NURSING PERSPECTIVES ON FALL RELATED CONCERN IN COMMUNITY DWELLING OLDER ADULTS – PSYCHOMETRIC STUDY OF THE FES-INTERNATIONAL
PROBLEMATIKA STRACHU Z PÁDU U SENIOROV V KOMUNITE Z PERSPEKTÍVY OŠETROVATEĽSTVA – PSYCHOMETRICKÉ VLASTNOSTI THE FALL EFFICACY SCALE – INTERNATIONAL

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ABSTRACT
Background: Fear of falling is prevalent mainly among older adults and associated with adverse health outcomes. In nursing, is one of the aetiologies of the risk of falling, risk for frailty and frailty nursing diagnoses. In the context of clinical practice, nurses must systematically assess fear of falling. The FES-International, an instrument developed to measure concern about falls, has not been tested in Czech active, community dwelling older adults.
Objective: The aim of this study was to evaluate selected psychometric properties of Czech version of the FES-International. Sample and methodology: A psychometric study. Convenience sample of 281 community dwelling, active older adults living in north-eastern region of Czech Republic. A two-part instrument was used (sociodemographic, health profile, fall history and the FES-CZ. Construct validity (factorial analysis), known group validity and the reliability were evaluated. Previous authorization was obtained from the Ethic Committee and from older adults involved in a study.
Results: Czech version of the FES -I (translated by Reguli, Svobodová, 2011) had excellent internal consistency (0,93). Factor analysis revealed two relevant factors related to FOF in more demanding physical activities, and less demanding social and physical activities which explained variance of 65.2%. A significantly higher score of fall related concern was associated with higher age, adverse health, and fall history. Females did not score significantly higher than men, with exception of women without fall history, they scored significantly higher than their male counterparts.
Conclusion: The validity and reliability study of the Czech version of the FES-International revealed that this scale is an adequate tool for evaluation of fear of falling in community dwelling older adults.

Key words: Community dwelling older adults. Fall related concern. Nursing Psychometric properties. The FES – International

ABSTRAKT
Východiská: Strach z pádu je problém, ktorý sa vyskytuje vo vyššej miere práve u seniorov, často v dôsledku zhoršeného zdravia. V ošetrovateľstve je zároveň rizikovým či etiologickým faktorom ošetrovateľských diagnóz riziko syndrómu krehkosti a syndrómu krehkosti v séniu. V kontexte klinickej praxe by mal byť strach z pádu sestrou identifikovaný. Škála, The Fall Efficacy Scale – International (FES-I), ktorá bola vytvorená za účelom objektivizácie obavy z pádu, nebola doteraz validovaná v českej populácii aktívnych seniorov žijúcich v komunite, v svojich domácnostiach.
Cieľ: Cieľom štúdie bolo vyhodnotiť vybrané psychometrické vlastnosti českej verzie škály FES-I.
Súbor: Dostupným a zámerným výberom bolo oslovených 281 seniorov žijúcich na severovýchode Českej republiky, ktorí boli aktívni v čase realizácie štúdie v kluboch dôchodcov. Výskumný zámer bol schválený Etickou komisiou a tiež súhlasným stanoviskom (podpisom informovaného súhlasu) každého zo zúčastnených respondentov.
Metóda: Testovacia batéria obsahovala položky vlastnej konštrukcie, zamerané na zistenie sociodemografických položiek, zdravotného stavu a pádovej anamnézy. Druhú časť batérie tvoril štandardizovaný nástroj FES-I, v českej jazykovej mutácii. V rámci analýzy psychometrických vlastností dotazníka boli zisťované: konštruktová validita (metódou faktorovej analýzy), validita známych skupín a reliabilita (vnútorná konzistencia) nástroja.
Výsledky: Česká jazyková mutácia (v preklade Reguli a Svobodová, 2011) dosahuje excelentné hodnoty vnútornej konzistencie (0,93). Faktorová analýza odhalila dva relevantné faktory obáv z pádu u seniorov: fyzicky náročnejšie aktivity, zvyčajne realizované vo vonkajšom prostredí a menej náročné aktivity (realizované v interiéri alebo majúce charakter sociálnej aktivity a participácie), ktoré spolu vysvetlili 65,2% variability. Signifikantne vyššiu mieru obáv z pádu mali seniori starší, s horším zdravotným stavom a pozitívnou pádovou anamnézou. Ženy dosahovali v miere prežívania obáv z pádu vyššie celkové priemerné skóre ako muži, no rozdiel dosiahol štatistickú významnosť iba v skupine bez predošlého pádu.
Záver: Psychometrické vlastnosti českej jazykovej mutácie FES-I poukázali, na to, že ide o spoľahlivú a validnú škálu na objektivizáciu strachu z pádu v komunite aktívnych seniorov.

