TITLE: Use of Steadi and Physical Activity Vital Sign in Fall Risk Assessment

CURRENT SECTION: Geriatrics

AUTHORS: Colleen Griffin Hergott, Nathan Massey, Debra Ann Beazley, Lori Bolgla

ABSTRACT BODY:

Purpose/Hypothesis: The timed-up-and-go (TUG) test is a reliable and valid tool for identifying individuals who may be a fall risk. Recently, the CDC has recommended using its STEADI for the same purpose. While the STEADI includes the TUG, it begins with three-key questions (3KQ). Asking 3KQ may be a sufficient screen to identify older adults at higher risk of falls. Another important initiative, Exercise is Medicine (EIM), is a global health initiative managed by the American College of Sports Medicine. EIM recommends use of the Physical Activity Vital Sign (PAVS) as an objective measure of physical activity. A higher PAVS may be associated with a reduced incidence of falls. The purpose of this study was to determine associations and diagnostic accuracy for using the 3KQ and PAVS to identify individuals who may be a fall risk. We hypothesized that a positive association would exist between 3KQ and TUG score and an inverse association between PAVS and TUG score.

Number of Subjects: 65

Materials and Methods: First, subjects completed the PAVS based on the following information: the average days per week of moderate to strenuous activity and the average number of minutes performed at this activity level. The average days multiplied by the average minutes represented the PAVS. We classified subjects with a PAVS less than 150 minutes as being a fall risk. Next, they answered the 3KQ from the CDC STEADI toolkit. The 3KQ inquired about falls in the past year; feeling of unsteadiness with standing or walking; and worrying about falling. One "yes" answer classified the subject as being a fall risk. Subjects then completed the TUG in a standardized manner. We recorded the time required to stand from a standard armchair, walk a 3-m distance, turn, and sit down to the nearest 1/10th of a second. Subjects who completed the TUG in more than 12 s represented a fall risk. Bivariate correlations were used to determine associations between PAVS and TUG and 3KQ and TUG. Sensitivity and specificity were calculated to determine the diagnostic accuracy for using the 3KQ and PAVS to identify fall risk subjects based on TUG results. The level of significance for the correlation analyses was 0.05.

Results: A fair association ($r = -0.35$; $P = 0.004$) existed between PAVS and TUG. A moderate-to-good association ($r = 0.57$; $P < 0.001$) existed between 3KQ and TUG. Using the TUG as the reference standard, sensitivity was 0.60 and 0.90 for the PAVS and 3KQ, respectively. Specificity was 0.62 and 0.73 for the PAVS and 3KQ, respectively.

Conclusions: Overall, the 3KQ had a stronger association with the TUG than the PAVS. The 3KQ also had high sensitivity. This finding suggested that older adults who answer "no" to all 3KQ represent a low fall risk based on the established TUG threshold. The PAVS was less capable of identifying subjects classified as a fall risk.

Clinical Relevance: Although the TUG is a commonly used test, it requires time to administer. Findings from this study have provided preliminary evidence that clinicians can ask 3KQ as an even quicker way to screen for fall risk. The PAVS is important for gaining information regarding exercise level but not necessarily useful as a screen for fall risk.

TITLE: Feasibility, Usability, Efficacy of Health in Motion Otago- a Digital Fall Prevention Program
CURRENT SECTION: Geriatrics
AUTHORS: Sheryl Maureen Flynn, Vanessa Oviedo, Charlotte Kurchian, William Pu
ABSTRACT BODY:

Purpose: The purpose of this study was to examine the feasibility, usability, and efficacy (non-inferiority) of Health in Motion- Otago (DIGITAL) compared with traditional Otago Exercise Program (PAPER).
Study Design: A/B crossover with pseudo-random assignment to the initial treatment condition (DIGITAL x 4 weeks or PAPER x 4 weeks).
Description: Falls are a public health concern. Currently, fall prevention programs lack scalability and have reduced access to the vast majority of adults over the age of 60. Health in Motion is a digital platform designed to provide education, exercise, and self-evaluation for fall prevention and management of chronic diseases. We created Health in Motion-Otago to support a wider dissemination of fall prevention programs while retaining a tether to the physical therapist. This method enables more older adults to benefit by engaging with the Otago Fall Prevention exercises and empowers them to keep track of their fall risk over time. The older adult downloads the app to their computer or smart device. A physical therapist assigns exercise routines (Otago) and evidence-based self-evaluations of fall risk (Fall Risk Assessment-FRA, One Leg Stand Test-OLST, 30 Second Sit to Stand Test-30STST, Timed Up and Go-TUG, Activity-specific Balance Confidence Scale-ABC). We conducted a 2-month study comparing home use of the digital Health in Motion-Otago with traditional paper home exercise program. The PT tracked the patient's performance using a web-based dashboard. Thirty community dwelling adults aged (Mean=69.53 yr., SD=6.45) completed the study.
Feasibility: Feasibility was measured in terms of the number of technical difficulties reported and tracking issues found when Health in Motion is used in the home. Technical difficulties reported by participants include: internet connection (28%), mouse problems (6%), laptop hardware lag (19%), and television issues (3%). Of the reported technical issues, 0% were attributable to the Health in Motion software, rather, technical issues were due to inconsistent Wi-Fi and internet speeds. Tracking issues were reported <10% of the time across all exercises and all participants.
Usability: Usability for Health in Motion was measured using the System Usability Scale (SUS). Health in Motion's usability was rated as very good >83%ile and was not statistically different from PAPER 80th%ile.
Non-Inferiority: Non-inferiority was measured using the TUG, FRQ, 30STST, OLST, Berg Balance Test (BBS) and the SF36. We used a repeated measures ANOVA (time X condition) and found no differences between intervention delivery method for TUG, OLST, BBS, SF36-overall. However, there was a main effect for time for the 30STST ($F(1,62)=8.26$, $p<0.01$), BBS ($F(1,62)=4.74$, $p<0.05$), indicating that both interventions were effective at improving strength and balance, and a main effect for condition for the SF36-pain ($F1,62)=8.05$, $p<0.01$) indicating DIGITAL reduced pain more than PAPER, this may be due to the benefit of correct posture/form demonstrations in the app by the on-screen avatar or because gamification has been shown to reduce pain.
Summary of Use: Results from this study indicate that a digital version of Otago Fall Prevention program is feasible, has high usability, and shows no significant difference from the traditional paper methods.
Importance to Members: The Health in Motion Otago Platform may provide physical therapists with a scalable tool that both empowers older adults to keep track of their fall risk and enables long term tracking of patient progress or change in fall risk. Health in Motion can also serve to reduce barriers of access to fall risk interventions. By addressing the barriers to access as well scalability issues, PTs may reduce overall catastrophic and reoccurring falls in a greater population.

TITLE: Implementation of an Accelerated Knee Arthroplasty Pathway: Is Success Age Dependent?
CURRENT SECTION: Geriatrics
AUTHORS: Karen Barker
ABSTRACT BODY:

Purpose/Hypothesis: The emphasis on reducing the number of days patients spend in hospital is growing with enhanced recovery pathways. We implemented an innovative non-selective accelerated pathway for knee arthroplasty that aimed for discharge on the day of surgery (Day 0). Early discharge was facilitated by delaying knee flexion until Day 5 after surgery which allowed patients to be mobilised in a timely manner. We hypothesised that adopting a single accelerated pathway would reduce length of stay with no adverse effect on knee flexion or adverse outcomes.

Number of Subjects: 1221 consecutive patients between September 2016 and June 2019 undergoing elective knee arthroplasty in a UK orthopaedic hospital setting.

Materials and Methods: A consecutive cohort of patients undergoing minimally invasive knee arthroplasty from September 2016 followed an accelerated pathway. They were mobilised by a physiotherapist, weight bearing as tolerated, on the day of surgery and were discharged home if medically well. For the next 5 days patients were told to keep the post-operative bandage on and their knee straight, perform only static quadriceps and circulatory exercises and walk around inside using crutches. On Day 5, they returned to a physiotherapy clinic appointment and knee flexion commenced along with a programme of functional activity based exercises.

Results: Mean length of stay reduced significantly from 2.6 days to 1.02 days (median 1 day) [p=0.001]. Overall 572/1221 [47%] of patients went home on Day 0, 412/1221 [34%] on Day 1 and 237/1221 [19%] on Day 2 or more. However, this was age dependent. For patients under the age of 65years 58% were discharged on Day 0 and 14% stayed 2 days or more. For patients aged 75-84 these figures were 39% and 23% respectively and for those aged 85 years or over only 7% were discharged on Day 0 and 53% stayed 2 or more days. The reasons the oldest patients in this cohort did not go home on Day 0 were; slow or unsafe mobility 42%, 12.5% lived alone or social reasons kept them in hospital, 12.5% had post-operative altered sensation or muscle strength which slowed their mobility and the past medical history of 7% necessitated an overnight stay.

At 6 weeks mean flexion was 109° (60-135°). Data collected from a previous cohort using the old protocol, when knee flexion was initiated on day 1 post-operatively, showed mean flexion of 108° at 6 weeks. There was no significant difference in flexion between the two groups (p=0.5). Patient satisfaction at 6 weeks using the Surgical Satisfaction Questionnaire showed 98% of patients discharged on day 0 were satisfied or very satisfied.

Conclusions: We demonstrated that an accelerated pathway with delayed post-operative knee flexion until Day 5 produced similar, or better knee flexion at 6 weeks when compared to the previous, more traditional, protocol. Patients of all ages including the very elderly, could be safely discharged but the probability of discharge on Day 0 decreased with age. The most common reasons the very elderly stayed in hospital were poor or unsafe mobility or social reasons. It may therefore be appropriate pre-operatively for physiotherapists to focus on balance and strengthening exercises and for occupational therapists to optimise the home environment in preparation for discharge home.

Clinical Relevance: This pragmatic, non-selective day surgery pathway is safe and acceptable to all ages of patients, allowing discharge for 80% of patients by the end of post-operative Day 1 resulting in a substantial reduction in bed occupancy, good clinical outcomes and high patient satisfaction. Non selective pathways are appropriate and should be considered for all patients irrespective of age, whilst accepting that the success of a Day 0 discharge will be likely to incrementally decrease with the age of the patients.

TITLE: Form ≠ Function: Fast Gait Speed in Older Adults Is Best Predicted By Functional Performance
CURRENT SECTION: Geriatrics
AUTHORS: Daniel William Komforti, Chestton Joffe, Adonis Magras, Alexander Peller, Emily Garbe, Rishi Garib, Ashleigh Dyanne Trapuzzano, Nicole Therese Dawson, Matt S. Stock

ABSTRACT BODY:

Purpose/Hypothesis: Gait speed is now recognized as an important clinical tool in the older adult population. However, fast gait speed appears to better reflect lower-extremity muscle performance and declines more rapidly in advanced age than comfortable gait speed. While it has long been known that ankle plantarflexion power plays a critical role in the gait cycle, its contribution to fast gait speed in older adults remain poorly understood. Gaining a better understanding could help with examination and intervention development. Therefore, using a comprehensive testing battery, we sought to determine the predictors of fast gait speed in older adults. We hypothesized that measures of lower-extremity skeletal muscle size and quality would be strong predictors.

Number of Subjects: Ninety community-dwelling adults (33 men, 57 women) ≥ 60 years of age (mean +/− SD age = 74 +/− 6 years) participated. All subjects were members of the University of Central Florida's Learning Institute for Elders group.

Materials and Methods: Data collection occurred during a single visit to the laboratory. B-mode ultrasonography was used to capture images of the dominant vastus lateralis, rectus femoris, and medial and lateral gastrocnemius in the transverse plane. Following imaging, each subject performed the following tests: 30-second chair stand test, heel-rise test, functional reach test, and grip strength of the dominant hand. Finally, fast gait speed was measured using the NIH Toolbox 4 Meter Walk Test. During ultrasound data analysis, ImageJ software was used to quantify cross-sectional area (CSA), subcutaneous adipose tissue thickness, and muscle quality via echo intensity (EI). Stepwise regression evaluated two prediction models. Model 1 utilized each of the muscle morphology variables as independent variables. Model 2 included the muscle morphology variables and the functional outcomes as independent variables.

Results: Model 1 indicated that the combination of medial gastrocnemius CSA and subcutaneous thickness explained 22.8% of the variance in fast gait speed ($r^2 = .228$, adjusted $r^2 = .210$, $F = 12.7$, $p < .001$). Medial gastrocnemius EI and all measures from the vastus lateralis, rectus femoris, and lateral gastrocnemius were excluded. Model 2 demonstrated that performance during the 30-second chair stand, heel-rise, and grip strength tests explained 45.5% of the variance ($r^2 = .455$, adjusted $r^2 = .435$, $F = 23.6$, $p < .001$), but the morphological variables were excluded.

Conclusions: While medial gastrocnemius morphology is important, other measures of physical function are better predictors of fast gait speed than lower-extremity CSA, subcutaneous tissue thickness, and EI. This highlights the importance of a holistic clinical examination including key functional assessments to aid plan or care development.

Clinical Relevance: These results highlight a potential dissociation between skeletal muscle morphology and fast gait speed. This may imply that declines in muscle characteristics with advanced age (e.g., atrophy) do not appropriately predict functional performance changes.

TITLE: A Comparison of Clinical and Lab-Based Measures As Predictors of Dual-Task Effect in Older Adults
CURRENT SECTION: Geriatrics
AUTHORS: Faisal Dee Shaikh, Jaclyn E Tennant, Renee Nicole Hamel, Lisa A Zukowski
ABSTRACT BODY:

Purpose/Hypothesis: Community ambulation is critical to older adults maintaining independence. Everyday walking typically involves performance of a cognitive task (i.e., thinking) while walking (i.e., dual-task walking), as opposed to just walking (1). Current rehabilitative outcomes for older adults focus on single-task mobility performances in controlled environments and do not typically assess dual-task performance ability because of clinic limitations (2). To address limitations, therapists should select outcome measures that predict how differently older adults are likely to respond to real-world tasks relative to clinical tests (i.e., dual-task effect). Therefore, the purpose of this study is to determine the ability of functional mobility measures, cognitive testing, balance confidence, and self-reported physical activity to predict dual-task effects on gait speed (DTE_{gs}) and cognitive reaction time (DTE_{rt}) (3,4). We hypothesize that functional mobility measures will be the greatest predictor of DTE_{gs} and DTE_{rt}.

Number of Subjects: 40 community-dwelling older adults ($\geq$60 years of age).

Materials and Methods: Demographic factors were collected. Cognitive testing included Computerized Stroop Selective Interference Reaction Time Test, Wechsler Adult Intelligence Scale (WAIS-IV) coding subtest, and Comprehensive Trail Making Test (CTMT). Functional mobility testing included 10 Meter Walk Test (10MWT), Time Up and Go (TUG), Four Square Step Test (FSST), and 30 Second Sit to Stand (30STS). Participants also completed self-reported measures on physical activity (Physical Activity Scale for the Elderly (PASE)) and balance confidence (Activities-Specific Balance Confidence Scale). Gait speed and cognitive reaction time (Clock task) were recording during 1) single-task cognitive, 2) single-task gait, and 3) dual-task walking trial conditions, as appropriate. DTE_{gs} and DTE_{rt} were calculated.

Results: An exploratory factor analysis revealed a Functional Mobility factor (TUG, 10MWT, 30STS), a Cognitive Processing Speed factor (CTMT and Coding subtest), and a Physical Activity factor (PASE). Regressions, with demographic covariates, then determined several predictors of DTE_{gs} and DTE_{rt}. PASE scores ($\beta = -0.535$, $p<.001$) predicted DTE_{rt}, with DTE_{rt} decreasing as PASE scores increased. Functional Mobility ($p=.189$) and Cognitive Processing Speed ($p=.570$) did not predict DTE_{rt}. No variable predicted DTE_{gs} (Functional Mobility: $p=.149$; Cognitive Processing Speed $p=.737$).

Conclusions: Greater amounts of self-reported physical activity predicted less of a cognitive reaction time performance decrement while dual-task walking in older adults.

Clinical Relevance: Clinicians should utilize PASE as a pre-/post- outcome measure for older adults to track clinical outcomes in regard to readiness for community ambulation, and more specifically in therapeutic interventions that target improvements in dual-task performance and increased physical activity (5). Promoting physical activity as indicated by PASE performance may help guide a plan of care and inform clinical decision making.

TITLE: Performance and Clinimetric Properties of the Timed up from Floor Test
CURRENT SECTION: Geriatrics
AUTHORS: Marilyn A. Moffett
ABSTRACT BODY:

Purpose/Hypothesis: Identifying mobility limitations as early as possible in the aging process allows interventions to be introduced before significant strength and mobility are lost. Earlier intervention may produce better outcomes by delaying the physical decline which deprives individuals of their independence. The Timed Up from Floor (TUFF) test is a screening tool in which the individual is timed transitioning from supine on the floor to stable, upright stance. The TUFF is functional and quick yet challenging enough to identify signs of impending mobility limitation earlier than many tests currently in use. The purpose of this study was to determine reliability and validity of the TUFF test as a screening tool to identify early signs of mobility limitation in community-dwelling older women.
Number of Subjects: 53
Materials and Methods: In this prospective descriptive study, 53 community-dwelling women, 55 years of age and older, participated in mobility testing. Inter-rater reliability of the TUFF test was established by comparing the timing results of 3 raters observing the same videotaped performances. Test-retest reliability was determined by having the same 3 raters time videos of the same participants performing the TUFF test during 2 sessions approximately 1 week apart. To establish validity, the association of TUFF test times with the SF-36 questionnaire scores, usual and fast gait speeds, and 30-second sit-to-stand test repetitions were examined.
Results: The TUFF test was determined to have excellent inter-rater reliability with an intraclass correlation coefficient (ICC) of 0.99. Test-retest reliability was excellent with an ICC=0.91. Convergent validity was demonstrated by the correlation of TUFF ($p < 0.001$) with the physical function component of the SF-36 ($r = -0.692$), usual gait speed ($r = -0.480$), fast gait speed (-0.740), and the 30-second sit-to-stand test ($r = 0.457$).
Conclusions: The TUFF test is a reliable and valid screening tool to identify early signs of mobility limitation in community-dwelling female older adults.
Clinical Relevance: Early detection can lead to earlier intervention to provide community-dwelling older adults the attention they need before they have lost too much of their mobility and independence. The TUFF test is a physical performance test that, in addition to providing early detection of functional decline and mobility limitation, also provides objective data about individuals' ability to recover from a fall.

