ความสัมพันธ์ระหว่างความกลัวการล้ม ความเครียด และคุณภาพชีวิตในผู้ใหญ่ และผู้สูงอายุ

Association Among Fear of Falling, Stress, and Quality of Life in Adults and Older People

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Abstract

Fall-related injuries in older people have become a crucial and unease topic in public health area. The present study investigated the relationship of fall-related factors among fear of falling (FOF), stress, and quality of life (QOL) in adults and older people via structured questionnaires and informal interviews. A cross-sectional study was conducted in the central region of Thailand with 33 participants (9 males, 24 females) aged 45 - 86 years. Significant differences were indentified between groups in psychological well-being (P = 0.021), and stress (P = 0.034), respectively. QOL was significantly correlated with stress (r = -0.551, P = 0.002), and FOF (r = 0.517, P = 0.002), respectively. FOF was significantly correlated with stress (r = -0.310, P = 0.040) as well. The main evidence obtained from the present study suggests that decreasing FOF and/or stress could give prerequisite contribution to improving QOL not only in adults but also in older people. Fall prevention strategies may be more effective if consideration is given to the built environmental design in terms of design for sustainability in order to reduce the incidence possibility, minimize the chance of consequent injuries in elderly Thai population, and enhance their life qualities.

Keywords
Fear of Falling
Stress
Quality of Life
Adults
Older People

บทคัดย่อ

การบาดเจ็บที่เกี่ยวเนื่องมาจากการล้มในผู้สูงอายุถือเป็นประเด็นสำคัญทางสุขภาพ การวิจัยนี้จึงทำการศึกษาความสัมพันธ์ของปัจจัยที่เกี่ยวเนื่องกับการล้มระหว่างความกลัวการล้ม ความเครียด และคุณภาพชีวิต ในกลุ่มผู้ใหญ่ และผู้สูงอายุ โดยทำการเก็บข้อมูลอาสาสมัคร จำนวน 33 คน ที่อาศัยอยู่ในภาคกลางของประเทศไทย ประกอบด้วย เพศชาย 9 คน และเพศหญิง 24 คน ช่วงอายุระหว่าง 45 – 86 ปี พบว่า มีความแตกต่างกันระหว่างกลุ่มอย่างมีนัยสำคัญทางสถิติในประเด็นของสุขภาวะทางจิต (P = 0.021) และความเครียด (P = 0.034) ตามลำดับ นอกจากนี้ยังพบว่า คุณภาพชีวิตมีความสัมพันธ์กันอย่างมีนัยสำคัญทางสถิติ (ในทางลบ) กับความเครียด (r = -0.551, P = 0.002) และความกลัวการล้ม (r = 0.517, P = 0.002) ตามลำดับ ในขณะที่ ความกลัวการล้มมีความสัมพันธ์กันอย่างมีนัยสำคัญทางสถิติ (ในทางลบ) กับความเครียด (r = -0.310, P = 0.040) ผลจากการศึกษานี้แสดงให้เห็นว่า การลดความกลัวการล้ม และ/หรือ ความเครียดมีความสัมพันธ์ที่สำคัญกับการสนับสนุนให้เกิดการพัฒนาคุณภาพชีวิตที่ดีขึ้นทั้งในกลุ่มผู้ใหญ่และผู้สูงอายุ ทั้งนี้ การศึกษาเพื่อทำความเข้าใจถึงความสัมพันธ์ของปัจจัยที่เกี่ยวเนื่องกับการล้ม ถือเป็นการสร้างโอกาสทางสภาพแวดล้อมสรรค์สร้างในการลดอุบัติการณ์ และเหตุบาดเจ็บที่สามารถเกิดขึ้น พัฒนาภาพรวมของสุขภาวะ รวมถึงการพัฒนาคุณภาพชีวิต

คำสำคัญ
ความกลัวการล้ม
ความเครียด
คุณภาพชีวิต
ผู้ใหญ่
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1. Introduction

