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A 2-year follow-up after a 2-year RCT with vitamin D and exercise: effects on falls, injurious falls and physical functioning among older women

Uusi-Rasi K, Patil R, Karinkanta S, Kannus P, Tokola K, Lamberg-Allardt C, Sievänen H.

J. Gerontol. A Biol. Sci. Med. Sci. 2017; ePub(ePub): ePub.

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DOI 10.1093/gerona/glx044 **PMID** 28369286

Abstract

BACKGROUND: Both exercise and vitamin D are recommended means to prevent falls among older adults, but their combined effects on fall-induced injuries are scarcely studied.

METHODS: A 2-year follow-up of a previous 2-year randomized controlled trial with vitamin D and exercise (Ex) of 409 older home-dwelling women using a factorial 2 METHODS: × 2 design (D-Ex-, D+Ex-, D-Ex+, D+Ex+). Besides monthly fall diaries, femoral neck bone mineral density (fn-BMD), and physical functioning were assessed at 1 and 2 years after the intervention.

RESULTS: After the intervention, S-25OHD concentrations declined to baseline levels in both supplement groups. The groups did not differ for change in fn-BMD or physical functioning, except for leg extensor muscle strength, which remained about 10% greater in the exercise groups compared with the reference group (D-Ex-). There were no between-group differences in the rate of all falls, but medically attended injurious falls reduced in D+Ex- and D-Ex+ groups compared with D-Ex-. However, all former treatment groups had less medically attended injured fallers, HRs (95% CI) being 0.62 (0.39-1.00) for D+Ex-, 0.46 (0.28-0.76) for D-Ex+, and 0.55 (0.34-0.88) for D+Ex+, compared with D-Ex-.

CONCLUSIONS: Exercise-induced benefits in physical functioning partly remained 2 years after cessation of supervised training. Although there was no difference in the rate of all falls, former exercise groups continued to have lower rate of medically attended injured fallers compared with referents even 2 years after the intervention. Vitamin D without exercise was associated with less injurious falls with no difference in physical functioning.

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An exploratory survey of older women's post-fall decisions

Bergeron CD, Friedman DB, Spencer SM, Miller SC, Hilfinger Messias DK, McKeever R.

J. Appl. Gerontol. 2016; ePub(ePub): ePub.

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DOI 10.1177/0733464816653361 **PMID** 28380700

Abstract

This research examined factors influencing older women's post-fall decision making. We surveyed 130 independent older women from continuing care retirement communities and non-institutional homes. We categorized women's post-fall decisions as medical, corrective, and social decisions, and examined the associations between post-fall decision categories, decisional conflict, number of post-fall changes, self-rated health, frequency of falls, severity of falls, health literacy, awareness and openness to long-term care institutional options, and demographics. Older women experienced greater decisional conflict when making medical decisions versus social (p =.012) and corrective (p =.047) decisions. Significant predictors of post-fall decisional conflict were awareness of institutional

care options (p =.001) and health literacy (p =.001). Future educational interventions should address knowledge deficits and provide resources to enhance collaborative efforts to lower women's post-fall decisional conflict and increase satisfaction in the decisions they make after a fall.
PDF Y Endnote Y

Association of family history of exceptional longevity with decline in physical function in aging
Ayers E, Barzilai N, Crandall JP, Milman S, Verghese J.
J. Gerontol. A Biol. Sci. Med. Sci. 2017; ePub(ePub): ePub.
Affiliation: Department of Medicine