TITLE: Functional Mobility Improvement and Rehospitalization Risk Following Discharge from Skilled Nursing Facility: A Pilot Study

CURRENT SECTION: Geriatrics

AUTHORS: Ronald Floyd Walser, Robert Sorrells, PhD, Ben Crawford, BS, Diana Rhodes, DVM, PhD, Eric Chyn, MD, Thomas A. Longbottom, Olivia Barton, BS, PTA

ABSTRACT BODY:

Purpose/Hypothesis: In recent years, the Centers for Medicare and Medicaid Services have implemented value-based purchasing programs to improve care and outcomes in Skilled Nursing Facilities (SNF). Hospital readmissions are a focused outcome measure in these programs. The purpose of this research is three fold; first, our hypothesis is that a final compilation of a patient's pain intensity and their performance of basic mobility will be predictive of rehospitalization risk upon discharge from a SNF to a lesser level of care. Second, assessment of a new pain and mobility outcome measure and it's relation to rehospitalization risk. Third, obtain rehospitalization and mortality rates of those patients who were discharged from a SNF to a lesser level of care.

Number of Subjects: 28

Materials and Methods: This is a prospective cohort study with Institutional review board approval. Following application of inclusion and exclusion criteria, data from 28 subjects who were admitted to a single skilled nursing facility were analyzed. The initial Pain and Mobility Index (PMI) and Short Physical Performance Battery (SPPB) were scored in the same physical therapy session or the following visit. The PMI and SPPB were also completed within one week of the patients' planned discharge.

Results: Average admission score of the Total PMI (which includes pain) was 35.06, Mobility PMI was 30.64, and SPPB was 1.14. Average discharge scores of the Total PMI was 19.06, Mobility PMI was 17.11, and SPPB was 3.75. With subjects divided in to Non-Hospitalized (NH) and Hospitalized (H) groups, the bed mobility module of the PMI ($p = 0.02$) and the SPPB ($p = 0.04$) showed significant differences. Between groups with the Mobility PMI was not significant at $p = 0.08$. All-cause rehospitalization rate, within 30 days of discharge from SNF to a lesser level of care was 25%. Rehospitalization diagnoses that were related to their initial SNF admission diagnoses was 17.9%. Mortality rate was 3.6%. Admission SPPB and Mobility PMI scores correlation was $r = -.855$ ($p < 0.001$), Discharge SPPB and Mobility PMI scores correlation was $r = -.799$ ($p < 0.001$).

Conclusions: The SPPB was selected to compare the results of the PMI due to its valid utility in identifying disability and overall improvement in function. There is a strong correlation in this pilot study between the PMI and SPPB. No relationship identified between pain and rehospitalization. However, improvements in basic functional mobility appears to be associated with decreased rehospitalization risk.

Clinical Relevance: The number of subjects is low, but the significant finding of higher SPPB scores between groups is worthy of further exploration in research. A focus on core strengthening and educating patients on techniques to enable them to perform bed mobility with increased ease may be time well spent during subacute therapy. Improvement in mobility, among geriatric patients, should be a main consideration in reducing a patients risk for rehospitalization upon discharge from a SNF to a lesser level of care.

TITLE: Student Led Wellness Program, Falls Risk, and Quality of Life in Long Term Care Residents
CURRENT SECTION: Geriatrics
AUTHORS: Katherine Wallingford, Willow L. Henry, Kaelyn Ragonese, Colleen Leonardi, Madeleine Rose Sparks, Daniel S. Spencer, Melissa Ann Cummings, Jacob St.Hilaire
ABSTRACT BODY:

Purpose/Hypothesis: This study examines whether a 6-week student implemented exercise program, utilizing the Otago program, will decrease risk of falls and improve quality of life in long term care residents. The study also analyzes the efficacy of performing the program two times per week versus three times per week with this population. It was hypothesized that after six weeks of treatment, with nine patients receiving treatment three times a week and four patients receiving treatment twice a week, there will be a decrease in fall risk as well as an increase in quality of life, as shown by various outcome measures. It was also hypothesized that the participants in the 3x/week group would show greater improvements in the outcome measures than those in the 2x/week group.
Number of Subjects: 13 long term care residents.

Materials and Methods: Thirteen long term care residents completed the Otago exercise program either two or three times per week for six weeks. Five outcome measures (Timed Up & Go, Functional Reach Test, 30 Second Chair Rise, 10 Meter Walk Test, and Quality of Life Questionnaire) were used during four different testing periods throughout the study to track progress. Additionally, the Ottawa-Georgia Mood Scale was used before and after every treatment to monitor changes in mood.

Results: The results of this study did not show a statistically significant improvement in the outcome measures, however the mean data for each group did show notable increases in performance. The 3x/week group showed greater improvements than the 2x/week group in the 10 Meter Walk and TUG. Results of the Quality of Life Questionnaire showed that all of the participants either remained the same or showed improvement in their quality of life by the end of the program.

Conclusions: While the hypothesis was not accepted for this study, the implementation of the Otago exercise program improved mean performance on all outcome measures for both the two and three times per week participants. Mean improvement in the 10 Meter Walk Test surpassed the MCID and, while the other tests did not have an MCID, it is clear that improvements were made based on the mean differences between testing periods.

Clinical Relevance: With the baby boomer generation aging, there has been a rise in the elderly population in the United States, as well as a rise in the number of elderly people residing in long term care facilities. Despite the fact that there are so many known benefits of exercise in residents in long term care facilities, residents still spend up to 65% of their time alone in their rooms. Incidence of falls is higher in long term care facilities than in community dwelling older adults, yet much of the research is completed with community dwellers. It is imperative that falls in this population are researched and wellness programs are established. Student physical therapists provision of wellness programs is a no cost delivery method, and supplies a learning opportunity for the students.

TITLE: The Senior Athlete Fitness Exam: A Tool for Screening Health Risk Factors in Aging Athletes
CURRENT SECTION: Geriatrics
AUTHORS: Becca D. Jordre, William E Schweinle
ABSTRACT BODY:

Purpose/Hypothesis: The purpose of this study is to introduce the Senior Athlete Fitness Exam as a tool for screening health in aging athletes and to investigate this tool's ability to identify health-risk factors.
Number of Subjects: 2,042
Materials and Methods: Senior athletes registered to compete in the National Senior Games between 2011 and 2017 signed an IRB-approved consent to participate in this study of the Senior Athlete Fitness Exam (SAFE). The SAFE involves a battery of tests, common to most physical therapists, divided into categories of cardiovascular risk, strength, flexibility, balance and mobility. Cardiovascular risk was screened via waist circumference, waist to hip ratio and body mass index. Strength was assessed via hand grip dynamometry and the five times sit to stand test. Flexibility screening included shoulder flexion active range of motion (AROM), dorsiflexion AROM with the knee straight, the Thomas Test and a supine pillow test for kyphosis. Balance was assessed via single leg stance under three conditions: eyes open, eyes closed and on a foam pad. Mobility was addressed via walking speed and was utilized as a vital sign. This included self-selected walking speed, maximal walking speed and walking speed reserve. A health history interview was conducted with each participant and relevant items were utilized for assessing the diagnostic value within each broad category of the SAFE. Pass/fail thresholds were established for each test within the larger SAFE categories based on already published cut-scores for these tests or by utilizing one standard deviation below the population mean where cut-scores were not already established. Logistic regression and ROC analyses were utilized for data analysis.
Results: Participants who failed all cardiovascular measures demonstrated a probability of approximately 50% of having cardiovascular disease or diabetes mellitus (p<.0001). Those that passed at least one threshold demonstrated a 44% decreased probability of having these conditions (p<.0001). Strength variables were most predictive of fall risk with a 43% decreased probability of falling for each item passed (p<.0001). Flexibility was also predictive of fall risk with the probability of falling reduced by 34% for each passed threshold. Balance scores demonstrated a 45% reduction in the probability of falling with each condition passed (p<.0001). Walking speed tests were predictive of heart disease, stroke history, low bone density and diabetes mellitus. For each threshold passed in this category the participant's probability of having the associated conditions reduced by 54% (p<.0001).
Conclusions: The SAFE demonstrates utility as a means for identifying aging athletes at risk for cardiovascular disease, diabetes, low bone density and falls. Normative SAFE data from this large population can further provide perspective to those assessing this unique and growing population.
Clinical Relevance: Clinicians engaged in the care of aging athletes may find it useful to screen these individuals with the SAFE as a means of identifying risk factors and comparing these unique individuals to more relevant normative data.

TITLE: Difference Between Three Height Groups in Reach Distance on the Forward Functional Reach (FRR)
CURRENT SECTION: Geriatrics
AUTHORS: Jill Elaine Heitzman, Jennifer M. Canbek, Shari Ann Rone-Adams, Steven Bryce Chesbro
ABSTRACT BODY:

Purpose/Hypothesis: Loss of balance is a significant factor associated with falls in the aging population. The Forward Functional Reach (FFR) test was developed by Duncan et al. in1990 to assess anterior/posterior (AP) balance and identify fall risk in aging adults. Previous study results on identification of falls using FFR have been variable, possibly because an individual's height was not considered in determining ability to reach in an anterior direction. The purpose of this study was to determine if an individual's height is related to anterior functional reach distance.
Number of Subjects: Sixty-six participants age 60 and older were recruited from the local community
Materials and Methods: Participant completed a demographic questionnaire that include fall history, co morbidities as well as completing the Activities Based Confidence Scale, and comorbidities. Patients were included in the study if they were over the age of 60 years, had no recent comorbidity affecting their ability to stand independently. Participants unable to stand independently for 2 minutes were excluded from the study. Participants' height was measured using a stadiometer. Each participant performed the FRR test using the 1-arm reaching method per the protocol by Duncan et al (1990) Participants were stratified in the following height groups: <65 inches, between 65 and 69 inches, >69 inches for analysis. Descriptive statistics were used to describe sample characteristics. Pearson correlation was used to examine the relationship between reach and height. ANOVA was used to analyze differences in reach distance between height groups.
Results: A moderate correlation ($r=0.63$) between height and reach was found for the entire study group. There was a statistically significant difference between the 3 height groups for the unilateral forward functional reach ($p=3.03\text{x}10^{-6}$).
Conclusions: Height is a factor FFR distance and should be considered in the interpretation of testing. This study does not support the use of a single value cut score (currently identified as 10") for identification of fall risk based on the statistical differences between height groups in regards to reach distance. Future studies should determine the cut score for each height group for more accurate identification of fall risk. Other factors to consider include the quality of movement of the individuals with relation to the one arm reach including substitution and movement variability that may be eliminated if 2 arm reach approach is utilized.
Clinical Relevance: The current standard of using a single value (10") as the cutoff may lead to a increase fall positives in the shorter height groups and false negatives in the taller height groups. Identifying specific cut score based on height for indentifying fall risk may provide more accurate identification and prediction of fall risk in order to provide appropriate early intervention to reduce the fall related injuries and thus reduce overall healthcare costs.

TITLE: Skilled Nursing Facility Residents Demonstrate Sedentary Behavior and Low Physical Activity During and After Discharge

CURRENT SECTION: Geriatrics

AUTHORS: Julie Ann Stutzbach, Allison Marie Gustavson, Danielle Derlein, Riley James Ruse, Shalomi Shelton, Jennifer M Blankenship, Jennifer Elaine Stevens-Lapsley

ABSTRACT BODY:

Purpose/Hypothesis: Studies demonstrate a skilled nursing facility (SNF) stay leaves patients unprepared for the transition to home following hospitalization, as evidenced by enduring deficits in physical function, and continued dependence for activities of daily living at time of discharge.[1] Sedentary behavior and lack of physical activity contribute to the development and persistence of physical deconditioning for medically-complex older adults,[2] and increase risk of rehospitalization.[3] However, it is unknown how activity levels change during the transition from a SNF to home, a critical period when patients are at high risk for adverse events.[4] The purpose of this study was to quantify physical activity levels and sedentary time among SNF residents during the last few days prior to SNF discharge and the first few days at home. We hypothesized that patients would increase step counts, upright time, and demonstrate less sedentary time after discharge because of multiple barriers to mobility specific to inpatient settings, such as restrictions in place to prevent falls.[5]

Number of Subjects: 22 residents from 2 SNFs (mean age 76±11 years, 61% male and 39% female).

Materials and Methods: Physical activity and sedentary behavior were assessed during the last 4-5 days before discharge from SNF and the initial 4-5 days at home using the ActivPAL^{TM} physical activity monitor.[6] After removing sleep time, we quantified sedentary time (sitting or lying), upright time (i.e. standing or stepping) and total steps. Participants completed 2 short surveys in the SNF and at home related to their perceived physical activity and ability to complete daily tasks on a 4-point Likert scale.

Results: Compared to SNF, participants spent more time upright at home (15% ± 13% versus 18% ± 13% of waking hours, P=0.047). Daily, participants averaged 1,475 ± 1,279 steps in the SNF and 1,553 ± 1272 steps at home (P=0.69). Participants spent 81% ± 14% of their waking hours sedentary (in bed or a chair) in the SNF and 79% ± 14% at home (P=0.20). Most participants rated themselves as "somewhat active" or "somewhat inactive" both during (65%) and after (70%) their SNF stay.

Conclusions: SNF residents demonstrate extremely low levels of mobility both during and after their SNF stay, with step counts low enough to increase risk of mortality[7] and well-below normal for older adults with disabilities (3,500-6,000 steps daily).[8] Importantly, these low activity levels persist after discharge from a SNF, when restrictions on mobility secondary to fall risk no longer exist. Healthcare systems need to develop strategies that improve patient mobility both during the SNF stay and after the transition to home, a critical transitional period when patients are at high-risk for adverse events such as falls and rehospitalization.[3]

Clinical Relevance: Physical therapists (PTs) in the SNF and home health settings need to facilitate mobility both during and outside of structured rehabilitation time. PTs should intervene to prepare and empower patients to mobilize when they transition from the SNF setting to home.

TITLE: Prefrontal Recruitment During Obstacle Walking Is Predicted By Older Age and Executive Function
CURRENT SECTION: Geriatrics
AUTHORS: Sudeshna A. Chatterjee, Jared Skinner, Paige Lysne, Chanoan Sumonthee, Samuel Wu, Ronald Cohen, Dorian Kay Rose, Adam Woods, David Clark

ABSTRACT BODY:

Purpose/Hypothesis: Impaired executive function (EF) is strongly associated with age-related walking deficits and fall risk. Obstacle walking is an everyday task that is very demanding of executive resources. The prefrontal cortex is crucial for the control of EF. This study investigated the predictors of prefrontal recruitment during obstacle walking in older adults using functional near-infrared spectroscopy (fNIRS).

Number of Subjects: Forty-one

Materials and Methods: Older adults (mean age 75 years) performed three trials of Typical walking and Obstacle walking at preferred speed. fNIRS was used to measure prefrontal oxyhemoglobin concentration (O2Hb) from Brodmann area 10 during alternating 30 second periods of rest and walking. The change in O2Hb between resting and active periods (ΔO2Hb) was calculated for each task. The primary outcome variable was change in prefrontal recruitment (ΔPFR) from Typical to Obstacle walking (ΔPFR = Obstacle ΔO2Hb – Typical ΔO2Hb). A stepwise regression model was used to identify predictors of ΔPFR, including age, sex, 10-meter preferred walking speed, Activities-specific Balance Confidence Scale score, Berg Balance Scale score, and EF measured by the Trail Making Test completion time (TMT B - A). Secondary comparisons of task-related ΔO2Hb and walking speed were conducted based on the predictor variables.

Results: Greater ΔPFR was predicted by lower age and poor EF (i.e., longer TMT time) ($R^2 =0.30$, p=0.02). Participants were divided into Old and Oldest-old subgroups by a median split of age. Compared to the Old group, the Oldest-old group exhibited higher ΔO2Hb (i.e., over-recruitment) during Typical walking ($d=0.55$), and lower ΔO2Hb (i.e., a ceiling effect) during Obstacle walking ($d=0.53$). In addition, compared to the Old group, the Oldest-old group exhibited worse EF ($d=0.83$), and slower walking speed during Typical walking ($d=0.43$) and Obstacle walking ($d=0.59$).

Conclusions: Greater task-related prefrontal recruitment during Obstacle walking relative to Typical walking was predicted by lower age and poor EF. Further analysis revealed that the oldest adults exhibited atypical task-related prefrontal recruitment. First, prefrontal over-recruitment occurred at low levels of task difficulty (i.e., Typical walking). Second, EF deficits and inefficient recruitment of prefrontal resources were observed. These factors may hasten reaching the recruitment resource ceiling, as indicated by a lack of task appropriate increase in prefrontal recruitment during Obstacle walking in the oldest adults.

Clinical Relevance: Older age and poor EF are linked to inefficient brain recruitment and poor obstacle walking performance. Future studies should investigate if this impacts safe obstacle negotiation, and if rehabilitation strategies to optimize brain recruitment should be considered in the elderly.

TITLE: The Effectiveness of a Matter of Balance Lay Leader Model in Decreasing Fear of Falling

CURRENT SECTION: Geriatrics

AUTHORS: Ann W.B. Coventry, Alicia Braga, SPT, ToniAnn Catanzaro, SPT, Jillian Hampton, SPT, Kelly Moses, SPT, Leana Mae Richards, Lauren Wiske, SPT

ABSTRACT BODY:

Purpose/Hypothesis: The purpose of this study was to examine whether the A Matter of Balance (MOB) program decreased the fear of falling and increased balance in aging, community dwelling adults. The hypothesis for this study was that participants will increase their TUG score by the MCID of 2.6 seconds, increase 30CSTS by the MCID of 2.6 repetitions, and 90% of participants will report improvements in subjective questionnaire.

Number of Subjects: 16

Materials and Methods: 16 participants ages, 60+ years who had expressed a fear of falling participated in eight, two hour a MOB sessions instructed by lay leaders over the course of 4 weeks. All participants answered a pre-survey and post-survey regarding fear of falling and ability to reduce fall risk. They all were also tested utilizing the TUG and 30 Second Chair Sit to Stand.

Results: Paired t-test used to examine significance of the TUG and 30CSTS. Calculated significance of TUG scores were $p<0.026$ and for the 30CSTS were $p<0.002$. In subjective questionnaire 31% of participants reported improvement in their concerns about falling interfering with life, 56% reported an improved ability to find a way to reduce falls, and 63% reported improved ability to increase their physical strength.

Conclusions: The scores for the 30CSTS and TUG demonstrated statistically significant improvements in pre and post testing. Results of this study indicate that the lay leader model of A Matter of Balance effectively met the goals of the program as it did when implemented by healthcare professionals.

Clinical Relevance: Utilizing a standardized education and exercise program demonstrated that lay leaders (student physical therapists) were able to provide the class and the participants had significant improvement in their TUG and 30 CSTS scores. Additionally, participants reported reduced concerns about falling, and improved ability to increase their strength.

