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Association of long-term exercise training with risk of falls, fractures, hospitalizations, and mortality in older adults: a systematic review and meta-analysis

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JAMA Intern. Med. 2018; ePub(ePub): ePub.

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DOI 10.1001/jamainternmed.2018.5406 **PMID** 30592475

Abstract

IMPORTANCE: Long-term exercise benefits on prevalent adverse events in older populations, such as falls, fractures, or hospitalizations, are not yet established or known.

OBJECTIVE: To systematically review and investigate the association of long-term exercise interventions (≥1 year) with the risk of falls, injurious falls, multiple falls, fractures, hospitalization, and mortality in older adults. DATA SOURCES: PubMed, Cochrane Central Register of Controlled Trials, SportDiscus, PsychInfo, and Ageline were searched through March 2018. STUDY SELECTION: Exercise randomized clinical trials (RCTs) with intervention length of 1 year or longer, performed among participants 60 years or older. DATA EXTRACTION AND SYNTHESIS: Two raters independently screened articles, abstracted the data, and assessed the risk of bias. Data were combined with risk ratios (RRs) using DerSimonian and Laird's random-effects model (Mantel-Haenszel method).

MAIN OUTCOMES AND MEASURES: Six binary outcomes for the risk of falls, injurious falls, multiple falls (≥2 falls), fractures, hospitalization, and mortality.

RESULTS: Forty-six studies (22 709 participants) were included in the review and 40 (21 868 participants) in the meta-analyses (mean [SD] age, 73.1 [7.1] years; 15 054 [66.3%] of participants were women). The most used exercise was a multicomponent training (eg, aerobic plus strength plus balance); mean frequency was 3 times per week, about 50 minutes per session, at a moderate intensity. Comparator groups were often active controls. Exercise significantly decreased the risk of falls (n = 20 RCTs; 4420 participants; RR, 0.88; 95% CI, 0.79-0.98) and injurious falls (9 RTCs; 4481 participants; RR, 0.74; 95% CI, 0.62-0.88), and tended to reduce the risk of fractures (19 RTCs; 8410 participants; RR, 0.84; 95% CI, 0.71-1.00; P = .05). Exercise did not significantly diminish the risk of multiple falls (13 RTCs; 3060 participants), hospitalization (12 RTCs; 5639 participants), and mortality (29 RTCs; 11 441 participants). Sensitivity analyses provided similar findings, except the fixed-effect meta-analysis for the risk of fracture, which showed a significant effect favoring exercisers (RR, 0.84; 95% CI, 0.70-1.00; P = .047). Meta-regressions on mortality and falls suggest that 2 to 3 times per week would be the optimal exercise frequency.

CONCLUSIONS AND RELEVANCE: Long-term exercise is associated with a reduction in falls, injurious falls, and probably fractures in older adults, including people with cardiometabolic and neurological diseases.

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Challenging standing balance reduces the asymmetry of motor control of postural sway poststroke

Pollock CL, Hunt MA, Vieira TM, Gallina A, Ivanova TD, Garland SJ.

Motor Control 2019; ePub(ePub): ePub.

Affiliation: Western University.

DOI 10.1123/mc.2017-0098 **PMID** 30599808

Abstract

BACKGROUND: Ankle plantarflexor muscle impairment contributes to asymmetrical postural control poststroke.

OBJECTIVE: This study examines the relationship of plantarflexor electromyography (EMG) with anterior-posterior center of pressure (APCOP) in people poststroke during progressive challenges to standing balance.

METHODS: Ten people poststroke and 10 controls participated in this study. Anteriorly directed loads of 1% body mass (BM) were applied to the pelvis every 25-40 s until 5%BM was reached. Cross-correlation values between plantarflexor EMG and APCOP (EMG:APCOP) position and velocity were compared.

RESULTS: EMG:APCOP velocity correlations were stronger than EMG:APCOP position across all muscles ($p < .01$), and correlations were predominately stronger in the nonparetic compared with the paretic leg ($p < .05$). Increasing challenge to standing balance reduced asymmetry of EMG:APCOP relationships.

