSION: The improvement in force steadiness for older adults during the NMES-evoked contractions indicates that the age-associated decline in force steadiness is attributable to changes in the neural drive to muscle, rather than the mechanical properties of muscle. In contrast, the decline in force steadiness for young adults during concurrent TENS suggests that heightened sensory feedback compromised the neural drive to muscle during the steady contraction.

1820   Board #81   May 31 3:30 PM - 5:00 PM

Effects Of Resistance Training On Maximal Motor Unit Firing Rates In Young And Older Males

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(No relevant relationships reported)

It is unknown if resistance training (RT) has differential effects on maximum firing rates (MAX_{FR}) of motor units (MUs) across the recruitment threshold (REC_T), and whether or not age has an influence.

PURPOSE: To examine the effects of short-term RT on MAX_{FR} of MUs in young and older males.

METHODS: Thirteen young and seventeen older males were randomly assigned to either a training (young group [YTG]: n = 8, age = 21 ± 1.6 yrs; old group [OTG]: n = 10, age = 64.1 ± 7.4 yrs) or control (young group [YCG]: n = 5, age = 22 ± 3.1 yrs; old group [OCG]: n = 7, age = 64 ± 9.3 yrs) group. RT involved knee extensions for 4 sets of 10 repetitions for 2 weeks. Before (PRE) and after (POST) RT subjects performed 2 maximum isometric ramp contractions (MVCs) of the knee extensors while 4 surface electromyography (sEMG) signals were recorded from the vastus lateralis. The raw sEMG signals were then decomposed into their constituent MU action potential trains. REC_T, defined as the relative force level (%MVC) when the MU began firing, and MAX_{FR} were calculated for each MU. The highest 500 ms average for torque was considered peak torque (PT). Linear regression was used on the pooled and individual data for the groups separately, to examine the relationship between REC_T and MAX_{FR}. Two-way (group [young vs. old] × time [PRE vs. POST]) repeated measures analyses of variance were used to compare individual slope coefficients (SLP_c) and PT across time.

RESULTS: A total of 1,403 (PRE = 713; POST = 690) MUs were detected. SLP_c (p = 0.136) and PT (p = 0.781) remained unaltered in the control groups at POST. No significant group × time interactions were observed for SLP_c (p = 0.678) or PT (p = 0.100), but a main effect for time was demonstrated for SLP_c (-44.1%; p = 0.001) and PT (+12.5%; p = 0.001).