TITLE: Effects of Blood Flow Restriction Training in Older Adults: A Systematic Review
CURRENT SECTION: Geriatrics
AUTHORS: Ashraf Elazzazi, Daniel Joseph Clark, Thomas W. Jalowiec, Derrick Sekuterski, Richard Spinella
ABSTRACT BODY:

Purpose/Hypothesis: The purpose of this systematic review was to compare the strength, hypertrophic and functional outcomes of low-load BFR training to traditional training in older adults. Low-load BFR training and walking with BFR was compared to high and low intensity resistance training as well as traditional walking.

Number of Subjects: 15 studies were included in this systematic review.

Materials and Methods: An electronic database search was conducted in February, 2019 using an EBSCO Host search. The following databases were searched: Academic Search Complete, AgeLine, CINAHL Complete, Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, Health Source: Nursing/Academic Edition, MEDLINE Complete, and SPORTDiscus. In addition, a hand search of literature was performed. The Cochrane Risk of Bias tool was used to assess risk of bias. For an article to be included, it had to be in the English language and published in a peer-reviewed journal. Also, the study participants had to be 50 years old or older, with one group receiving a form of BFR training and another group receiving comparable training without BFR. Studies that used only a non-exercise control group were excluded.

Results: Out of 457 articles that were screened, 15 articles met the inclusion criteria of this systematic review. Thirteen of the articles compared the outcomes of resistance training with and without BFR, and two articles compared the outcomes of walking with and without BFR.

Conclusions: Blood flow restriction training resulted in greater strength and hypertrophic adaptations than low load resistance training, and similar adaptations to high load resistance training. Walking with BFR resulted in improved strength, hypertrophy, and function that is not seen when walking without BFR. BFR training also resulted in significant improvements in functional outcomes compared to the control groups. More research is needed in older adults to further explore the effects of BFR training on functional outcomes and the effects of walking with BFR.

Clinical Relevance: BFR training is shown to be a safe and effective way to achieve comparable outcomes as high intensity resistance training with less mechanical stress. Low-load BFR training is superior to traditional low-load resistance training. BFR training is within the physical therapy scope of practice according to the APTA.

TITLE: Weekly Time Spent Standing and Sitting As Predictors of Body Composition in Older Adults
CURRENT SECTION: Geriatrics
AUTHORS: Kalie Pietsch, Juan Miguel Robledo, Lisa Le, Martha M. Acosta, Alexis Ortiz
ABSTRACT BODY:

Purpose/Hypothesis: Greater body composition is a contributing factor to the increased risk for cardiometabolic diseases in older adults leading to premature disability and death. Higher levels of metabolically active time, such as standing, along with less time in sedentary activities, such as sitting, have been found to impact body composition directly. Our purpose was to evaluate the relationship of time spent standing, sitting, lying, and steps per week with body composition in older adults.

Number of Subjects: 315 older adults (age: 63.47 ± 5.9 years; male: 155; female: 160) within the Interactive Diet and Activity Tracking in AARP (iDATA) database from the National Cancer Institute comprised the sample size for this study.

Materials and Methods: IDATA variables were screened for normality and extreme outliers for the variables of body mass index (BMI), steps per week, and weekly time spent standing, sitting, and lying down. After screening procedures, 93% of the entire sample remained meeting the assumptions of normality. Subjects were divided into three major BMI ($kg\cdot m^{-2}$) categories; normal weight: 18.5-24.9; overweight: 25-29.9; obese: ≥30. Five continuous days of accelerometer data, where the subjects wore the accelerometer for at least ten waking hours, was considered valid data and averaged for a weekly representation. Descriptive statistics were performed for the entire sample and all three subcategories. Analysis of variance (ANOVA) between the three groups were performed for weekly steps and time spent standing, sitting, and lying down. An alpha level of .05 was considered statistically significant. A linear regression analysis was performed to explore the association between these variables and body composition for the entire sample.

Results: The average BMI for the entire sample was 27.91 ± 4.54 $kg\cdot m^{-2}$ and exhibited an average of 12,246 ± 4,590 steps/week with 23,390 ± 8,127 seconds (6.5 hours) spent standing; 32,838 ± 10,296 seconds (9.1 hours) sitting, and 6,118 ± 5,327 seconds (1.7 hours) lying down. The ANOVA revealed statistically significant differences for time spent standing and sitting between the normal weight (standing: 26,941 ± 8,163 secs; sitting: 29,954 ± 9,197 secs) group and the overweight (standing: 22,840 ± 7,892 secs; sitting: 33,632 ± 10,630 secs) and obese (standing: 20,836 ± 7,318 secs; sitting: 34,467 ± 10,335 secs) groups. The regression analysis showed a statistically significant association (r=.31, r^2=.094; $p < .001$) among steps, standing, sitting, and lying with the greatest contributors to the model being standing time (p=.008) and sitting (.042). The greater time standing indicated lower BMI and greater time sitting contributed to greater BMI.

Conclusions: Greater time spent standing and lower time spent sitting appears to be the greater contributors for desirable body composition in older adults.

Clinical Relevance: As physical therapists we should encourage older adults to spend most of their waking hours in standing, while decreasing their time spent sitting, to enhance their health and wellness to promote a better body composition for a more desirable cardiometabolic profile.

TITLE: Predicting Falls in Community-Dwelling Older Adults Using the Repetitive Step Test
CURRENT SECTION: Geriatrics
AUTHORS: Harold Merriman, Kurt Jackson, Jamie Wynk, Megan Gordon, SPT, Kathryn Quinn, Sarah Welsh
ABSTRACT BODY:

Purpose/Hypothesis: The Repetitive Step Test (RST) is a newly developed dynamic test of balance that requires rapid stepping in multiple directions. It is unique because it can be administered quickly in a small space without special equipment, is normalized to leg length, has a minimal ceiling effect and assesses the stepping ability of both lower extremities individually. It has previously demonstrated excellent test-retest and inter-rater reliability and a good ability to retrospectively classify individuals who had fallen more than once in the past 12 months from those who had not fallen. However, its prospective ability to predict falls has not been evaluated. The purpose of this ongoing study is to determine the capability of the RST and other common balance tests to identify individuals likely to fall prospectively over 12 months. We are reporting the results of the first 6 months of this study.

Number of Subjects: 63

Materials and Methods: 63 community-dwelling older adults $\geq$65 years old (mean age 75.7 $\pm$ 6.5 SD) were tested using the following balance and mobility measures: RST, 10 Meter Walk Test (10MWT), Activities-specific Balance Confidence (ABC) scale, Four Square Step Test (FSST) and Timed Up and Go (TUG) test. For the RST participants completed as many steps as possible in 15 seconds at 50% and 75% of their right leg length in the anterolateral and posterolateral directions with both legs. Participants completed a daily fall log that was reported on a monthly basis.

Results: Based on the most recent data available (6 months of the 12 month study), receiver operating characteristic (ROC) curve analysis was used to compare adults who fell $\geq$ 2 times (n=10) to adults who did not fall (n=38). Area under the curve (AUC) results with 95% confidence interval are as follows: RST at 50% 0.45 (0.24-0.65), RST at 75% 0.49 (0.28-0.69), 10MWT 0.70 (0.54-0.87), ABC 0.55 (0.35-0.76), FSST 0.58 (0.37-0.79) and TUG 0.56 (0.37-0.75).

Conclusions: In this population of community-dwelling older adults, the RST and other commonly used balance and mobility measures either failed to or poorly predicted the number of falls at 6 months. However, these findings may change at 12 months. More research is needed to determine how best to predict falls in this population, and whether any single test of balance and mobility can effectively identify individuals who are most likely to fall.

Clinical Relevance: Currently, there is no single and simple measure of balance and mobility that can accurately predict falls in community-dwelling older adults. The newly developed RST was also ineffective in predicting falls at 6 months but its effectiveness at 12 months is yet to be determined. Regardless of the outcome, given the unique characteristics of the RST, it may still be a useful tool for assessing and monitoring bilateral lower extremity performance and stepping ability, especially in individuals who present with asymmetrical impairments (e.g., stroke, multiple sclerosis). Future research in clinical populations is warranted and needed to determine the potential usefulness of the RST.

TITLE: The Prevalence and Association of Sleep Disorders With Osteoarthritis in Older Adults: A Retrospective Study

CURRENT SECTION: Geriatrics

AUTHORS: Mohammed M. Alshehri, Aqeel Alenazi, Shaima Abdullah M Alothman, Bader A Alqahtani, Jeffery Hoover, Lemel Waitman, Patricia Michelle Kluding

ABSTRACT BODY:

Purpose/Hypothesis: Previous evidence has shown that sleep disorders are common comorbidities among people with osteoarthritis (OA). However, the main focus of previous research was on localized OA (LOA) (i.e. OA affecting one or two joints). Generalized OA (GOA) (i.e. OA affecting 3 or more joints) could be associated with sleep disorders due to multisite pain and degenerative changes. Therefore, the aim of this study was to examine the prevalence of sleep disorders in older adults with GOA and LOA, and to investigate whether GOA is associated with a greater prevalence of sleep disorders when compared with LOA in this population.

Number of Subjects: A total of 2110 patients who were 65 years or older were included using a retrospective database (mean age= 74.58 ± 7.16, 66.3% females).

Materials and Methods: A retrospective review of de-identified data was performed for patients who were seen between 2011 and 2017 using Healthcare Enterprise Repository for Ontological Narration (HERON) database at the University of Kansas Medical Center. A query was built using i2b2 to select patients who have diagnoses codes using ICD-9 or ICD-10 codes. Each patient must have at least 2 diagnostic codes of OA separated by at least one day to be included. The codes included primary GOA, primary LOA and sleep disorders. Other covariates included age, sex, race, diabetes, hypertension, dyslipidemia, depression, and anxiety. The main outcome was the presence of sleep disorders diagnoses codes. Chi square and logistic regression were used at a .05 alpha level.

Results: The overall prevalence of sleep disorders was 12.7% among older adults with OA. The prevalence of sleep disorders was significantly greater in people with GOA (21.9%) than those with LOA (5.5%), $p < 0.001$. After controlling for demographics (age, sex and race), logistic regression showed that GOA was significantly associated with sleep disorders (odds ratio 5.31, 95% confidence interval $3.91 - 7.21$, $p < 0.001$). The final model showed that GOA was significantly associated with sleep disorders (odds ratio 3.12, 95% confidence interval $2.25 - 4.34$, $p < 0.001$) after controlling for covariates including age, sex, race, diabetes, hypertension, dyslipidemia, depression, and anxiety.

Conclusions: This study identified about higher prevalence of sleep disorders in people with GOA when compared to LOA. Older adults with GOA were about 3 times more likely to have sleep disorders when compared to LOA. The data was utilized from a tertiary academic medical center and prevalence rates may not be reflective of all healthcare populations. Further research is required to explore the association between the types of sleep disorders and OA with considering the pain level and using objective measures on population based.

Clinical Relevance: This study identified the burden of OA and its association with sleep disorders among older adults. Aging itself is associated with poor sleep quality and progression of OA. Therefore, clinicians need to screen for sleep and number of joints with OA to choose a systemic treatment approach rather than localized treatment.

TITLE: Changing Physical Therapist Students' Perspectives of Dementia Through a Community-Based Experiential Learning Activity

CURRENT SECTION: Geriatrics

AUTHORS: Brandy Brewster Schwarz, Mike V. Richardson, Kathlene Elizabeth Camp

ABSTRACT BODY:

Purpose/Hypothesis: The purpose of this study was to determine the impact of the Virtual Dementia Tour (VDT) experiential learning activity (ELA) on student attitudes towards individuals with Alzheimer's disease and related dementias (ADRD).

Number of Subjects: 40

Materials and Methods: As part of a course in the DPT curriculum, students participated in the VDT ELA at a facility specializing in ADRD. The VDT is a hands-on ELA consisting of physical and mental challenges similar to those experienced by people with ADRD. The Dementia Attitudes Scale (DAS) is a 20-item, self-reported tool consisting of an overall total score as well as subscales of "knowledge and "social comfort". Students participated in this pretest-posttest design with DAS scores prior to and following the VDT.

Results: For the DAS "total" score and "knowledge" subscale score, the data were not normally distributed, a non-parametric Wilcoxon signed-ranks test was used to compare these scores prior to and following the VDT ELA. The median DAS "total" score prior to the ELA was 100.0 (IQR: 85-115) and 115.5 following the learning activity with a very large effect size ($d = 1.44$). For the DAS "knowledge" subscale score, the median score prior to the ELA was 58.0 (IQR: 51-65) and 64.0 following the learning activity with a very large effect size ($d = 1.32$). For the DAS "social comfort" subscale score, the data were normally distributed, a paired t-test was used to compare DAS "social comfort" subscale score prior to and following the ELA. The DAS "social comfort" subscale score prior to the ELA was 42.50 (8.16) and 51.63 (7.03) following the ELA with a very large effect size ($d = 1.14$).

Conclusions: Although clinically relevant thresholds have not been established for the DAS, this study indicated that the VDT ELA significantly improved student attitudes towards individuals with ADRD as the DAS "total" score ($p = <.001$) and "knowledge" subscale score ($p = <.001$) improved by one full quartile and the DAS "social comfort" subscale score ($p = <.001$) improved by more than one standard deviation.

Clinical Relevance: According to Ries (2018), people with ADRD face discrimination based on ignorance, and PTs and PTAs have a general perception that there is little they can to do assist people with dementia. Experiential learning activities such as a VDT may allow students to gain a more comprehensive understanding of everyday life issues regarding quality of life and disease management faced by those with ADRD (Roberts & Noble, 2015). Improving health professionals' attitudes and knowledge towards individuals with ADRD can help to highlight the importance of providing patient-centered care.

TITLE: Effect of Virtual Reality-Based Dance Training Paradigm on Cardiovascular Autonomic Modulation in Older Adults

CURRENT SECTION: Geriatrics

AUTHORS: Tanvi Bhatt, Gonzalo Varas, Savitha Subramaniam, Larissa Delgado, Shane A. Phillips

ABSTRACT BODY:

Purpose/Hypothesis: The aim of this study was to determine if a six-week virtual reality (VR)-based dance training protocol could improve the cardiovascular autonomic modulation, assessed by heart rate variability (HRV) analysis, and the cardiorespiratory fitness, assessed by the maximal O2 consumption (VO_{2max}) in healthy older adults. We hypothesized that there would be a significant increment of parasympathetic activity assessed by HRV, and a significant increment in VO_{2max} after a 6-week VR-based dance training protocol in healthy older adults.

Number of Subjects: Twenty healthy older adults ($\geq$ 65 years old) were randomly assigned to two groups.

Materials and Methods: Group A received a VR-based dance aerobic training for 6 weeks using a commercially available Kinect dance video game "Just Dance 3", while the control group received a one-hour education on conventional physical exercises. Data obtained and calculated for HRV analysis pre and post-intervention consisted of high-frequency (HF) power, and low and high-frequency ratio (LF/HF) in the frequency domain analysis, and RMSSD and NN50 values in the time domain analysis. The assessment of HRV outcome variables was performed during rest and during a 6MWT. In addition, the YMCA submaximal cycle ergometer test was used to acquire maximal O2 consumption (VO_{2max}) pre and post-intervention.

Results: After the training, Group A showed an increment in HF, RMSSD and NN50 values ($p < 0.05$), and a decrease in LF/HF ratio ($p < 0.05$) compared to the baseline assessments on rest condition and during 6MWT. Additionally, Group A also showed significantly higher VO_{2max} after the training compared to the baseline ($p < 0.05$). On the other hand, the control group exhibited no change in HRV frequency and time domain parameters, along with no difference in VO_{2max} ($p > 0.05$).

Conclusions: Our results support the effectiveness of the VR-based aerobic dance training for improving HRV and VO_{2max} values in aging.

Clinical Relevance: The proposed training protocol might be a potential exercise intervention for improving autonomic modulation, cardiorespiratory fitness, and consequently reduce the risk of cardiovascular disease in older adults.

TITLE: Postural Sway Measures: Body Worn Inertial Sensors Distinguish Fallers From Non-Fallers
CURRENT SECTION: Geriatrics
AUTHORS: Bethoney McAndrews, Hilaire J. Thompson, Marcus Alan Johnson, Ellen L McGough
ABSTRACT BODY:

Purpose/Hypothesis: Up to 40% of adults over 65 will fall each yea.[1] Clinical or home application of body worn inertial sensors have the potential to provide quantifiable and objective detection of fall risk in older adults.[2] Increased postural sway is associated with instability,[3] however, optimal sway test conditions and inertial sensor measures for identifying fallers is unknown. The purpose of this study was to investigate postural sway conditions and inertial sensor sway measures that discriminate between fallers and non-fallers.
Number of Subjects: 52 Community-dwelling older adults at high risk for falls [mean age 77.4 yrs, SD 6.9].
Materials and Methods: This cross-sectional study was completed at baseline of a randomized controlled trial, [Influence of Cognitive Training on Fall Prevention in at Risk Older Adults (R21NR015541, P.I. Thompson)]. Participants reported concern or a history of falling and demonstrated <1.0 m/s gait speed or <53 sec on the 90-sec balance test. The APDM Mobility Lab™ (APDM Inc., USA) was used to collect in-home postural sway measures via inertial sensors at the 5th lumbar level. Participants completed two 30-second static stance trials: (1) eyes open usual base (EO) and (2) eyes closed usual base (EC). APDM ISway measures of ellipse area (m^2/s^4), root mean squared of sway angle (RMS) (m/s^2), and acceleration path length (m^2/s^2) were derived.[4,5] Self-reported fall history was collected. **Analysis:** t-tests were used to examine sway differences in fallers and non-fallers. Receiver operating characteristic (ROC) curves were used to calculate area under the curve (AUC) and to examine the ability of sway measures to detect fallers.
Results: Thirty-eight participants reported at least one fall (fallers) and 14 reported no falls (non-fallers) within the past year. In the EC condition, fallers had significantly higher RMS (mean diff = 0.038 (SE=.01), p = .002), and ellipse area (mean diff = 0.069 (SE=.03), p=.01) compared to non-fallers. In the EC condition, RMS and ellipse area demonstrated good ability to detect fallers, as seen by ROC curves of postural sway (AUC=.75 and .71 respectively); RMS and Ellipse area cut points for fallers were found with sensitivity of 91% and 79% respectively. In the EO condition fallers had significantly higher ellipse area compared to non-fallers (mean diff = 0.039 (SE=.01) p=.01), but there were no significant differences in RMS or path length. In the EO condition, the sway parameters were less sensitive in identifying fallers (AUC = $0.64-0.68$).
Conclusions: Inertial sensor sway measures differentiated between older adult fallers and non-fallers in EC usual base test conditions. In particular, RMS and ellipse area were sensitive for fallers. Sway measures during EO usual base stance were less sensitive in distinguishing fallers.
Clinical Relevance: Postural sway inertial sensor measures of RMS and ellipse area have promising potential to improve the objective accuracy of fall risk screening. The cut-points identified in this study may be utilized in clinical interpretation of sensitive inertial sensor output to identify older adults at the highest risk for falls, leading to timely skilled PT intervention.