Older people encounter falls frequently which may result in health issues that are severe (Dionyssiotis, 2012, pp. 805-813). Fall problems in older people can lead to critical concerns in wellness, social, and psychological areas (Peel, McClure & Hendrikz, 2007, pp. 145-151). One of the crucial public health problems is associated with fall- related injuries which can cause handicap and loss of life for the elderly population (Swanenburg, de Bruin, Uebelhart & Mulder, 2010, pp. 317-321). Families and healthcare professionals are mostly worried about older people's potential risk to be injured. To keep older people healthy and to prolong their skills to live effectively and independently in their own residences, fall prevention is key. Such approach can help minimize chance of injuries caused by falls, emergency department visits, hospital treatment as well as nursing home needs (Rogers, Rogers, Takeshima & Islam, 2004, 29-39; Romyanond, 2012). Several fall-related determinants that are likely risk factors have been frequently mentioned such as FOF (Li, Fisher, Harmer, McAuley & Wilson, 2003, pp. 283-290), which is a common concomitant psychological symptom of falls among adults and older people whether or not they have sustained a fall (Tinetti, Speechley & Ginter, 1988, pp. 1701-1707), Stress (Gonyea & Burnes, 2013, pp. 333-347), and also QOL (Hartholt et al., 2011, pp. 748-753). However, the relationships among fall-related factors remain unclear. The purpose of the present study is to address this critical knowledge gap by examining the relationship among FOF, stress, and QOL in adults and older people. A better understanding of relationships among fall-related factors underlying falls in adults and older people may lead to supportive evidence to promote strategies in fall prevention and approach to finally improve QOL.

2. Materials and Methods

2.1 Participants

A cross-sectional study was carried out in the central region of Thailand. The study sample comprised a total of 33 volunteers (9 males, 24 females) aged 45 – 86 years (mean 55.61, SD 11.3 years) comprised the study sample.

Different countries categorize and label age differently and this also varies across time. This could be explained by the gap in social layer and people's skill to contribute as workforce. It seems however that present circumstance in politics and economy tends to play a more vital role in determining definition of older age. Frequently, the retirement age where that of women was less than men is in connection with the classification. The principle to define old age is related to the progress in livelihood which takes place between the ages of 45 and 55 years for women and between the ages of 55 and 75 years for men (Organization, 2017; Thane, 1978, pp. 234-236).

Presently, United Nations standard numerical benchmark does not exist. However, the indicator at 55 years and over that determines elderly population is reasonable to use for the present study. Therefore, 18 of those participants who aged 45 – 55 years of ages were classified as adults group (mean age 47.8, SD 2.6 years) and 15 participants at the age of 60 years and older were classified as older people group (mean age 65, SD 10.6 years). Participants were recruited from a social network through advertisements. To be included, participants needed to be of age 45 years or older, and also were willing to be informally interviewed as well as were able to complete all structured questionnaires where personal data were not gathered and personal identities were not collected. Verbal consent agreements were recorded together with the witnesses, who was one of their family members. They were excluded if they were unable to understand the purpose of the study.

2.2 Measurements

The structured questionnaires were mainly divided into 2 parts as socio-demographic and fall-related factors. Socio-demographic factors were adapted from the center of research and health promotion in elderly people. Fall-related factors consisted of 3 subparts: (1) FOF scale was documented using Thai translated version of an assessment of FOF in older people. FOF contained 10 activities representing activities of daily living (ADLs) and instrumental activities of daily living (IADLs). Scoring was generated from 0 to 10 points, with higher scores indicating a greater confidence in no FOF. (2) Stress levels were documented using an assessment and self-analysis questionnaires from Department of Mental Health, Ministry of Public Health which comprised 20 items with a rating scale from 0 to 3 points. (3) QOL status was documented using the brief Thai version of the World Health Organization quality of life questionnaire (WHOQOL-BREF-THAI). It consisted of 26 items with both perceived objective and self-report subjective, a rating scale from 1 to 5 points. Five subscales measure physical health, psychological well-being, social relationships, satisfaction with the environment, and overall health.

2.3 Statistical analysis

The participants' characteristics were described by descriptive statistics. Skewness statistic and histogram test were used to check the normality of the distributions. Differences between adults and older people groups in the continuous variables were analyzed with the independent (unpaired) t-test which presented as mean (± standard deviation) and in discrete variables by using Chi-square test which presented as number (% of total). Fall-related factors ran by partial correlations on all variables while age was controlled and Pearson correlation (one-tailed) as well. The sample size of 33 randomized participants was confirmed by reversely calculating power with 97% power at the 5% significance level (two-sided) to detect the effect of correlations.

3. Results

Participant characteristics were significantly different between groups in age and occupation ($P < 0.001$), education ($P = 0.038$), and religion ($P = 0.047$), respectively. In contrast, no significant differences were found between groups in height, weight, sex, and status (Table 1).