CONCLUSIONS: These data suggest that sensory information reflected in APCOP velocity interacts more strongly with plantarflexor activity in people poststroke and controls than APCOP position. Furthermore, increasing challenge to standing balance reduces postural control asymmetry between legs poststroke.

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Community-dwelling adults with a history of falling report lower perceived postural stability during a foam eyes closed test than non-fallers

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Exp. Brain Res. 2019; ePub(ePub): ePub.

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DOI 10.1007/s00221-018-5458-1 **PMID** 30604020

Abstract

Perceived postural stability has been reported to decrease as sway area increases on firm surfaces. However, changes in perceived stability under increasingly challenging conditions (e.g., removal of sensory inputs) and the relationship with sway area are not well characterized. Moreover, whether perceived stability varies as a function of age or history of falls is unknown. Here we investigate how perceived postural stability is related to sway area and whether this relationship varies as a function of age and fall history while vision and proprioceptive information are manipulated. Sway area was measured in 427 participants from the Baltimore Longitudinal Study of Aging while standing with

eyes open and eyes closed on the floor and a foam cushion. Participants rated their stability [0 (completely unstable) to 10 (completely stable)] after each condition, and reported whether they had fallen in the past year. Perceived stability was negatively associated with sway area (cm^2) such that individuals who swayed more felt less stable across all conditions ($\beta = -0.53$, $p < 0.001$). Perceived stability decreased with increasing age ($\beta = -0.019$, $p < 0.001$), independent of sway area. Fallers had a greater decline in perceived stability across conditions ($F = 2.76$, $p = 0.042$) compared to non-fallers, independent of sway area. Perceived postural stability declined as sway area increased during a multisensory balance test. A history of falling negatively impacts perceived postural stability when vision and proprioception are simultaneously challenged. Perceived postural stability may provide additional information useful for identifying individuals at risk of falls.

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Effects of assistive home technology on quality of life and falls of people with dementia and job satisfaction of caregivers; results from a pilot randomized controlled trial

Lauriks S, Meiland FJM, Osté JP, Hertogh CMPM, Dröes RM.

Assist. Technol. 2018; ePub(ePub): ePub.

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DOI 10.1080/10400435.2018.1531952 **PMID** 30592439

Abstract

OBJECTIVES: Determine the effects of the implementation of Assistive Home Technology (AHT) in group homes on the quality of life (QoL) of people with dementia and on job satisfaction of caregivers.

METHOD: Pilot randomized controlled trial in nine in-patient care group homes (group homes with vs. without AHT). Participants were 54 people with dementia and 25 professionals. Outcome measurements were QoL, fall incidents, needs, use of restraints, job satisfaction, workload, and general health.

RESULTS: Living in a group home with AHT had a positive effect on four QoL domains: 'social isolation', 'having things to do', 'esthetics', and 'quality of life appreciation'. No effects were found on 12 other QoL domains. Fall incidents during bathroom visits were significantly reduced by the application of AHT. During this implementation phase, in the AHT group home, a moderate negative effect was found on caregiver's appreciation of work circumstances. No effects on other outcome measures were found.

CONCLUSION: Positive effects were found on aspects of QoL and fall incidents in the bathroom. The lower caregiver appreciation of work circumstances in the AHT group confirms the importance of intensive support and guidance of personnel during the implementation of AHT.

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Exercise programs in older adults-a prescription for fall reduction
Kraemer RR, Landefeld CS.
JAMA Intern. Med. 2018; ePub(ePub): ePub.
Affiliation: Department of Medicine, University of Alabama at Birmingham, Birmingham.

DOI 10.1001/jamainternmed.2018.5389 **PMID** 30592478
Abstract [Abstract unavailable]
PDF Y Endnote Y

Hilliness and the development of walking difficulties among community-dwelling older people
Keskinen KE, Rantakokko M, Suomi K, Rantanen T, Portegijs E.
J. Aging Health 2018; ePub(ePub): ePub.
Affiliation: Gerontology Research Center, University of Jyväskylä, Finland.