Kľúčové slová: Medzinárodná škála účinnosti spojenej s pádom. Ošetrovateľstvo. Psychometrické vlastnosti. Seniori v komunite. Strach z pádu

INTRODUCTION
World population projection on aging points out, that the number of people over the age of 60 will

double by the year 2050. A steady increase in people´s longevity is associated with health risks of elderly population and falls are highlighted among them (WHO, 2015). These changes challenge nursing, especially in the sense of health promotion and implementing preventive nursing care. Among the many risk factors for falls in the elderly population, fear of falling (FOF) has called attention, both in nursing research and practice. Nowadays, FOF is used as a synonym for the full range of psychological consequences of falling. These consequences form a relatively heterogeneous group, which is collectively referred to as Fall Related Psychological Concerns (FRC). They are fear of falling (FOF), fall related efficacy (FE − *Fall Efficacy*), or reduced self-confidence to maintain balance (BC − *Ballance Confidence*) (Huges et al., 2015; Payette et al., 2016). FOF is defined as lasting concern about falling that leads to an individual avoiding activities that one remains capable of performing (Huges et al., 2015).

FOF is one of the aetiologies of nursing diagnoses of *frailty syndrome* (00257) and *risk for frailty syndrome* (00231) (Herdman et al., 2021), being related determinant factor especially in the elderly (Vitorino et al., 2019). Frailty is defined as „*dynamic state of unstable equilibrium that affects the older adults who undergoes deterioration in one or more health domains and leads to increased susceptibility to adverse health effect, in particular disability* ". Nursing diagnoses *"fall risk* (00155), which is defined as „increased susceptibility to falls that can cause physical damage and compromise health" is missing FOF on list of risk factor (Herdman et al., 2021). Despite of it, is apparent, that they both - risk for fall and FOF shares many factors which are highly corelated as fall history, higher age, decreased health status, perception, and cognitive impairment (El Fakiri et al., 2018; Pena et al., 2019).

FOF on the elderly person can trigger activity restriction, limit physical capacity, and cause social isolation, which has significant impact on older people independence and life´s quality (Malini et al., 2016). Despite of this is not common practice for nurses and other health care professionals to assess FOF and it remains unnoticeable. From this point the assessment of FOF is a key element of preventive nursing practice (Marques-Vieira, 2021).

FOF as well as other phenomena of subjective character are not easy „visible or measurable ". It means that it should be assessed actively by health care professionals, using valid and reliable tools. One of those scales, aimed to assess fall related concern in older adults, living in community is The Fall Efficacy Scale – International (FES-I) by Yardley et al. (2005). It has been shown that the FES-I has excellent reliability and validity across different cultures and languages and has become a widely accepted tool for assessing FOF. This scale operationalizes the fear of falling as a level of concern related to fall in performing a range of activities of daily living. To date, there has been one study conducted to evaluate psychometric properties of the Czech version of the FES-I (FES-CZ) in patients with early stage of dementia (Kisvetrová et al., 2019) Therefore, the purposes of this study were to describe the: a) known group validity by testing differences between two or more groups with expected differences; b) internal consistency and factor structure of FES- CZ in active, community dwelling older adults in north-eastern region of Czech Republic.

