

SafetyLit December 31, 2017**Adjusting challenge-skill balance to improve quality of life in older adults: a randomized controlled trial**

Yoshida I, Hirao K, Nonaka T. *Am. J. Occup. Ther.* 2018; 72(1): 7201205030p1-7201205030p8.

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DOI 10.5014/ajot.2018.020982 **PMID** 29280723

Abstract

OBJECTIVE: We sought to investigate whether occupational therapy that includes adjusting the challenge-skill balance improves health-related quality of life (HRQOL) for older adults in comparison with standard occupational therapy.

METHOD: In this single-blind, randomized controlled trial, 56 older adults were assigned to two groups that received 10 sessions of occupational therapy with and without adjustment of challenge-skill balance. The primary outcome was change in HRQOL after 10 sessions of occupational therapy.

RESULTS: Significant differences were observed in HRQOL using the EuroQol-5 Dimension score ($p = .022$, $d = 0.76$) and the eight-item Short-Form Health Survey scores for general health ($p = .001$, $d = 0.99$) and in flow experience using the Flow State Scale for Occupational Tasks ($p = .008$, $d = 0.82$).

CONCLUSION: Assessment and adjustment of the challenge-skill balance of activities may effectively improve older adults' HRQOL.

PDF N Endnote Y

Association between calcium or vitamin D supplementation and fracture incidence in community-dwelling older adults: a systematic review and meta-analysis

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(Copyright © 2017, American Medical Association)

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Abstract

IMPORTANCE: The increased social and economic burdens for osteoporosis-related fractures worldwide make the prevention of such injuries a major public health goal. Previous studies have reached mixed conclusions regarding the association between calcium, vitamin D, or combined calcium and vitamin D supplements and fracture incidence in older adults.

OBJECTIVE: To investigate whether calcium, vitamin D, or combined calcium and vitamin D supplements are associated with a lower fracture incidence in community-dwelling older adults.

DATA SOURCES: The PubMed, Cochrane library, and EMBASE databases were systematically searched from the inception dates to December 24, 2016, using the keywords calcium, vitamin D, and fracture to identify systematic reviews or meta-analyses. The primary randomized clinical trials included in systematic reviews or meta-analyses were identified, and an additional search for recently published randomized trials was performed from July 16, 2012, to July 16, 2017. **STUDY SELECTION:** Randomized clinical trials comparing calcium, vitamin D, or combined calcium and vitamin D supplements with a placebo or no treatment for fracture incidence in community-dwelling adults older than 50 years.

DATA EXTRACTION AND SYNTHESIS: Two independent reviewers performed the data extraction and assessed study quality. A meta-analysis was performed to calculate risk ratios (RRs), absolute risk differences (ARDs), and 95% CIs using random-effects models.

MAIN OUTCOMES AND MEASURES: Hip fracture was defined as the primary outcome. Secondary outcomes were nonvertebral fracture, vertebral fracture, and total fracture.

RESULTS: A total of 33 randomized trials involving 51 145 participants fulfilled the inclusion criteria. There was no significant association of calcium or vitamin D with risk of hip fracture compared with placebo or no treatment (calcium: RR, 1.53 [95% CI, 0.97 to 2.42]; ARD, 0.01 [95% CI, 0.00 to 0.01]; vitamin D: RR, 1.21 [95% CI, 0.99 to 1.47]; ARD, 0.00 [95% CI, -0.00 to 0.01]. There was no significant association of combined calcium and vitamin D with hip fracture compared with placebo or no treatment (RR, 1.09 [95% CI, 0.85 to 1.39]; ARD, 0.00 [95% CI, -0.00 to 0.00]). No significant associations were found between calcium, vitamin D, or combined calcium and vitamin D supplements and the incidence of nonvertebral, vertebral, or total fractures. Subgroup analyses showed that these results were generally consistent regardless of the calcium or vitamin D dose, sex, fracture history, dietary calcium intake, and baseline serum 25-hydroxyvitamin D concentration.

CONCLUSIONS AND RELEVANCE: In this meta-analysis of randomized clinical trials, the use of supplements that included calcium, vitamin D, or both compared with placebo or no treatment was not associated with a lower risk of fractures among community-dwelling older adults. These findings do not support the routine use of these supplements in community-dwelling older people.

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Association between statin use and physical function among community-dwelling older Japanese adults

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Geriatr. Gerontol. Int. 2017; ePub(ePub): ePub.

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(Copyright © 2017, Japan Geriatrics Society, Publisher John Wiley and Sons)

DOI 10.1111/ggi.13228 **PMID** 29278297

Abstract

AIM: Statin-associated muscle symptoms (SAMS) are the muscle-related side-effects of statins, but the association between statin use and physical function among community-dwelling older adults is unclear. The objective of the present study was to examine the association between statin use and physical function among community-dwelling older Japanese adults by considering the risk factors of statin-associated muscle symptoms.

METHODS: The participants were 1022 community-dwelling older adults aged 65-88 years, who participated in comprehensive health checkups from 2013 to 2015. Statin use in the participants (381 men and 559 women) was verified by using data from their medicine notebooks. The differences between statin use (users and non-users) and physical functions (grip strength, knee extension torque, normal and maximum gait speed, Timed Up & Go test, one-legged stance, quadriceps muscle thickness and echo intensity) were analyzed using the t-test. Multiple regression analyses were also carried out to examine the association between statin use and physical function.

RESULTS: A total of 93 men (24.4%) and 154 women (27.5%) were statin users. Grip strength, normal gait speed and one-legged stance declined significantly in statin users compared with the non-users. In multiple regression analysis while controlling for the risk factors of statin-associated muscle symptoms, including age, sex, body mass index and number of medicines, no independent

association, between statin use and the reduction of physical functions, was observed.

CONCLUSIONS: Statin use was not associated with the decline of physical function in community-dwelling older Japanese adults. *Geriatr Gerontol Int* 2017; ••: ••-••.

