

**Safety Literature 17<sup>th</sup> October 2021****A class-imbalanced deep learning fall detection algorithm using wearable sensors**

Zhang J, Li J, Wang W. *Sensors (Basel)* 2021; 21(19): e6511.

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**DOI** 10.3390/s21196511 **PMID** 34640830

**Abstract**

Falling represents one of the most serious health risks for elderly people; it may cause irreversible injuries if the individual cannot obtain timely treatment after the fall happens. Therefore, timely and accurate fall detection algorithm research is extremely important. Recently, a number of researchers have focused on fall detection and made many achievements, and most of the relevant algorithm studies are based on ideal class-balanced datasets. However, in real-life applications, the possibilities of Activities of Daily Life (ADL) and fall events are different, so the data collected by wearable sensors suffers from class imbalance. The previously developed algorithms perform poorly on class-imbalanced data. In order to solve this problem, this paper proposes an algorithm that can effectively distinguish falls from a large amount of ADL signals. Compared with the state-of-the-art fall detection algorithms, the proposed method can achieve the highest score in multiple evaluation methods, with a sensitivity of 99.33%, a specificity of 91.86%, an F-Score of 98.44% and an AUC of 98.35%. The results prove that the proposed algorithm is effective on class-imbalanced data and more suitable for real-life application compared to previous works.

Language: en

**Keywords**

deep learning; class imbalance; fall detection; wearable sensor

## **A hierarchical approach to activity recognition and fall detection using wavelets and adaptive pooling**

Syed AS, Sierra-Sosa D, Kumar A, Elmaghraby A. *Sensors* (Basel) 2021; 21(19): e6653.

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### **Abstract**

Human activity recognition has been a key study topic in the development of cyber physical systems and assisted living applications. In particular, inertial sensor based systems have become increasingly popular because they do not restrict users' movement and are also relatively simple to implement compared to other approaches. In this paper, we present a hierarchical classification framework based on wavelets and adaptive pooling for activity recognition and fall detection predicting fall direction and severity. To accomplish this, windowed segments were extracted from each recording of inertial measurements from the SisFall dataset. A combination of wavelet based feature extraction and adaptive pooling was used before a classification framework was applied to determine the output class. Furthermore, tests were performed to determine the best observation window size and the sensor modality to use. Based on the experiments the best window size was found to be 3 s and the best sensor modality was found to be a combination of accelerometer and gyroscope measurements. These were used to perform activity recognition and fall detection with a resulting weighted F1 score of 94.67%. This framework is novel in terms of the approach to the human activity recognition and fall detection problem as it provides a scheme that is computationally less intensive while providing promising results and therefore can contribute to edge deployment of such systems.

Language: en

### **Keywords**

fall detection; artificial intelligence; activity recognition; cyber physical systems; direction and severity; Internet of Things (IoT); smart health

## **A mobile app (FallSA) to identify fall risk among Malaysian community-dwelling older persons: development and validation study**

Kaur Ajit Singh D, Goh JW, Shaharudin MI, Shahar S. JMIR Mhealth Uhealth 2021; 9(10): e23663.

(Copyright © 2021, JMIR Publications)

**DOI** 10.2196/23663 **PMID** 34636740

### **Abstract**

**BACKGROUND:** Recent falls prevention guidelines recommend early routine fall risk assessment among older persons.

**OBJECTIVE:** The purpose of this study was to develop a Falls Screening Mobile App (FallSA), determine its acceptance, concurrent validity, test-retest reliability, discriminative ability, and predictive validity as a self-screening tool to identify fall risk among Malaysian older persons.

**METHODS:** FallSA acceptance was tested among 15 participants (mean age 65.93 [SD 7.42] years); its validity and reliability among 91 participants (mean age 67.34 [SD 5.97] years); discriminative ability and predictive validity among 610 participants (mean age 71.78 [SD 4.70] years). Acceptance of FallSA was assessed using a questionnaire, and it was validated against a comprehensive fall risk assessment tool, the Physiological Profile Assessment (PPA). Participants used FallSA to test their fall risk repeatedly twice within an hour. Its discriminative ability and predictive validity were determined by comparing participant fall risk scores between fallers and nonfallers and prospectively through a 6-month follow-up, respectively.