TITLE: Clinical Implementation of Resistance Training (RT) Guidelines Through Use of a Clinical Knowledge Broker
CURRENT SECTION: Geriatrics
AUTHORS: Patrick William Hennessy, Sarah Elizabeth Townsend-Grant, Jessica Kele Kathleen Murdin, Patricia Lou Scheets
ABSTRACT BODY:

Purpose/Hypothesis: Muscle weakness in older adults is an established phenomenon as is the associated cycle of diminished function and falls.[1-4] Resistance training (RT) has been demonstrated to be safe and effective in older adults, however is commonly under-dosed in clinical practice.[6-9] This quality improvement project utilized knowledge translation (KT) interventions, including the use of a clinical knowledge broker (CKB), to implement RT in skilled nursing facilities (SNF). The hypotheses were that clinician skills and perceived confidence with RT would improve with CKB intervention.
Number of Subjects: 29 clinicians (12 physical therapists (PT), 17 physical therapist assistants (PTA)) across 9 SNFs.

Materials and Methods: Clinicians completed initial online training on RT. A skills checklist citing essential behaviors for RT delivery was developed to guide clinician appraisal and feedback for a single treatment session. The scale consists of 10 items across 3 domains, each scored by a 3-point ordinal scale. A target score of >80% indicates delivery of RT consistent with best practices across all domains. The CKB intervention was implemented in 4 phases. Phase 1-adapting knowledge to local context[11] through the development of knowledge tools and products. Phase 2-assessing barriers and facilitators[11] through discussion with leaders and clinicians at each site. A categorization schema for facilitators and barriers was developed and completed on each site visit. Phase 3-selecting, tailoring and implementing the intervention[7-8,11-13] through 1:1 mentoring during patient care, with post-session feedback using the skills checklist. Phase 4-monitoring adherence and sustainability. A post-intervention survey was completed, consisting of 16 questions using a 5-point ordinal scale, to identify KT facilitators, impact of CKB, and clinician's perceived confidence . Descriptive statistics were used to measure improvement in skills checklist scores, with a paired t-test performed to identify statistical significance.

Results: Each clinician received a mean 3.54 ± 1.35 mentoring sessions over 89.11 ± 63.65 days. Skills checklist scores significantly improved from initial mentoring session ($28.42\%\pm24.03$) to final session ($76.66\% \pm 23.97$), p=2.34e-11. There was no significant difference between the mean initial or final scores between PTs and PTAs. 11 clinicians from 7 facilities responded to the post-intervention survey. Items scores related to KT facilitators, CKB impact, and self-confidence with delivering RT were 4.34 (range 4.2-4.6) and 3.45 (range 3.2-4.1), respectively, indicating positive perception.

Conclusions: The use of a CKB significantly improved clinician skills and self-perception related to delivery of RT consistent with published recommendations.

Clinical Relevance: Following an established KT framework and use of a CKB to facilitate implementation may greatly improve clinician uptake of evidence-based practice recommendations.

TITLE: Effects of a Single Session Reactive Step Training Intervention in the Geriatric Population
CURRENT SECTION: Geriatrics
AUTHORS: JJ Mowder-Tinney, Jennifer C. Fay, Season Manchester Bonino, Lucas Daniel Bennett, Gabrielle M. Charles, Amanda Elizabeth DeBarr, Christopher Chad Gallina, Jake A. Garbeck, Luke Charles Longo, Sarah Papponetti, Cassidy Jo Ann Rose, Alyssa Tretowicz

ABSTRACT BODY:

Purpose/Hypothesis: On average, 33% of people older than 65 experience a fall each year and many are recurrent. Conventional physical therapy interventions have been proven to require at least 50 hours of training to decrease fall risk. Recent studies indicate a single session of repeated slip training, involving 24 slips or trips, cuts annual fall risk for older adults by 50%. However, the majority of studies lack translation into the clinical setting. The purpose of this study is to determine the efficacy of a one session step training program performed in a clinical setting on improving walking ability and decreasing risk and fear of falls in older adults.

Number of Subjects: Fourteen healthy older adults.

Materials and Methods: A convenience sample was screened using a health status questionnaire. Outcome measures included the Activities-Specific Balance Confidence Scale (ABC Scale), Four Square Step Test (FSST), reactive stepping portion of MiniBest, 10 Meter Walk Test (10MWT), and speed adjustment setting of a virtual reality treadmill. Single session of reactive step training was performed two weeks following pretesting. The subjects completed the process detailed in the feasibility study. Seven subjects performed only slips/trips and 6 subjects experienced an additional auditory cue as a dual task. The Wilcoxon Signed Ranks and Mann-Whitney U nonparametric tests were used to analyze data, due to the small sample size.

Results: Fourteen healthy individuals (12 female; 2 male) greater than 65 years of age (Mean=77.36 SD=6.70) who met inclusion criteria were selected. There was no significant difference between the single and dual task groups for all post-test outcome measures. When data sets were combined, significant differences were found for pre/post comparisons in the 10MWT (p=.046), FSST (p=.005), reactive balance assessment (p=.010), and speed adjustment (p=.002). No significant changes were detected in the ABC Scale over time. Standardized effect sizes were either large or moderately large.

Conclusions: Overall, participants demonstrated statistically significant improvements in gait and balance measures, indicating a decrease in fall risk. Previous studies show that a single session of repeated slip training or perturbation training decreases fall risk for older adults using self-report data collected in a laboratory setting. Our study demonstrates functional improvements in a clinic setting. Although ABC scale scores did not improve, future studies may consider the impact of the number of sessions on this measure. In conclusion, this study indicates that a single session step training program significantly improves walking ability and decreases fall risk in older adults. Further research should consider diagnosis specific response to single session reactive step training for improved clinical application. The major limitation of this study was the small, homogeneous sample of convenience.

Clinical Relevance: Clinicians can implement a single session of reactive step training in their clinical setting to improve functional outcome measures and decrease fall risk.

TITLE: Postural Alignment Contributes to Different Balance Strategies Between Young and Old Adults
CURRENT SECTION: Geriatrics
AUTHORS: Yahiko Takeuchi, Yuri Yoshida, Kaiwi Chung-Hoon
ABSTRACT BODY:

Purpose/Hypothesis: Currently, one third of adults 65 and over have experienced a fall. Changes to the neuromuscular, musculoskeletal and sensorimotor systems with aging may also affect the ability of older adults to maintain optimal postural steadiness and balance. Postural changes such as forward head position or thoracic spine kyphosis have been reported to affect balance in older adults though the evidence has varied. However, the evidence is limited regarding older adults who have both forward head and kyphotic postural alignments and their ability to maintain balance. Thus, the purpose of this study was to examine whether older adults demonstrate different postural control during standing on an unstable surface when compared to healthy young adults.

Number of Subjects: 10 healthy young (HYA, $\bar{X}$ = 20.5 ± 1.5 years) and 14 healthy old (HOA, $\bar{X}$ = 66.9 ± 3.1 years) adults participated in this study.

Materials and Methods: Twenty four participants were instructed to stand with eyes open on an unstable surface, Airex® pad, for 10 seconds. Balance performance was measured using a MAC 3D motion analysis system with AMTI force plates. Center of pressure (COP) and body segment movements in two directions, anterior/posterior (AP) and medio-lateral (ML), were assessed in both groups. Body segment movements were characterized as the root mean square (RMS) of the acceleration of the center of mass (COM) for the head, trunk and pelvis. The amount of contribution that each segmental movement obtained was determined by using the percentage of each RMS (%RMS). Independent t-tests were conducted to detect differences for each body segment between the groups. Additionally, Pearson product moment correlation coefficients were used to evaluate bivariate relationships between RMS in each body segment and the COP movements.

Results: The AP direction for HOA demonstrated significantly larger head %RMS (26.1%) compared to HYA (22.4%: $p < 0.05$). No significant differences and correlations were detected in COP and %RMS between the HYA and HOA in the ML direction ($p > 0.05$). Moderate correlations in COP to Pelvis %RMS were apparent in HOA ($r = 0.65$, $p < 0.05$) and not in HYA ($r = 0.61$, $p = 0.06$) No significant correlations for head %RMS and COP in HOA ($r = 0.45$, $p = 0.06$) were detected. Collectively, a significant correlation in COP for both head %RMS ($r = 0.42$, $p < 0.05$) and pelvis %RMS ($r = 0.63$, $p < 0.01$) in the AP direction.

Conclusions: The results suggest that different strategies in postural control were apparent between the healthy young and old adults. In general, both pelvis and head movements contribute to postural control in the AP direction while aging may also change the ratio of contribution of these two segments, which may challenge balance abilities in older adults.

Clinical Relevance: Older adults demonstrate increased head movement when maintaining balance. Clinicians should be aware of postural alignments when assessing balance in older adults.

TITLE: Are Age, Velocity, or Propulsion Force Predictors of Gait Related Changes in Older Adults?
CURRENT SECTION: Geriatrics
AUTHORS: Dheyani Malde, Natalie Pizzimenti, John McCamley, Marc Jacofsky, Bonnie Sumner
ABSTRACT BODY:

Purpose/Hypothesis: Gait patterns are heavily influenced by aging. The neuromuscular changes associated with aging are very complex, which is why it is vital we understand how the biomechanics of walking are altered throughout life. Previous research indicates that velocity and reduced FP are important parameters in aging. However, there is limited research that directly compares the effect of reduced speed vs. reduced propulsive force production (FP) on age related gait changes. Our goal was to determine how aging related changes in the gait of older adults, correlates with age, speed, or peak FP, over a 6 year time span.

Number of Subjects: 17

Materials and Methods: Subjects had a mean $\pm$ standard deviation age of 66.3 $\pm$ 2.2 (first visit) and 72.5 $\pm$ 9.1 (second visit), height of 166.2 $\pm$ 2.0 cm (first visit) and 165.6 $\pm$ 1.9 cm (second visit), and weight of 72.3 $\pm$ 3.1 kg (first visit) and 75.6 $\pm$ 3.3 kg (second visit). Subjects were asked to walk across a 3 meter walkway, embedded with force platforms, while wearing at least 24 reflective markers. We used a paired t-test to determine which variables changed significantly between visits. We then used linear regressions to determine if combinations of velocity, peak FP, and age, could significantly predict gait related changes, in the 11 variables, that differed significantly between the first and second visits.

Results: Subjects generated more ankle joint power during the first visit, whereas during the second visit they used more hip joint power during gait. The percent contribution of ankle work did not change over time, although the percent contribution of knee and hip work did change over time. This can suggest a redistribution of power contribution to the proximal joint over a span of time. Propulsive force differences were more pronounced than velocity differences. We found that peak propulsive (anterior) GRF was a significant indicator of knee flexion range of motion and positive ankle work, while velocity was a significant indicator of step length.

Conclusions: Consistent with prior gait analyses, subjects walked at reduced speeds and with wider steps but the differences were not great enough to reach the level of significance in our study. Within our longitudinal sample, we found that both, velocity and FP, are correlated with some gait related changes indicating that both are important factors in aging. However, we found insignificant regressions for the majority of the variables we explored. Given the complexities of aging and gait, it is unlikely that any combination of simple parameters can explain all the differences that are seen in older adult gait.

Clinical Relevance: Many prior gait studies have focused specifically on the association between walking speed and age. However, previous research shows that changes in gait mechanics are not due solely to speed and/or aging. This study provides a step forward towards understanding the gradual changes in ambulation that lead to age related gait declines.

TITLE: Comparison of High-Intensity Resistance and Power Training Programs in Pre-Frail and Frail Older Adults
CURRENT SECTION: Geriatrics
AUTHORS: Justin T. Mierzwicki, Kelsey Marie Harrison, Kevin Robert Griffith, Madelyn Ann Fox, Nikki Marie Singley, Daryl Holstay

ABSTRACT BODY:

Purpose/Hypothesis: Frailty is characterized by declines in strength, muscle mass, slowness of movement, fatigue, low levels of physical activity, and predisposes individuals to adverse outcomes. Approximately 6.9% of community-dwelling adults over age 65 are characterized as frail and 46.6% are pre-frail. High-intensity resistance training and power training have shown to be effective interventions to combat frailty, however, few studies have directly compared the two interventions. The purpose of this study was to determine if high-intensity resistance training at 87-93% 1 RM or power training at 50% 1RM is a more effective intervention in pre-frail and frail older adults.

Number of Subjects: n=20

Materials and Methods: Participants were recruited from a continuing care community, and screened utilizing Fried's Criteria and the FRAIL scale. Twenty participants (14 female, 6 male, mean age = 86.3 years +/−6.89 SD; 7 frail, 13 pre-frail) met eligibility criteria and were assigned to the high-intensity resistance or power training group in a 1:1 fashion. Intervention, performed two times per week for ten weeks, consisted of: warm up, resistance OR power training utilizing Keiser® pneumatic weight equipment: chest press, shoulder press, elbow extension, leg press, knee extension and hamstring curls; and a cool down. High-intensity participants slowly performed three sets of 3-5 repetitions of each exercise at 87-93% of 1RM, whereas, the power group performed two sets of 20 repetitions at 50% of 1RM as quickly as possible. Pre and post-intervention data collected included sit to stand tests, gait speed, timed up and go, hand held dynamometry, and 1RM for each exercise performed. Data analyses included paired t-tests and independent samples t-tests.

Results: Six participants withdrew from the study; four due to unrelated medical issues, and two due to dislike of exercise. Final data were collected on the 14 remaining participants (8 High-intensity, 6 Power). Paired samples t-tests results: statistically significant improvement in 16/24 dependent variables in the high-intensity group and 2/24 power group dependent variables (p<0.05). Independent samples t-tests of the change scores demonstrate statistically significant improvements in the high intensity relative to the power group for 6/24 dependent variables.

Conclusions: Participants in the high-intensity training group demonstrated greater improvements in strength (1RM of knee extension and hamstring curls, as well as hip and knee dynamometry) and mobility function (30 second chair rise) than did the power training group. The two interventions were statistically similar for gait speed, timed up and go performance, 5 times sit to stand, certain 1RM and handheld dynamometry measures.

Clinical Relevance: Determining optimal exercise prescription is critical to adequately meet the needs of the growing, frail older adult population. While further research into whether high-intensity resistance or power training is optimal in this population, it is possible that a combination of both interventions may be ideal.

TITLE: A Cross-Species Paradigm for Testing Dual-Task Costs of Walking and Cognition With Aging
CURRENT SECTION: Geriatrics
AUTHORS: David Clark, Abbi R. Hernandez, Steven P. Winesett, Sara N. Burke
ABSTRACT BODY:

Purpose/Hypothesis: Walking while simultaneously performing a cognitive task (dual-tasking) is common in everyday life, and performance worsens with advancing age. Poor dual-task ability can contribute to mobility difficulties, such as the ability to engage in community ambulation and a heighted risk of falling. Studies in animals have been conducted to test mechanistic brain contributions to dual-task performance with aging. However, to our knowledge the protocols used in animals have not been validated by testing analogous protocols in humans. Therefore, we developed and tested a dual-tasking protocol across two species: rats and humans. The hypothesis of the study was that both humans and animals, particularly those with older age, would exhibit dual-task costs. Here we present findings from the human participants.

Number of Subjects: Twelve older adults (66 ± 5 years old) and eight young adults (23 ± 3 years old).

Materials and Methods: The walking task involved a rectangular Figure-8 path (15 meters on each side) in which the participant must remember to take alternating left and right turns ("WalkTurn"). The cognitive task involved memorization and recognition of objects that are encountered on one side of the path ("Object Recognition"). Each task was performed separately and combined ("Dual-Task"). A standard walking test without alternating turns was also performed ("Walk"). During each task, cognitive/executive demand was measured by functional near infrared spectroscopy (fNIRS) over the left prefrontal cortex. Performance was quantified as the number of mistakes or indecision (pausing to think) during 10 consecutive trials of each task. Performance was also quantified as slowing of gait in the steps just prior to making a left/right turning decision.

Results: Both the older and younger groups self-reported greater perceived difficulty of performing the dual-task relative to either single task ($p<0.05$). Performance (sum of mistakes and indecision) on the Object Recognition portion of the Dual-Task tended to be worse in older versus younger adults (effect size 0.68, $p=0.11$). For older participants, slowing of step time was more pronounced for the WalkTurn and Dual-Task conditions as compared to the Walk condition ($p<0.01$ for both). Prefrontal activity was higher in the older adults than in the young adults for both the WalkTurn and Dual-Task conditions ($p<0.05$).

Conclusions: Older adults exhibited poorer performance and greater prefrontal recruitment than younger adults during dual-tasking. These results are similar to what we have observed in young and old rats. Consistent results across species support the validity of this approach for use in future translational research to understand mechanisms of age-related changes in dual-task performance.

Clinical Relevance: Understanding mechanisms of dual-task walking deficits is crucial for developing effective therapeutic interventions. Validating animal dual-task protocols by testing analogous protocols in humans is a valuable approach for optimizing the success of translational research.

TITLE: Potential Benefits of Stand-up Tests to Screen Early Mobility Decline in Assistive-Care Beneficiaries
CURRENT SECTION: Geriatrics
AUTHORS: Toru Matsuda, Yuri Yoshida, Joseph Zeni, Shingo Muranaga
ABSTRACT BODY:

Purpose/Hypothesis: In light of a government-initiated campaign to support an aging demographic, Japanese medical associations have placed a strong emphasis on healthy aging and endorsed a new stand-alone diagnosis of 'Locomotive Syndrome (LS)'. This new concept recognizes mobility problems as its own diagnosis, regardless of the underlying pathology. The Stand up Test (SUT), is used to diagnose LS. For the SUT, a patient stands from a 40cm-stool like a single leg squat. If he can successfully complete the task on each limb, he passes the criteria and is not diagnosed with LS. If he fails, he is diagnosed as LS Stage 1. Subsequently, the individual completes a bilateral sit to stand test from a stool height of 20 cm. If the individual cannot rise from the 20 cm height, he is diagnosed with Stage 2 LS. LS diagnosis are highly correlated with gold-standard tests like Timed Up and Go (TUG) and gait speed in independent community dwellers. However, there is limited information as to whether SUT correlated with gold-standard tests in those with mild disabilities. Therefore, the aim of this study was twofold: 1) determine if SUT was correlated with gold-standard tests in assistive-care beneficiaries in Japan and 2) determine if the prevalence of LS stages differed between those at different disability levels as defined by the Japanese disability classification.

Number of Subjects: 79 assistive-care beneficiaries in Japan ($\bar{X}$: 81±8 years) participated. They were classified as mild disability (Levels 1-4) based on the 7-level disability classification, in which 7 is the most severe. Levels 1-4 are those who are independent with their mobility. Individuals with substantial mobility deficits are classified above Level 4 and were excluded. This classification is a key component of the Japanese criteria for receiving government assistance for healthcare.