MATERIAL AND METHODS

The study is designed as a cross-sectional quantitative study with the use of FES-CZ. Czech version of standardized scale FES-I by Yardley et al. (2005) was translated to Czech by Reguli, Svobodová (2011). It represents a specific instrument to measure FE in the population over the age of 65 (Yardley et al., 2005), which is operationalized as a measure of concern of falling in individual ADL´s. The scale consists of 16 items − activities of daily living, which the elderly evaluates on a four-point Likert scale (from 1 "I'm not afraid at all" − to 4 "I'm very worried"). The overall score (TS FES-I) can reach values from 16 to 64 points (min-max), with a higher score indicating a higher rate of FOF. Delbaere et al. (2010) established cut-points for low, moderate, and high concern about falling on the FES-I scores. Scores > 23 for the 16-item scale indicated high concern about falling, exactly low concern (16 − 19 points), moderate concern (20 − 27 points) and high concern (28 − 64 points).

Approval for the study was obtained from the ethics committee of the Faculty of Education, Palacký University Olomouc, the Czech Republic (no. 2/2018). The participants for our research were recruited from the senior centres from/in Hradec Králové, Olomouc and Ostrava. The selection of respondents was intentional, with the main selection criteria being the age 65 and over, living in one's home/community and mobility without the use of

compensatory aids. The data was collected in 2019 – 2020 by printed questionnaires, with the assistance of trained undergraduate students at Palacký University Olomouc. The return rate of the questionnaires was 100 %, which we attribute to the assisted data collection. Informed consent was sought from participants prior to their participation in the study.

Empirical data were processed in the statistical programme SPSS version 23 and STATISTICA. For statistical analysis of the data, we used description the summation of points (so called total score) and average values ($\overline{x}$) calculated from the respondents' answers, and the standard deviation ($\pm$). Known group validity measures an instrument's ability to distinguish among distinct groups. Group differences in the FOF rate were determined using a nonparametric Mann-Whitney U-Test and two pairs t test with Welch correction in the groups, as well as Kruskal Wallis test and Dunn´s post-test of individual pairs. Values with $p < 0.05$ and < 0.001 were consider statistically significant. Relations between variables were calculated using Pearson´s corelation. The internal structure of the FES-CZ was examined by factorial analysis (Principal Component Analysis PCA) with Varimax rotation. The extracted factors obtained by factor analysis can be considered reliable, relevant, and constant if the ratio of the number of respondents to the number of variables is at least 7 to 10. That means that the number of respondents is seven to ten times greater than the number of items on the scale. From this perspective, the criterium for adequate sample size is met (N = 281). Internal reliability of the FES-CZ was evaluated by calculating the Cronbach´s alpha coefficient for the whole scale and by examining Pearson's correlation between items and total score. A minimum value of 0.75 was adopted, considered as acceptable internal consistency and more than 0.3 in the item – total correlation (*Cronbach's alpha. Statistical…*)

RESULTS

Characteristics of the sample

The sample consisted in 281 older adults who met the eligibility criteria. The mean age of the sample was 74.12 years ($\pm$ 6.19 years) and 67.9 % were female. 40.9% presented a previous history of fall in last year, of which 34,7 % fell more than once. Characteristics of the sample, namely age, gender, health condition and fall history are listed in the table 1.

Reliability and construct validity

Internal reliability/consistency of the FES-CZ was 0.93. All items contributed positively to the reliability of the scale with the values above 0,3 for item – total correlation, respectively from 0,55 – 0,82. Although the full range of responses was used for every item, there was a skew toward low level of concern on half the item, particularly those from original FES by Tinetti (1990) (median values, Table 2) The evaluation of the internal structure of FES-CZ was carried out by Principal Component analysis. Factor loadings correspond to the correlation between each one of the sixteen items and each factor, being generally referred to as loadings of the factors. Each question presented a factor load, presented in Table 2. In this study, we considered significant the factorial loads above 0.5. This way, it is possible to associate the items 4, 7, 9, 10, 11, 13, 14 and 15 to the Factor 1 and items 1, 2, 3, 5, 6, 8, 12, and 16 to the Factor 2. The percentage of variance explained by the Factor 1 was 51 % and by Factor 2, 9.5 %, which amounts to a total of 65.2% (Tab. 2)

Known group validity

Comparison of between group differences in scale-total scores revealed differences for selected demographics, self-reported health condition and fall history variables (Tab. 3).

