Validity and Reliability of 11-face Faces Pain Scale in the Iranian Elderly Community with Chronic Pain

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Abstract

Background: Accurate pain assessment in elderly population is essential for pain management and nurses have a pivotal role. The 11-face Faces Pain Scale (FPS-11) is a well-established pain assessment measure that has not been validated in the Iranian elderly. **Aim:** The aim was to study the property assessment of the Iranian version of FPS-11 (FPS-11-IR) among elderly outpatients with chronic pain. **Methods:** This is a cross-sectional validation study that conducted in three outpatient clinics in Tehran, Iran, in 2017. Older people aged ≥60 years ($n = 217$) with chronic knee pain due to degenerative joint disease were participated. The construct validity was examined by applying contrast constructs, and the face validity was determined by rank-ordering test. To assess concurrent validity, the Spearman's correlation coefficient was calculated between the scores of 11-point Numeric Rating Scale (NRS) and FPS-11-IR. Test–retest reliability was determined in 1-week interval. **Results:** Most of elderly participants (72%) agreed that pain construct displays in faces of the FPS-11-IR and participants'' agreement on face rank ordering were vary for each face, ranging from 80% to 100%. Spearman's correlation coefficient between FPS-11-IR and NRS scores was very strong ($r = 0.91$, $P < 0.01$). Intraclass correlation coefficient between test–retest scores was 0.96 that indicates excellent reliability. **Conclusions:** The FPS-11-IR is a reliable and valid pain assessment scale to use in geriatric patients chronic pain.

Keywords: Aged, Faces Pain Scale, pain measurement, validity

INTRODUCTION

Increasing elderly population is inevitable,[1] and one in eight people was aged 60 + years in 2015 worldwide.[2] Pain is one of the most common symptoms in older patients receiving palliative care with the prevalence of >66%.[3] Symptom control is crucial in palliative care to improve quality of life.[3,4] Therefore, adequate pain management is important in palliative care.[5]

Pain management begins with an accurate pain assessment,[6] and nurses have a pivotal role in pain management.[7] Pain treatment is not simple, especially in older adults with complex health problems.[6,8] Nontreatments due to inaccurate pain assessment might lead to additional problems for patients and health systems.[9] Whereas pain is known as a subjective experience,[10] Self-reporting is considered as a gold standard method for pain assessment.[9] One of the most frequently used pain assessment scales, in clinics and research, is Faces Pain Scale (FPS) that is applied to measure pain intensity initially

in children.[11] Furthermore, some studies approved the validity of FPS for pain assessment in elderly population.[12-15]

Since talking ability is not necessary to complete the FPS,[16] the FPS was considered useful in older adults with mild and moderate cognitive impairments.[17] FPS is simple and desirable to use in both cognitively intact and impaired elderly participants.[15,18] Although there are different versions of FPS,[13,19-21] in this study, 11-face FPS (FPS-11) was used. After universal recommendations for the use of 0–10 Numeric Rating Scale (NRS),[13,22] NRS was known as a gold standard by the American Pain Society.[23] Since eleven faces in the FPS-11

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are comparable with the 0–10 in NRS, without mathematical adaptations,[13] we used FPS-11 to validate among the Iranian elderly with chronic knee pain. FPS-11 was used in the Korean elderly who had different sociodemographic background.[13]

An applied tool that used in a different population with a different language should pass the adaptation process. This process is beyond translating that included evaluating of psychometric properties, based on the study population.[11] Considering the cultural differences in the Persian language elderly, the pain assessment scales should confirm through the adaptation process. Studies on pain scale validity in the Iranian elderly are limited, and there is only one validation study on brief pain inventory in the Iranian elderly with cancer pain.[24] There is no evidence for psychometric properties of FPS-11 among the Persian language elderly. The aim was to study the psychometric properties' evaluation of FPS-11 in terms of construct and concurrent validities and test–retest reliability in Iranian elderly outpatients with chronic knee pain.