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Both psychological factors and physical performance are associated with fall-related concerns

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DOI 10.1007/s40520-017-0882-9 **PMID** 29264814

Abstract

BACKGROUND: Fall-related concern strongly correlates to activity avoidance in older people. In this complex phenomenon, different terminology and instruments are often used interchangeably. Three main concepts make up fall-related concerns: fear of falling, consequence concern, and falls self-efficacy. It is suggested that fall-related concerns are mediated by psychological and physical factors.

AIMS: Our aims were to describe the prevalence of fall-related concerns and find explanatory factors for its most studied concept-falls self-efficacy-in an older population.

METHODS: We executed a cross-sectional study on a random sample of 153 community-dwelling older people (70 years or older). We used validated and reliable instruments as well as structured interviews to gather data on the three concepts of fall-related concerns and possible mediating factors. We then calculated descriptive statistics on prevalence and regression models for the total group, and men and women, separately.

RESULTS: 70% of the total sample (80% of women and 53% of men) reported at least one of the three concepts of fall-related concern. For the total sample, fear of falling, morale, and physical performance were associated factors with falls self-efficacy. For women, the number of prescription medications was added. For men, physical performance and concerns for injury were associated.

CONCLUSION: Fall-related concern is prevalent in large proportions with higher prevalence for women than for men. Important factors are fear of falling, morale, and physical performance.

Gender differences in the emergence and variance of fall-related concern and the relation between physical performance and fall-related concern should be targeted in future research endeavors.

PDF Y Endnote Y

Cortical control of upright stance in elderly

Ozdemir RA, Contreras-Vidal JL, Paloski WH.

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(Copyright © 2017, Elsevier Publishing)

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Abstract

This study examined differences between young and elderly volunteers in cortical involvement to human posture control during quiet stance with normal and altered sensory stimulation (Experiment-1), and biomechanical perturbations (Experiment-2). The primary focus of the first part

was to monitor changes in cortical activity when unexpectedly altering the sensory conditions of upright stance, such as switching from stable (eyes open, fixed support surface) to less-stable (eyes closed, sway-referenced support surface) conditions. Our results demonstrate increased cortical activations in delta (0.2-4 Hz) and gamma (30-50 Hz) oscillations, primarily over central-frontal, central, and central parietal cortices during challenging postural conditions. While increased delta rhythms were observed in both groups during challenging sensory conditions, elderly individuals also showed increased gamma band activity over sensorimotor and parietal cortices, when compared to the younger group. To our knowledge, this study is the first to show age differences in balance related cortical activations during continuous postural tasks with challenging sensory conditions. Preliminary correlations also suggest that increased cerebral activity became more relevant to the control of Center of Mass (COM) dynamics when upright stance is threatened. The results of Experiment-2 also showed for the first time that oscillatory rhythms of the cortex are coherent with muscle firing characteristics suggesting increased corticospinal drive from leg motor cortex to lower limb motoneurons following postural perturbations. Finally, perturbation evoked potential (PEP) analyses suggest that, rather than motor system malfunctioning, impairments in perceptual processing of sensory afference forms the basis of prolonged muscle response delays during perturbed balance in the elderly.

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Delirium pathophysiology: an updated hypothesis of the etiology of acute brain failure

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Abstract

BACKGROUND: Delirium is the most common neuropsychiatric syndrome encountered by clinicians dealing with older adults and the medically ill and is best characterized by 5 core domains: cognitive deficits, attentional deficits, circadian rhythm dysregulation, emotional dysregulation, and alteration in psychomotor functioning.

DESIGN: An extensive literature review and consolidation of published data into a novel interpretation of known pathophysiological causes of delirium.

RESULTS: Available data suggest that numerous pathological factors may serve as precipitants for delirium, each having differential effects depending on patient-specific patient physiological characteristics (substrate). On the basis of an extensive literature search, a newly proposed theory, the systems integration failure hypothesis, was developed to bring together the most salient previously described theories, by describing the various contributions from each into a complex web of pathways-highlighting areas of intersection and commonalities and explaining how the variable contribution of these may lead to the development of various cognitive and behavioral dysfunctions characteristic of delirium. The specific cognitive and behavioral manifestations of the specific delirium picture result from a combination of neurotransmitter function and availability, variability in integration and processing of sensory information, motor responses to both external and internal cues, and the degree of breakdown in neuronal network connectivity, hence the term acute brain failure.

CONCLUSIONS: The systems integration failure hypothesis attempts to explain how the various proposed delirium pathophysiologic theories interact with each other, causing various clinically observed delirium phenotypes. A better understanding of the underlying pathophysiology of delirium may eventually assist in designing better prevention and management approaches.

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Developing a falls prevention program for community-dwelling stroke survivors in Singapore: client and caregiver perspectives

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DOI 10.1080/09638288.2017.1419293 **PMID** 29277114

Abstract

PURPOSE: Drawing on the perspectives of stroke survivors, family members and domestic helpers, this study explores participants' experiences of self-perceived fall risk factors after stroke, common fall prevention strategies used, and challenges to community participation after a fall.

METHODS: Semi-structured interviews were conducted in Singapore with community-dwelling stroke survivors with a previous fall (n = 9), family caregivers (n = 4), and domestic helpers (n = 4) who have cared for a stroke survivor with a previous fall. Purposive sampling was used for recruitment; all interviews were audio-recorded with permission and transcribed. Thematic analysis was conducted using NVivo (v10) software.

RESULTS: All participants shared their self-perceived intrinsic and extrinsic fall risk factors and main challenges after a fall. For stroke participants and family caregivers, motivational factors in developing safety strategies after a previous fall(s) include social connectedness, independent living and community participation. For family caregivers and domestic helpers, the stroke survivor's safety is their top priority, however this can also lead to over-protective behavior outside of the rehabilitation process.