Table 1 Characteristics of participants

Gender	Men	Women	Total
	90	191	281
Age/ years (mean ± SD)	74.12 ± 6.19		
Health condition	Subjectively healthy/ feel healthy	1 – 2 chronic health conditions	Comorbid (3 or more chronic health conditions)
	67	173	41
Fall history (in last 12 months)	No falls	1 fall	2 or more falls
	166	75	40

Table 2 Internal consistency and factor analysis of the FES- CZ and FES-I (Yardley et al, 2005)

FES-I items[*]	FES-CZ		FES-I[**]	Two factor solution FES-CZ		Two factor solution FES-I[**]	
	$\bar{x}$ SD	M	$\bar{x}$ SD	Loading F1	Loading F2	Loading F1	Loading F2
1. Cleaning the house	1.33 ± 0.67	1	1.67 ± 0.96	0.36	**0.62**	0.41	**0.68**
2. Getting dressed/undressed	1.20 ± 0.51	1	1.50 ± 0.81	0.41	**0.56**	0.20	**0.81**
3. Preparing simple meals	1.08 ± 0.35	1	1.32 ± 0.71	0.06	**0.84**	0.14	**0.83**
4. Taking a bath or shower	1.46 ± 0.71	1	2.09 ± 1.09	**0.60**	0.33	0.55	**0.56**
5. Going to the shop	1.27 ± 0.60	1	1.83 ± 1.06	0.42	**0.64**	0.55	**0.66**
6. Getting in or out of a chair	1.38 ± 0.69	1	1.49 ± 0.79	0.53	**0.55**	0.24	**0.75**
7. Going up or down stairs	1.85 ± 0.88	2	2.06 ± 1.08	**0.78**	0.33	0.55	**0.61**
8.Walking around outside	1.26 ± 0.60	1	1.99 ± 1.07	0.45	**0.57**	**0.66**	0.57
9. Reaching up or bending down	1.80 ± 0.86	2	2.14 ± 1.11	**0.76**	0.32	**0.62**	0.51
10. Answering the telephone	1.41 ± 0.70	1	1.64 ± 0.96	**0.61**	0.38	0.39	**0.70**
11.Walking on a slippery surface	2.56 ± 0.94	2	3.06 ± 1.00	**0.84**	0.08	**0.84**	0.12
12.Visiting a friend/relative	1.19 ± 0.51	1	1.62 ± 0.95	0.26	**0.68**	0.45	**0.69**
13. Going to a place with crowds	1.67 ± 0.87	1	2.13 ± 1.17	**0.63**	0.46	**0.68**	0.50
14.Walking on an uneven surface	2.15 ± 0.93	2	2.73 ± 1.07	**0.83**	0.21	**0.88**	0.22
15.Walking up or down a slope	2.10 ± 0.94	2	2.46 ± 1.16	**0.79**	0.25	**0.79**	0.37
16. Going out to a social event	1.22 ± 0.55	1	1.85 ± 1.06	0.16	**0.79**	0.55	**0.61**

Legend: varimax normalised; > 0,50 marked in bold; $\bar{x}$ – arithmetic mean, *SD*– standard deviation, M – median; *Items are abbreviated; full wording of the scale is available from https://sites.manchester.ac.uk/fes-i/ ; ** source of the data Yardley et al, 2005

Table 3 Group differences in FOF

Variable		participants	FES-CZ TS score ± SD	M	P value	P value
Demographic characteristics		-	-	-		
Age (65 - 98), years		-	-	-	p^t 0,001	P^{mw} 0,002
≤75		182	23.8±7.3	22		
>75		99	27.0±9.3	24		
Gender					p^t 0.54	P^{mw}
Male		90	24.5±8.5	22		
Female		191	25.1±8.1	23		0.18
Health condition	code	-	-	-	p^{kw} 0,001	P^D
						A/B/C
Subjectively healthy	A	67	22.8±6.5	19		-/***/***
< 2 chronic conditions	B	173	25.6±8.4	23		***/-/ns
> 3 chronic conditions	C	41	27.3±8.6	25		***/ns/-
Fall history in last year		-	-	-	p^{kw} 0,001	P^D
						A/B/C
No fall	A	166	22.8±6.7	21		-/*/***
One fall	B	75	25.3±7.5	23		*/-/***
Two or more falls	C	40	33.0±10.0	33		***/***/-