Medical and IADLs characteristics were significantly different between groups in eyeglasses ($P = 0.025$), mobility aid ($P = 0.047$), and number of diseases ($P = 0.048$), respectively (Table 2).

There were significant differences between groups in psychological well-being ($P = 0.021$), and stress ($P = 0.034$), respectively. In contrast, no significant differences were found between groups in FOF, physical health, social relationships, satisfaction with the environment, overall health, and QOL (Table 3).

FOF was significantly correlated with QOL ($r = 0.517$, $P = 0.002$), overall health ($r = 0.486$, $P = 0.005$), physical health ($r = 0.484$, $P = 0.005$), and satisfaction with the environment ($r = 0.477$, $P = 0.006$), respectively. Surprisingly, FOF was not significantly correlated with psychological well-being, social relationships, and especially stress (Table 4).

Similarly, stress was significantly correlated with QOL ($r = -0.551$, $P = 0.001$), satisfaction with the environment ($r = -0.537$, $P = 0.002$), psychological well-being ($r = -0.494$, $P = 0.004$), and physical health ($r = -0.395$, $P = 0.025$), respectively. However, stress was not significantly correlated with overall health but correlation with social relationships was borderline significant ($r = -0.345$, $P = 0.053$) in Table 4.

Interstingly, in Pearson correlation (one-tailed), FOF was significantly correlated with psychological well-being ($r = 0.424$, $P = 0.007$), social relationships ($r = 0.354$, $P = 0.022$), and also stress ($r = -0.310$, $P = 0.040$), respectively. In addition, stress was significantly correlated with social relationships ($r = -0.382$, $P = 0.014$). However, the correlation between stress, and overall health was still not significant ($r = -0.208$, P = 0.123).

Table 1. Participant characteristics

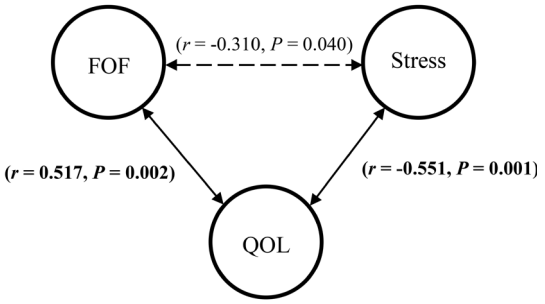
Variable	All (n = 33)	Adults (n = 18)	Older people (n = 15)
Age (years)	55.58 (±11.26)	47.78 (±2.58)	64.93 (±10.48)
Height (cm)	158.36 (±7.68)	156.83 (±6.82)	160.20 (±8.47)
Weight (kg)	60.70 (±10.78)	59.17 (±12.02)	62.53 (±9.15)
Sex			
Male	9 (27.3%)	3 (9.1%)	6 (18.2%)
Female	24 (72.7%)	15 (45.5%)	9 (27.3%)
Education			
Secondary school	8 (24.2%)	7 (21.2%)	1 (3.0%)
High school	12 (36.4%)	7 (21.2%)	5 (15.2%)
Bachelor and upper degree	13 (39.4%)	4 (12.1%)	9 (27.3%)
Occupation			
Retirement	6 (18.2%)	0	6 (18.2%)
Unemployed	7 (21.2%)	2 (6.1%)	5 (15.2%)
Employee	17 (51.5%)	16 (48.5%)	1 (3.0%)
Business owner	2 (6.1%)	0	2 (6.1%)
Farmer	1 (3.0%)	0	1 (3.0%)
Status			
Single	7 (21.2%)	6 (18.2%)	1 (3.0%)
Married	21 (63.6%)	10 (30.3%)	11 (33.3%)
Divorce	3 (9.1%)	2 (6.1%)	1 (3.0%)
Widow	2 (6.1%)	0	2 (6.1%)
Religion			
Buddhism	30 (90.9%)	18 (54.5%)	12 (36.4%)
Islam	3 (9.1%)	0	3 (9.1%)