CONCLUSIONS: Reducing the risk of falls in community-dwelling stroke survivors seems to be more important than promoting community participation among caregivers. The study findings highlight that a structured and client-centered fall prevention program targeting stroke survivors and caregivers is needed in Singapore. Implications for rehabilitation Falls after stroke can lead to functional decline in gait and mobility and restricted self-care activities. Community-dwelling stroke survivors develop adaptive safety strategies after a fall and want to be socially connected. However, caregivers see the safety of the stroke survivors as their top priority and demonstrate over-protective behaviors. Fall prevention programs for community-dwelling stroke survivors should target both stroke survivors and their caregivers. A structured and client-centered fall prevention program targeting at multiple risk factors post-stroke is needed for community-living stroke survivors.

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Falls efficacy, postural balance, and risk for falls in older adults with falls-related emergency department visits: prospective cohort study

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BMC Geriatr. 2017; 17(1): e291.

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(Copyright © 2017, Holtzbrinck Springer Nature Publishing Group)

DOI 10.1186/s12877-017-0682-2 **PMID** 29268720

Abstract

BACKGROUND: Risk for falls in older adults has been associated with falls efficacy (self-perceived confidence in performing daily physical activities) and postural balance, but available evidence is limited and mixed. We examined the interaction between falls efficacy and postural balance and its association with future falls. We also investigated the association between falls efficacy and gait decline.

METHODS: Falls efficacy, measured by the Modified Falls Efficacy Scale (MFES), and standing postural balance, measured using computerized posturography on a balance board, were obtained from 247 older adults with a falls-related emergency department visit. Six-month prospective fall rate and habitual gait speed at 6 months post baseline assessment were also measured.

RESULTS: In multivariable proportional odds analyses adjusted for potential confounders, falls efficacy modified the association between postural balance and fall risk (interaction $P = 0.014$): increasing falls efficacy accentuated the increased fall risk related to poor postural balance. Low baseline falls efficacy was strongly predictive of worse gait speed (0.11 m/s [0.06 to 0.16] slower gait speed per IQR decrease in MFES; $P < 0.001$).

CONCLUSION: Older adults with high falls efficacy but poor postural balance were at greater risk for falls than those with low falls efficacy; however, low baseline falls efficacy was strongly associated with worse gait function at follow-up. Further research into these subgroups of older adults is warranted. **TRIAL REGISTRATION:** ClinicalTrials.gov identifier: NCT01713543.

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Feasibility trial of tailored home modifications: process outcomes

Stark S, Somerville E, Conte J, Keglovits M, Hu YL, Carpenter C, Hollingsworth H, Yan Y.

Am. J. Occup. Ther. 2018; 72(1): 7201205020p1-7201205020p10.

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Abstract

OBJECTIVE: The aim of this study was to conduct a process evaluation to examine the implementation of a randomized controlled trial of home modifications designed to reduce the risk of falls and improve daily activity performance among community-dwelling older adults.

METHOD: A process evaluation was conducted alongside a blinded, randomized sham-controlled trial ($n = 92$). Participants were followed for 1 yr after intervention. The process evaluation was framed using the Reach, Effectiveness, Adoption, Implementation, and Maintenance framework.

RESULTS: The treatment group improved daily activity performance over 12 mo compared with the sham control group ($F = 4.13$; $p = .024$). The intervention elements and dose were delivered with

greater than 90% accuracy. Participants reported a 91% adherence rate at 12 mo.

CONCLUSION: The complex intervention of home modifications examined in this study is acceptable to older adults, is feasible, and can be delivered with high fidelity for frail, community-dwelling older adults.

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Glaucoma and quality of life: fall and driving risk

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Curr. Opin. Ophthalmol. 2017; ePub(ePub): ePub.

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DOI 10.1097/ICU.0000000000000455 **PMID** 29266021

Abstract

PURPOSE OF REVIEW: Numerous population-based studies suggest that glaucoma is an independent risk factor for falling and motor vehicle collisions, particularly for older adults. These adverse events lead to increased healthcare expenditures and decreased quality of life. Current research priorities, therefore, include identifying factors that predispose glaucoma patients to falling and unsafe driving, and developing screening strategies and targeted rehabilitation. The purpose of this article is to review recent studies that address these priorities.

RECENT FINDINGS: Studies continue to support that glaucoma patients, particularly those with advanced disease, have an increased risk of falling or unsafe driving. Risk factors, however, remain variable and include severity and location of visual field defects, contrast sensitivity, and performance on divided attention tasks. Such variability is likely because of the multifactorial nature of ambulating and driving and compensatory strategies used by patients. **SUMMARY:** Falls and unsafe driving remain a serious public health issue for older adults with glaucoma. Ambulation and driving are complex tasks and there is no consensus yet, regarding the best methods for risk stratification and targeted interventions to increase safety. Therefore, comprehensive and individualized assessments are recommended to most effectively evaluate a patient's risk for falling or unsafe driving.

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Loss of maximal explosive power of lower limbs after two weeks of disuse and incomplete recovery after retraining in older adults

Rejc E, Floreani M, Taboga P, Botter A, Toniolo L, Cancellara L, Narici M, Šimunič B, Pišot R, Biolo G, Passaro A, Rittweger J, Reggiani C, Lazzer S.