**RESULTS:** The findings of our study showed that FallSA had a high acceptance level with 80% (12/15) of older persons agreeing on its suitability as a falls self-screening tool. Concurrent validity test demonstrated a significant moderate correlation ( $r=.518$ ,  $P<.001$ ) and agreement ( $k=.516$ ,  $P<.001$ ) with acceptable sensitivity (80.4%) and specificity (71.1%). FallSA also had good reliability (intraclass correlation.948; 95% CI.921-.966) and an internal consistency ( $\alpha=.948$ ,  $P<.001$ ). FallSA score demonstrated a moderate to strong discriminative ability in classifying fallers and nonfallers. FallSA had a predictive validity of falls with positive likelihood ratio of 2.27, pooled sensitivity of 82% and specificity of 64%, and area under the curve of 0.802.

**CONCLUSIONS:** These results suggest that FallSA is a valid and reliable fall risk self-screening tool. Further studies are required to empower and engage older persons or care givers in the use of FallSA to self-screen for falls and thereafter to seek early prevention intervention.

Language: en

### **Keywords**

fall risk; mobile app; older person; self-screening

## **Accelerometer-measured daily steps, physical function, and subsequent fall risk in older women: the Objective Physical Activity and Cardiovascular Disease in Older Women Study**

Schumacher BT, Bellettiere J, LaMonte MJ, Evenson KR, Di C, Lee IM, Sleet DA, Eaton CB, Lewis CE, Margolis KL, Tinker LF, Lacroix AZ. *J. Aging Phys. Act.* 2021; ePub(ePub): ePub.

(Copyright © 2021, Human Kinetics Publishers)

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### **Abstract**

Steps per day were measured by accelerometer for 7 days among 5,545 women aged 63-97 years between 2012 and 2014. Incident falls were ascertained from daily fall calendars for 13 months. Median steps per day were 3,216. There were 5,473 falls recorded over 61,564 fall calendar-months. The adjusted incidence rate ratio comparing women in the highest versus lowest step quartiles was 0.71 (95% confidence interval [0.54, 0.95]; ptrend across quartiles =.01). After further adjustment for physical function using the Short Physical Performance Battery, the incidence rate ratio was 0.86 ([0.64, 1.16]; ptrend =.27). Mediation analysis estimated that 63.7% of the association may be mediated by physical function (p =.03). In conclusion, higher steps per day were related to lower incident falls primarily through their beneficial association with physical functioning. Interventions that improve physical function, including those that involve stepping, could reduce falls in older adults.

Language: en

### **Keywords**

epidemiology; older adults; incident falls

## Assessment of risk factors for falls among patients with Parkinson's disease

Wilczyński J, Ścipniak M, Ścipniak K, Margiel K, Wilczyński I, Zieliński R, Sobolewski P. Biomed. Res. Int. 2021; 2021: e5531331.

(Copyright © 2021, Hindawi Publishing)

DOI 10.1155/2021/5531331 PMID 34621895

### Abstract

**INTRODUCTION:** The aim of this study was to assess the risk factors for falls in patients with Parkinson's disease.

**MATERIALS AND METHODS:** The study comprised 53 participants (52.8% women and 47.2% men). The Hoehn and Yahr 5-point disability scale was used to assess the severity of Parkinson's disease. The Tinetti Balance and Gait Scale were used to evaluate the risk of falls. The Katz scale was used to test the independence of people with PD. The Falls Efficacy Scale-International Short Form (FES-I) was implemented to assess fear of falling.