Table 2. Medical and IADLs characteristics

Variable	All (n = 33)	Adults (n = 18)	Older people (n = 15)	*P* value
BMI (kg/m^2)	24.22 (±4.14)	24.03 (±4.52)	24.45 (±3.78)	0.775
Number of diseases	0.73 (±1.01)	0.39 (±0.61)	1.13 (±1.25)	0.048*
Vision				0.692
Clear	21 (63.6%)	12 (36.4%)	9 (27.3%)	
Unclear	12 (36.4%)	6 (18.2%)	6 (18.2%)	
Hearing				**0.092**
Clear	17 (28%)	17 (51.5%)	11 (33.3%)	
Unclear	5 (15.2%)	1 (3.0%)	4 (12.1%)	
Eyeglasses				**0.025***
Yes	15 (45.5%)	5 (15.2%)	10 (30.3%)	
No	18 (54.5%)	13 (39.4%)	5 (15.2%)	
Mobility aid				**0.047***
Yes	3 (9.1%)	0	3 (9.1%)	
No	30 (90.9%)	18 (54.5%)	12 (36.4%)	
Denture				**0.805**
Yes	9 (18.2%)	3 (9.1%)	3 (9.1%)	
No	27 (81.8%)	15 (45.5%)	12 (36.4%)	

* Significant at $P < 0.05$ of the difference between adults and older people

In QOL, the correlations between physical health, satisfaction with the environment, psychological well-being, overall health, and social relationships were high (r = 0.860, r = 0.831, r = 0.815, r = 0.649, r = 0.591, P < 0.001, respectively). Psychological well-being was also very significantly correlated with physical health, and satisfaction with the environment (r = 0.635, r = 0.593, P < 0.001, respectively). In subgroup of QOL, all variables were significantly correlated together. For example, social relationships was significantly correlated with physical health (r = 0.437, P = 0.012), and psychological well-being (r = 0.350, P = 0.049), respectively. Satisfaction with the environment was significantly correlated with physical health (r = 0.520, P = 0.002), and social relationships (r = 0.420, P = 0.017), respectively. Overall health was significantly correlated with physical health (r = 0.543, P = 0.001), satisfaction with the environment (r = 0.539, P = 0.001), and psychological well-being (r = 0.451, P = 0.010), respectively. The correlation between overall health, and social relationships (r = 0.138, P = 0.451) was not significant (Table 4).



The significance from Partial correlations with age controlled (two- tailed) in bold letters
The significance from Pearson correlation (one-tailed) in regular letters

Figure 1. Association between FOF, stress, and QOL

Table 3. Fall-related factors

Factors	All (n = 33)	Adults (n = 18)	Older people (n = 15)	*P* value
FOF	82.32 (±16.91)	83.57 (±12.33)	80.81 (±21.55)	0.648
Stress	10.12 (±7.03)	7.78 (±6.78)	12.93 (±6.44)	0.034*
Physical	26.12 (±3.98)	27.28 (±2.68)	24.73 (±4.86)	0.085
Psychological	23.45 (±2.73)	24.50 (±1.76)	22.20 (±3.19)	0.021*
Social	9.88 (±1.58)	9.89 (±1.71)	9.87 (±1.46)	0.969
Environment	27.42 (±3.08)	27.66 (±2.94)	27.27 (±3.39)	0.793
Overall health	6.97 (±1.05)	6.83 (±0.99)	7.13 (±1.13)	0.420
QOL	93.85 (±9.87)	96.06 (±6.32)	91.20 (±12.67)	0.192

* Significant at P < 0.05 of the difference between adults and older people

Table 4. Association between FOF, Stress, and QOL

	FOF	Stress	Physical	Psychological	Social	Environment	Overall health	QOL
FOF	1							
Stress	-0.123	1						
Physical	0.484* **(0.005)**	-0.395* **(0.025)**	1					
Psychological	0.226 (0.213)	-0.494* **(0.004)**	0.635* **(<0.001)**	1				
Social	0.312 (0.082)	-0.345 (0.053)	0.437* **(0.012)**	0.350* **(0.049)**	1			
Environment	0.477* **(0.006)**	-0.537* **(0.002)**	0.520* **(0.002)**	0.593* **(<0.001)**	0.420* **(0.017)**	1		
Overall Health	0.486* **(0.005)**	-0.251 (0.166)	0.543* **(0.001)**	0.451* (0.010)	0.138 **(0.451)**	0.539* **(0.001)**	1	
QOL	0.517* **(0.002)**	-0.551* **(0.001)**	0.860* **(<0.001)**	0.815* **(<0.001)**	0.591* **(<0.001)**	0.831* **(<0.001)**	0.649* **(<0.001)**	1

* Significant at P < 0.05

4. Discussion

The present study was conducted from participants in older people group than adults age group with relatively high level of education, and various types of occupations and religions. The reflection of medical factors such as the number of diseases and the use of IADLs such as eyeglasses and mobility aid was prescribed differently between age-related groups in the present study.