DOI 10.1093/gerona/glx053 **PMID** 28379407
Abstract
BACKGROUND: Although many genetic and nongenetic factors interact to determine an individual's physical phenotype, there has been limited examination of the contribution of family history of exceptional parental longevity on decline in physical function in aging.
METHODS: The LonGenity study recruited a relatively genetically homogenous cohort of Ashkenazi Jewish adults age 65 and older, who were defined as either offspring of parents with exceptional longevity ([OPEL]: having at least one parent who lived to age 95 or older) or offspring of parents with usual survival ([OPUS]: neither parent survived to age 95). Decline in performance on objective measures of strength (grip strength), balance (unipedal stance), and mobility (gait speed) as well as a composite physical function measure, the Short physical performance battery (SPPB), were compared between the two groups over a median follow-up of 3.2 years, accounting for age, sex, education, and comorbidities.
RESULTS: Of the 984 LonGenity participants (mean age 76, 55% women), 448 were OPEL and 536 were OPUS. Compared to OPUS, OPEL had slower decline on measures of unipedal stance (-0.03 log-units/year, p =.026), repeated chair rise (0.13 s/year, p =.020) and SPPB (-0.11 points/year, p =.002). OPEL women had slower decline on chair rise and SPPB scores compared to OPUS women, although OPEL men had slower decline on unipedal stance compared to OPUS men.
CONCLUSION: Our findings provide evidence that variation in late-life decline in physical function is associated with familial longevity, and may vary for men and women.
PDF Y Endnote Y

Cognitive processing speed across the lifespan: beyond the influence of motor speed
Ebaid D, Crewther SG, MacCalman K, Brown A, Crewther DP.
Front. Aging Neurosci. 2017; 9: e62.
Affiliation: Department of Psychology and Counselling, School of Psychology and Public Health, La Trobe University Melbourne, VIC, Australia.

DOI 10.3389/fnagi.2017.00062 **PMID** 28381999 **PMCID** PMC5360696
Abstract
Traditional neuropsychological measurement of cognitive processing speed with tasks such as the Symbol Search and Coding subsets of the WAIS-IV, consistently show decline with advancing age. This is potentially problematic with populations where deficits in motor performance are expected, i.e., in aging or stroke populations. Thus, the aim of the current study was to explore the contribution of hand motor speed to traditional paper-and-pencil measures of processing speed and

to a simple computer-customized non-motor perception decision task, the Inspection Time (IT) task. Participants were 67 young university students aged between 18 and 29 (59 females), and 40 older adults aged between 40 and 81 (31 females) primarily with a similar education profile. As expected, results indicated that age group differences were highly significant on the motor dexterity, Symbol Search and Coding tasks. However, no significant differences or correlations were seen between age groups and the simple visual perception IT task. Furthermore, controlling for motor dexterity did not remove significant age-group differences on the paper-and-pencil measures. This demonstrates that although much of past research into cognitive decline with age is confounded by use of motor reaction times as the operational measure, significant age differences in cognitive processing also exist on more complex tasks. The implications of the results are crucial in the realm of aging research, and caution against the use of traditional WAIS tasks with a clinical population where motor speed may be compromised, as in stroke.
PDF Y Endnote Y

Community demographics, socio-economic and health status among older Australian residents of Japanese origin living in New South Wales, Australia
Watanabe Y, Honda K.
Australas. J. Ageing 2017; ePub(ePub): ePub.
Affiliation: Gosford Hospital, Gosford, New South Wales, Australia.

DOI 10.1111/ajag.12409 **PMID** 28371118
Abstract
OBJECTIVE: This study aimed to describe demographic and socio-economic characteristics and to assess baseline health status and care needs among Japanese residents aged 60 years and over living in New South Wales, Australia.
METHODS: A postal questionnaire was used to survey older community-dwelling Japanese residents recruited from a number of different sources.
RESULTS: Eighty-two residents responded to the questionnaire (mean age: 70.5 years, range 60-85), and 56 (68.3%) were female. The respondents appeared to be socio-economically comfortable. While 63.4% of respondents noticed reduced strength and balance, and 45% had at least one chronic medical condition, the majority did not require help with personal care or domestic chores. However, there were respondents who were considered at risk of subsequent development of major mobility limitations.
CONCLUSION: Overall, the respondents in this study demonstrated good function. There may be a role for interventional programs aimed at maintaining functional independence.