METHODS

Setting and participants
In this cross-sectional validation, study participants were selected through convenience sampling between participants aged 60+ years with chronic knee pain due to degenerative joint disease (DJD) who were attended in three outpatient clinics. The sample size was calculated by Hulley's formula ($\alpha = 0.001$ and $\beta = 0.10$). Farsi language and ability to communicate were the inclusion criteria. Older patients who had cognitive impairment measured by Mini-Mental State Examination (MMSE $\leq$23 score),[25,26] visual impairment (visual acuity <2), and hearing impairment (positive whisper test) were excluded from the study.[27] Finally, 217 eligible elderly participants who agreed to contribute were signed or fingerprinted the informed consent form.

Data collection
Qualified elderly participants through medical records received appropriate explanations about the aim of this study to express assent. The MMSE applied to determine the presence of cognitive impairments. NRS as a gold standard pain assessment was measured, by pointing the most appropriate number that shows the level of current knee pain in the elderly.[13] Then, the Iranian version of FPS-11 (FPS-11-IR) was presented to elderly participants and asked them to rate their current knee pain by explaining that the first face demonstrates "no pain" and the last face is "the worst imaginable pain."

Ethical considerations
This study was conducted according to guidelines laid down in the Declaration of Helsinki and all human procedures that were approved by ethical standards of the Ethics Committee of Medical School Tehran University of Medical Sciences (Ethics code: EC-00358). The aim of this study was explained, and written consent form was signed by elderly participants and their proxies.

Measurement instruments
Faces Pain Scale
The original version of FPS was developed for pediatrics with six faces;[19] the other versions had seven[20] and nine faces.[21] Herr *et al*. removed tears from faces of FPS-9, to prevent the bias that conducted by personal beliefs about pain manifestations.[28] Kim and Buschmann modified McGrath's FPS-9 into a 11-face scale to match with 11-point NRS.[13] After obtaining permission from the developer, we used FPS-11 version that was reliable and valid in Korean language.[13] In the present study, faces are represented by a black and white 8 cm × 8 cm line drawing [Figure 1].

Numeric Rating Scale
NRS is a self-reporting pain assessment scale with 11 points ranging from 0 to 10. Number 0 represents "no pain", while 10 represents "the worst possible pain." The common format is a horizontal bar or line with guide words of "no pain" at one end, "moderate pain" in the middle, and "the worst possible pain" at the other end of the scale. Elderly participants were asked, to select only one number that was the best description for current pain intensity. "No pain" was described by 0 score, "mild pain" was demonstrated by 1–3 scores, "moderate pain" was demonstrated by 4–6 scores, and "severe pain" was considered by 7–10 scores.[18]

Mini-Mental State Examination
MMSE is a 30-point questionnaire that is developed to measure cognitive impairments in community and clinical settings. The MMSE examines registration, attention and calculation, recall, language, ability to follow simple commands, and orientation functions.[29] The MMSE Persian version is a reliable and valid tool to discriminate cognitive impairments in older population, with the cutoff score of 23; the sensitivity and specificity were 98% and 100%, respectively.[25]

Reliability and validity
Reliability of the FPS was examined by applying FPS-11 and NRS at 1-week interval for 10% of the participants.

In terms of face validity, clarity, and understandability of the scale was confirmed by two gerontologists, three geriatric nurses, a pain specialist, and clinical psychologist. Each face was printed on a separate 8 × 8 cm card, and cards were
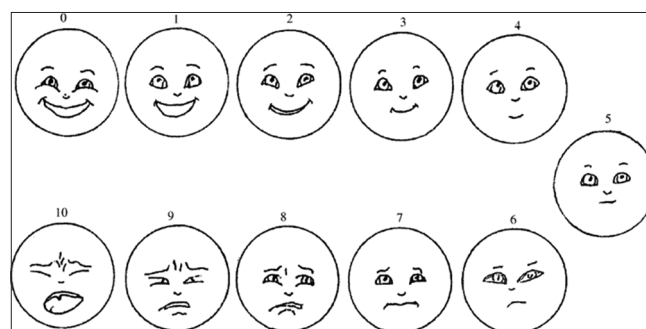