Legend: p – probability value, M- Median, SD – Standard Deviation, p^t two sample t-test with Welch correction; p^{mw} Mann-Whitney test; p^{kw} - Kruskal-Wallis test and Dunn´s post-test of individual pairs;: * - p<0,05; *** - p<0,01

The FES – CZ scores and medians were significantly higher in participants with decreased health status and those with fall history. Also, the differences in medians and arithmetic means of The FES – CZ score between older (> 75 years) and younger participants (≤ 75 years) were extremely significant. There were no significant differences between man and women generally, but women without fall history scored significantly higher than their male counterparts (20.84 ± 7.37 vs. 23.55 ± 6.35; p < 0.01).

DISCUSSION

The FES- International by Yardley et al. (2005)

has already been translated into 35 languages, having transcultural equivalence following a standard translation protocol. Cross-cultural adaptation and translation is a systematic process that prepares questionnaires and scales for use in another setting (Baeton et al, 2020). As Gurková (2019) stated: *"The adaptation of a research instrument does not only mean translation, but also the steps that follow, because when we adapt a research instrument, we assume that we work with it as with a newly designed instrument. In addition to translation and adjustments it is necessary to verify its validity and reliability".* The purpose of this study was to verify known group validity, internal consistency, and structure of the FES-CZ in active community dwelling older adults. The mean total and individual item scores of FES-CZ are lower than those of the original validation sample (Yardley et al., 2005). Responses were skewed toward low concern, except for the three items (11; 14; 15) as opposed to original FES-I study (4; 7; 9; 11; 13; 14; 15) indicating the risk of floor effect in the current study. Mean FES-(CZ) total score was comparable to those found in other FES-I validation studies with community-dwelling older adults (Yardley et al., 2005; Kempen et al., 2007; Camargos et al., 2010; Billis et al., 2011). The items with the highest mean score in the FES-I: walking on a slippery surface (item 11), walking on an uneven surface (item 14) and going up or down stairs (item 7) are consistent with the original (Yardley, et al., 2005) and other translations (Nordell et al., 2009; Ruggiero et al., 2009; Kwan et al., 2013). Our results demonstrates that The FES-CZ in active community dwelling older adults have excellent internal consistency (Cronbach α – 0.93), comparable to the original version 0.96 (Yardley et al., 2005) as well as other language mutations f. e. German 0.90, Dutch 0.96 (Kempen et al., 2007), Sweden 0.95 (Nordell et al, 2009) Italian 0.97 (Rugierro et al., 2009), Greek 0.92 (Billis et al., 2011), Brazilian 0.93 (Camargos et al., 2010), Chinese and Turkish 0.94 (Kwan et al., 2013; Ulus et al., 2013. The internal consistency of the same scale (FES-CZ) was even higher in patients with mild dementia (0.96) in Czech Republic (Kisvetrová et al., 2019). The factor analysis, which was performed using the same technique as in the original validation of FES-I (Yardley, 2005), discriminate two-factor structure. In our study Factor 1 explained 51 % of the variance and was dominated by items assessing concern about more demanding physical activities mostly

outside the home. Factor 2 explained 9.5 % of the variance and contain items associated to "concerns of the elderly person regarding less demanding activities, we can say basic activities of daily living inside of the home and social activities. Identified factors demonstrate similar factor loadings as original scale in the four items loaded on to different factors. In bifactorial solution, some differences were found in different language versions of FES-I, in which some items have been placed on different places. Factor "concerns of the older person regarding more complex and physically demanding activities" including in our study items 4; 7; 9; 10; 11; 13; 14; 15; in the FES-I original (Yardley, 2005) of items 8; 9; 11; 13; 14 and 15; in the Swedish version (Nordell et al., 2009) of items 7; 11; 14; 15; in Chinese version (Kwan et al., 2013) items 7; 11; 13; 14; 15 and items 7; 9; 11; 13; 14 and 15 in Portuguese Brazilian version (Camargos et al., 2010). Three items listed under domain of outdoor, more demanding activities, which have ambulation on a difficult/dangerous surface in common were the same across cultures (11: walking on a slippery surface;14: walking on uneven surface; and 15: walking up or down a slope).