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DOI 10.1113/JP274772 **PMID** 29266264

Abstract

Disuse-induced loss of muscle power can be detrimental in older individuals, seriously impairing functional capacity. In this study, we examined the changes in maximal explosive power (MEP) of lower limbs induced by a 14-day disuse (bed-rest, BR) and a subsequent 14-day retraining, to assess whether the impact of disuse was greater in older than in young men, and to analyse the causes of

such adaptations. Sixteen older adults (Old: 55-65 years) and seven Young (18-30 years) individuals participated in this study. In a subgroup of eight Old subjects, countermeasures based on cognitive training and protein supplementation were applied. MEP was measured with an explosive ergometer, muscle mass was determined by magnetic resonance, motor control was studied by EMG, and single muscle fibres were analysed in vastus lateralis biopsy samples. MEP was ~33% lower in Old than in Young, and remained significantly lower (-19%) when normalized by muscle volume. BR significantly affected MEP in Old (-15%), but not in Young. Retraining tended to increase MEP; however, this intervention was not sufficient to restore pre-BR values in Old. Ankle co-contraction increased after BR in Old only, and remained elevated after retraining (+30%). Significant atrophy occurred in slow fibres in Old, and in fast fibres in Young. After retraining, the recovery of muscle fibre thickness was partial. The proposed countermeasures were not sufficient to affect muscle mass and power. The greater impact of disuse and smaller retraining-induced recovery observed in Old highlight the importance of designing suitable rehabilitation protocols for older individuals. This article is protected by copyright. All rights reserved.

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Management team perceptions of risks and strategies for preventing falls among short-stay patients in nursing homes

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Health Care Manag. (Frederick) 2017; ePub(ePub): ePub.

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DOI 10.1097/HCM.000000000000192 **PMID** 29266090

Abstract

We sought to understand strategies reported by members of the nursing home management team used to prevent falls in short-stay nursing home patients. Using Donabedian's model of structure, process, and outcomes, we interviewed 16 managers from 4 nursing homes in central North Carolina. Nursing home managers identified specific barriers to fall prevention among short-stay patients including rapid changes in functional and cognitive status, staff unfamiliarity with short-stay patient needs and patterns, and policies impacting care. Few interventions for reducing falls among short-stay patients were used at the structure level (eg, specialized units, workload ratio, and staffing consistency); however, many process-level interventions were used (eg, patient education on problem solving, self-care/mobility, and safety). We described several barriers to fall prevention among short-stay patients in nursing homes. From these descriptions, we propose three interventions that might reduce falls for short-stay patients and could be tested in future research: (1) clustering short-stay patients within a physical location to permit higher staff-patient ratios and enhanced surveillance, (2) population-based prevention interventions to supplement existing individually tailored prevention strategies (eg, toileting schedules, medication review for all), and (3) transitional care interventions that transmit key information from hospitals to nursing homes.

PDF N Endnote Y

On the validity and consistency of misjudgment of stepping ability in young and older adults

Citation

Kluft N, Bruijn SM, Weijer RHA, van Dieen JH, Pijnappels M.

PLoS One 2017; 12(12): e0190088.

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Abstract

Disparities between perceived and actual physical abilities have been shown in older adults and may lead to balance loss or falls. However, it is unclear whether one's misjudgment is an inherent trait and thus consistent across different tasks, and whether this misjudgment is age-related. We measured the degree of misjudgment in young and older adults on four different stepping tasks; stepping over a raised bar, crossing a declining cord by stepping over it at a self-selected height, crossing a virtual river by stepping over it at a self-selected width, and making a recovery step after release from an inclined position. Before comparison, we carefully checked the validity of the different tasks to determine the misjudgment. No substantial differences were found in the amplitude of the misjudgment between the age groups, and the degree of misjudgment did not transfer across different stepping tasks. However, since only one task (i.e., stepping over a raised bar) met our criteria for validly assessing one's misjudgment, it remains unclear whether the degree of misjudgment is task-specific or an inherent trait. These findings stress the importance of testing the construct validity of the task, prior to the examination of the misjudgment of stepping ability.

PDF Y Endnote Y

Outcome of traumatic brain injury in elderly population: a tertiary centre experience from a developing country

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World Neurosurg. 2017; ePub(ePub): ePub.

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(Copyright © 2017, Elsevier Publishing)

DOI 10.1016/j.wneu.2017.12.034 **PMID** 29258949

Abstract

BACKGROUND: The increasing ratio of elderly population has contributed to increased incidence of TBI in this cohort. Authors put forward their institutional experience in the management of elderly TBI.

MATERIALS AND METHODS: A 3-year retrospective analysis of 73 consecutive patients aged ≥ 65 years admitted with TBI at our university hospital was performed. The following were excluded- concussion injuries, chronic subdural hematomas (SDH), patients discharged against medical advice (DAMA) and declared dead soon after arrival (within 6 hours). Mode of injury, clinico-radiological features, management and outcomes were analysed. Glasgow outcome scale (GOS) was used to assess outcome.

RESULTS: Males predominated (82%). Mean age was 72.1 years (range 65-97 years) and 20 were aged ≥ 75 years. There were 37 mild, 18 moderate and 18 severe head injuries (HI). Contusions constituted the majority. Fifty-five (75%) cases were managed conservatively while 18 (25%)

underwent surgery. There were 7 deaths(9.5%). Overall, poor outcome was 26%, while being 45% in patients aged ≥ 75 years. Poor outcome in severe HI for the entire cohort was 83% (15/18) but was 100% (7/7) for the very elderly patients. On univariate analysis, age ≥ 75 years, severe HI, acute SDH and surgical management were significantly associated with poor outcome while acute SDH and surgical management were significant on multilogistic regression analysis.

CONCLUSIONS: Age ≥ 75 years, severe HI and acute SDH are poor prognostic factors. Benefit of surgery in such conditions is unlikely and surgery needs to be judiciously considered keeping in mind the economics involved and fate of caregivers, especially in developing countries.

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Preventing falls and fall-related injuries at home

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Am. J. Nurs. 2018; 118(1): 58-61.

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Abstract

This article is part of a series, Supporting Family Caregivers: No Longer Home Alone, published in collaboration with the AARP Public Policy Institute.