Materials and Methods: The SUT, TUG, gait speed, 30s Chair Rise Test (30sCRT)), handgrip and quadriceps strength were assessed. Spearman's Correlation were used to examine the relation between LS tests and other tests. χ^2 test was used to examine the prevalence of LS stages between Level 1-4.

Results: SUT was significantly correlated with all reference tests (30sCRT: rho=0.55, Gait speed:rho=−0.44, TUG:rho=−0.52) as well as quadriceps strength (rho=0.40) and handgrip (rho=0.23). 91% of individuals with Level 4 disability had LS Stage 2 and this was significantly greater than the other levels; Level 1 (50%), Level 2 (65%), and Level 3 (50%).

Conclusions: Our results indicated that the SUT could detect different mobility levels in different disability levels in a similar way as the reference tests, were correlated with muscle strength, and differentiated individuals with Level 4 disability from lower levels.

Clinical Relevance: The SUT seem adequately sensitive for evaluating subtle mobility decline in the assistive-care beneficiaries with mild disability, and may be beneficial as an early screening tool.

TITLE: Effects of Core Muscle Training on Balance and Postural Sway in Older and Younger Populations
CURRENT SECTION: Geriatrics
AUTHORS: Richard A. Ferraro, Sarah Jeanne Garman, Rebecca Taylor, James Scott Parrott PhD, Jennifer Kadlowec PhD
ABSTRACT BODY:

Purpose/Hypothesis: Previous research suggests a direct association between core strength training and proximal postural control with improved balance and function resulting. Despite growing evidence that core training improves functional mobility and balance, previous studies have failed to distinguish these immediate training benefits between older and younger populations. The specific purpose of this pilot study was twofold: 1.) To determine the effectiveness of a one time transverse abdominis (TrA) training session during two balance activities in older and younger adults and 2.) To identify differences in core and support limb muscle recruitment patterns during a challenging balance task in older and younger adults

Number of Subjects: 56

Materials and Methods: A pretest-posttest design was used with a TrA training session as the intervention. Dependent variables included center of pressure acceleration velocities in the anterior-posterior direction (COPx), medial-lateral direction (COPy), total linear path distance (COPpath), number of maximum sway episodes (COPmaxsway) and surface electromyography (sEMG). Postural sway and sEMG data were collected during single limb standing (SLS) before and after training. Repeated measures ANOVAs were used to evaluate differences in change trajectories for the three age groups. Post hoc contrasts were used to evaluate cohort differences.

Results: Older (n=18, x=66.4), Middle (n=16, x=48.6), and Younger (n=22, x=24.5), subjects performed a Functional Reach Test and SLS dynamic balance task before and after a single TrA training session. Reach distance marginally increased across all age groups (p=0.06); post-hoc contrasts indicated reach distance increased more for the older than younger individuals (p=0.03). There were statistically significant improvements across all postural sway variables (p<0.05). For both COPy and COPpath, older adults improved more than younger (p<0.001) and middle-age subjects (p<0.03). For COPmaxsway, older subjects improved significantly more than younger subjects (p<0.001). There were no statistically significant differences between groups with regard to sEMG amplitude and activation patterns [note this pilot study was not powered to detect sEMG differences]. However, based on observation of the sEMG values for older compared to younger subjects divergent patterns of muscle recruitment did begin to.

Conclusions: Proper training of the TrA was associated with reduced postural sway and is support for the importance of the TrA function in proximal stability. Despite potential differences in muscle activation patterns among the three age groups, all subjects showed improved COPy, COPtotal and COPmaxsway. Particularly for the older adults, the results of this study suggest that the TrA plays a role in decreasing postural sway during demanding balance exercises.

Clinical Relevance: This TrA training technique is both practical and easy to administer. Clinicians should consider incorporating TrA training to complement traditional balance training when working with older adults or patients with a higher risk of falls.

TITLE: Assessing Risks and Benefits of Aging Adults Playing the Competitive Racquet-Sport Pickleball

CURRENT SECTION: Geriatrics

AUTHORS: Rachael Walton-Mouw, SueAnn L. McCall, Michael A. Polascik, Robert Powers, M.Div., Ph.D.

ABSTRACT BODY:

Purpose/Hypothesis: Pickleball (PB) is an emerging racquet-sport in aging active adult communities. While communal/competitive sports are likely an important component in the continued health and quality of life (QoL) of aging individuals, with aging comes an increased potential for injury. Play related injuries or the fear of injuries may be a significant factor in the decline of sports and exercise in aging individuals. Data from 126 active aging PB players indicated a substantial risk of injuries associated with PB play, however these players assessed physical, social, and QoL benefits of PB play worth the risks – including benefits such as a reduced fall rate in daily life.

Number of Subjects: 126

Materials and Methods: An online survey of 126 PB players from north Georgia age 50+ was conducted with age breakdown of 54% age 60-69, 32% age 70-79, and 14% age 50-59, with majority being male (57%). Eighty-four percent self-rated their health as "better than average" or "excellent."

Results: Respondents were physically active individuals and dedicated PB players, based on frequency and length of time playing PB. Reasons for playing PB were to improve health (37%), become a better player (34%), and for social interactions (21%). Half (50%) have suffered a physical injury playing PB. Of those injured playing PB, 40% reported that they have been unable to play PB for a period of time due to a PB-related injury, 46% had to seek healthcare due to an injury, and 33% reported their PB injury as chronic rather than acute. Falls while playing PB were reported by 58% of respondents (31% had fallen more than once), yet only 6% reported falls not associated with PB ($p < 0.05$ by Chi-Square). Surprisingly, 90% of those injured said that their PB injuries did not negatively affect their lives and 85% reported that they do not worry about playing PB because of a fear of injury. Ninety-eight percent reported that they believe that playing PB improves QoL.

Conclusions: The results of this study suggest that although a substantial number of aging individuals experienced significant injuries while playing PB, nearly all believed that the benefits of physical activity and social interactions outweigh risk of injury. In fact, although half of the respondents reported injuries while playing PB, they reported that a fear of injury did not affect their choice to play. Additionally, it appears playing PB may actually lead to fall and injury reduction in daily life. This suggests that aging adults are gaining substantial benefits from playing PB even though the activity may be objectively dangerous.

Clinical Relevance: To facilitate the QoL of active aging adults, communal/competitive sports offer an opportunity to integrate physical and social activities. Even though evidence may suggest that there is a significant risk of injury while playing the sport, the benefits, perceived and actual, may outweigh the risk of injury. Clinicians may wish encourage communal/competitive sports activities for the aging adult as part of a comprehensive wellness and failure prevention program.

TITLE: A Frailty Self-Management Program Improves Physical Activity in Older Adults
CURRENT SECTION: Geriatrics
AUTHORS: Margaret K. Danilovich, Megan McCabe, Elizabeth Pedi, Amanda M. Fox, Kathryn Barousse
ABSTRACT BODY:

Purpose/Hypothesis: Frailty is a medical syndrome diagnosed by the presence of three or more of the following criteria: unintentional weight loss, self-reported exhaustion, weakness, slow walking speed, and low physical activity.[1] Comprehensive geriatric inter-professional assessment and treatment are key interventions for the frailty syndrome.[2] However, no self-management programs have been developed and tested for frailty. To address this need in a rapidly aging society, the purpose of this study was to 1) develop a physical therapist (PT)-led self-management intervention, 2) evaluate intervention feasibility through program satisfaction and adherence rates and 3) determine the impact of the self-management intervention on frailty classification, self-rated health, self-efficacy, and frailty knowledge.

Number of Subjects: 84

Materials and Methods: We developed a frailty specific self-management intervention through an interdisciplinary collaboration of focus groups and interviews. The self-management intervention contained four modules covering goal setting, physical activity, nutrition, hydration, resistance exercise, sarcopenia, fatigue and mobility. We then used a single arm, pre-post test design to evaluate the intervention. We first recruited participants over the age of 60 from senior centers and retirement communities. We administered a program evaluation to measure satisfaction rates. We calculated adherence rates as the number of sessions attended out of four. We measured grip strength, gait speed, and self-efficacy for managing chronic disease, at baseline, immediately following the intervention, and a 6 month follow-up to evaluate frailty classification, self-rated health, self-efficacy, and healthcare utilization. We asked participants open-ended questions about frailty knowledge and management strategies. For data analysis, we used a Wilcoxon rank test to evaluate differences in quantitative outcomes. We coded open-ended questions to create themes for qualitative outcomes.

Results: We enrolled 84 adults (mean age 73.6 years) with 33% of participants male and 67% female. Overall, 6% of participants had a grade school education, 44% high school, and 50% college or more. The majority of participants lived alone (64%). Participants were evaluated based on frailty indicators. After intervention, — participants had zero frailty indicators in comparison to — at baseline. Between baseline and the end of the intervention, there were statistically significant differences in PASE scores at four weeks (p= 0.015) and in self-efficacy at six months (p=0.042). Results from the open-ended frailty questions showed participants had an increased knowledge of frailty and understanding of how to manage their condition. At the conclusion of the intervention, answers to open ended questions were more specific, had greater detail and overall were more accurate. After evaluating themes in participant's definitions, 26 included weakness at baseline and 30 at four weeks. In addition, six participants included nutrition and fatigue at baseline and 16 at four weeks. Qualitatively, an evaluation of open ended questions regarding frailty, it was evident that participants were both engaged in the four week intervention and gained knowledge of frailty. At four weeks, participants responses to frailty questions more specific and accurate. Program satisfaction averaged 8.5/10 on a Likert scale. Satisfaction measures demonstrated that most participants reported that the intervention was excellent/good at meeting their expectations.

Conclusions: A four week frailty intervention improves self-reported physical activity in older adults (p=0.042). This demonstrates that when engaged with intervention, participants are able to learn how to manage frailty (by improving physical activity) through education. Results from this study show that physical therapists are able to provide preventative wellness services. Limitations include decreased long-term follow-up demonstrated by participant adherence at six months. However, based on participant satisfaction with the program, this can be a means to bring people into the clinic to prevent and address frailty concerns.

Clinical Relevance: Physical therapists can lead a self-management program for older adults as a means to provide preventative services as well as group-based wellness programming for older adults in the community.

TITLE: Does Dance Improve Quality of Life in Older Adults? A Systematic Review

CURRENT SECTION: Geriatrics

AUTHORS: Kevin Jones, Alex Wright Aker, Merissa Denning, Michael Alan Gorze, Mary Jo Westendorf

ABSTRACT BODY:

Purpose/Hypothesis: Quality of Life is one of the most important outcomes for older adults. Dance is a multidimensional activity that integrates physical, cognitive, emotional and social elements, and may be a promising adjunct to traditional exercise programs to improve quality of life. The aim of this systematic review is to examine whether or not dance improves quality of life in older adults.

Number of Subjects: NA

Materials and Methods: A systematic search was performed through all relevant databases through the Southwest Baptist University library. The following inclusion criteria was used: peer reviewed, academic journal, published within the past ten years, English language, outcome measures of quality of life, specifically the SF-12/36, dance as the intervention, and older adults. Studies were excluded if they did not meet the previously listed criteria or was specific to Parkinson's disease diagnosis. Quality and suitability were assessed using the PEDro scale and Downs and Black quality assessment tools. All studies included in this systematic review were found to be of at least fair quality.

Results: There was a total of 698 participants with ages ranging from 59-95 years old. All were community dwelling older adults. Interventions included instructor led classes that varied on style of dance taught. The intervention duration ranged from eight weeks to 12 months and the frequency varied from two to four times per week for 60-90 minutes. Three of the four studies used the SF-12 as a quality of life measure while the third used the SF-36.

Conclusions: After analyzing the four studies, it is uncertain if dance can in-fact improve the quality of life in older adults. This in turn leaves plenty of room for further research in this area. It would be beneficial to investigate through randomized control trials, specific styles of dance programs, frequency, if specific functional improvements can impact quality of life, and additional populations such as assisted living or skilled nursing facilities.

Clinical Relevance: The studies included in this review did not conclusively find that dance improved quality of life. However, they did show improvement at the impairment and activity levels. It would be beneficial to investigate, specific styles of dance programs, frequency and if specific functional improvements can impact quality of life. Additional populations such as those in assisted living or skilled nursing facilities should be studied as well.

TITLE: Physical Therapy for Gluteus Medius Tendinopathy Post Tenex Procedure in a 65-Year-Old Community Dwelling Adult
CURRENT SECTION: Geriatrics
AUTHORS: Anna Marie Bennett, Sharon Fleming Walsh, Amy M. Schlessman
ABSTRACT BODY:

Background and Purpose: This case report describes the outcomes of a 65-year-old female post Tenex tenotomy and a course of PT. Tendinopathy contributes to pain and functional limitations that inhibit optimal health and function. When the gluteus medius tendon is injured, it limits gait, stair climbing, and squatting. The Tenex method of tenotomy aims to excise the injured areas of the tendon while limiting damage or side effects. This procedure is novel and does not have substantial evidence regarding the benefits of the procedure, methods to guide the rehab, or to apply the methods to the elderly population. The purpose of this case report is to establish guidelines for rehab protocols following a Tenex procedure to treat gluteus medius tendinopathy.

Case Description: The subject was a 65-year-old female whose preinjury level of function included walking for 30 minutes 3x/week, playing with her grandchildren, and doing regular gardening and yard work. She injured her right gluteus medius tendon approximately 12 months previous when she fell on the ice. Treatment consisted of a 3-month episode of unsuccessful PT to treat right hip pain, along with cortisone injections. Patient had a medical history of Grave's Disease, Hyperthyroidism, and Osteopenia. This study examined 1 period of outpatient PT for right hip pain following a Tenex tenotomy. Six weeks after the surgery, she reported bilateral hip pain and limitations with functional tasks including walking, stairs, and squatting. She received 3 sessions of PT over 4 weeks focusing on bilateral hip mobilization and soft tissue massage to normalize range of motion, and strengthening exercises to improve proximal hip stability and balance. A HEP was developed to increase the exercise frequency to 7 days/week over the 4-week episode of care.

Outcomes: After the course of treatment, the patient demonstrated improved bilateral hip active range of motion improving right hip flexion by 77 degrees and left hip flexion by 85 degrees, displaying ROM within functional limits. She also improved gluteus medius muscle use for increased proximal stability, measured by single leg stance time improvement from 0 to 12 sec. on the right and from 5 to 20 secs. on the left. Subjectively, the patient reported improved independence with ADLs via the Lower Extremity Functional Scale improving from 50/80 to 76/ 80. Pain levels also improved from a pre-treatment level of 5/10 to post treatment of 2/10. At a follow up 6 months after this episode of care, the patient reported improved walking tolerance greater than 1 mile, being able to lift her grandchildren (approximately 50 pounds), perform yard work tasks, climb more than 2 flights of stairs, and tolerate exercise on her elliptical for 30 minutes 3x/week.

Discussion: Outpatient physical therapy was found to be a beneficial treatment following a Tenex tenotomy procedure by improving functional participation in ADLs, decreasing pain, and improving functional mobility. Future studies are needed to provide evidence for a consistent tx protocol to improve function after this surgical procedure.

TITLE: Variable Tempo Gait Training Outcomes Using Rhythmic Auditory Stimulation Embedded in Older Adults' Preferred Music

CURRENT SECTION: Geriatrics

AUTHORS: Cathy Ann Aymen Larson, Edward A Roth, Alycia Sterenberg, Michael K. Crinion, Kelsey Fischer, Sun H Yim

ABSTRACT BODY:

Purpose/Hypothesis: Older adults must have the ability to walk at a variety of speeds in order to adapt to community demands. The purposes of this phase one study were to examine if an emphasizing beat (rhythmic auditory stimulation[1]) embedded in older adults' preferred-music while progressively increasing and decreasing the tempo above/below self-selected, baseline cadence can 1) accurately be performed; and increase 2) overall walking distance, 3) velocity, 4) balance, and 5) enjoyment during walking.

Number of Subjects: 14 female, older adults (mean age 72.6±4.4 years, height 163.1±7.7 cm, weight 84.3±18.8 kg, mini-mental state examination 29.4±1.3 (25–30) points).

Materials and Methods: Walk with music training occurred over a seven week duration with two supervised sessions per week and self-walking with music encouraged on the other days. Variable music/cadence tempos were gradually introduced [−15%, −10%, −5%, 0% (baseline), +5%, +10%, +15% cadences/tempos]. Baseline, 2- & 4-week, and final gait measures were recorded using an electronic walkway. Baseline & final six minute walk tests (SMWT), Berg balance scores (BBS), and enjoyment were recorded.

Results: Mean walking with music training session attendance was 94.5±5.6%. When walking with music with embedded beats, participants walked at significantly greater cadences than targeted −15% & −10% cadences (p=0.001). Participants' cadences matched targeted −5%, baseline, +5%, +10% & +15% cadences. Mean baseline to final SMWT increased 90.8±46.5 meters); t(1,13)= −7.3; p ≤ 0.005; MCID 14.0-30.5.[2] Mean velocity increased 0.36±0.14 m/s; t(1,13)= −9.35; p<0.005; MCID 0.10-0.20 m/s.[3] While the participants did not have major balance impairments, mean BBS improved from 53.1±2.1 (baseline) to 55.1±1.1 (final) points; t(1,13)= − 4.28; p=0.01; MCID older adults 6.5 points.[4] 12 of 14 adults stated they enjoyed walking with music since music increased "walking at home", "motivation", "pace", and "pep" while 2 of 14 did not enjoy walking with music since they were "bored with same 10 songs".

Conclusions: In a recent study, participants were able to synchronize walking cadences to all music tempos at baseline or faster.[5] Similarly, in the current study, participants did synchronize at baseline, slightly below & above baseline, and at faster cadences; however, they did not synchronize at the slowest cadences below baseline. Over the seven week period, participants increased their overall walking distance, velocity, and expressed enjoyment during walking with music. Balance issues were not identified using the BBS. A phase 2 study will investigate walking with music for individuals post-stroke.

Clinical Relevance: Utilizing walking with music at various tempos/cadences may be a promising community activity for older adults. This may translate to an individual's ability to adapt walking speeds to various community demands.