DOI 10.1177/0898264318820448 **PMID** 30587067
Abstract
OBJECTIVE: The objective of this study is to study the associations of objectively defined hilliness with the prevalence and incidence of walking difficulties among community-dwelling older adults, and to explore whether behavioral, health, or socioeconomic factors would fully or partially explain these associations.
METHOD: Baseline interviews (n = 848, 75-90 years) on difficulties in walking 500 m, frequency of moving through the neighborhood, and perceived hilliness as a barrier to outdoor mobility were conducted. Two-year follow-up interviews (n = 551) on difficulties in walking 500 m were conducted among participants without baseline walking difficulties. Hilliness objectively defined as the mean slope in 500-m road network.
RESULTS: Logistic regression showed that hilliness was associated with incident walking difficulties at the 2-year follow-up (odds ratio [OR] = 1.66, 95% confidence interval [CI] = [1.09, 2.51]) but not with the prevalence of walking difficulties at baseline. Adding behavioral, health, or socioeconomic factors to the models did not markedly change the results.
DISCUSSION: Greater hilliness should be considered a risk factor for developing walking difficulties among older adults.
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Milk drinking and risk of hip fracture. The Norwegian Epidemiologic Osteoporosis Studies (NOREPOS)
Holvik K, Meyer HE, Laake I, Feskanich D, Omsland TK, Søgaard AJ.
Br. J. Nutr. 2018; ePub(ePub): ePub.
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DOI 10.1017/S0007114518003823 **PMID** 30588895
Abstract [Abstract unavailable]
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Older hospital inpatients' fall risk factors, perceptions, and daily activities to prevent falling

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Geriatr. Nurs. 2018; ePub(ePub): ePub.

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DOI 10.1016/j.gerinurse.2018.11.005 **PMID** 30595233

Abstract

PURPOSE: To identify associations among patient fall risk factors, perceptions, and daily activities to improve patient engagement with fall prevention among hospitalized older adults.

BACKGROUND: The risk of falling increases for older patients but few researchers have reported patient-centered measures on this topic.

METHODS: Surveys and chart reviews of inpatients aged ≥ 65 with Morse Falls Scale scores of ≥ 45. Measurements included validated tools and the modified Fall Behavioral Scale-Inpatient (FaB-I).

RESULTS: A fall within 3 months before hospitalization was associated with an increased level of importance to preventing falls and higher FaB-I score (more fall prevention behaviors) but decreased level of confidence related to preventing falls ($p < 0.05$). Perception measures (concern: $r = 0.52$; patient activation: $r = 0.46$) were positively associated with FaB-I ($p < 0.001$).

CONCLUSIONS: Addressing patient-centered measures such as perceptions of and daily activities for fall prevention could add value to existing fall prevention programs.

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Should we screen for frailty in primary care settings? A fresh perspective on the frailty evidence base: a narrative review

Ambagtsheer RC, Beilby JJ, Visvanathan R, Dent E, Yu S, Braunack-Mayer AJ.

Prev. Med. 2018; ePub(ePub): ePub.

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DOI 10.1016/j.ypmed.2018.12.020 **PMID** 30594533

Abstract

With older adults living longer, health service providers have increasingly turned their attention towards frailty and its significant consequences for health and well-being. Consequently, frailty screening has gained momentum as a possible health policy answer to the question of what can be done to prevent frailty's onset and progression. However, who should be screened for frailty, where and when remains a subject of extensive debate. The purpose of this narrative review is to explore the dimensions of this question with reference to Wilson and Jungner's time-tested and widely accepted principles for acceptable screening within community settings. Although the balance of the emerging evidence to support frailty screening is promising, significant gaps in the evidence base remain. Consequently, when assessed against Wilson and Jungner's principles, extensive

population screening does not appear to be supported by the evidence. However, screening for the purpose of case-finding may prove useful among older adults.