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Computerized dual-task testing of gait and visuospatial cognitive functions; test-retest reliability and validity
Szturm TJ, Sakhalkar VS, Kanitkar A, Nankar M.
Front. Hum. Neurosci. 2017; 11: e105.
Affiliation: Mobility and Cognition Lab, College of Rehabilitation Sciences, University of Manitoba Winnipeg, MB, Canada.

DOI 10.3389/fnhum.2017.00105 **PMID** 28367119 **PMCID** PMC5355418

Abstract

The common occurrence of age decline in mobility and cognition does cause a decrease in the level of physical activity and an increased falls risk. Consequently, dual -task (DT) assessment that simultaneously addresses both mobility skills and cognitive functions are important because, continued difficulties and fall injuries will have a sizable impact in this population. The first objective of the present study was to assess test-retest reliability of a computerized DT treadmill walking protocol and concurrent outcome measures of gait and visuospatial executive function in a group of healthy older adults. Secondly, discriminative validity was evaluated by examining the effect of DT conditions (single task vs. dual-task) on; (a) spatiotemporal gait measures (average and coefficient of variation) and (b) visuomotor and visuospatial executive performance measures. Twenty-five community-dwelling individuals median age 65 (range 61-67) were recruited from a Fitness Facility. Participants performed a computerized visuomotor tracking task and a visuospatial executive game task in standing and while treadmill walking. Testing was conducted on two occasions, 1 week apart. Moderate to high test-retest reliability (ICC values of 0.65-0.88) were observed for spatiotemporal gait variables. No significant differences between the group means were observed between test periods in any gait variable. Moderate test-retest reliability (ICC values of 0.6-0.65) was observed for measures of visuomotor and visuospatial executive performance during treadmill walking. Significant DT effects were observed for both spatiotemporal gait variables and visuospatial executive performance measures. This study demonstrates the reliability and reproducibility of the computer-based assessment tool for dual task treadmill walking. The high to moderate ICC values and the lack of systematic errors in the measures indicate that this tool has the ability to repeatedly record reliable data from community-dwelling older adults. The present computerized dual-task protocols broaden the types of standardized visuomotor and visuospatial executive activities for use with DT treadmill walking that has previously been reported.

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Effectiveness of a balance-focused exercise program for enhancing functional fitness of older adults at risk of falling: a randomised controlled trial

Zhao Y, Chung PK, Tong TK.

Geriatr. Nurs. 2017; ePub(ePub): ePub.

Affiliation: Department of Physical Education, Hong Kong Baptist University, Hong Kong, China.

DOI 10.1016/j.gerinurse.2017.02.011 **PMID** 28359614

Abstract

This study examined the effectivenss of a balance-focused training program (i.e., Exercise for Balance Improvement Program, ExBP) in improving functional fitness of older nonfallers at risk of falling. Sixty-one participants were randomly assigned to receive 16 weeks of ExBP or Tai Chi (TC) training, or no treatment (CON) with an 8-week follow-up. The Senior Fitness Test battery was applied to assess functional fitness. After the intervention, results revealed significant improvements in all fitness components in the ExBP group. Compared with the CON group, the ExBP group demonstrated more improvements in lower extremity muscle strength, agility and balance, and aerobic endurance. The ExBP group also displayed more improvements in aerobic endurance than the TC group in posttest and follow-up test. Therefore, the balance-focused exercise can be applied as an effective way in improving overall functional fitness among older nonfallers who are at risk of

falling.

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Effects of Tai Chi exercise on body stability among the elderly during stair descent under different levels of illumination
Song Q, Tian X, Wong D, Zhang C, Sun W, Cheng P, Mao D.
Res. Sports Med. 2017; 25(2): 197-208.
Affiliation: Shandong Sport University , Jinan , China.