RESULTS of focus groups, conducted as part of the AARP Public Policy Institute's No Longer Home Alone video project, supported evidence that family caregivers aren't given the information they need to manage the complex care regimens of family members. This series of articles and accompanying videos aims to help nurses provide caregivers with the tools they need to manage their family member's health care at home. The articles in this new installment of the series explain principles for promoting safe mobility that nurses should reinforce with family caregivers. Each article also includes an informational tear sheet-Information for Family Caregivers-that contains links to instructional videos. To use this series, nurses should read the article first, so they understand how best to help family caregivers, and then encourage the caregivers to watch the videos and ask questions. For additional information, see Resources for Nurses.

PDF Y Endnote Y

Scaffolding and working together: a qualitative exploration of strategies for everyday life with dementia

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Age Ageing 2017; ePub(ePub): ePub.

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(Copyright © 2017, Oxford University Press)

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Abstract

BACKGROUND: living with dementia has been described as a process of continual change and adjustment, with people with dementia and their families adopting informal strategies to help manage everyday life. As dementia progresses, families increasingly rely on help from the wider community and formal support.

METHODS: this article reports on a secondary analysis of qualitative data from focus groups and individual interviews with people with dementia and their carers in the North of England. In total, 65 people with dementia and 82 carers took part in the research: 26 in interviews and 121 in focus groups. Focus group and interview audio recordings were transcribed verbatim. A qualitative, inductive, thematic approach was taken for data analysis.

FINDINGS: the article applies the metaphor of scaffolding to deepen understanding of the strategies used by families. Processes of scaffolding were evident across the data where families, communities, professionals and services worked together to support everyday life for people with dementia. Within this broad theme of scaffolding were three sub-themes characterising the experiences of families living with dementia: doing things together; evolving strategies; and fragility and fear of the future.

CONCLUSIONS: families with dementia are resourceful but do need increasing support (scaffolding) to continue to live as well as possible as dementia progresses. More integrated, proactive work is required from services that recognises existing scaffolds and provides appropriate support before informal strategies become unsustainable; thus enabling people with dementia to live well for longer.

PDF Y Endnote Y

Sleep disturbance, activities of daily living, and depressive symptoms among older adults

Webb CA, Cui R, Titus C, Fiske A, Nadorff MR.

Clin. Gerontol. 2017; ePub(ePub): ePub.

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(Copyright © 2017, Informa - Taylor and Francis Group)

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Abstract

OBJECTIVE: Research suggests sleep disturbance plays a role in depression and risk for suicidal behavior (i.e., ideation, attempts, death by suicide). How sleep disturbance affects suicide risk is unclear and one's ability to perform activities of daily living (ADLs) may help explain this relation. This study examined associations between sleep problems, ADLs, and either depressive symptoms or suicide risk among older adults. We hypothesized that ADLs would mediate relations between sleep problems and depressive symptoms and suicide risk.

METHOD: Participants (N = 134; age ≥65) were recruited through Amazon's Mechanical Turk. Participants completed questionnaires that assessed insomnia symptoms, nightmares, ADLs, depressive symptoms, and suicidal behaviors.

RESULTS: Nightmares were associated with depressive symptoms and suicide risk but not independently associated with ADLs. Insomnia symptoms were associated with depressive symptoms, suicide risk, and ADLs. ADLs mediated the relation between insomnia symptoms and

depressive symptoms. The insomnia symptom-suicidal behavior relation and the nightmare-suicidal behavior relation were significantly mediated by a pathway containing ADLs and depressive symptoms.

DISCUSSION: ADLs help explain how insomnia symptoms and nightmares confer suicide risk among older adults, either independently or in association with depressive symptoms. **CLINICAL**

IMPLICATIONS: Practitioners should attend to ADL performance when treating older adults with insomnia and depression.

PDF Y Endnote Y

The effect of auditory cueing on the spatial and temporal gait coordination in healthy adults

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Abstract

Walk ratio, defined as step length divided by cadence, indicates the coordination of gait. During free walking, deviation from the preferential walk ratio may reveal abnormalities of walking patterns. The purpose of this study was to examine the impact of rhythmic auditory cueing (metronome) on the neuromotor control of gait at different walking speeds. Forty adults (mean age 26.6 ± 6.0 years) participated in the study. Gait characteristics were collected using a computerized walkway. In the preferred walking speed, there was no significant difference in walk ratio between uncued (walk ratio = $.0064 \pm .0007$ m/steps/min) and metronome-cued walking (walk ratio = $.0064 \pm .0007$ m/steps/min; $p = .791$). A higher value of walk ratio at the slower speed was observed with metronome-cued (walk ratio = $.0071 \pm .0008$ m/steps/min) compared to uncued walking (walk ratio = $.0068 \pm .0007$ m/steps/min; $p < .001$). The walk ratio was less at faster speed with metronome-cued (walk ratio = $.0060 \pm .0009$ m/steps/min) compared to uncued walking (walk ratio = $.0062 \pm .0009$ m/steps/min; $p = .005$). In healthy adults, the metronome cues may become an attentional demanding task, and thereby disrupt the spatial and temporal integration of gait at nonpreferred speeds.

PDF Y Endnote Y

A novel approach to assessing head injury severity in pediatric patient falls

Dufek JS, Ryan-Wenger NA, Eggleston JD, Mefferd KC.

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Abstract

INTRODUCTION: Pediatric patient falls with head-to-floor impact have the greatest potential for injury.

METHODS: An objective measure of head injury severity, the Head Injury Criterion (HIC15), was calculated from anthropometric and biomechanical components of patient falls. A secondary aim was to compare HIC15 levels with the hospital's subjective assignment of level of harm (1-9 scale) used for regulatory reports.

RESULTS: Adverse event reports yielded a sample of 49 falls from heights of 72.5 to 1793.0 cm by children ages 11 months through 17 years. Contact velocity from beginning to end was 2.81 to 6.16 ms. Mean acceleration was 19.5 to 95.3g. HIC15 levels of impact ranged from 26.4 to 1,330.0, and mean force upon contact was 2.0 to 9.8 N/kg body mass. Seven (14.3%) children's HIC15 levels exceeded age-specific thresholds, with no follow-up scheduled. Hospital-assigned levels of harm were not correlated with HIC15 levels ($r = .23$, $R^2 = .05$, $p = .12$).