**RESULTS:** The majority of participants was at a high risk of falls, being at the same level for women and men. A significant relationship was noted between the risk of falls and subjective assessment of mobility ( $\chi(2) = 31.86, p < 0.001$ ), number of falls ( $\chi(2) = 37.92, p < 0.001$ ), independence of the subjects ( $\chi(2) = 19.28, p < 0.001$ ), type of injury suffered during the fall ( $\chi(2) = 36.93, p < 0.001$ ), external factors ( $\chi(2) = 33.36, p < 0.001$ ), and the level of fear of falling ( $\chi(2) = 8.88, p < 0.001$ ). A significant relationship also occurred between the number of falls and the fear of falling ( $\chi(2) = 33.49, p < 0.001$ ) and between the number of falls and disease severity ( $\chi(2) = 45.34, p < 0.001$ ). The applied physiotherapy did not reduce the risk of falls ( $\chi(2) = 3.18, p = 0.17$ ).

**CONCLUSIONS:** Individuals who rated their mobility as good or excellent were at a low risk of falls. People who fell more times were at a high risk of falling. People more independent were at a low risk of falls. Previous injuries were the most associated with being at risk of falling. Uneven surfaces and obstacles on one's path are the external factors most associated with the risk of falling. People with low levels of fall anxiety were at a low risk of falls. Most people with low fall anxiety have never fallen. Additionally, the majority of patients with stage 1 of the disease have not fallen at all. The reason for the ineffectiveness of physiotherapy may be due to the exercise programs used and the lack of systematic implementation of them. PD is different for each patient; thus, it is important to select individually customized physiotherapy depending on motor and nonmotor symptoms, as well as general health of a patient.

Language: en

## **Audiologists should not fail with falls: a call to commit to prevention of falls in older adults**

Rogers C. S. *Afr. J. Commun. Disord.* 2021; 68(1): e1-e5.

(Copyright © 2021, AOSIS Publishing)

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### **Abstract**

Globally, falls are a serious economic and public health concern. While all age groups are impacted by falls, the threats to morbidity and mortality are most severe in older adults. Recent literature has linked hearing loss, and related issues such as an increase in sedentary behaviour, to a greater risk of falls. Therefore, this opinion article aims to raise audiologists' awareness of falls in ageing patients or clients, and calls for change in terms of having these rehabilitation professionals embrace identification and management of fall risk.

Language: en

### **Keywords**

older adults; falls; fall prevention; fall risk; audiology; hearing impairment

## **Balance provocation tests identify near falls in healthy community adults aged 40-75 years; an observational study**

Baker N, Grimmer K, Gordon S. *Physiother. Theory Pract.* 2021; ePub(ePub): ePub.

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**DOI** 10.1080/09593985.2021.1983909 **PMID** 34637669

### **Abstract**

**BACKGROUND:** Near falls, such as stumbles or slips without falling to the ground, are more common than falls and often lead to a fall.

**PURPOSE:** The objective of this study was to investigate which balance tests differentiate near fallers from fallers and non-fallers.

**METHODS:** This cross-sectional, observational study assessed balance in healthy community dwelling adults aged 40-75 years. Participants reported falls and near falls in the previous 6 months. Balance testing was completed in the local community for static (i.e. feet together and single-leg stance) and dynamic balance (i.e. tandem walk, Functional Movement Screen hurdle step and lunge). Between-group comparative analysis of pass-fail for each balance test was undertaken.

**RESULTS:** Of 627 participants, there were 99 fallers (15.8%), 121 near fallers (19.3%) and 407 non-fallers (64.9%). Near fallers were twice as likely as non-fallers to fail single-leg stance eyes (OR 2.7, 95% CI 1.5-4.9), five tandem steps (OR 2.5, 95% CI 1.5-5.7), hurdle step (OR 2.9, 95% CI 1.4-5.8), and lunge (OR 2.5, 95% CI 1.5-4.1). The predictive capacity differentiates near fallers with a sensitivity of 73.3%.

**DISCUSSION:** A new battery of tests assessing static and dynamic balance identifies near fallers in seemingly healthy, community dwelling middle- and young-older-aged adults.