DOI 10.1080/15438627.2017.1282363 **PMID** 28367687
Abstract
The elderly are prone to stair descent falls under low illumination. Tai Chi, a traditional Chinese conditioning exercise, has been proved to improve body stability by altering body condition, gait, and proprioception. This study investigates whether Tai Chi exercise could improve body stability during stair descent under high and low illumination. Three groups of elderly women who practice Tai Chi, brisk walking, and no exercise were included. They descended from a simulated staircase. Tai Chi participants decreased horizontal velocity, centre of mass (COM) sway, and increased foot clearance compared with other participants, these movements could increase body stability; Compared with under high illumination, Tai Chi participants decreased horizontal velocity, loading rate, braking impulse, and increased inclination angle, COM sway, centre of pressure displacement under low illumination. Tai Chi participants were more sensitive to the difference in illumination, and took corresponding strategies to stabilize their bodies during stair descent.
PDF Y Endnote Y

Falls amongst older people in Southeast Asia: a scoping review
Romli MH, Tan MP, Mackenzie L, Lovarini M, Suttanon P, Clemson L.
Public Health 2017; 145: 96-112.
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DOI 10.1016/j.puhe.2016.12.035 **PMID** 28359399
Abstract
OBJECTIVES: The older population in the Southeast Asian region is accelerating and is expected to surpass the proportion of the ageing population in North America and Europe in the future. This study aims to identify the research literature related to falls among older people in Southeast Asia, to examine current practice and discuss the future direction on falls prevention and interventions in the region.
STUDY DESIGN: A scoping review design was used.
METHODS: A systematic literature search was conducted using the Medline, CINAHL, AMED, Ageline, PsycINFO, Web of Sciences, Scopus, Thai-Journal Citation Index, MyCite and trial registries databases.
RESULTS: Thirty-seven studies and six study protocols were included, from Thailand, Malaysia, Singapore, Vietnam, Indonesia and the Philippines. One-sixth of the studies involved interventions,

while the remainder were observational studies. The observational studies mainly determined the falls risk factors. The intervention studies comprised multifactorial interventions and single interventions such as exercises, educational materials and visual correction. Many of the studies replicated international studies and may not have taken into account features unique to Southeast Asia.
CONCLUSION: Our review has revealed studies evaluating falls and management of falls in the Southeast Asian context. More research is required from all Southeast Asian countries to prepare for the future challenges of managing falls as the population ages.

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Geriatric polypharmacy: pharmacist as key facilitator in assessing for falls risk
Fritsch MA, Shelton PS.
Clin. Geriatr. Med. 2017; 33(2): 205-223.
Affiliation: North Carolina Association of Pharmacists, 1101 Slater Road, Suite 110, Durham, NC 27703, USA.

DOI 10.1016/j.cger.2017.01.003 **PMID** 28364992
Abstract
This article highlights the significant health impact of falls among older adults. An emphasis is placed on the vital role of the pharmacist, regardless of practice setting, in assessing and reducing falls risk for this growing population. In addition, the importance of a stepwise comprehensive approach to falls assessment by pharmacists in collaboration with other clinicians is elucidated.

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Home- and community-based occupational therapy improves functioning in frail older people: a systematic review
De Coninck L, Bekkering GE, Bouckaert L, Declercq A, Graff MJ, Aertgeerts B.
J. Am. Geriatr. Soc. 2017; ePub(ePub): ePub.
Affiliation: CEBAM Belgian Centre for Evidence-based Medicine vzw, Leuven, Belgium.

DOI 10.1111/jgs.14889 **PMID** 28369719
Abstract
OBJECTIVES: The objective is to assess the effectiveness of occupational therapy to improve performance in daily living activities in community-dwelling physically frail older people.
DESIGN: We conducted a systematic review and meta-analysis. We included randomized controlled trials reporting on occupational therapy as intervention, or as part of a multidisciplinary approach. This systematic review was carried out in accordance with the Cochrane methods of systematic reviews of interventions.
MEASUREMENTS: Meta-analyses were performed to pool results across studies using the standardized mean difference. The primary outcome measures were mobility, functioning in daily living activities, and social participation. Secondary outcome measures were fear of falling, cognition, disability, and number of falling persons.