Older people group have high risk of falls and almost overall have lower level in QOL than adults group, especially in psychological well-being. In older people, the highest rate of stress was originated from the decrease in sexuality in later life. The highest rate of psychological well-being was originated from the frequency of dismal feelings such as loneliness, sorrow, depression, loss of hope or worry. The lowest group rates in FOF (low confidentce in ADLs) were originated from doing light household chores, walking to near places outside their homes, and bending or reaching position.

It was found in previous studies that living on one's own could promote possibility of unhealthy intake of food, more medication consumption, less physical activities, a decline in social connection as well as increased weakness (Hokby, Reimers & Laflamme, 2003, pp. 196-201). These are all associated with threatening chance of falls. Especially for women, independent fall risk factors is being single and/or living alone (Espino et al., 2000, pp. 1252-1260). It was also discovered that marital status at the moment rather than in the past was an indicator of fall danger. Women who are unmarried, divorced or widowed can be exposed to a higher chance of falls than those in marriage or cohabitation (Farahmand et al., 2000, pp. 803-808). This is because being married offers positive impacts linking to health habits (Schone & Weinick, 1998, pp. 618-627). There is possible justification of the function by mean of which fall-related factors control fitness and are then preventive factor of a negative health consequence (Peel, McClure & Hendrikz, 2007, pp. 145-151).

The characteristics of falls seem to vary across genders and ADLs. From Previous studies, it could be stated that women are more likely to fall inside their homes in the afternoon or in the evening while men have a tendency towards falling outside their residence during leisure time activities (Berg, Alessio, Mills, & Tong, 1997, pp. 261-268; Campbell et al., 1990). This may be explained by the concept that women are likely to spend a greater proportion of time indoors on household duties (Freiberger & Menz, 2006, pp. 261-267). Most falls can be linked with traceable risk factors such as frailty and shaky gait (Rubenstein, 2006, pp. ii37-ii41) as well as the difficulties in ADLs or IADLs (Choi, Hayward & Langa, 2013) which could double the risk (Bloch et al., 2010). When one is on his/her daily routines including tripping the feet, reaching or bending, falls may happen. Several activities were restricted by limits of stability (LOS) which is the maximum distance one can deliberately shift his/her gravity center, and bend his/her body in a given way not losing steadiness, stepping or grabbing. Therefore, a person's LOS skill tends to be a key necessity to effectively plan and achieve the displacement. For example, one uses a step stool to get an object placed in the upper part of the cupboard or bends over to reach an item on the floor (Melzer, Benjuya, Kaplanski & Alexander, 2009, pp. 119-123). In terms of consequences, falls are perceived to be one of the major causes of unintentional injuries and mortality which affect the quality of life in older age. Previous studies indicated that a more effective indicator of life fulfillment for adults and older people is coping resource capability. The present study discovered meaningful difference levels of life satisfaction across different ages. Also, perceived stress, and coping resources were identified. From the evaluation of perceived stress and coping, life fulfillment in all ages, especially in older people, has relationship with such factors (Hamarat, 2001, pp. 181-196). Health services use is also constantly linked with the concurrence of high level of life tension and less social assistance (Counte & Glandon, 1991, pp. 348-361).

Previous studies have linked length of time living in residence and unification with the community with health consequences. For those having lived at their present location longer, a study's findings indicated that they would feel more at home to their environments, which then has connection with finer physical and psychological state (Young, Russell & Powers, 2004, pp. 2627-2637). Also, chance of falling is reduced when one is familiar with the surroundings (Carter, Campbell, Sanson-Fisher, Redman & Gillespie, 1997, pp. 195-202) as fall-related factors have been in association with a number of environmental threats (Lee, Lee & Rodiek, 2017, p. 163). The increasing hazards in the rural area might generate from inappropriate residential environment, unhealthy diet and health condition that is at risk (Jitapunkul et al., 1998, pp. 233-242). Social status in lower level might too result in improper household surroundings and might also be in connection with other health concerns such as vision problems or other kinds of impairment that are not treated. Such circumstance is related to tension and falls (Tripathy, Jagnoor, Patro, Dhillon & Kumar, 2015, pp. 1801-1805).