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The association between apathy, decline in physical performance, and falls in older persons
Henstra MJ, Rhebergen D, Stek ML, Swart KMA, van Dijk SC, Zillikens MC, Oliai Araghi S, de Groot LCMGM, van Schoor NM, van der Velde N.
Aging Clin. Exp. Res. 2019; ePub(ePub): ePub.
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DOI 10.1007/s40520-018-1096-5 **PMID** 30600489
Abstract
BACKGROUND: Symptoms of apathy are common in older persons. Negative effects on physical performance and fall risk are plausible, considering the pathophysiology of apathy. However, literature is scarce.
AIM: To longitudinally assess the association between apathy and (1) decline of physical performance and (2) the number of falls in older community-dwelling persons.
METHODS: The 'B vitamins for the PRevention Of Osteoporotic Fractures' study provided data on 2919 older persons over a period of 2 years. Apathy was assessed using the Geriatric Depression Scale 3. A physical performance score (PPS) was calculated using three performance tests. Falls were registered prospectively. We calculated adjusted odds ratios (ORs), Incidence Rate Ratios (IRRs), and their 95% confidence intervals. Effect modification by age and gender was investigated. We also investigated mediation by baseline PPS for the association between apathy and the number of falls.
RESULTS: Apathy and decline of PPS were independently associated. After stratification, the effect only remained in men. Age was an effect modifier; higher ORs for decreasing age. Apathy was also independently associated with the number of falls. After stratification, women had higher IRRs than men. Age modified the association in the opposite direction: higher IRRs for increasing age. Baseline PPS was a mediator in the association.
CONCLUSION: The impact of apathy on physical performance and fall incidents varied with age and gender. Potentially, in older individuals with apathy, fall risk is preceded by a decline in physical performance. In clinical practice, identifying apathy in older persons might be useful to target mobility preserving interventions.
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The Wisconsin gait scale - the minimal clinically important difference
Guzik A, Drużbicki M, Wolan-Nieroda A, Przysada G, Kwolek A.
Gait Posture 2018; 68: 453-457.
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DOI 10.1016/j.gaitpost.2018.12.036 **PMID** 30599331
Abstract
BACKGROUND: Wisconsin Gait Scale (WGS) is an observational tool for the evaluation of gait quality in individuals after stroke with hemiplegia. It is divided into four subscales, which assess a total of fourteen spatiotemporal and kinematic parameters of gait observed during the consecutive gait phases. However, the WGS score change indicative of important and clinically meaningful change has not been determined. RESEARCH QUESTION: The study has been designed to define the minimal clinically important difference (MCID) of the WGS.
METHODS: Four methods were used to determine the MCID for the WGS in 50 participants who had experienced a stroke: anchor-based study, distribution-based study, linear regression analysis and specification of the receiver operating characteristic (ROC) curve.
RESULTS: In the anchor-based study, the mean change score in the MCID group was 1.9 points (the first MCID estimate). In the distribution-based study, the standard error of measurement for the no-change group was 0.3 (the second MCID estimate). The slope of the regression line was 1.21 which means than 1-point change in the Barthel Index (BI) is associated with 1.21-point change in the WGS. This translates to 2.25 points change in the WGS with 1.85 points change in the BI (the third MCID estimate). The best cut-off point, determined with ROC curve, was the value corresponding to 1 point of change in the WGS (the fourth MCID estimate). SIGNIFICANCE: We established that the MCID of the WGS was 2.25 points, based on the largest of the four MCID estimates. The value 2.25 of the MCID can help clinicians and researchers determine if the change in the scores on the WGS is clinically important. CLINICAL TRIAL REGISTRATION: Data are parts of the following clinical trial: ACTRN12617000436370.