RESULTS: Nine studies met the inclusion criteria. Overall, the studies were of reasonable quality with low risk of bias. There was a significant increase in all primary outcomes. The pooled result for functioning in daily living activities was a standardized mean difference of -0.30 (95% CI -0.50 to -0.11; P = .002), for social participation -0.44 (95% CI -0.69, -0.19; P = .0007) and for mobility -0.45 (95% CI -0.78 to -0.12; P = .007). All secondary outcomes showed positive trends, with fear of falling being significant. No adverse effects of occupational therapy were found.
CONCLUSION: There is strong evidence that occupational therapy improves functioning in community-dwelling physically frail older people.

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Programs and place: risk and asset mapping for fall prevention
Smith ML, Towne SD, Motlagh AS, Smith DR, Boolani A, Horel SA, Ory MG.
Front. Public Health 2017; 5: e28.
Affiliation: Department of Health Promotion and Community Health Sciences, School of Public Health, Texas A&M University , College Station, TX , USA.

DOI 10.3389/fpubh.2017.00028 **PMID** 28361049 **PMCID** PMC5352653
Abstract
Identifying ways to measure access, availability, and utilization of health-care services, relative to at-risk areas or populations, is critical in providing practical and actionable information to key stakeholders. This study identified the prevalence and geospatial distribution of fall-related emergency medical services (EMS) calls in relation to the delivery of an evidence-based fall prevention program in Tarrant County, Texas over a 3-year time period. It aims to educate public health professionals and EMS first respondents about the application of geographic information system programs to identify risk-related "hot spots," service gaps, and community assets to reduce falls among older adults. On average, 96.09 (±108.65) calls were received per ZIP Code (ranging from 0 calls to 386 calls). On average, EMS calls per ZIP Code increased from 30.80 (±34.70) calls in 2009 to 33.75 (±39.58) calls in 2011, which indicate a modest annual call increase over the 3-year study period. The percent of ZIP Codes offering A Matter of Balance/Volunteer Lay Leader Model (AMOB/VLL) workshops increased from 27.3% in 2009 to 34.5% in 2011. On average, AMOB/VLL workshops were offered in ZIP Codes with more fall-related EMS calls over the 3-year study period. FINDINGS suggest that the study community was providing evidence-based fall prevention programming (AMOB/VLL workshops) in higher-risk areas. Opportunities for strategic service expansion were revealed through the identification of fall-related hot spots and asset mapping.
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Thriving in relation to cognitive impairment and neuropsychiatric symptoms in Swedish nursing home residents
Björk S, Lövheim H, Lindkvist M, Wimo A, Edvardsson D.
Int. J. Geriatr. Psychiatry 2017; ePub(ePub): ePub.
Affiliation: School of Nursing and Midwifery, La Trobe University, Melbourne, Australia.

DOI 10.1002/gps.4714 **PMID** 28370353

Abstract
OBJECTIVES: The purpose of this study was to explore relations among thriving, cognitive function, and neuropsychiatric symptoms (NPS) in nursing home residents.
METHODS: A national, cross-sectional, randomized study of Swedish nursing home residents (N = 4831) was conducted between November 2013 and September 2014. Activities of daily life functioning, cognitive functioning, NPS, and thriving were assessed with the Katz activities of daily living, Gottfries' Cognitive Scale, Nursing Home version of the Neuropsychiatric Inventory, and Thriving of Older People Scale, respectively. Individual NPS were explored in relation to cognitive function. Simple linear and multiple regression models were used to explore thriving in relation to resident characteristics.
RESULTS: Aggression and depressive symptoms were identified as negatively associated with thriving regardless of resident cognitive functioning. At higher levels of cognitive functioning, several factors showed associations with thriving; however, at lower levels of cognitive functioning, only the degree of cognitive impairment and the NPS was associated with thriving. Most of the individual NPS formed nonlinear relationships with cognitive functioning with higher symptom scores in the middle stages of cognitive functioning. Exceptions were elation/euphoria and apathy, which increased linearly with severity of cognitive impairment.
CONCLUSIONS: The lower the cognitive functioning was, the fewer factors were associated with thriving. Aggression and depressive symptoms may indicate lower levels of thriving; thus, targeting these symptoms should be a priority in nursing homes. Copyright © 2017 John Wiley & Sons, Ltd.