The advantages of the present research are the application of standardized questionnaire measures of FOF, stress, and QOL, with a high response rate and less number of missing data. However, there were some limitations to study such as the use of questionnaire which could have resulted in recall bias when participants were asked to retrieve past events. The relatively small sample size in the present study was subjected to time and a specific geographical location which was the central region of Thailand. Thus, the result cannot be used to quantitatively identify representatives of population in such part of Thailand and also should be interpreted with caution. To corroborate the clinical interpretation of results, further study should be more accurate in the measurement or test to define specific diseases and disabilities of participants e.g., the number of diseases as well as visual and hearing acuity.

5. Conclusion

The main result obtained from the present study was that decreasing FOF and/or stress could give its key contribution to improving QOL not only in adults but also in older people. Creating valid and useful design plans and practices in order to improve the built environment to prevent fall-related and stress factors could be a challenge. By utilizing these tools, the present study offers preliminary evidence for one to take care of his/her own health and to better manage the restrictions and problems associated with ADLs or IADLs. Forming the understanding of falls, what can increase chance of falls and what can be done as a precaution in terms of fall-related factors will bring more possible opportunities to reduce the incidence, minimize chance of consequent injuries, improve the overall well-being of adults and older people as well as possibly give inspiration on improving the QOL.

6. Conflicts of interest

None to declare.

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References

Berg, W. P., Alessio, H. M., Mills, E. M., & Tong, C. (1997). Circumstances and consequences of falls in independent community-dwelling older adults. *Age Ageing, 26*(4), 261-268.

Bloch, F., Thibaud, M., Dugué, B., Brèque, C., Rigaud, A. S., & Kemoun, G. (2010). Episodes of falling among elderly people: a systematic review and meta-analysis of social and demographic pre-disposing characteristics. *Clinics, 65*(9), 895-903. DOI: 10.1590/S1807-59322010000900013.

Campbell, A. J., Borrie, M. J., Spears, G. F., Jackson, S. L., Brown, J. S., & Fitzgerald, J. L. (1990). Circumstances and consequences of falls experienced by a community population 70 years and over during a prospective study. *Age Ageing, 19*(2), 136-141.

Carter, S. E., Campbell, E. M., Sanson-Fisher, R. W., Redman, S., & Gillespie, W. J. (1997). Environmental hazards in the homes of older people. *Age and Ageing, 26*(3), 195-202. DOI: 10.1093/ageing/26.3.195.

Choi, H., Hayward, R. A., & Langa, K. M. (2013). Fall associated difficulty with Activities of Daily Living (ADL) in functionally independent older adults aged 65 to 69 in the United States: A cohort study. *Journal of the American Geriatrics Society, 61*(1), 96-100. DOI: 10.1111/jgs.12071.

Counte, M. A., & Glandon, G. L. (1991). A panel study of life stress, social support, and the health services utilization of older persons. *Med Care, 29*(4), 348-361.

Dionyssiotis, Y. (2012). Analyzing the problem of falls among older people. *International Journal of General Medicine, 5*, 805-813. DOI: 10.2147/IJGM.S32651.

Espino, D. V., Palmer, R. F., Miles, T. P., Mouton, C. P., Wood, R. C., Bayne, N. S., & Markides, K. P. (2000). Prevalence, incidence, and risk factors associated with hip fractures in community-dwelling older Mexican Americans: results of the Hispanic EPESE study. Establish Population for the Epidemiologic Study for the Elderly. *J Am Geriatr Soc, 48*(10), 1252-1260.

Farahmand, B. Y., Persson, P. G., Michaelsson, K., Baron, J. A., Parker, M. G., & Ljunghall, S. (2000). Socioeconomic status, marital status and hip fracture risk: a population-based case-control study. *Osteoporos Int, 11*(9), 803-808.

Freiberger, E., & Menz, H. B. (2006). Characteristics of falls in physically active community-dwelling older people: findings from the "Standfest im Alter" study. *Zeitschrift für Gerontologie und Geriatrie, 39*(4), 261-267. DOI: 10.1007/s00391-006-0394-2.

Gonyea, J. G., & Burnes, K. (2013). Aging well at home: Evaluation of a neighborhood-based pilot project to "Put connection back into community". *Journal of Housing For the Elderly, 27*(4), 333-347. DOI: 10.1080/02763893.2013.813425.