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Three-dimensional augmented reality system for balance and mobility rehabilitation in the elderly: a randomized controlled trial
Ku J, Kim YJ, Cho S, Lim T, Lee HS, Kang YJ.
Cyberpsychol. Behav. Soc. Netw. 2018; ePub(ePub): ePub.
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DOI 10.1089/cyber.2018.0261 **PMID** 30596530
Abstract
We attempted to evaluate the clinical efficiency of a novel three-dimensional interactive augmented reality system (3D-ARS) for balance and mobility rehabilitation. This system enables participant training with a realistic 3D interactive balance exercise and assessing movement parameters and joint angles by using a kinetic sensor system. We performed a randomized controlled trial in a general hospital. Thirty-six participants (age, 56-76 years) who could independently walk and stand on one leg were recruited. The participants were randomly assigned to either group. The control group (n = 18) underwent a conventional physical fitness program such as lower-extremity strengthening and balance training thrice per week for 1 month. The experimental group (n = 18)

experienced 3D-ARS training thrice per week (1 session = 30 minutes) for 4 weeks. Training comprised a balloon game for hip exercise, cave game for knee exercise, and rhythm game for one-leg balance exercise. Lower-extremity clinical scale scores, fall index, and automatic balance score were measured by using Tetrax® posturography before, during, and after training. Significant group (3D-ARS vs. control) × time (before and after exercise) interaction effect was observed for Berg balance scale (BBS) scores ($p = 0.04$) and timed-up-and-go (TUG; $p < 0.001$). Overall improvements occurred in stability index, weight distribution index, fall risk index, and Fourier transformations index of posturography for both groups. However, score changes were significantly greater in the 3D-ARS group. Significant group × time interaction effect was observed for the fall risk index. This demonstrates that the 3D-ARS system can improve balance in the elderly more effectively.
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Walking speed best explains perceived locomotion ability in ambulatory people with chronic stroke, assessed by the ABILOCO questionnaire
Avelino PR, Menezes KKP, Nascimento LR, Faria-Fortini I, Faria CDCM, Teixeira-Salmela LF. Rev. Bras. Fisioter. 2018; ePub(ePub): ePub.
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DOI 10.1016/j.bjpt.2018.12.005 **PMID** 30598364
Abstract
BACKGROUND: The identification of the predictors of locomotion ability could help professionals select variables to be considered during clinical evaluations and interventions.
OBJECTIVE: To investigate which impairment measures would best predict locomotion ability in people with chronic stroke.
METHODS: Individuals (n=115) with a chronic stroke were assessed. Predictors were characteristics of the participants (i.e. age, sex, and time since stroke), motor impairments (i.e. muscle tonus, strength, and motor coordination), and activity limitation (i.e. walking speed). The outcome of interest was the ABILOCO scores, a self-reported questionnaire for the assessment of locomotion ability, designed specifically for individuals who have suffered a stroke.
RESULTS: Age, sex, and time since stroke did not significantly correlate with the ABILOCO scores (-0.07<ρ<0.05; 0.48<p<r
CONCLUSIONS: Walking speed and lower limb strength best predicted locomotion ability as perceived by individuals who have suffered a stroke.

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In-hospital neonatal falls: an unintended consequence of efforts to improve breastfeeding
Hughes Driscoll CA, Pereira N, Lichenstein R.
Pediatrics 2018; ePub(ePub): ePub.
Affiliation: Department of Pediatrics, School of Medicine, University of Maryland, Baltimore, Maryland.

DOI 10.1542/peds.2018-2488 **PMID** 30593451

Abstract

In-hospital neonatal falls are increasingly recognized as a postpartum safety risk, with maternal fatigue contributing to these events. Recommendations to support rooming-in may increase success with breastfeeding; however, this practice may also be associated with maternal fatigue. We report a cluster of in-hospital neonatal falls associated with a hospital program to improve breastfeeding, which included rooming-in practices. Metrics related to breastfeeding were prospectively collected by chart audit or patient survey while ongoing efforts to improve breastfeeding occurred (September 2015-August 2017). Falls were identified through the hospital adverse event reporting system from January 2011 to February 2018. Medical records were reviewed to determine factors associated with the falls, including time of event, pain medication administration, hours of life at fall, method of delivery, or other notable factors that may have contributed to the fall event. Three fall events occurred within 1 year of commencing improvement efforts as process and outcome metrics associated with breastfeeding improved. All events were associated with mothers falling asleep while feeding their infant, and all occurred between midnight and 6 am Falls occurred from 38.0 to 75.7 hours after birth. No sedating pain medications were administered within 4 hours of any event. In 2 of 3 cases, mothers experienced notable ongoing social stressors. Rooming-in was the most significant change involved in our health care delivery during the programmatic effort to improve breastfeeding. Monitoring for in-hospital neonatal falls may be needed during projects aimed at improving breastfeeding, particularly if rooming-in practices are involved.