Language: en

### **Keywords**

falls; methods; near falls; Postural balance

## **Effect of hearing aids on body balance function in non-reverberant condition: a posturographic study**

Ninomiya C, Hiraumi H, Yonemoto K, Sato H. PLoS One 2021; 16(10): e0258590.

(Copyright © 2021, Public Library of Science)

**DOI** 10.1371/journal.pone.0258590 **PMID** 34644358

### **Abstract**

**OBJECTIVE:** The purpose of this study was to evaluate the effect of hearing aids on body balance function in a strictly controlled auditory environment.

**METHODS:** We recorded the findings of 10 experienced hearing aid users and 10 normal-hearing participants. All the participants were assessed using posturography under eight conditions in an acoustically shielded non-reverberant room: (1) eyes open with sound stimuli, with and without foam rubber, (2) eyes closed with sound stimuli, with and without foam rubber, (3) eyes open without sound stimuli, with and without foam rubber, and (4) eyes closed without sound stimuli, with and without foam rubber.

**RESULTS:** The auditory cue improved the total path area and sway velocity in both the hearing aid users and normal-hearing participants. The analysis of variance showed that the interaction among eye condition, sound condition, and between-group factor was significant in the maximum displacement of the center-of-pressure in the mediolateral axis ( $F [1, 18] = 6.19, p = 0.02$ ). The maximum displacement of the center-of-pressure in the mediolateral axis improved with the auditory cues in the normal-hearing participants in the eyes closed condition (5.4 cm and 4.7 cm,  $p < 0.01$ ). In the hearing aid users, this difference was not significant (5.9 cm and 5.7 cm,  $p = 0.45$ ). The maximum displacement of the center-of-pressure in the anteroposterior axis improved in both the hearing aid users and the normal-hearing participants.

Language: en

## **Falls associated with indoor and outdoor environmental hazards among community-dwelling older adults between men and women**

Lee S. BMC Geriatr. 2021; 21(1): e547.

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DOI 10.1186/s12877-021-02499-x PMID 34641812

### **Abstract**

**BACKGROUND:** Hazardous environmental exposures are recognized risk factors for falls among older adults. However, the gender differences in the associations of falls with indoor and outdoor environmental hazards are scarce. This study examined the indoor and outdoor environmental risk factors for falls and compared the data for men and women among U.S. older adults using nationally representative data.

**METHODS:** We used the 2011 National Health and Aging Trends Study (NHATS) for a cross-sectional analysis of 6680 community-dwelling adults aged  $\geq 65$  years in the United States. A series of logistic regressions was used to identify the indoor and outdoor environmental hazards associated with falls stratified by gender after adjusting for sociodemographic, health, and behaviors. We also tested for significant interactions with gender.

**RESULTS:** Compared to men, women had a higher prevalence of falls. In the model adjusted for sociodemographic, health, and behavioral conditions, there were gender differences in the association of falls with the presence of indoor and outdoor environmental hazards. Gender-specific analyses showed that women with the presence of indoor environmental hazards (OR = 1.37, 95% CI = 1.04-1.79) had higher odds of falls, whereas for men, the presence of outdoor environmental hazards (OR = 1.34, 95% CI = 1.02-1.75) was associated with falls. We also found a significant interaction term between outdoor environmental hazards and gender (OR = 0.65, 95% CI = 0.47-0.90). The interaction plot indicated that the presence of outdoor environmental hazards increased the risks of falling in men but not in women.

**CONCLUSIONS:** Significant gender differences exist in the association of falls with indoor and outdoor environmental hazards among older men and women. Our findings suggest that gender-tailored prevention programs to increase awareness of the environmental hazards and gender-specific environmental interventions are needed to help prevent falls.

Language: en

### **Keywords**

Gender differences; Clinical and environmental fall prevention; Indoor and outdoor environmental hazards

## **Gait and age-related hearing loss interactions on global cognition and falls**

Sakurai R, Kawai H, Yanai S, Suzuki H, Ogawa S, Hirano H, Ihara K, Takahashi M, Kim H, Obuchi S, Fujiwara Y. *Laryngoscope* 2021; ePub(ePub): ePub.