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Tools for assessing fall risk in the elderly: a systematic review and meta-analysis
Park SH. Aging Clin. Exp. Res. 2017; ePub(ePub): ePub.
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DOI 10.1007/s40520-017-0749-0 **PMID** 28374345
Abstract
The prevention of falls among the elderly is arguably one of the most important public health issues in today's aging society. The aim of this study was to assess which tools best predict the risk of falls in the elderly. Electronic searches were performed using Medline, EMBASE, the Cochrane Library, CINAHL, etc., using the following keywords: "fall risk assessment", "elderly fall screening", and "elderly mobility scale". The QUADAS-2 was applied to assess the internal validity of the diagnostic studies. Selected studies were meta-analyzed with MetaDisc 1.4. A total of 33 studies were eligible out of the 2,321 studies retrieved from selected databases. Twenty-six assessment tools for fall risk were used in the selected articles, and they tended to vary based on the setting. The fall risk assessment tools currently used for the elderly did not show sufficiently high predictive validity for differentiating high and low fall risks. The Berg Balance scale and Mobility Interaction Fall chart showed stable and high specificity, while the Downton Fall Risk Index, Hendrich II Fall Risk Model, St. Thomas's Risk Assessment Tool in Falling elderly inpatients, Timed Up and Go test, and Tinetti Balance scale showed the opposite results. We concluded that rather than a single measure, two assessment tools used together would better evaluate the characteristics of falls by the elderly that

can occur due to a multitude of factors and maximize the advantages of each for predicting the occurrence of falls.

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Neurologic correlates of gait abnormalities in cerebral palsy: implications for treatment

Zhou J, Butler EE, Rose J.

Front. Hum. Neurosci. 2017; 11: e103.

Affiliation: Department of Orthopaedic Surgery, Stanford UniversityStanford, CA, USA; Motion and Gait Analysis Lab, Lucile Packard Children's HospitalPalo Alto, CA, USA.

DOI 10.3389/fnhum.2017.00103 **PMID** 28367118 **PMCID** PMC5355477

Abstract

Cerebral palsy (CP) is the most common movement disorder in children. A diagnosis of CP is often made based on abnormal muscle tone or posture, a delay in reaching motor milestones, or the presence of gait abnormalities in young children. Neuroimaging of high-risk neonates and of children diagnosed with CP have identified patterns of neurologic injury associated with CP, however, the neural underpinnings of common gait abnormalities remain largely uncharacterized. Here, we review the nature of the brain injury in CP, as well as the neuromuscular deficits and subsequent gait abnormalities common among children with CP. We first discuss brain injury in terms of mechanism, pattern, and time of injury during the prenatal, perinatal, or postnatal period in preterm and term-born children. Second, we outline neuromuscular deficits of CP with a focus on spastic CP, characterized by muscle weakness, shortened muscle-tendon unit, spasticity, and impaired selective motor control, on both a microscopic and functional level. Third, we examine the influence of neuromuscular deficits on gait abnormalities in CP, while considering emerging information on neural correlates of gait abnormalities and the implications for strategic treatment. This review of the neural basis of gait abnormalities in CP discusses what is known about links between the location and extent of brain injury and the type and severity of CP, in relation to the associated neuromuscular deficits, and subsequent gait abnormalities. Targeted treatment opportunities are identified that may improve functional outcomes for children with CP. By providing this context on the neural basis of gait abnormalities in CP, we hope to highlight areas of further research that can reduce the long-term, debilitating effects of CP.