TITLE: Drums Alive Golden Beats Improves Brake Onset Time in Older Adults
CURRENT SECTION: Geriatrics
AUTHORS: Brittney Moshos, Peter Wright, Greg Walsh, Sarah Davey, Kiera Wilkinson, Mackenzie Hagan, Kristen Marie Harrell, Chelsea Noser, Austin Robinson, Anne Graff, Nathan Forrest Johnson

ABSTRACT BODY:

Purpose/Hypothesis: Age-related declines in reaction time (RT) are pervasive. Driver RT is one of the most important factors related to accident avoidance. Increased RT reduces the window of opportunity to appropriately stop or maneuver a motor vehicle. Driver RT is comprised of constituent parts that contribute to a total response time (TT). Simple RT (sRT) is comprised of the requisite sensory and central processing of TT. Movement time (MT) is comprised of the requisite movement of a particular behavioral response (e.g., moving your foot from the accelerator to the brake). Maintaining a physically active lifestyle can help attenuate age-related declines in RT. Drums Alive is a therapeutic movement program that uses choreographed rhythmic movements to improve cardiorespiratory health, mobility and flexibility. This study aimed to determine if a 10-week Drums Alive intervention, Golden Beats, could improve brake onset time in community dwelling older adults. We hypothesized that a 10-week Drums Alive intervention would improve driver RT when compared to a non-aerobic stretching intervention.

Number of Subjects: 22

Materials and Methods: Eleven community dwelling volunteers (2 males) completed the Drums Alive intervention (mean age = 68.82 years, SD = 5.33). Eleven age and sex matched control participants (2 males) completed the stretching intervention (mean age = 68.76 years, SD = 4.76). The Drums Alive intervention consisted of 20 one-hour sessions over the course of 10 weeks (2 sessions per week). Each Drums Alive session started with a 10-minute warm-up followed by 40 minutes of choreographed rhythmic movements and a 10-minute cool-down. The stretching intervention also consisted of one-hour sessions but met 3 times a week. Each stretching session started with a 10-minute warm-up on a recumbent bike followed by 50 minutes of total body stretches and targeted isometric holds (i.e., scapular retraction and pelvic tilts). Driver RT was assessed before and after each intervention. A computerized driving simulation task was used to measure sRT, MT, and TT on a brake onset task.

Results: Independent-samples t-tests were used to determine significant between-group changes in sRT, MT, and TT. A new p-value threshold was set to account for multiple comparisons (0.05/3 = 0.017). There was a statistically significant difference in pre- to post-intervention MT between the Drums Alive ($M = -0.052$, $SD = 0.063$) and control groups ($M = 0.007$, $SD = 0.039$; $t (22) = 2.61$, p = 0.017, two-tailed). The magnitude of the differences in the means (0.059, 95% CI: 0.012 to 0.106) was large (eta squared = 0.25). No significant group differences were observed for sRT and TT.

Conclusions: Findings suggest that a choreographed rhythmic exercise intervention benefits a constituent component of driving-related RT.

Clinical Relevance: Driver RT is an essential part of roadway safety. Age-related declines in RT limit driving performance in older adults. Physical therapists are in a unique position to promote novel intervention strategies aimed at improving motor performance in older adults.

TITLE: Tai Chi Effect on Stiff Knee Gait Post Chronic Total Knee Arthroplasty
CURRENT SECTION: Geriatrics
AUTHORS: Kathy W. Mercuris
ABSTRACT BODY:

Purpose/Hypothesis: The purpose of this study was to determine the effect of tai chi (TC) intervention on stiff-knee gait and physical function in older adults greater than 6-months post- total knee arthroplasty (TKA). Stiff knee gait is defined as ≤10° difference between knee extension at heel contact to foot flat during gait and may be observed following a TKA. Additional gait changes and functional activity limitations may also occur. Tai chi provides safe, pain free movements to improve balance and gait in older adults, but its impact upon chronic TKA function has not been examined.

Number of Subjects: Sixteen participants (10 female); community volunteers post-TKA surgery 4.03 years (SD ± 7); mean age 72 years (SD± 8). All participants met criteria for stiff knee gait as measured by a strain gauge during forward walking.

Materials and Methods: Participants attended one-hour TC classes 3x/week for 10 weeks led by a certified TC instructor. Pre-and post outcome measures included: The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC); 30 Second Sit to Stand (30STS); Timed Stair Climbing Test (TSCT, s); Single Leg Stance time (SLS, s); dynamic knee flexion/extension during gait with strain gauge (degrees) and goniometric passive range of motion (PROM); and three passes of preferred, fast, and backward gait over an instrumented walkway. Gait variables derived were step length (cm) on the TKA limb, velocity (cm/s) and cadence (step/min). Paired sample t-tests were used to examine pre-and post mean change in all measures.

Results: Average class attendance was 85.25%. Pre/post mean changes for outcome measures on the TKA limb were: knee flexion PROM 115/122, p=0.007; knee extension PROM −9/−7, p=0.010; 30STS 9/13 repetitions, p<0.001; TSCT 17.3/13.88, p=0.016; step length on the TKA limb (preferred pre/post mean 60.3/64.6, p=0.005; fast 68.5/73.5 p<0.001; backward 40.0/46.3, p<0.001). Also, velocity improved in all conditions (preferred 110/123, p=0.007; fast 151/170, p<0.001; backward 76/92, p<0.001); cadence (preferred 110/115, p=0.02; fast 132/139, p=0.015; backward 109.119, p=0.003). The following measures improved but did not reach significance: SLS 14.30/14.81; WOMAC 24.48/19.52; dynamic knee flexion 9.4/11.7 and extension −5.8/−9.4.

Conclusions: Benefits in physical function, PROM, and step characteristics in usual and challenging walking conditions were evident following TC practice in subjects post-TKA with stiff knee gait. Dynamic knee motion improved but didn't reach significance possibly due to small sample size. Improved mean WOMAC scores may not have reached significance due to initial low self-reported impairment levels.

Clinical Relevance: Patients with persistent stiff-knee gait post-TKA benefited from TC. TC may be considered an alternative exercise to promote continued functional progress. It is a low cost and enjoyable form of exercise and available in most communities. Referral to TC community based programs should be considered post-TKA.

TITLE: Characterizing Frailty in Individuals With Advanced Knee Osteoarthritis Awaiting Total Knee Replacement
CURRENT SECTION: Geriatrics
AUTHORS: Justin Michael Freund, Jerad Jeffrey Cook, William Christoph Cox, Kristie W Kelley, Ali Oliashirazi, Saurabh Mehta

ABSTRACT BODY:

Purpose/Hypothesis: Frailty is a state of increased vulnerability in elderly leading to diminished ability to cope with acute stressors.[1] Emerging evidence suggests higher prevalence of frailty in those with osteoarthritis of the knee (KOA).[2] This study aimed to screen individuals with advanced KOA (AKOA), awaiting total knee replacement (TKR), for frailty and characterize the demographic and health variables as well as measures of physical function associated with frailty in these patients.

Number of Subjects: 46 patients with AKOA (67.9±15.9 years of age).

Materials and Methods: English speaking patients with AKOA were recruited from pre-TKR class. Those with other lower extremity pathology, cognitive impairment, or hardware in forearm that would preclude assessment of bone health were excluded. Participants completed the numeric pain rating scale and short form for Knee Injury Osteoarthritis Outcome Score (KOOS-PS). Three student raters were standardized to collect data for physical function measures of grip strength (GS),[3] walking speed (WS),[4] and the five repetition sit-to-stand test (5STS).[5] Bone mineral density (BMD) was assessed at distal radius. Using previously established criteria,[6] patients were classified as frail if they had ≥2 of the following present. (i) >13 pounds (6 kg) weight loss in past 6 months; (ii) inability to arise from chair without support to complete the 5STS; (iii) self-reported exhaustion. Descriptive statistics were calculated to obtain summary of demographic, health, and physical function variables in those classified as frail versus not frail. We also examined the associations between demographic, health, and physical performance variables with frailty. P-vales were of <0.05 were considered significant.

Results: Of 46 patients, 18 patients were classified as frail (8 men and 10 women; p=0.4). Those who were frail had worse WS (0.87±0.2 vs. 1.27±0.26 meters/second; p<0.001), worse scores on 5STS (26.7±8.9 vs. 14.4±4.5 seconds; p<0.001), worse pain (5.6±1.4 vs. 4.5±1.9 seconds; p=0.03), and worse KOOS-PS scores (51.3±15 vs. 59.3±11.4 seconds; p=0.04). There were no differences in gender, obesity, BMD, or GS between those who were deemed frail versus not frail.

Conclusions: The results suggested that proportion of patients awaiting TKR for AKOA are frail. Those who are frail have worse performance on 5STS and WS and also report greater pain as well as disability. Since higher pre-surgery impairments are associated with poor outcomes after TKR, the results of our study warrant the need to optimize physical functioning in patients awaiting TKR who demonstrate frailty.

Clinical Relevance: Physical therapists (PT) provide care to those with AKOA on the continuum even after TKR. Our study has significant clinical implications for those PT, especially in screening for frailty status in patients awaiting TKR and addressing impairments in physical functions to maximize gains functional status after TKR. The results are also relevant considering that it is not a common practice to assess for frailty pre-TKR and our results provide a preliminary support to do so.

TITLE: Effects of Pole Walking on Older Adults Following Six Weeks of Training
CURRENT SECTION: Geriatrics
AUTHORS: Meridee Green Danks, Samantha Nicole Forsch, Raevyn Renee Haugland
ABSTRACT BODY:

Purpose/Hypothesis: The purpose of this study is to determine the effects of pole walking on overall physical functioning of community-ambulators 60 years of age and older. It has been hypothesized that the use of walking poles can improve the efficiency of gait and balance, improve posture, increase strength, and impact cardiovascular responses to exercise.

Number of Subjects: 11 healthy older adults

Materials and Methods: All subjects participated and completed pre- and post-participation fitness screens and surveys. The fitness screen included implementation of the Senior Fitness Test (SFT) battery, posture assessment, and gait analyses through use of the GAITRite. Each individual was provided and fit with walking poles and received general instruction on walking technique. All subjects participated in all 45-minute exercise sessions consisting of warm-up, pole walking, and cool down, two times per week, for six weeks.

Results: Data analysis consisted of paired t-Tests ($\alpha \leq 0.05$) to compare pre- and post-test findings for the SFT battery, posture, and gait parameters. Significant improvements from pre- to post-test were identified in the following: 30-second chair stand test mean reps increased from 16 to 18 ($p = .005$), 2-minute step test mean reps increased from 101 to 113 ($p = .001$), mean heart rate decreased following endurance testing from 93 bpm to 85 bpm ($p = .008$), and gait velocity mean improved from 1.30 m/s to 1.48 m/s ($p = .009$). Posture was found by researchers to be improved in pre- and post-images in 10 of the 11 participants with use of walking poles, all participants felt their posture improved when using the poles.

Conclusions: Based on the evidence provided, it can be concluded that in healthy older adults; pole walking can improve gait and balance, enhance posture, increase lower extremity strength, and impact endurance. Future research looking at populations beyond healthy older adults, i.e., people with Parkinson's disease, may be warranted to see if similar benefits of pole walking can be found.

Clinical Relevance: Pole walking is applicable and an appropriate tool physical therapists can use to help improve physical function in community-dwelling older individuals and/or patient populations. Walking poles may be more acceptable to some clients as they are viewed as a "sporty" walking device versus a medical one.

TITLE: Cardiorespiratory Fitness and Sex Contribute to Brake Onset Time in Older Adults
CURRENT SECTION: Geriatrics
AUTHORS: Nathan Forrest Johnson
ABSTRACT BODY:

Purpose/Hypothesis: More than a quarter of the world's population will be over the age of 65 by the year 2030. Maintaining independence by "aging in place" is the most important objective among older adults. Mobility is a fundamental part of maintaining independence. Mobility refers to any form of movement that permits a physical change in body position or destination. It includes, but is not limited to, bed mobility, ambulation and motor vehicle operation. Driving is the preferred choice of mobility reported by older adults. Driver reaction time (RT) is a crucial component of roadway safety. Individuals over the age of 65 have the second highest motor-vehicle-related mortality rates in the United States. Superior cardiorespiratory fitness (CRF) is associated with faster RTs on a variety of behavioral tasks. This study aimed to determine the strongest predictor of constituent components of driver RT on a brake onset test. We hypothesized that CRF would be the strongest predictor of driver RT.
Number of Subjects: 50
Materials and Methods: Fifty community dwelling healthy volunteers (24 males) completed all aspects of the study (mean age = 66.49 years, SD = 4.14). Participants completed a graded exercise test to determine the highest observed rate at which the body extracts and utilizes oxygen during high intensity exercise, or VO_2 peak. A computerized driving simulation task was used to measure simple reaction time (sRT), movement time (MT), and total time (TT) on a brake onset task (STISIM Drive, Systems Technology Inc., Hawthorne, CA). sRT, MT, and TT were recorded for 5 trials. Two trials were considered practice trials. Mean values for sRT, MT, and TT were used for all analyses.
Results: CRF made the largest unique contribution to sRT variance (beta = -0.35, p = 0.03). Sex made the largest unique contribution to MT (beta = -0.44, p = 0.003) and TT (beta = -0.28, 0.05). CRF also showed a marginal contribution to TT variance (beta = -0.25, p = 0.08). Age did not significantly contribute to sRT, MT or TT.
Conclusions: Findings suggest that a modifiable lifestyle variable benefits constituent components of driving-related RT.
Clinical Relevance: Operating a motor vehicle is a form of mobility many clinicians fail to consider. Driver RT is an essential part of roadway safety. Age-related declines in RT limit the mobility of older adults. Physical therapists are in a unique position to help attenuate aged-related declines in RT by improving modifiable lifestyle variables that contribute to driving performance.

TITLE: Tilburg Frailty Indicator Has Good Concurrent and Discriminant Validity in Elderly Patients Attending Geriatric Clinic

CURRENT SECTION: Geriatrics

AUTHORS: Saurabh Mehta, Pavithra Indramohan, Kaylan Johnson, Aman Ajmeri, Moninder Singh, Lynne Goebel

ABSTRACT BODY:

Purpose/Hypothesis: Frailty is a state of decreased homeostatic reserve and increased vulnerability to institutionalization, fall-related injuries, and mortality.[1] Tilburg Frailty Indicator (TFI) is a self-reported measure intended to screen for frailty in older adults,[2] which has not been validated in the American context. This study examined the concurrent and discriminant validity of the TFI in patients attending geriatric clinic.

Number of Subjects: 41 patients (79.1±7.8 years of age)

Materials and Methods: English speaking patients consulting geriatricians were recruited. Using wheelchair for mobility, cognitive deficits, or conditions that caused permanent mobility impairments were exclusion criteria. Demographic and health variables were captured for all patients. Three research trainees were standardized to obtain assessments for gait speed (GS), hand grip strength (HGS), five repetition sit-to-stand (5STS), and short physical performance battery (SPPB). Patients completed the TFI and Rapid Assessment of Physical Activity (RAPA)[3] questionnaires. Patients were classified as frail using frailty phenotype framework.[4] To be deemed frail, they met >2 of these criteria: 1) GS of <1 meter/second,[5] 2) HGS of <16 kg for women and <26 kg for men,[6] 3) ≥10% weight loss in last 6-months, 4) those classified as under-active or sedentary using RAPA, and 5) self-reported exhaustion. Pearson Correlation Coefficients (r) assessed concurrent relationships between TFI, GS, HGS, 5STS, and SPPB. Receiver operating characteristics (ROC) curve was plotted to determine whether TFI scores accurately discriminated between those who were frail versus non-frail, where area under the curve (AUC) of ≥0.80 indicated good discrimination.

Results: Of 41 patients screened, 18 were classified as frail. TFI scores showed high correlations with CST (r=0.68; P<0.001) and moderate to low correlations (r<0.60) with other measures. TFI scores were significantly different in those classified as frail versus non-frail (5.7±2.3 vs. 2.5±1.7; P=0.0009). TFI scores accurately discriminated between frail vs non-frail patients (AUC=0.803; 95% confidence interval 0.661−0.94). Our results further validated the established cut-off score of 5/15 on TFI[2] as having high diagnostic accuracy (specificity of 92%).

Conclusions: To our knowledge, this is likely one of the first reports that examined the concurrent and discriminant validity of the TFI in American context. Our results support using the TFI to screen for frailty in geriatric outpatient clinic. We recommend validating the results of our study, especially further refining the cut-off scores for TFI, in a larger cohort.

Clinical Relevance: Frailty is commonly assessed using frailty phenotype framework by geriatric physical therapists. The TFI accurately discriminates between frail vs non-frail individuals that are classified using this framework. Given that the TFI is a self-reported measure, it can serve as an important tool in screening for frailty in instances where assessment of some markers of frailty phenotype might be challenging to administer or contraindicated.

TITLE: Change in Physical Function After a Targeted Kyphosis Intervention in Older Adults With Hyperkyphosis: Secondary Analysis of a Randomized Controlled Trial

CURRENT SECTION: Geriatrics

AUTHORS: Amy Maria Elisabeth Gladin, Wendy Beth Katzman, Shirley Wong, Yoshimi Fukuoka, Nancy E Lane

ABSTRACT BODY:

Purpose/Hypothesis: An association between greater degree of kyphosis in older adults and lower physical function is well known, however few interventions have investigated the effects of a targeted kyphosis intervention on physical function in a low-functioning cohort. We performed a secondary analysis of randomized clinical trial (RCT) data to explore changes in physical function before and after a 3-month kyphosis exercise and posture training intervention to provide a sample size estimate for a larger RCT in low functioning older adults. We also explored and compared change in kyphosis, lordosis, physical function, and health related quality of life (HrQol) before and after the intervention in low functioning versus high functioning older adults.

Number of Subjects: 101

Materials and Methods: We stratified the original cohort into low function (LFG) and high function (HFG) groups using a score of 10 points or less on the Short Physical Performance Battery (SPPB) for low function at baseline. Baseline characteristics were compared between the LFG and HFG using t-tests or Wilcoxon nonparametric tests for continuous variables and the Pearson's χ^2 statistic for categorical variables. We compared spinal curvature, physical function, and HrQol change scores pre/post intervention between the low and high function groups utilizing paired t-tests.

Results: Twenty-seven of 101 (26.73%) older adults in the original cohort were stratified into the low function group, mean SPPB 9.62+/−1.17 points. At baseline the LFG was older, 74.2+/−6.5 versus 68.80+/−5.15 p=.005, had less lumbar lordosis p=.03, had worse physical function (p<.0001 to p=.01 on 7 measures) and worse HrQol (p=.001, p=.01). At baseline, there were no differences in kyphosis p=0.7 and spinal strength (p=.1, p=.2) between the LFG and HFG. After the intervention, there was no difference between the groups in change in kyphosis, p=0.41 and both groups improved. SPPB increased 0.62+/−2 points in the LFG and decreased 0.04+/− 0.98 points in the HFG, and the between group difference in change was significant, p=0.02. Spinal extensor strength decreased by 8.5% in the LFG and increased by 10.5% in the HFG, and the between group difference in change was significant, p=0.02. Gait speed improved 0.04+/−0.15 m/s in the LFG and declined 0.01+/− 0.22 m/s in the HFG, but the between group difference was not significant, p=0.41.