(Copyright © 2021, Lippincott Williams and Wilkins)

**DOI** 10.1002/lary.29898 **PMID** 34636436

### **Abstract**

**OBJECTIVES:** Age-related hearing loss (ARHL) is considered a risk factor for cognitive impairment and falls. The association may be modulated by gait performance because ARHL is related to mobility decline, which strongly contributes to cognitive impairment and falls. We investigated the interactive effects of gait and ARHL on global cognition and falls among older adults. **STUDY DESIGN:** Retrospective cohort study.

**METHODS:** The auditory acuity of 810 community-dwelling older adults was measured using a pure-tone average of hearing thresholds at 1,000 and 4,000 Hz in the better-hearing ear. Participants were then stratified as follows: normal hearing,  $\leq 25$  dB; mild hearing loss (HL),  $>25$  and  $\leq 40$  dB; and moderate to severe HL,  $>40$  dB. Gait speed was assessed as an indicator of gait performance and fall occurrence within the previous year. Global cognition was determined using the Montreal Cognitive Assessment (MoCA) test.

**RESULTS:** A total of 320 (39.5%) and 233 (28.8%) participants had mild and moderate to severe HL, respectively. Hierarchical multiple and logistic regression analyses showed interactions between gait performance and moderate hearing loss on both global cognition and the occurrence of falls. Specifically, older adults with moderate hearing loss who walked slowly showed lower MoCA scores and a higher incidence of falls, whereas those with decent gait speed did not show such a tendency.

**CONCLUSION:** Our results suggest that poor gait performance might modulate the effects of ARHL, leading to cognitive decline and falls. Poor cognitive performance and falls may be prevalent in older adults with ARHL, especially in those with slower gait and moderate hearing loss. **LEVEL OF EVIDENCE:** 3 *Laryngoscope*, 2021.

Language: en

### **Keywords**

cognitive impairment; fall; gait speed; Hearing loss; interactive effects

## Identification of modified dynamic gait index cutoff scores for assessing fall risk in people with Parkinson disease, stroke and multiple sclerosis

Torchio A, Corrini C, Anastasi D, Parelli R, Meotti M, Spedicato A, Groppo E, D'Arma A, Grosso C, Montesano A, Cattaneo D, Gervasoni E. *Gait Posture* 2021; 91: 1-6.

(Copyright © 2021, Elsevier Publishing)

DOI 10.1016/j.gaitpost.2021.09.201 PMID 34628216

### Abstract

**BACKGROUND:** Balance and gait impairments increase fall rate and injury in people with neurological disorders(PwND). The modified Dynamic Gait Index(mDGI) is a scale assessing dynamic balance during walking, however its ability in identifying Fallers and Recurrent Fallers has not been studied. **RESEARCH QUESTION:** To evaluate mDGI's ability in identifying retrospective Fallers and Recurrent Fallers establishing cut-off scores for its use in clinical practice.

**METHOD:** In this cross-sectional study, the number of retrospective falls and mDGI scores were collected. PwND were categorised as Non-Fallers or Fallers (falls $\geq$ 1) and as Recurrent Fallers(falls $\geq$ 2) or Non-Recurrent/Non-Fallers(falls $<$ 2) according to their number of retrospective falls over two months. Two generalised linear logistic models were developed using a machine learning method to detect Fallers (Model 1) and Recurrent Fallers (Model 2) based on mDGI scores. ROC curves were used to identify mDGI cut-off scores to distinguish between different fall categories.