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Subclinical peroneal neuropathy: a common, unrecognized, and preventable finding associated with a recent history of falling in hospitalized patients

Poppler LH, Groves AP, Sacks G, Bansal A, Davidge KM, Sledge JA, Tymkew H, Yan Y, Hasak JM, Potter P, Mackinnon SE.

Ann. Fam. Med. 2016; 14(6): 526-533.

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DOI 10.1370/afm.1973 **PMID** 28376439

Abstract

PURPOSE: Identification of modifiable risk factors for falling is paramount in reducing the incidence and morbidity of falling. Peroneal neuropathy with an overt foot drop is a known risk factor for

falling, but research into subclinical peroneal neuropathy (SCPN) resulting from compression at the fibular head is lacking. The purpose of our study was to determine the prevalence of SCPN in hospitalized patients and establish whether it is associated with a recent history of falling.
METHODS: We conducted a cross-sectional study of 100 medical inpatients at a large academic tertiary care hospital in St Louis, Missouri. General medical inpatients deemed at moderate to high risk for falling were enrolled in the summer of 2013. Patients were examined for findings that suggest peroneal neuropathy, fall risk, and a history of falling. Multivariate logistic regression was used to correlate SCPN with fall risk and a history of falls in the past year.
RESULTS: The mean patient age was 53 years (SD = 13 years), and 59 patients (59%) were female. Thirty-one patients had examination findings consistent with SCPN. After accounting for various confounding variables within a multivariate logistic regression model, patients with SCPN were 4.7 times (95% CI, 1.4-15.9) more likely to report having fallen 1 or more times in the past year.
CONCLUSIONS: Subclinical peroneal neuropathy is common in medical inpatients and is associated with a recent history of falling. Preventing or identifying SCPN in hospitalized patients provides an opportunity to modify activity and therapy, potentially reducing risk.

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Video Movement Analysis Using Smartphones (ViMAS): a pilot study
Finkbiner MJ, Gaina KM, McRandall MC, Wolf MM, Pardo VM, Reid K, Adams B, Galen SS.
J. Vis. Exp. 2017; (121): e54659.
Affiliation: Physical Therapy Program, Department of Healthcare Sciences, Eugene Applebaum College of Pharmacy and Health Sciences, Wayne State University; sujay.galen@wayne.edu.

DOI 10.3791/54659 **PMID** 28362382
Abstract
The use of smartphones in clinical practice is steadily increasing with the availability of low cost/freely available "apps" that could be used to assess human gait. The primary aim of this manuscript is to test the concurrent validity of kinematic measures recorded by a smartphone application in comparison to a 3D motion capture system in the sagittal plane. The secondary aim was to develop a protocol for clinicians on the set up of the smartphone camera for video movement analysis. The sagittal plane knee angle was measured during heel strike and toe off events using the smart phone app and a 3D motion-capture system in 32 healthy subjects. Three trials were performed at near (2-m) and far (4-m) smartphone camera distances. The order of the distances was randomized. Regression analysis was performed to estimate the height of the camera based on either the subject's height or leg length. Absolute measurement errors were least during toe off (3.12 ± 5.44 degrees) compared to heel strike (5.81 ± 5.26 degrees). There were significant ($p < 0.05$) but moderate agreements between the application and 3D motion capture measures of knee angles. There were also no significant ($p > 0.05$) differences between the absolute measurement errors between the two camera positions. The measurement errors averaged between 3 - 5 degrees during toe off and heel strike events of the gait cycle. The use of smartphone apps can be a useful tool in the clinic for performing gait or human movement analysis. Further studies are needed to establish the accuracy in measuring movements of the upper extremity and trunk.
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