DISCUSSION: A point-of-care computerized HIC15 algorithm would be useful for diagnostic and follow-up decisions.

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PDF Y Endnote Y

An event-triggered machine learning approach for accelerometer-based fall detection

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Abstract

The fixed-size non-overlapping sliding window (FNSW) and fixed-size overlapping sliding window (FOSW) approaches are the most commonly used data-segmentation techniques in machine learning-based fall detection using accelerometer sensors. However, these techniques do not segment by fall stages (pre-impact, impact, and post-impact) and thus useful information is lost, which may reduce the detection rate of the classifier. Aligning the segment with the fall stage is difficult, as the segment size varies. We propose an event-triggered machine learning (EventT-ML) approach that aligns each fall stage so that the characteristic features of the fall stages are more easily recognized. To evaluate our approach, two publicly accessible datasets were used. Classification and regression tree (CART), k-nearest neighbor (k-NN), logistic regression (LR), and the support vector machine (SVM) were used to train the classifiers. EventT-ML gives classifier F-scores of 98% for a chest-worn sensor and 92% for a waist-worn sensor, and significantly reduces the computational cost compared with the FNSW- and FOSW-based approaches, with reductions of up to 8-fold and 78-fold, respectively. EventT-ML achieves a significantly better F-score than existing fall detection approaches. These results indicate that aligning feature segments with fall stages significantly increases the detection rate and reduces the computational cost.

PDF Y Endnote Y

Can dual task walking improve in Parkinson's disease after external focus of attention exercise? A single blind randomized controlled trial

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Abstract

BACKGROUND: It may be possible to use attention-based exercise to decrease demands associated with walking in Parkinson's disease (PD), and thus improve dual task walking ability. For example, an external focus of attention (focusing on the effect of an action on the environment) may recruit automatic control processes degenerated in PD, whereas an internal focus (limb movement) may recruit conscious (nonautomatic) control processes. Thus, we aimed to investigate how externally and internally focused exercise influences dual task walking and symptom severity in PD.

METHODS: Forty-seven participants with PD were randomized to either an Externally (n = 24) or Internally (n = 23) focused group and completed 33 one-hour attention-based exercise sessions over 11 weeks. In addition, 16 participants were part of a control group. Before, after, and 8 weeks following the program (pre/post/washout), gait patterns were measured during single and dual task walking (digit-monitoring task, ie, walking while counting numbers announced by an audio-track), and symptom severity (UPDRS-III) was assessed ON and OFF dopamine replacement. Pairwise comparisons (95% confidence intervals [CIs]) and repeated-measures analyses of variance were conducted.

RESULTS: Pre to post: Dual task step time decreased in the external group ($\Delta = 0.02$ seconds, CI 0.01-0.04). Dual task step length ($\Delta = 2.3$ cm, CI 0.86-3.75) and velocity ($\Delta = 4.5$ cm/s, CI 0.59-8.48) decreased (became worse) in the internal group. UPDRS-III scores (ON and OFF) decreased (improved) in only the External group. Pre to washout: Dual task step time (P = .005) and percentage in double support (P = .014) significantly decreased (improved) in both exercise groups, although only the internal group increased error on the secondary counting task (ie, more errors monitoring numbers). UPDRS-III scores in both exercise groups significantly decreased (P = .001).

CONCLUSIONS: Since dual task walking improvements were found immediately, and 8 weeks after the cessation of an externally focused exercise program, we conclude that externally focused exercise may improve on functioning of automatic control networks in PD. Internally focused exercise hindered dual tasking ability. Overall, externally focused exercise led to greater rehabilitation benefits in dual tasking and motor symptoms compared with internally focused exercise.

PDF Y Endnote Y

Coherence analysis of trunk and leg acceleration reveals altered postural sway strategy during standing in persons with multiple sclerosis

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Abstract

Balance task performance is affected in persons with multiple sclerosis (PwMS), but the control strategies used to perform specific tasks are not well understood. The purpose of this study was to evaluate segmental control during quiet standing in PwMS and controls to understand whether MS alters use of the ankle and hip strategies to manage postural sway. Coherence of acceleration between the trunk and legs was evaluated with accelerometers placed on the sacrum and lower leg. Thirty-six PwMS and 20 healthy control subjects performed quiet standing with eyes open and

closed while center of pressure (CoP) and acceleration of postural sway was measured. Acceleration frequencies were divided into lower frequencies (≤ 1.0 Hz) and higher frequencies (> 1.0 Hz) to categorize sway characteristics. With eyes open, coherence was significantly lower in PwMS compared to controls at lower frequencies only. With eyes closed, coherence was significantly lower in PwMS compared to controls, who use an ankle strategy at lower frequencies only, at both lower and higher frequencies. Both groups showed decreased coherence with increasing frequency when eyes were open and closed. Coherence was significantly correlated with CoP sway area in PwMS during the eyes closed condition only. The reduced coherence in PwMS during both lower and higher frequency sway indicates PwMS utilize a mixed ankle-hip sway strategy regardless of sway frequency. This is in contrast to sway in healthy subjects which utilizes an ankle strategy at lower frequencies and a mixed strategy at higher frequencies. Lack of adaptability in segmental control strategy likely contributes to abnormal postural control, as reflected by CoP sway patterns, in PwMS.

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Dynamic balance is related to physiological impairments in persons with multiple sclerosis

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Abstract

OBJECTIVES: To compare physiological impairments between persons with multiple sclerosis (MS) with a history of falls and persons with MS without a history of falls and to investigate the association between physiological impairments and dynamic balance.

DESIGN: Cross-sectional study.

SETTING: University motion analysis laboratory.