Comparisons of between group differences in FES-(CZ) scale total scores revealed group differences for selected variables as age, gender, health condition and fall history in last 12 months. Participants older than 76 years of age demonstrates significantly higher fall related concern than younger seniors (≤ 75 years) in current study. These findings are consistent with prior studies as it was previously shown that older people had higher scores in FES-I compared to younger participants (Kempen et al., 2007; Delbaere et al., 2010; Ulus et al., 2012, Figueiredo et al., 2017). The FES-CZ scores and medians were significantly higher in participants with decreased health status and those with fall history. In regard to health characteristics, which were widely operationalize such as decreased health (Margues- Viera et al, 2018), medical comorbidities (Ulus et al, 2012), presence of dizziness (Kwan et al., 2013), the number of current medications (Margues Viera et al, 2018), functional impairment and use of walking aids (Ulus et al., 2012), reduced balance and mobility (Margues Viera et al, 2018), hearing and sight impairment (Malini et al., 2016;Vitorino et al., 2019; Ehrlich et al, 2019) and health related quality of life (Bjerk et al., 2018), the convergent validity of FES-I was confirmed. The

previous study showed that FES-I total scores were higher in participants with a fall history (Kempen et al., 2007; Delbaere et al., 2010; Billis et al., 2011; Vliet et al., 2013; Kwan, 2013, Figueiredo et al. 2017). It was also found that total score of the FES-I was the most relevant variable to predict future falls (Camargos et al., 2010) In contrast, the Turkish version of the FES-I total score was not associated with a history of falls (Ulus et al., 2012). We did not obtain confirmation regarding female gender and FOF level as it was in other studies (Delbaere et al., 2010; Ulus et al., 2012; Kwan et al., 2013, Halaweh et al., 2015, Figueiredo et al., 2017). Women otherwise scored higher than men in current study, but not significantly. Concerning these results, we must highlight, that women present significantly higher level of FOF than their male counterparts, but in a group without previous fall only. However, female did not always achieve significantly higher level of FOF, as in the Greek study, where the men score higher than women. Variations in scores can be explained by the various characteristics of a samples (i.e., 59 % of elderly has no fall history in last year in current study vs. 46,6 % of respondents in validation sample in UK), environmental differences, cultural perception of falls and different levels of social inclusion (Kempen et al., 2007; Helbostad et al, 2010; Kwan et al., 2013; Kisvetrová et al, 2019)

Some limitations of the study need to be acknowledged. The participants were selected as a convenience sample of community-based and relatively health elderly who were active in senior centres. Further investigation with larger population, including community-dwelling older adults with variety of health conditions and using a representative stratified sample would be helpful to provide normative data. The retrospective assessment of fall history was also a limitation of this study given the possibility of recall bias. At least, is necessary to acknowledge the certain number of references used in the study published before 2015. The FES – International (Yardley et al., 2005) was developed in 2005 and a bulk of studies referred to translation and adaptation process were carried out between 2005 – 2013 (Margues-Vieira et al., 2016)

CONCLUSION

Findings of the FES-CZ suggest that the Czech version of the FES-I had excellent reliability and validity properties, and it can be used as an important instrument of assessment of FOF in both research and clinical/community practice. Standardized tool can contribute to more accurate nursing diagnoses and consequently clinical reasoning for individualized nursing care. Such a positive findings about psychometric properties of the FES-CZ scale also prefigure the similar qualities for Short FES-I scale (which is derived from FES-I and consist only seven items). The short version of FES – I can increase professional adherence to the application of the scale and consequently the introduction of measures, which prevent FOF from becoming an aetiological factor of other conditions such as frailty, immobility, dependence, institutionalization, and deterioration in quality of life of elderly.

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