**RESULTS:** 58 PwND (mean  $\pm$  standard deviation age: 63.4  $\pm$  12 years) including 28 people with Multiple Sclerosis, 15 people with Parkinson's disease and 15 people with Stroke were analysed. The mDGI score(median (IQR)) for Non-Fallers, Fallers, Recurrent Fallers and Non-Recurrent/Non-Fallers was respectively 50(22), 37(22), 26.5(20.25) and 46.5(20.5)points. The cut-off to identify Fallers from Non-Fallers was 49 points(sensitivity:100 %, specificity:50 %, post-test probability with mDGI  $\leq$  cut-off: 53.2 %, post-test probability with mDGI  $>$  cut-off: 0%, AUC:0.68), while 29 points(sensitivity:60 %, specificity:79 %, post-test probability with mDGI  $\leq$  cut-off:52.1 %, post-test probability with mDGI  $>$  cut-off:16.1 %, AUC:0.70) was the best cut-off to identify Recurrent Fallers.

**SIGNIFICANCE:** People with mDGI score $>$ 49 points have low or minimal fall risk, while people with mDGI score $\leq$ 49 points should be further investigated with other scales before starting a balance-focused rehabilitation intervention. People scoring  $\leq$ 29 points on the mDGI scale may need a fall prevention intervention, regardless of the results of other balance clinical measures.

Language: en

### Keywords

Falls; Balance; Rehabilitation; mDGI; Neurological disorders

**Impoverished inhibitory control exacerbates multisensory impairments in older fallers**

Scurry AN, Lovelady Z, Lemus DM, Jiang F. *Front. Aging Neurosci.* 2021; 13: e700787.

(Copyright © 2021, Frontiers Research Foundation)

DOI 10.3389/fnagi.2021.700787 PMID 34630067

**Abstract**

Impaired temporal perception of multisensory cues is a common phenomenon observed in older adults that can lead to unreliable percepts of the external world. For instance, the sound induced flash illusion (SIFI) can induce an illusory percept of a second flash by presenting a beep close in time to an initial flash-beep pair. Older adults that have enhanced susceptibility to a fall demonstrate significantly stronger illusion percepts during the SIFI task compared to those older adults without any history of falling. We hypothesize that a global inhibitory deficit may be driving the impairments across both postural stability and multisensory function in older adults with a fall history (FH). We investigated oscillatory activity and perceptual performance during the SIFI task, to understand how active sensory processing, measured by gamma (30-80 Hz) power, was regulated by alpha activity (8-13 Hz), oscillations that reflect inhibitory control. Compared to young adults (YA), the FH and non-faller (NF) groups demonstrated enhanced susceptibility to the SIFI. Further, the FH group had significantly greater illusion strength compared to the NF group. The FH group also showed significantly impaired performance relative to YA during congruent trials (2 flash-beep pairs resulting in veridical perception of 2 flashes). In illusion compared to non-illusion trials, the NF group demonstrated reduced alpha power (or diminished inhibitory control). Relative to YA and NF, the FH group showed reduced phase-amplitude coupling between alpha and gamma activity in non-illusion trials. This loss of inhibitory capacity over sensory processing in FH compared to NF suggests a more severe change than that consequent of natural aging.

Language: en

**Keywords**

aging; fall-risk; inhibition; multisensory processing; sound-induced flash illusion

## Potentially inappropriate prescribing in a falls clinic using the STOPP and START criteria

Chiam R, Saedon N, Khor HM, A/P Subramaniam S, Binti Mohmad Nasir SS, Binti Abu Hashim NFI, Tan MP. *Int. J. Clin. Pharm.* 2021; ePub(ePub): ePub.

(Copyright © 2021, Holtzbrinck Springer Nature Publishing Group)

DOI 10.1007/s11096-021-01329-9 PMID 34626298

### Abstract

**Background** Potentially inappropriate prescribing is increasingly common in older patients with falls. However, published indicators to assess inappropriate prescribing remains unestablished in many countries.

**OBJECTIVE** This study determined the burden and profile of potentially inappropriate prescribing among patients attending a falls clinic using the STOPP/START criteria and evaluated the factors for falls potentially associated to inappropriate prescribing. Setting University of Malaya Medical Centre Falls Clinic.