PARTICIPANTS: Fifty-five persons with MS (27 recurrent fallers and 28 non-fallers). Participants were classified as fallers if they self-reported 2 or more falls in the previous six months.

INTERVENTIONS: None.

MAIN OUTCOME MEASURES: Physiological impairment was assessed with sensorimotor delays, spasticity, plantar cutaneous sensation, and the sensory, cerebellar, and pyramidal Expanded Disability Status Scale (EDSS) subscales. Dynamic balance was assessed using the average and variability of margin of stability and variability of trunk accelerations.

RESULTS: Compared to non-fallers, fallers had lower plantar sensation, longer sensorimotor delays, more spasticity, and more impairment in the pyramidal and cerebellar EDSS subscales. Additionally, these impairments were all moderately to strongly correlated with worse dynamic balance.

CONCLUSIONS: The present study highlights the multifactorial nature of instability in persons with

MS. A better understanding of the physiological mechanisms of dynamic instability in persons with MS can be used to improve methods of monitoring disease progression, identifying which impairments to target through interventions, and appropriately evaluating intervention efficacy.

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Evaluating the effectiveness of a fall risk screening tool implemented in an electronic medical record system

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Abstract

We investigated the effect of using a fall risk screening tool in an electronic medical record system by using data for 25 039 patients in 24 general wards of a single institution. The probability of the occurrence of falls decreased after the tool was implemented, but using the tool did not reduce the actual occurrence of falls. This indicates that we must improve not only the assessment of the risk of falls but also the interventions to prevent falls.

PDF N Endnote Y

Fall risk during opposing stance perturbations among healthy adults and chronic stroke survivors

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Abstract

Studies examining recovery from SLIPS and TRIPS indicate higher incidence of falls during SLIPS than TRIPS however, differences in the recovery mechanisms during these opposing perturbations have not been examined. We therefore aimed to compare the reactive balance responses contributing to fall risk during SLIPS and TRIPS at comparable perturbation intensity among community-dwelling healthy adults and chronic stroke survivors. Younger adults (N = 11), age-matched adults (N = 11) and chronic stroke survivors (N = 12) were exposed to a single SLIP and TRIP through a motorized treadmill (16 m/s², 0.20 m). Center of mass (COM) state stability was measured by recording COM position and velocity relative to base of support, i.e., \dot{D} COM/BOS and \dot{X} COM/BOS, respectively. Trunk and compensatory step kinematics were also recorded. During SLIPS, the incidence of falls among stroke survivors was greater than healthy adults (53.83% vs. 0%), however not for TRIPS. All groups showed higher change in postural stability from liftoff to touchdown during TRIPS than SLIPS. Among healthy adults higher change in \dot{D} COM/BOS during TRIPS was accompanied by the ability to control trunk flexion at step touchdown and lower peak trunk velocity as compared with SLIPS, with

no significant differences in compensatory step length between the perturbations ($p > 0.05$). Chronic stroke survivors increased compensatory step length during TRIPS versus SLIPS ($p < 0.05$) contributing to greater stability change. They were unable to control trunk excursion and peak trunk velocity as compared with the healthy adults leading to lower stability than healthy younger and age-matched adults during SLIPS and lower stability than younger adults during TRIPS. Difficulty in trunk control during SLIPS among all individuals and compensatory step length among stroke survivors emphasizes higher fall risk for SLIPS than TRIPS among these populations.

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Fatigue, quality of life and walking ability in adults with cerebral palsy

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(Copyright © 2017, Elsevier Publishing)

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Abstract

INTRODUCTION: Few studies on fatigue, quality of life and walking ability in adults with cerebral palsy (CP) are available. It is unclear whether these variables are associated.

AIM: The aim was to study the influence of CP on fatigue, quality of life, and gait of adult patients.

MATERIAL AND METHODS: Three-dimensional gait analysis was performed on 24 women and 26 men, mean age 32.1 (range 21.7-67.2), 23 with unilateral and 27 with bilateral CP. The Gait Profile Score was calculated; Fatigue Severity and EQ Visual Analogue scales were used.

RESULTS: Fatigue severity was higher than in controls, mean 3.8 (SD 1.8) vs 3.0 ($p = 0.012$). Fatigue in the unilateral group was 3.3 (SD 1.8) and in the bilateral 4.2 (SD 1.7), ($p = 0.07$). EQ Visual Analogue scale in the unilateral group was mean 79.5 (21.9) and in the bilateral 64.0 (20.8), $p = 0.007$. The group with bilateral CP tended toward crouch gait, decreased balance and low walking speed.

Muscle work was shifted from the ankle to hip muscles. Fatigue correlated with the Gait Profile Score, $CC = 0.31$ ($p = 0.038$), and with knee flexion deviation, $CC = 0.31$ ($p = 0.037$).

DISCUSSION: Crouch gait, increased knee flexion in stance, contributes to increased deviation in the lower extremity associated with high fatigue and low quality of life in adults with CP, effects more pronounced in those with bilateral CP. Compensation mechanisms in gait were noted.

CONCLUSION: Rational follow-up programs for CP, ideally identifying risk factors early, should be established to prevent development of fatigue and deterioration of gait in adulthood.

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Identifying mechanisms of stance control: a single stimulus multiple output model-fit approach

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Abstract

BACKGROUND: Posture control models are instrumental to interpret experimental data and test hypotheses. However, as models have increased in complexity to include multi-segmental dynamics, discrepancy has arisen amongst researchers regarding the accuracy and limitations of identifying neural control parameters using a single stimulus.

NEW METHOD: The current study examines this topic using simulations with a parameterized model-fit approach. We first determine if the model-fit approach can identify parameters in the theoretical situation with no noise. Then, we measure variability and bias of parameter estimates when realistic noise is included. We also address how the accuracy is influenced by the frequency bandwidth of the stimulus, signal-to-noise of the data, and fitting procedures.