Conclusions: This secondary analysis was not powered to detect changes in physical function, however, suggests older adults with hyperkyphosis and low physical function may improve physical function after a kyphosis specific exercise and posture training program.

Clinical Relevance: Larger adequately powered studies are warranted to determine if physical function improves after a targeted kyphosis exercise and posture training intervention in older adults with hyperkyphosis and low physical function.

TITLE: Inflammatory Blood Biomarkers Associated With Musculoskeletal Pain Among Older Adults: A Systematic Review
CURRENT SECTION: Geriatrics
AUTHORS: Jessica Mah, Sarah Bailey, Vaclav Bednar, David Matthew Rowland, Adam Payne Goode, Corey B. Simon
ABSTRACT BODY:

Purpose/Hypothesis: Older adults are the population at greatest risk for musculoskeletal (MSK) pain and pain-related disability. Recent research found older adults experience a spike in inflammatory blood biomarkers with pain, and preliminary work has associated this inflammatory response with physical performance. However, to our knowledge, this is the first systematic appraisal of inflammatory blood biomarkers and MSK pain among older adults.
Number of Subjects: 8,420
Materials and Methods: Searches were conducted in three databases for observational or experimental studies published between 1998 and May 2018. Articles were included if the mean or median age of participants was at least 55, and subjects experienced MSK pain either clinically or experimentally. Outcome measures were inflammatory blood biomarkers (e.g. IL-6) and pain intensity. Four researchers independently performed a double-blinded title and abstract screen of 6,830 articles and a full-text screen of 251 articles. The 41 articles which met eligibility criteria were qualitatively assessed using the Modified Quality in Prognosis Studies Tool.
Results: The majority of studies assessed older adults with low back pain, knee osteoarthritis (OA), or unspecified chronic pain. Twenty-five studies found a positive association between biomarkers and pain, four studies illustrated an inverse relationship, and 13 studies found no association. The strongest correlations were observed for CRP, IL-6, TNFα, and leptin. In addition, several studies found associations between biomarkers and pain-related disability or physical performance among older adults with MSK pain. Qualitative analysis revealed the majority of research (71%) had high risk of bias. One particular limitation was that 28 of 41 studies utilized a cross-sectional design.
Conclusions: We identified convergences for specific inflammatory blood biomarkers and MSK pain among older adults, though no single biomarker was found to have uniform findings across studies. Moreover, study design issues for included studies currently limit inferences to clinical care.
Clinical Relevance: Currently, the clinical relevance of circulating inflammatory markers among older adults with MSK pain is limited due to study design issues, equivocality, and research bias. However, our systematic review provides concrete recommendations for future studies and research advances, which align with current federal initiatives for precision medicine. The overarching goal is to include inflammatory blood markers as a means to phenotype older adults with MSK pain, thereby implementing physical therapy services earlier to prevent downstream disability.

TITLE: Impact of Outpatient Physical Therapy on Gait Speed in Older Adults With Musculoskeletal Diagnoses
CURRENT SECTION: Geriatrics
AUTHORS: Lance F. Angelle, Joey Renee Miller, Gregory W. Hartley, Kathryn Elizabeth Roach
ABSTRACT BODY:

Purpose/Hypothesis: Gait speed has been referred to as a vital sign in aging adults and has been shown to predict mortality, morbidity, frailty, falls, and institutionalization. The negative health outcomes associated with decreased gait speed limit social participation. Safe community ambulation requires a comfortable gait speed of approximately 1.2 m/s. Factors related to significant improvement in gait speed are not fully understood. The purpose of this study was to identify factors related to achieving a significant improvement in gait speed in patients age ≥ 60 receiving outpatient physical therapy (OPPT) for musculoskeletal problems.
Number of Subjects: 75
Materials and Methods: Data from a de-identified database that included demographic information, clinical characteristics, LIMAT score and gait speed at the initial and discharge visits, length of care episode (LCE), and number of OPPT visits (kept and missed) were analyzed. Inclusion criteria were age ≥ 60, and receiving OPPT for a lower extremity musculoskeletal diagnosis. We used 0.13 m/s as the minimal clinically important difference for gait speed, and classified subjects as improved (I, n=58, change ≥ 0.13 m/s) and not improved (NI, n=15, change < 0.13 m/s). We defined treatment intensity as kept visits divided by LCE. We then compared the characteristics of the 2 groups.
Results: Both I group and NI groups were predominantly Hispanic (77.6 % v 86.7%, p=.64), female (81% v 73%, p=.51), and were similar in age (72 v 71 years, p=.64) and initial LIMAT score. The I group had a slightly lower initial gait speed (.85 v .98 m/s, p=.12) and improved an average of .54 m/s, while NI subjects improved only .05 m/s (p=.0007). Patients in the I group received 16.5 OPPT visits compared to 13.2 visits for the NI group (p=.04). Change in gait speed was moderately correlated with both initial gait speed (r= −.29, p=.01) and with treatment intensity (r=.28, p=.02).
Conclusions: On average, the patients who improved in gait speed had almost 3 more OPPT visits than those who did not improve, and there was a modest relationship between the treatment intensity and change in gait speed. This suggests that the dose of OPPT may be an important factor in improving gait speed in older adults.
Clinical Relevance: Gait speed is an important health marker in older adults and may facilitate social participation. The intensity (dose) of OPPT may be an important factor in improving gait speed in this population.

TITLE: Validity and Reliability of the Nih Toolbox Balance Test Compared to the Biodex Balance SD
CURRENT SECTION: Geriatrics
AUTHORS: Alexander Peller, Rishi Garib, Emily Garbe, Daniel William Komforti, Chestton Joffe, Adonis Magras, Ashleigh Dyanne Trapuzzano, Matt S. Stock, Nicole Therese Dawson

ABSTRACT BODY:

Purpose/Hypothesis: The NIH Toolbox® was developed to assess functions among motor, sensory, emotional, and cognitive domains. The motor domain of the NIH Toolbox® consists of an assessment for standing balance. Studies through the National Institutes of Health have validated early versions of the balance assessment for ages 3 through 85; however, no studies have examined the reliability and validity in its current version (Balance Pod using iPod Touch) against established balance measurements. The Biodex Balance SD is designed to measure balance and has shown good test-retest reliability amongst active elderly adults. This study aimed to compare the NIH Toolbox® balance measures to the Biodex m-CTSIB to assist clinicians in choosing the best tool during their examination.

Number of Subjects: 90 community dwelling older adults (33 males 57 females) all $\geq$ 60 years old (SD 74 $\pm$ 6).

Materials and Methods: An observational study using a convenient sample of 90 older adults to participate in a one-day assessment using the NIH Toolbox® and the Biodex SD m-CTSIB. Participants performed two trials of the NIH Toolbox® balance assessment per the standardized protocol as well as two assessments on the Biodex SD m-CTSIB. Intraclass correlation coefficients (ICC [3,1]) were used to measure the retest reliability of each measure, and Pearson's product correlation examined criterion validity between measures.

Results: The overall composite score of the 5 conditions on the Biodex SD m-CTSIB showed moderate test-retest reliability (ICC [3,1]=0.71). Comparatively, the overall reported theta of the NIH Toolbox® balance assessment showed moderate reliability (ICC [3,1]=0.84). Individually, each specific condition of the Biodex SD m-CTSIB showed poor to moderate reliability (0.45$-$0.61). However, the NIH Toolbox® balance measures revealed moderate to good test-retest reliability of individual conditions (0.71$-$0.82) except for condition 5, tandem standing (0.47). When compared to each other the NIH Toolbox® balance theta score and Biodex SD m-CTSIB overall Sway Index shows acceptable criterion validity (r=0.52) indicating moderate overlap in constructs being assessed.

Conclusions: This study supports previous research that the Biodex SD m-CTSIB demonstrated overall good test-retest reliability, but individual conditions have poor reliability. The NIH Toolbox® balance assessment demonstrated good reliability overall and individually among 4 of the 5 conditions. The NIH Toolbox® balance assessment also demonstrates acceptable criterion validity compared to the Biodex SD m-CTSIB; therefore, appear to measure similar aspects of balance.

Clinical Relevance: The NIH Toolbox® balance assessment uses an iPod Touch and an iPad, which are portable and readily available to clinicians. It demonstrated good reliability and validity compared to the Biodex SD m-CTSIB. The NIH Toolbox® is a valid, reliable, and accessible device that will allow clinicians to measure balance in individuals; therefore, should be considered for use in clinical evaluations.

TITLE: Assessing Quadriceps Strength and Movement Quality During a Step-Down Task After Total Knee Arthroplasty
CURRENT SECTION: Geriatrics
AUTHORS: Peter Benson Thomsen, Jesse Colin Christensen, Cory Buenting Gritton, Cory Lynn Christiansen
ABSTRACT BODY:

Purpose/Hypothesis: Patients quadriceps strength and movement quality deficits commonly persist following total knee arthroplasty (TKA), particularly noticeable during high-demand joint loading tasks such as stair descent. These deficits negatively affect functional performance and joint health of both lower limbs. Enhanced understanding of the relations between quadriceps strength and joint loading may prove valuable for future rehabilitation protocol design and implementation. Therefore, the purpose of this study was to: 1) evaluate the relationships between surgical limb quadriceps strength and lower limb joint loading behaviors, and 2) compare lower limb joint moment symmetry and total support moment symmetry of the surgical and non-surgical limbs during a high-demand step-down task after a 10-week rehabilitation post-TKA.

Number of Subjects: 20 patients with TKA (age: 66.2 ± 6.6 years, Sex: 50% male, BMI: 29.7 ± 5.0 kg/m^2).

Materials and Methods: Participants performed a step-down task (19.05 cm step height) following completion of a standardized 10-week physical therapy program. Lower limb joint kinetics were obtained using a three-dimensional motion analysis system (Vicon, CO, USA) with embedded force plates. Sagittal plane lower limb joint moments, peak vertical ground reaction force, and loading rate were calculated using Visual3D (C-Motion, MD, USA). Peak isometric knee extensor torque was collected using an isokinetic dynamometer (CSMi Solutions, MA, USA) as a measure of quadriceps strength. Pearson's r bivariate correlations were calculated between quadriceps strength and joint kinetics. Paired sample t-tests were used to compare differences between interlimb joint moment and total support moment asymmetries.

Results: Surgical limb quadriceps strength correlated strongly with surgical limb knee extension moment ($r=0.70$, $p<0.01$). The surgical limb generated a lower peak total support moment compared to the non-surgical limb ($p<0.01$), including decreased ankle ($p<0.01$) and knee ($p<0.01$) moments in the surgical limb. No differences were observed in landing limb loading metrics of vertical ground reaction force and loading rate ($p>0.05$).

Conclusions: Patients with diminished surgical limb quadriceps strength generate reduced knee moments during single-limb support, but do not experience increased loading of the non-surgical landing limb during weight acceptance of a step-down task. Interlimb joint loading asymmetries are present immediately following the conclusion of standard rehabilitation.

Clinical Relevance: The presence of between-limb loading asymmetries during the step-down task following standard rehabilitation indicates a need for improved approaches to postoperative therapy. Emphasis on quadriceps strengthening may limit the knee extension moment deficits present and improve functional capacity during high-demand tasks. Further, introduction of symmetry retraining protocols to retrain movement may attenuate the magnitude of present asymmetries to the benefit of both lower limbs.

TITLE: Steadi Fall Risk Screenings and Spatial-Temporal Gait Parameters Help Focus Interventions in Rural Older Adults

CURRENT SECTION: Geriatrics

AUTHORS: Lori A. Schrodt, Kim Hudson, David Hudson

ABSTRACT BODY:

Purpose/Hypothesis: Falls are the leading cause of injury-related death among older adults. Fall-related death rates are higher in rural western North Carolina (WNC) compared to other NC regions. This project explored: 1) fall risk and key risk factors to better inform fall prevention strategies, and 2) gait parameters associated with fall risk among rural older adults.

Number of Subjects: 16 older adults (14 female, mean age 70.8 yrs) attending a rural community social event who volunteered for a fall risk screening.

Materials and Methods: CDC STEADI screening and risk assessment procedures were completed [Stay Independent Questionnaire (SIQ), Timed Up and Go (TUG), 30-Second Chair Stand (30CS), and 4-Stage Balance Test]. Subjects performed the TUG and usual pace 20-foot walk on a GaitRite Mat. Spatial-temporal gait variables for usual pace gait and for 2 steps prior to the TUG turn (lead and trail steps) were compared for subjects with low fall risk and those with elevated risk (moderate and high risk) using Mann-Whitney U analysis.

Results: 4 subjects identified as low fall risk, 5 as moderate, and 7 as high risk per STEADI. 10 fell in the past year, 7 had multiple falls, and 6 had fall-related injuries. The overall mean 30CS percentile relative to peer data was 32.2 with only 5 subjects above the 40th percentile. 13 were unable to maintain single limb stance for > 6.5 seconds. Frequent risk factors per the SIQ were: prior fall (n=10), rushing to the toilet (n=9), worries about falling (n=8), and feeling unsteady (n=8). Subjects with elevated risk walked slower (1.01 m/s vs. 1.33 m/s; $p<.01$) and with shorter steps (.58 m vs .68 m; $p<.01$). During the turn approach, elevated risk subjects had a slower trail leg step velocity (.95 m/s vs 1.18 m/s; $p<.03$), but lead step velocities were not different. When normalized against baseline walking velocity, trail step velocity was not different (.88 m/s vs .89 m/s).

Conclusions: 62.5% of this small sample reported falling in the past year compared with 28.7% of older adults nationally. Key risk factors included weakness, balance impairment, worries about falling, and incontinence. Older adults with elevated fall risk walked slower with shorter step lengths. Both groups slowed for the turn; however, the elevated risk group did not slow down as much relative to their baseline velocity, indicating a possible motor control difference.

Clinical Relevance: A higher proportion of rural older adults may fall compared with national rates. Fall prevention programs should emphasize incontinence management and strategies to mitigate fear of falling in addition to strengthening and balance training. Training for control during changes of walking direction may be advantageous for older adults at moderate or high fall risk.

TITLE: Alpena Empowered Movement Program: A Outcomes Study in a Rural Community
CURRENT SECTION: Geriatrics
AUTHORS: Andrew John Doubek, Min-Hui Huang, Allon Goldberg
ABSTRACT BODY:

Purpose/Hypothesis: Falls in community ambulating older adults are a significant health risk and financial burden on US health care costs. This study was to examine the outcomes of the Empowered Movement Program (EMP), a 8-month evidence-based fall prevention program including education on participants' performance over time, in a rural community.

Number of Subjects: Thirty-four adults (3 male) aged 60 and older (76.1 ± 7.8 years).

Materials and Methods: The EMP consisted of three, one-hour group exercise classes per week, and two standardized 8-week falls and balance programs. Participants were assessed at the baseline, 4 months, and 8 months after starting the EMP. Outcome measures used for assessments were 30 Sit to Stand (30STS), Timed Up & Go (TUG), 4 stage standing balance test, and arm curl test. After each assessment, participants received education and feedback on their individual scores, interpretations of these scores relevant to the normative values and fall risk cut-off scores, and changes in their scores. Repeated measures in General Linear Model was used to examine if scores of outcome measures differed across three assessment time points. Post-hoc analysis was performed with Bonferroni adjustment. Two tailed significance level was $p < 0.05$.

Results: The effect of time was significant for 30STS, TUG, and arm curl test (all p values < 0.05). Post-hoc analysis showed that participants significantly improved (1) TUG scores from baseline (10.4 ± 3.0 sec) to 4 months (8.7 ± 2.5 sec) ($p = 0.002$), and from baseline to 8 months (8.7 ± 2.5 sec) ($p = 0.001$), (2) 30STS from baseline (12.2 ± 3.6) to 4 months (15.6 ± 4.6) ($p < 0.001$) and from baseline to 8 months (15.0 ± 5.0) ($p < 0.001$), and (3) arm curl test from baseline (15.7 ± 4.9) to 4 months (20.2 ± 5.1) ($p < 0.001$) and from baseline to 8 months (19.6 ± 5.2) ($p < 0.001$). Additionally, no significant differences in the scores at 4 months and 8 months were found, indicating that the gains in these test scores were maintained through month 8 from the baseline without regression. The scores of 4 stage standing balance test did not differ by time.

Conclusions: This outcomes study demonstrated that an evidence-based fall prevention program resulted in gains in balance, mobility, and lower and upper extremity functional strength in older adults living in a rural senior center. These benefits were evident at 4 months and 8 months after the start of the program.

Clinical Relevance: A group fall prevention program with an educational component can be implemented to manage risk factors of falls in older adults in a community where healthcare resources may be limited.

TITLE: Underlying Contributors to Balance Impairment in Adults With Cirrhosis

CURRENT SECTION: Geriatrics

AUTHORS: Susan Murphy, James Richardson, Jennifer A. Blackwood, Beanna Martinez, Emily Runyan, Megan Park, Elliott Tapper

ABSTRACT BODY:

Purpose/Hypothesis: Falls are common and associated with significant morbidity for persons with cirrhosis and hepatic encephalopathy. Unipedal stance time (UST) is a useful measure of balance as it requires the integration of sensory, neurocognitive, and muscular factors. In order to intervene with targeted rehabilitation efforts to reduce and prevent falls in adults with cirrhosis, a better understanding of mechanisms underlying balance deficits is needed.

Number of Subjects: 119 outpatient adults with cirrhosis and history of hepatic encephalopathy.

Materials and Methods: Each patient was evaluated for demographic and clinical factors [Child Turcotte Pugh (CTP) class, MELD score], physical function (grip-strength and hip-strength using lateral plank time), neurocognitive factors [Numbers Connection Test (NCT) A and B, recognition reaction time accuracy – ability to catch or inhibit catching an instrumented stick under 'lights on' and 'lights off' conditions within 400 ms], and sensory factors (lower limb vibratory sensation and visual contrast). The primary outcome was UST. Falls self-efficacy, perceived ability to perform different tasks without falling, was also assessed. We evaluated bivariate Pearson correlations and developed a linear regression model to identify significant contributors to balance impairment.

Results: Participants were 50% female, aged 62.9±7.3 years, 80% CTP A, 18% CTP B, 2% CTP C, with MELD 11±5. The mean UST was 12.7±9.9 seconds (median = 9.42 seconds, IQR = 19.26). In bivariate analyses, UST was most highly correlated with lateral plank time ($r =0.61$), followed by recognition reaction time accuracy [total, percent correct in lights on, and in lights off conditions ($r =0.47$, $r =.36$, $r =.33$)] and NCT A and B tests (each $r =0.27$). In multivariable regression, 54% of variance in UST was explained by significant factors of plank time, recognition reaction time accuracy, falls self-efficacy, age, and CTP. Based on standardized beta coefficients, plank time, CTP of B or C, and recognition reaction time accuracy were the strongest predictors. For every second increase of plank time, UST increases by 0.26 seconds on average. If classified by CTP of B or C, UST decreases by 5.8 seconds. For each additional percent correct on recognition reaction time accuracy, UST increases by 0.12 seconds.