**METHOD** Data of individuals aged  $\geq 65$  years referred to the falls and syncope clinic were extracted from the falls registry. Potentially inappropriate prescribing was determined with the STOPP/START version 2 criteria. The relationship between potentially inappropriate prescribing with polypharmacy ( $\geq 5$  medications), comorbidities and clinical variables were determined using Pearson's chi-square and potential confounders adjusted for with multivariate regression. Main outcome measure Potentially inappropriate medicines and/or omitted medicines using STOPP/START criteria.

**RESULTS** Data from 421 individuals, aged  $77.8 \pm 6.7$  years and 53.4% women, were included. Potentially inappropriate prescribing was present in 311 (73.9%). Potentially inappropriate medicines use accounted for 84.6% of the 325 prescriptions. 361/659 instances (54.8%) were falls-risk-increasing drugs, with vasodilators (49.3%) being the main potentially inappropriate medicine identified. Of the 177/421 with polypharmacy, 169/177 (95.5%) were exposed to  $\geq 1$  potentially inappropriate medicine. 129 instances of potentially omitted medicines were observed in 109 prescriptions (25.9%).

**CONCLUSION** STOPP/START criteria are useful to identify potentially inappropriate prescribing at the falls and syncope clinic. This finding has important implications for medication review strategies at falls clinic. Future research should determine whether identifying potentially inappropriate prescribing may reduce adverse falls outcomes among patients in this setting.

Language: en

### Keywords

Aged; Accidental falls; Adverse drug events; Inappropriate prescribing; STOPP START criteria

## **Risk factors associated with fall awareness, falls, and quality of life among ethnic minority older adults in upper northern Thailand**

Kantow S, Seangpraw K, Ong-Artborirak P, Tonchoy P, Auttama N, Bootsikeaw S, Choowanthanapakorn M. *Clin. Interv. Aging* 2021; 16: 1777-1788.

(Copyright © 2021, Dove Press)

DOI 10.2147/CIA.S328912 PMID 34629869

### **Abstract**

**BACKGROUND:** Falls are a major public health issue and one of the leading causes of morbidity and mortality among the older adults in many countries. Falls and their consequences have an impact on people's quality of life, particularly the older adults. However, there have been very few studies on falls among ethnic minority groups living in rural areas. The aim of this study was to examine factors related to fall awareness, falls, and quality of life among ethnic minority older adults living in northern Thailand.

**METHODS:** A cross-sectional study was conducted among 462 older adults from ethnic minority groups living in rural communities in Phayao and Lamphun provinces of northern Thailand using a multi-stage sampling technique. The data were collected through face-to-face interviews, with structured questionnaires covering health information, fall awareness, and quality of life (WHOQOL-OLD). The factors were determined using simple linear regression and binary logistic regression.

**RESULTS:** The mean age of the participants was 68.2, Karen (35.5%), Mien (24.2%), indigenous (20.8%), and Hmong (19.5%). In the previous 12 months, 20.6% of elders had experienced a fall, and 4.5% of them had experienced multiple falls. More than half of the elders had moderate fall awareness and quality of life (71.6% and 68.6%, respectively). Univariate analysis revealed that minority group, sociodemographic characteristics, sleep duration, and fear of falling were all found to be associated with fall awareness, falls, and quality of life score ( $p < 0.001$ ). There was a significant relationship among fall awareness, falls, and quality of life score ( $p < 0.001$ ). Compared to those who had not fallen in the previous year, the quality of life of the older adults who had fallen was about 11 points lower.

**CONCLUSION:** Several independent variables were discovered to be fall risk factors and quality of life indicators. It is critical to recognize the risk factors to promote fall prevention programs that are appropriate for the older adults among ethnic minorities. Therefore, public health agencies and local government should be aware of the problem and initiate an implementation program and policy to prevent falls and improve the quality of life among ethnic minority older adults.

Language: en

### **Keywords**

older adults; falls; quality of life; ethnic minority; fall awareness