Figure 1: The faces of 11-face Faces Pain Scale from Face 0 (no pain) to Face 10 (extreme pain).

classified by 24 elderly participants with normal cognition and 11 health-care experts based on the level of pain that was understood from each face, from "no pain" to "the worst possible pain." To determine the concurrent validity, the correlation between the FPS-11-IR and NRS was calculated. To evaluate construct validity of the FPS-11-IR, unlabeled series of all 11 faces were presented to 36 older adults. The elderly was asked to reply this question ''Do these faces represent pain?'' with "Yes", "No," or "Do not know." Since pain construct is in the contrast with sadness, anger, sleepiness, boredom, and sourness,[13,28,30] the same question was asked for each of the mentioned emotions, such as: "Do these faces represent sadness?"

Statistical analysis

Descriptive statistics were used for demographic data. All analyses were considered statistical significance at $\alpha < 0.05$ levels and performed using IBM SPSS Statistics for Windows, Version 21.0 (IBM Corp., Armonk, NY: USA).

Reliability was measured by intraclass correlation coefficient (ICC), between test–retest scores of the FPS-11-IR and NRS. The ICC ≥ 0.80 was considered acceptable.

Regarding face validity evaluation, the faces of FPS-11 were ranked to determine the level of pain that is perceived from each face by both elderly participants and health-care experts, and the accuracy rate in ranking was calculated for each face. Accuracy rate $\geq 75\%$ for elderly respondents and $\geq 80\%$ for health-care experts were considered as acceptable face validity.

Spearman's correlation coefficient ≥ 0.70 was considered as a good correlation between the scores of FPS-11 and NRS, which indicates a good concurrent validity. To determine construct validity, the percentage of elderly respondents who agreed pain and other contrast constructs was calculated, and agreement $\geq 70\%$ confirms construct validity.

RESULTS

The mean age of participants was 68.44 ± 6.79 years, and from 217 elderly participants, 153 people (70.5%) were female and 64 (29.5%) were male. The mean level of education was 5.93 ± 4.94 school years, and the mean score of cognitive status by MMSE was 27.22 ± 1.91.

Reliability

To calculate reliability of the FPS-11, the collected data at 1-week interval was analyzed by ICC. The ICC between test–retest scores of FPS-11-IR and NRS was obtained 0.63 and

0.72, respectively. The ICC between differences of FPS-11-IR and NRS in test–retests was obtained 0.96 that indicates the excellent reliability [Table 1].

Validity

To determine face validity, the percentage of experts and elderly participants who ranked faces of the FPS-11-IR in correct order was calculated for measuring agreements in ranking [Figure 2]. The most accurate ranking by experts was 100% for face numbers 3, 4, 7, 8, 9, 10, and 11. The face numbers 1, 2, 5, and 6 with 90% agreement had the least accuracy in ranking. The agreements of older people with the face number 11 were the most and with the face numbers 1, 2, and 4 were the least, with 100% and 80% agreement, respectively [Figure 2].

The means of pain intensity were obtained 5.87 ± 2.18 by FPS-11-IR and 5.26 ± 2.24 by NRS. Spearman's correlation coefficient between FPS-11-IR and NRS scores obtained very strong ($r = 0.91$, $P < 0.01$) that indicated excellent concurrent validity.

Figure 3 demonstrates the scree plot and regression line between FPS-11-IR and NRS. The scores of FPS-11-IR could be predicted based on NRS scores; this confirmed the criterion validity ($R^2 = 0.88$, confidence interval = 95%).

The agreement percentage for pain and contrast constructs presents in Table 2. Elderly participants (72.2%) agreed that pain construct displayed more strongly in the faces' FPS-11-IR than the other established emotional constructs.