Hamarat, D. T. K. M. Z. D. S. K. B. M. F. A. E. (2001). Perceived stress and coping resource availability as predictors of life satisfaction in young, middle-aged, and older adults. *Experimental Aging Research, 27*(2), 181-196. DOI: 10.1080/036107301750074051.

Hartholt, K. A., van Beeck, E. F., Polinder, S., van der Velde, N., van Lieshout, E. M. M., Panneman, M. J. M., . . . Patka, P. (2011). Societal consequences of falls in the older population: Injuries, healthcare costs, and long-term reduced quality of life. *Journal of Trauma and Acute Care Surgery, 71*(3), 748-753. DOI: 10.1097/TA.0b013e3181f6f5e5.

Hokby, A., Reimers, A., & Laflamme, L. (2003). Hip fractures among older people: do marital status and type of residence matter? *Public Health, 117*(3), 196-201. DOI: 10.1016/s0033-3506(03)00033-7.

Jitapunkul, S., Songkhla, M. N., Chayovan, N., Chirawatkul, A., Choprapawon, C., Kachondham, Y., & Buasai, S. (1998). Falls and their associated factors: a national survey of the Thai elderly. *J Med Assoc Thai, 81*(4), 233-242.

Lee, S., Lee, C., & Rodiek, S. (2017). Neighborhood factors and fall-related injuries among older adults seen by emergency medical service providers. *International Journal of Environmental Research and Public Health, 14*(2), 163.

Li, F., Fisher, K. J., Harmer, P., McAuley, E., & Wilson, N. L. (2003). Fear of falling in elderly persons: Association with falls, functional ability, and quality of life. *J Gerontol B Psychol Sci Soc Sci, 58*(5), P283-290.

Melzer, I., Benjuya, N., Kaplanski, J., & Alexander, N. (2009). Association between ankle muscle strength and limit of stability in older adults. *Age and Ageing, 38*(1), 119-123. doi: 10.1093/ageing/afn249.

Organization, W. H. (2017). *Proposed working definition of an older person in Africa for the MDS Projec*t. Reterived from http://www.who.int/healthinfo/survey/ageingdefnolder/en/.

Peel, N. M., McClure, R. J., & Hendrikz, J. K. (2007). Psychosocial factors associated with fall-related hip fractures. *Age and Ageing, 3*6(2), 145-151. DOI: 10.1093/ageing/afl167.

Rogers, M. E., Rogers, N. L., Takeshima, N., & Islam, M. M. (2004). Reducing the risk for falls in the homes of older adults. *Journal of Housing For the Elderly, 18*(2), 29-39. DOI: 10.1300/J081v18n02_04.

Romyanond, B. (2012). The detached house and design modification guidelines for adaptable housing for elderly people. *Journal of Architectural/Planning Research and Studies, 9*(2), 123-137.

Rubenstein, L. Z. (2006). Falls in older people: epidemiology, risk factors and strategies for prevention. *Age and Ageing, 35*(suppl 2), ii37-ii41. DOI: 10.1093/ageing/afl084.

Schone, B. S., & Weinick, R. M. (1998). Health-related behaviors and the benefits of marriage for elderly persons. *Gerontologist, 38*(5), 618-627.

Swanenburg, J., de Bruin, E. D., Uebelhart, D., & Mulder, T. (2010). Falls prediction in elderly people: A 1-year prospective study. *Gait Posture, 31*(3), 317-321. DOI: 10.1016/j.gaitpost.2009.11.013.

Thane, P. (1978). Muddled history of retiring at 60 and 65. *New Society, 45*(826), 234-236.

Tinetti, M. E., Speechley, M., & Ginter, S. F. (1988). Risk factors for falls among elderly persons living in the community. *N Engl J Med, 319*(26), 1701-1707. DOI: 10.1056/nejm198812293192604.

Tripathy, N. K., Jagnoor, J., Patro, B. K., Dhillon, M. S., & Kumar, R. (2015). Epidemiology of falls among older adults: A cross sectional study from Chandigarh, India. *Injury, 46*(9), 1801-1805. DOI: 10.1016/j.injury. 2015.04.037.

Young, A. F., Russell, A., & Powers, J. R. (2004). The sense of belonging to a neighbourhood: can it be measured and is it related to health and well being in older women? *Soc Sci Med, 59*(12), 2627-2637. DOI: 10.1016/j. socscimed.2004.05.001.