RESULTS: We found perfect identification of parameters in the theoretical model without noise. With realistic noise, bias errors were 4.4% and 7.6% for fits that included frequencies 0.02-1.2 Hz and 0.02-0.4 Hz, respectively. Fits between 0.02-1.2 Hz also had the lowest variability in parameter estimates compared to other bandwidths. Parameters with the lowest variability tended to have the largest influence on body sways. Results also demonstrated the importance of closely examining model fits because of limitations in fitting algorithms.

COMPARISON WITH EXISTING METHOD: The single-input model-fit approach may be a simpler and more practical method for identifying neural control mechanisms compared to a multi-stimulus alternative.

CONCLUSIONS: This study provides timely theoretical and practical considerations applicable to the design and analysis of experiments contributing to the identification of mechanisms underlying stance control of a multi-segment body.

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Influence of handrail height and fall direction on center of mass control and the physical demands of reach-to-grasp balance recovery reactions

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Abstract

The ability to maintain and recover center of mass (COM) and trunk control after a destabilization is critical for avoiding falls and fall-related injuries. Handrails can significantly enhance a person's ability to recover from large destabilizations, by enabling the person to grasp and apply high forces to the rail to stabilize their COM. However, the influence of handrail height and falling direction on COM control and the demands of grasping are unknown. We investigated the effect of handrail height (34, 38, 42 in.) and fall direction (forward, backward) on COM and trunk control, and the corresponding physical demands of reach-to-grasp balance reactions. Thirteen young adults were destabilized with platform perturbations, and reached to grasp a nearby handrail to recover balance without stepping. COM kinematics and applied handrail forces were collected. COM control was

evaluated in terms of: (1) COM range and peak displacement, velocity and momentum in all Cartesian axes; and (2) trunk angular displacement, velocity and momentum in the roll and pitch axes. The physical demands of grasping were estimated via resultant handrail impulse. Compared to forward-directed falling, backward-directed falling was generally associated with greater peak COM and trunk angular displacement, velocity and momentum, along with greater handrail impulse. Higher handrails generally resulted in reduced peak COM and trunk angular displacement, velocity and momentum, as well as reduced handrail impulse. These results suggest that higher handrails may provide a stability advantage within the range of handrail heights tested, with better COM control achieved with lower physical demands of grasping.

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Perceptions of balance and falls following a supervised training intervention - a qualitative study of people with Parkinson's disease

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Disabil. Rehabil. 2017; ePub(ePub): 1-7.

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Abstract

PURPOSE: To explore perceptions of balance and falls among people with mild to moderate Parkinson's disease 3 - 12 months following participation in supervised balance training.

MATERIALS AND METHODS: This qualitative study used in-depth individual interviews for data collection among 13 people with Parkinson's disease. Interviews were systematically analyzed using qualitative content analysis with an inductive approach.

RESULTS: Three main themes arose: Falls - avoided and intended highlights the wide spectrum of fall perceptions, ranging from worse-case scenario to undramatized events; Balance identity incorporates how gradual deterioration in balance served as a reminder of disease progression and how identifying themselves as "aware not afraid" helped certain participants to maintain balance confidence despite everyday activity restriction; Training as treatment recounts how participants used exercise as disease self-management with the aim to maintain independence in daily life. Interpretation of the underlying patterns of these main themes resulted in the overarching theme Training as treatment when battling problems with balance and falls.

CONCLUSIONS: Whereas certain participants expressed a fear of falling which they managed by activity restriction, others described being confident in their balance despite avoidance of balance-challenging activities. Training was used as treatment to self-manage disease-related balance impairments in order to maintain independence in daily life. Implication for Rehabilitation People with Parkinson's disease require early advice about the positive effects of physical activity as well as strategies for self-management in order to ease the psychological and physical burden of progressive balance impairment. Fear of falling should be investigated alongside activity avoidance in this group in order to provide a more accurate insight into the scope of psychological concerns regarding balance and falls in everyday life. Certain people with Parkinson's disease define their balance according to activities they continue to participate in, while others who express fear-related activity

avoidance require help to adapt balance-challenging activities in order to maintain balance confidence and avoid physical inactivity.

PDF Y Endnote Y

The laser shoes: a new ambulatory device to alleviate freezing of gait in Parkinson disease

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Abstract

OBJECTIVE: To assess, in a cross-sectional study, the feasibility and immediate efficacy of laser shoes, a new ambulatory visual cueing device with practical applicability for use in daily life, on freezing of gait (FOG) and gait measures in Parkinson disease (PD).

METHODS: We tested 21 patients with PD and FOG, both "off" and "on" medication. In a controlled gait laboratory, we measured the number of FOG episodes and the percent time frozen occurring during a standardized walking protocol that included FOG provoking circumstances. Participants performed 10 trials with and 10 trials without cueing. FOG was assessed using offline video analysis by an independent rater. Gait measures were recorded in between FOG episodes with the use of accelerometry.

RESULTS: Cueing using laser shoes was associated with a significant reduction in the number of FOG episodes, both "off" (45.9%) and "on" (37.7%) medication. Moreover, laser shoes significantly reduced the percent time frozen by 56.5% (95% confidence interval [CI] 32.5-85.8; $p = 0.004$) when "off" medication. The reduction while "on" medication was slightly smaller (51.4%, 95% CI -41.8 to 91.5; $p = 0.075$). These effects were paralleled by patients' positive subjective experience on laser shoes' efficacy. There were no clinically meaningful changes in the gait measures.

CONCLUSIONS: These findings demonstrate the immediate efficacy of laser shoes in a controlled gait laboratory, and offer a promising intervention with potential to deliver in-home cueing for patients with FOG.

CLASSIFICATION OF EVIDENCE: This study provides Class III evidence that for patients with PD, laser shoes significantly reduce FOG severity (both number and duration of FOG episodes).

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