DISCUSSION

This study presented that FPS-11 is a reliable and valid pain assessment scale in Iranian elderly outpatients with chronic pain caused by Degenerative joint disease (DJD). The excellent reliability and good construct validity of the FPS-11-IR were confirmed. Consistent with the previous studies, we found that
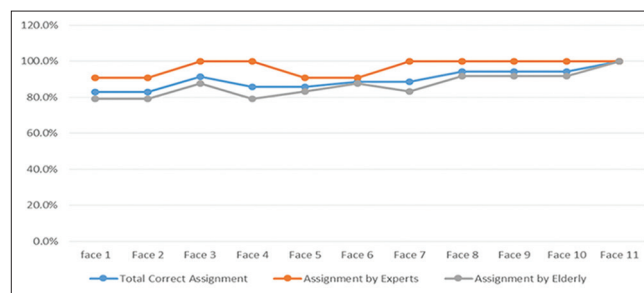

Figure 2: The accuracy of ordering faces.

Table 1: Reliability Analysis for 11-face Faces Pain Scale

	Mean±SD			ICC	95% CI
	Test	Retest	Test-retest difference		
FPS-11	5.87±1.69	4.33±1.69	1.38±1.97	0.63	0.15-0.84
NRS	5.26±2.24	3.44±1.69	1.92±1.82	0.72	0.37-0.88
Difference between FPS-11 and NRS				0.96	0.92-0.98

FPS-11: 11-face Faces Pain Scale, NRS: Numeric Rating Scale, SD: Standard Deviation, ICC: Intraclass correlation coefficients, CI: Confidence interval
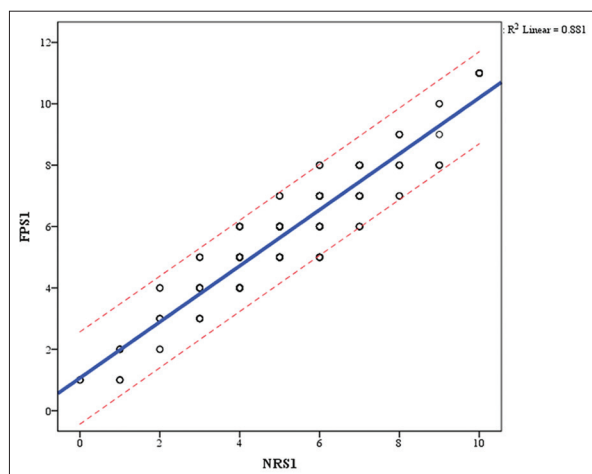
Figure 3: Scree plot and regression line between 11-face Faces Pain Scale and Numeric Rating Scale.

Table 2: Descriptive data for the elderly's perception of the 11-face Faces Pain Scale

Construct	Yes, *n* (%)	No, *n* (%)	Do not know, *n* (%)	Total, *n* (%)
Pain	26 (72.2)	2 (5.6)	8 (22.2)	36 (100)
Sourness	6 (16.7)	20 (55.6)	10 (27.8)	36 (100)
Sleepiness	6 (16.7)	20 (55.6)	10 (27.8)	36 (100)
Sadness	16 (44.4)	10 (27.8)	10 (27.6)	36 (100)
Anger	19 (52.8)	8 (22.2)	9 (25)	36 (100)
Boredom	6 (16.7)	8 (22.2)	22 (61.1)	36 (100)

FPS-11 is strongly correlated with the NRS in older adults.[13,31] Since NRS as a symbol of numeric counting is a gold standard of pain detection, the criterion validity of FPS-11 is approved.[13]

Agreement in rank ordering was good among the elderly and experts that indicated ranking of the faces in FPS-11-IR did not occurred by chance. Since the FPS had the best face validity in comparison with the other pain assessment scales in older adults,[32] we concluded that acceptable face validity might be due to good ranking order. The face numbers 1 and 2 were the most confusing faces for both the elderly and expert participants. Consistent with the previous studies,[11,13,14,30] face numbers 4, 5, and 6 located in the middle of FPS-11-IR had low accuracy in ranking arrangement; due to similarities in features, this made discrimination of the faces that demonstrate the most severe pain should be difficult.[11] Another reason for low accuracy in ranking arrangement might be decreasing in visual acuity of older adults that cause some faces did not place in the expected position.[14] The face number 11 had the highest accuracy in rank ordering, because severe pain was clearly understand of from this face.