Conclusions: The strongest factors associated with diminished balance, as indicated by UST, in this high fall-risk cirrhosis population are hip strength, clinical disease severity, and neurocognitive capacity.

Clinical Relevance: These findings support a rehabilitation approach that targets strengthening as well as neurocognitive training to address balance impairment.

TITLE: Rehabilitation After Emergency Spinal Fusion Secondary to Pyelonephritis Induced Vertebral Osteomyelitis: A Case Report
CURRENT SECTION: Geriatrics
AUTHORS: Folashade John, Kent Edward Irwin, Elizabeth A. Campione
ABSTRACT BODY:

Background and Purpose: Pyelonephritis occurs when a urinary tract infection (UTI) spreads from the bladder to the kidneys. UTIs account for 25% of older adult emergency department visits and 17% of hospitalizations. Though uncommon, UTIs have been known to cause vertebral osteomyelitis in adults. Typical presentation includes dull, unrelenting back pain that radiates into the lower extremities (LE), limb weakness, sensory loss, urine retention, and fever. Antibiotics are the primary treatment for vertebral osteomyelitis; however, surgery may be required to drain abscesses, release compression, or stabilize the spine to correct deformities caused by the infection. The purposes of this case report are to (1) inform healthcare practitioners of warning flags indicating serious spinal pathology and (2) describe successful outpatient physical therapy (OPPT) for an older adult who had emergency spinal fusion surgery due to pyelonephritis induced vertebral osteomyelitis.

Case Description: A 76-year-old female experienced unrelenting back pain four months after a hospital admission for a UTI. Diagnostic tests revealed abscesses and fractures in multiple locations of the thoracic spine due to vertebral osteomyelitis. Subsequent right sided foot drop and an inability to safely ambulate led to another hospitalization resulting in emergency multilevel thoracolumbar fusion following a diagnosis of pyelonephritis induced vertebral osteomyelitis.

The patient was evaluated in OPPT two months later. She had a history of osteoporosis, osteopenia, hypothyroidism, and right hip replacement. PT evaluation revealed bilateral LE weakness and increased fall risk. She expressed concern for her diminished functional mobility and lack of independence, as well as fear of PT exacerbating her symptoms. PT intervention focused on patient and family education concerning fear and activity avoidance, postural awareness, progressive LE strengthening, functional mobility and balance, and dynamic gait training.

Outcomes: After 21 OPPT visits the patient demonstrated improvements in her Focus on Therapeutic Outcomes (FOTO) functional status score (40/100 to 45/100; MDC=1.4) and fear avoidance belief about physical activity score (66/100 to 26/100; MCID=13), Berg Balance Scale score (7/56 to 37/56; MDC=4.6), and Timed Up and Go (56 seconds to 20 seconds; MCID=3.4). The patient was pleased with her ambulation ability, had more confidence and independence in mobility and household activities, and was excited to engage in previous community activities.

Discussion: Physical therapists may be unfamiliar with accurately identifying warning flags in persons with back pain. Patients presenting with non-mechanical back pain could have a life-threatening condition requiring an immediate referral to a physician for further diagnostic testing. This case highlights the benefit OPPT had on reducing fall risk and improving function in an older adult with limitations and fear of physical activity following back surgery due to pyelonephritis induced vertebral osteomyelitis.

TITLE: Identification of Older Adults at Risk for Falls With Drug-Based Indices
CURRENT SECTION: Geriatrics
AUTHORS: Courtney D. Hall, Emily L. Grieshaber, Blaine Hendricks, Kammie Alexandra Lewis, Seth A. McGrady, Megan Lea Morton, Brian L. Odle, PharmD, Peter Charles Panus

ABSTRACT BODY:
Purpose/Hypothesis: Falls in the older adult population are the leading cause of fatal and non-fatal injuries in America. Polypharmacy, the use of multiple medications, has been identified as a major risk factor for falls in older adults. A variety of medication screens exist that identify adverse effects of medications which can directly impact fall risk; however, current screening measures have limitations. The Quantitative Drug Index (QDI) is a new, clinically anchored index to quantify all potential adverse effects associated with drug-mediated fall risk. The purpose of this study was to validate the QDI as a fall risk screening tool.
Number of Subjects: 138 adults were recruited from local senior centers and screened. Inclusion criteria: community-dwelling, age 60 to 89 years, and currently prescribed at least one medication. Exclusion criteria: progressive neurological disorders, unstable medical conditions, cognitive impairment, severe depression or anxiety, severe lower extremity impairment that would impact mobility, and severe vision impairment.
Materials and Methods: Mobility and balance outcome measures related to fall risk included: 30-second chair stand test, 10-meter walk test, Timed Up and Go (TUG) and Dynamic Gait Index (DGI). Self-report measures of fall risk included fall history, Fall Risk Questionnaire (FRQ) and Activity-specific Balance Confidence scale (ABC). The QDI was derived from each participant's medications. Participants were classified as either fallers or nonfallers based on self-report history of falls within the past year. Nonparametric Spearman's Rho correlations were used to determine relationships between faller status and measures of fall risk. A receiver operating characteristic (ROC) curve analysis determined cutoff scores for outcome measures related to faller status.
Results: A fair to moderate relationship between the QDI and several physical performance and self-report measures was identified: FRQ (r=0.363), ABC (r=−0.401), DGI (r=−0.360). However, little to no relationship was found between faller status and QDI score (r=0.221). The ROC analysis determined the area under the curve for QDI was 0.63 with a cutoff score of 2.5 yielding sensitivity of 78% and specificity of 47%.
Conclusions: The development of the QDI was an interdisciplinary effort between pharmacists and physical therapists to screen for fall risk in older individuals. The QDI offers a better way to quantify the adverse effects of drugs on mobility compared with simple drug counts. The QDI alone does not identify individuals at fall risk; however, the QDI is significantly correlated to several measures of fall risk, including FRQ, ABC, and DGI. The ROC Curve Analysis identified a cutoff score for fall risk for the QDI which was found to have similar sensitivity and specificity to the TUG.
Clinical Relevance: The QDI could be incorporated into electronic medical records to identify patients who may be at fall risk and would be appropriate for further balance and mobility evaluation.

TITLE: Pain, Sensory and ABI Tolerance to Aquilo Bilateral Leg Cryo-Compression in Aged Individuals
CURRENT SECTION: Geriatrics
AUTHORS: Christopher J. Wingard, Sonja K. Bareiss, Catherine E. Crandell, Hannah L. Poteet, Logan D. Wright, Melissa C. Hammer, Savannah M. Trussell
ABSTRACT BODY:

Purpose/Hypothesis: Both cryo- and compression (CC) therapies are accepted modalities for musculoskeletal injuries, post-operative conditions and DOMS in young healthy populations.[1-2] CC combination has therapeutic potential in increasing pain tolerance, improving blood flow and reducing inflammatory processes.[3-6] The purpose of this study was to evaluate the tolerance to CC in older adult cohort examining pain, sensation and BP responses.

Number of Subjects: Participants included 21 aged individuals (65-79 yrs, 11 Aged Male (AM), 10 Aged Female (AF)) and 23 young individuals (20-27 yrs, 13 Young Male (YM), 10 Young Female (YF)). Exclusion criteria: recent orthopedic surgery, diabetes, uncontrolled hypertension, neuropathy, and score >0 on Wells DVT Criteria.

Materials and Methods: Height, weight, BMI, BP, HR, SpO_2 (2nd toe), McGill Pain Questionnaire, Wells DVT Criteria screen, and systems review were taken prior to testing. All received 15 min bilateral lower extremity CC session using Aquilo pants system. Pre/Post-session measures included: pressure pain & Von Frey sensory threshold measures; skin temperature at 1st web-space, plantar & dorsal surface of foot and medial thigh; circumference at metatarsal heads, mid-calf (10cm below tibial tuberosity), suprapatellar, and mid-thigh (half-way between suprapatellar and ASIS); ankle-brachial blood pressure index (ABI); pressure sensors at lateral calf, fibular head, and anterior thigh.

Results: Generally skin temp fell between 3-6°F on foot and 2-40°F on the thigh. Older participants experienced a 28.5 ± 1.1°F drop in thigh temp while young fell 23.9 ± 5.6°F. Pressure pain thresholds increased mean pressure thresholds 2.38 ± 0.65 lbf for AF and 1.82 ± 0.72 lbf for AM, both greater than those of young at 1.73 ± 1.73 YF and 1.29 ± 0.98 lbf YM. Sensory threshold increased 0.26 ± 0.27 for AF and 0.31 ± 0.19 for AM values greater than those for the young cohort (avg 0.14 ± 0.12, a decrease in sensitivity >6 gm of force). Circumferential limb measures for all sites reduced in aged by 0.28 ± 0.27cm and by 0.20 ± 0.37cm in the young. Compression pressures were unchanged (range 2-24 mmHg) with no age or sex differences. Overall ABI indices rose 1-2% in males with 10% reduction in females with mean AM ABI 1.19 ± 0.16 and AF 1.06 ± 0.17. BP, HR, and SpO_2 were unchanged.

Conclusions: CC using the Aquilo pants was tolerated by all without adverse events. The aged cohort had larger response changes than the young especially for skin temp, pressure pain thresholds & sensory threshold. The pain and sensory changes may be related to > changes in skin temperature. The CC session did not negatively impact CV endpoints including HR, BP, SpO_2 and ABI.

Clinical Relevance: The use of bilateral CC therapy for older adults was well tolerated. These results support the literature reports of an alternative way for older individuals to improve analgesia, lessen medication use, and potentially shorten hospital stays to maintain compliance to exercise therapy that may be accompanied with pain.

TITLE: Patient Status at Admission to Home Health Is Associated With Readmissions for Individuals With Dementia.
CURRENT SECTION: Geriatrics
AUTHORS: Sara Knox, Brian Downer, Allen Haas, Addie Middleton, Kenneth Ottenbacher
ABSTRACT BODY:

Purpose/Hypothesis: Our objective was to determine the association between mobility, self-care, caregiver supports, and cognition at admission to home health and 30-day potentially preventable readmissions during home health.
Number of Subjects: 118,171 Medicare beneficiaries receiving home health care (7/2013 – 6/2015) diagnosed with dementia (ICD-9 codes).
Materials and Methods: Data were derived from 100% national CMS data files during the period of July 1, 2013- June 1, 2015: Home Health Base file, OASIS, Medicare Provider Analysis and Review (MedPAR), and Beneficiary Summary files. Criteria from the Home Health Claims-Based Rehospitalization Measure and the Potentially Preventable 30-day Post Discharge Readmission Measure for the Home Health Quality Reporting Program were used to identify our cohort from 4,258,284 Medicare beneficiaries. The final cohort consisted of 118, 171 individuals with an ICD-9 code for dementia who were admitted to home health within 5 days of discharge from an acute care hospital. Beneficiaries with dementia were identified using the twenty-three ICD-9 codes included in the Chronic Conditions Data Warehouse algorithm for Alzheimer's disease, related disorders, or senile dementia. The outcome of interest was the occurrence of a potentially preventable readmission within 30-days of starting home health. The primary predictors of interest were mobility, self-care, caregiver support, and cognitive status. The OASIS items used to create the mobility, self-care, caregiver support, and cognitive domains. Sociodemographic and health care utilization characteristics were controlled for.
Results: Of the 118, 171 individuals in the sample, 65% were over the age of 81, 61% were female, and 80% were Caucasian. The overall 30-day PPR rate was 7.6% but varied significantly by patient and health care utilization characteristics. Readmission rates were significantly higher for dual eligible patients (8.8%) compared to non-dual eligible patients (7.2%) and increased with greater length of stay and number of days spent in the ICU. The largest difference in 30-day PPR rates were according to the number of acute hospital stays in the prior year. Patients with four or more stays had a 30-day PPR rate of 25.2% compared to 2.5% for patients with no other acute stays the previous year. Observed 30-day PPR rates increased as the level of independence decreased across all four domains. Across all four domains, status at admission to home health was associated with 30-day potentially preventable readmissions. The five most common conditions resulting in PPR were congestive heart failure (19%), septicemia (17%), renal failure (10%), urinary tract infection (11%), and bacterial pneumonia (9%).
Conclusions: Decreased independence in mobility and self-care tasks, a lack of caregiver support when needed, and impaired cognitive processing at admission to home health are associated with risk of PPR during home health for individuals with ADRD. These domains are areas that are regularly addressed by physical therapists.
Clinical Relevance: Early implementation of interventions to address these domains may impact the risk of potentially preventable readmission for individuals with dementia who are receiving home health care.

TITLE: The Role of Cognitive Impairment in Dual-Task Intervention
CURRENT SECTION: Geriatrics
AUTHORS: Zachary Tuttle, Olivia Kay Maiocco, Ben Gerami, Jeremy Wang, Andrew Sungmin Lee, Jamie Tan, Joseph Vitug, Olfat Said Mohamed, Barbara White, Young-Hee Cho, Vennila Krishnan

ABSTRACT BODY:
Purpose/Hypothesis: Aging is associated with functional decline in the sensory, motor, and cognitive systems affecting static and dynamic balance; consequently, the risk of falling increases for older adults. The purpose of this study is to evaluate whether level of cognitive impairment affects cognitive-motor dual-task training effectiveness in community-dwelling older adults.

Number of Subjects: 37 older adults (No Impairment (NI): 13 women and 3 men, ages 63-87; Mild Impairment (MI): 8 women and 4 men, ages 69-92; Cognitive Impairment (CI): 8 women and 1 man, ages 60-86) completed the study.

Materials and Methods: Cognitive (cog) impairment was measured using the Montreal Cog Assessment. Spatial and temporal gait parameters were collected at pre- and post-testing using the Zeno walkway system. Walking performance was measured using step length, velocity, swing and double support during single-task (S-T; walking alone) and dual-task (D-T; walking while performing serial subtraction by 3 (SS)). Cog performance was measured using percent correct on the SS task during S-T (performing SS while sitting) and D-T (performing SS while walking). D-T walking costs (DTWC) and D-T cog costs (DTCC) were used to measure D-T walking and D-T cog performance; computed as the difference between D-T performance and baseline S-T performance, divided by baseline S-T performance and multiplied by 100: [((DT - ST) / ST) * 100].

The intervention included a 75-minute group exercise class conducted twice per week for 8 weeks. The class included gait variation training, quadrato motor training, and balance training; each while simultaneously performing cog tasks.

Results: Multivariate analysis demonstrated a marginally significant interaction between time and group on D-T walking performance ($p = .053$). Next, 3 one-way MANOVAs with time as the independent variable were conducted including only the: NI group ($p = .014$), MI group ($p = .215$), and CI group ($p = .637$). Results of the univariate analyses for the NI group showed significant decreases in DTWC for step length (from −9.81 cm to −4.08 cm, $p = .015$) and velocity (from −21.77 cm/s to −11.09 cm/s, $p = .005$). Results of the ANOVA for the interaction between time and group on D-T cog performance was not significant ($p = .799$), but there were significant group differences ($p = .011$) and all groups showed decreased DTCC after the intervention ($p = .045$): NI group (from 4.83% to 13%), MI group (from −49.79% to −32.29%), and CI group (from −35.17% to −17.17%).

Conclusions: The intervention program successfully improved: 1) dual-task walking performance for older adults with no cognitive impairment and, 2) dual-task cognitive performance, regardless of impairment.

Clinical Relevance: Approaching dual-task performance holistically (evaluating DTWC and DTCC) is important for understanding what was affected by the intervention, and for whom. It is evident that cognitive impairment affects dual-task dynamic balance beyond the effects of age-related functional decline, even after intervention.

TITLE: Moderate-Intensity Strength and Balance Training in a Patient With Frontotemporal Dementia: A Case Report
CURRENT SECTION: Geriatrics
AUTHORS: Kayla Combs, Jeff Schmidt, Laura Catherine Neely, Nicole Therese Dawson
ABSTRACT BODY:

Background and Purpose: The National Institutes of Health has recognized the *importance of identifying promising non-pharmacological interventions to promote cognitive and functional health* in individuals with Alzheimer's disease and related dementias via multiple Alzheimer's Disease Research Summits.[1] The most recent, hosted by the National Institute of Neurological Disorders and Stroke urged scientists to include individuals with younger-onset dementia, such as fronto-temporal degeneration (FTD), in research as the body is literature is very limited. Frontotemporal Dementia (FTD) is the second most common form of dementia, usually affecting individuals under the age of 65 leading to deficits in behavior, executive function, language, and motor function[4] with a life expectancy of 7 to 13 years. It is important for clinicians to understand the most appropriate method of intervention for this specialized patient population; therefore, the purpose of this case report was to examine a progressive strengthening and balance exercise program use to improve function in an individual with FTD.

Case Description: The patient is a 47-year-old, male veteran with a 5-year history of FTD. At evaluation, he presented with decreased balance and cognition, lack of judgment, tremors, emotional blunting, and generalized weakness. His history consisted of multiple falls, seizures, transient ischemic attacks, and frequent hospital admissions due to physical/cognitive decline and violence. A biweekly, 12-week plan of care was developed to address weakness and balance impairments using moderate-intensity exercises based on an efficacious intervention for individuals with dementia.[2,3] Exercises were individually tailored and progressed to maintain moderate-intensity (60-80% of 1RM or 5-6/10 RPE) throughout the plan of care. The following outcome measures were assessed: 30-Second Chair Stand Test (CST), Four-Square Step Test (4SST), Tandem Walk with Cognitive Task, and Agility T-Test at regular intervals throughout the plan of care.

Outcomes: Throughout the course of treatment, the following improvements were noted: 30-Second CST: 12 repetitions to 23 repetitions after 7 visits (MDC=2 repetitions).[5] 4SST: 9.33 seconds to 5.86 seconds after 14 visits (indicating a non-fall risk).[6] Tandem Walk with Cognitive Tasks: dual-task cost from 50.10% to 31.02% after 3 months (MDC=5.6%).[7] Agility T-Test: 19.90 seconds to 16.39 seconds after 21 visits (MDC=1.10 second).[8] No hospital admissions were reported during treatment duration.

Discussion: Improvements in strength and balance were seen in as little as 7-14 visits, which can be applicable to the out-patient physical therapy setting, where the average plan of care is 13.1 visits.[9] Advances were also made in agility and dual-task cost allowing the patient to wean from daily use of his cane. In conclusion, an exercise regimen including progressive strength, balance, and agility exercises with the inclusion of dual-task, at moderate-intensity has the potential to improve physical and cognitive function in individuals diagnosed with FTD.