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Patterns of injury amongst cruise ship passengers requiring hospitalisation

Isom WJ, Accilien YD, Chery SB, Mederos-Rodriguez D, Berne JD.

Int. Marit. Health 2018; 69(4): 243-247.

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DOI 10.5603/IMH.2018.0039 **PMID** 30589063

Abstract

BACKGROUND: The number of commercial cruise ship passengers continues to rise and is projected to reach 27.2 million passengers worldwide in 2018. Accidental injury aboard these ships can result in serious morbidity and mortality. This study examines the injury mechanisms, patterns, demographics, and outcomes of these injuries which are serious enough to require hospitalisation in order to facilitate administrative, financial, and medical decision making to aid in injury prevention and treatment.

MATERIALS AND METHODS: This is a cross-sectional, retrospective, registry-based study of adult patients sustaining injury while on a cruise ship admitted to a Level I Trauma Centre in the United States over a 2-year period. Data on demographics, injury type and severity, surgical management, hospital charges, length of stay, mortality, and discharge disposition were recorded.

RESULTS: Sixty seven patients were identified and included in the analysis. 70.1% of patients were 65 or older and a majority were female (59.7%). The most common mechanism of injury was a ground level fall (79.1%), and the most common injury encountered was a femur fracture (52.2%) which involved the acetabulo-femoral joint in 85.7% of cases. Traumatic brain injuries were uncommon occurring in 7.5% of cases. There were no fatalities in this series.
CONCLUSIONS: The most common injuries aboard cruise ships requiring hospitalisation occur in the geriatric population as a result of a ground level fall. Most commonly, the injuries are long bone fractures, with femur fractures occurring most frequently and accounting for over half of all injuries sustained. Resources and protocols for pre-hospital management of cruise ship injuries should prioritise these patients, and fall prevention measures for this demographic should be mandatory aboard all cruise ships.
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Postural control and balance in a cohort of healthy people living in Europe: an observational study
Patti A, Bianco A, Şahin N, Sekulic D, Paoli A, Iovane A, Messina G, Gagey PM, Palma A.
Medicine (Baltimore) 2018; 97(52): e13835.
Affiliation: Regional Sport School of Sicily CONI (Olympic National Italian Committee), Palermo, Italy.

DOI 10.1097/MD.0000000000013835 **PMID** 30593180
Abstract
In the past 20 years, posturography has been widely used in the medical field. This observational study aimed to report the values derived from posturography of a wide set of healthy subjects from various European countries using a plantar pressure platform and a standardized method of measurement.A random cluster sampling of 914 healthy subjects aged between 7.0 and 85.99 years, stratified by age, was carried out. To provide percentile values of our cohort, data were processed to obtain 3 curves corresponding to the following percentiles: 25th, 50th, 75th, and the interquartile range. Distance-weighted least squares method was used to represent the percentile on appropriate graphs.In our sample, the balance to improve with age, up to approximately 45 years, but the trend to reverse with older age. The data show that the oscillations on the sagittal plane (y-mean) change with advancing age. Young people had more retro-podalic support than older people; the balance shifted forward in elderly people.As the study included a relatively large quantity of data collected using a standardized protocol, these results could be used as normative values of posturography for similar populations. On the basis of this data, correct diagnostic clues will be available to clinicians and professionals in the field. However, further studies are needed to confirm our findings.
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