In the present study, the scores of FPS-11-IR during 1-week interval between test and retest were relatively consistent. There is no evidence to support of acceptable time interval between the administration of scales in test–retest reliability,[33] although in some studies, 2-week interval was used to evaluate the stability of FPS in both cognitively impaired and intact elderly participants.[15,32,34] In cognitively impaired elderly,

a 3-day interval for test–retest reliability was found to be acceptable.[35,36] It can be concluded that a 3-day to 2-week intervals could be more acceptable for evaluating test–retest reliability of FPS in older population;[32] therefore, we used 1-week interval to reduce memory-bias effect.

Since FPS could also represent the other emotional constructs, the Iranian elderly with chronic DJD pain agreed that the faces of the FPS-11 represented pain, stronger than the other contrast constructs. We found a difference between pain and the other constructs in FPS-11-IR that was similar to Kim and Buschmann. These differences between pain and other constructs (i.e., sadness, sourness, boredom, and sleepiness) were significant with the exception of anger.[13] The reason that pain construct presented stronger than the other constructs in this and Kim and Buschmann studies might from the similarities in the Asian cultures or due to the use of the same version of FPS.[13] In contrast, some studies with other versions of FPS reported that FPS represents the other constructs more than pain, based on how the older individuals were guided.[30]

The concurrent validity of the FPS-11-IR was supported strongly among the elderly with chronic pain caused by DJD. The FPS-11 has compared with the other well-established pain intensity scales in several studies.[11,14,37] In consistent with the previous studies,[13,31] strong correlation was confirmed in this study, between FPS-11 and NRS in older adults with chronic pain.

Since pain scale preferences vary among the elderly, providing optimal pain scale might be helpful.[38] The FPS-11 is a more desirable scale to assess pain intensity rather than NRS in older adults,[32] because of fewer nonresponse rate, and more preference in responding FPS-11 rather than NRS in older people.[39] Patients' preference for FPS was reported 97.4% in an Asian study.[38] In cognitively impaired elderly participants, the FPS is reliable, valid,[40] and the most preferred self-reporting pain assessment scale.[15] Although self-reporting of pain in older adults is considered as a golden standard in pain assessment, with increasing the severity of cognitive impairment, the ability for self-reporting of pain is reduced.[40] Therefore, pain self-reporting as a first-line approach for assessing pain in cognitively impaired elderly participants should be accompanied with an observational assessment tool.[41]

Since self-reporting of pain is sensitive to cultural differences,[42] another important concern on FPS-11-IR is the effect of cultural background. The cultural context of elderly participants in this study was different from the other studies, but the results are similar to the previous studies that present the evidence to cross-cultural usefulness for FPS-11 especially in older population.[13,31]

Considering the limitations of this study, the FPS-11-IR sensitivity to detect pain changes that are important in both clinical practice and research did not determine that needs to be considered in future studies. Second, the cognitively

impaired elderly were excluded in this research; therefore, additional studies are recommended to assess psychometric properties of FPS-11 in the Iranian cognitively impaired elderly for broader use of the scale. Meanwhile, evaluating clinical usefulness of FPS-11-IR in contrary with the observational pain assessment scales is recommended in demented Iranian elderly participants.

Conclusions

Validity and reliability of the FPS-11-IR was confirmed in the Iranian elderly with chronic knee pain (DJD). The concurrent and criterion validity of FPS-11 supported strongly. The FPS-11-IR can replace the NRS as a gold standard in pain intensity measurement among older adults, if necessary.

Conflicts of interest

There are no conflicts of interest.

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