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RELIABILITY AND VALIDITY OF THE TURKISH VERSION OF THE MULTIDIMENSIONAL
FEAR OF INJECTION SCALE
ÇOK BOYUTLU ENJEKSİYON KORKUSU ÖLÇEĞİNİN TÜRKÇE GEÇERLİK GÜVENİRLİK ÇALIŞMASI

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ABSTRACT

To determine the validity and reliability of the Turkish version of the Multidimensional Fear of Injection Scale (MFIS-TR). Study sample consisted of 224 students. MFIS-TR were used to collect data. The Davis technique was used for content validity. The overall content validity index of the scale was 0.91. Confirmatory factor analysis was employed to assess construct validity. Confirmatory Factor Analysis revealed that the 16-item MFIS did not demonstrate sufficient fit. Three items were removed from the scale, resulting in a 13-item scale that showed good fit with a four-factor structure. The factor loadings for all items were above 0.40. The Cronbach's alpha coefficient was determined to be 0.88. MFIS-TR is a highly reliable measurement tool that can be used to assess individuals' fear of injections. The study was written based on the TRIPOD checklist.

ÖZ

Bu çalışma, Çok Boyutlu Enjeksiyon Korkusu Ölçeği'in (ÇBEKÖ) Türkçe versiyonunun geçerliliğini ve güvenilirliğini belirlemeyi amaçlamaktadır. Çalışma örneği 224 öğrenciden oluşmaktadır. Veri toplamak için MFIS-TR kullanılmıştır. Kapsam geçerliliği için Davis tekniği kullanılmıştır. Ölçeğin kapsam geçerlilik indeksi 0.91 olarak belirlenmiştir. Yapı geçerliliğini değerlendirmek için doğrulayıcı faktör analizi kullanılmıştır. On altı maddeli MFIS'in doğrulayıcı faktör analizi, ölçeğin yeterli uyumu göstermediğini ortaya koymuştur. Üç madde ölçekten çıkarılmış, bu da dört faktörlü bir yapıda iyi uyum gösteren 13 maddelik bir ölçek elde edilmiştir. Tüm maddeler için faktör yükleri 0.40'ın üzerindedir. Cronbach'ın alfa katsayısı 0.88 olarak belirlenmiştir. MFIS-TR, bireylerin enjeksiyon korkusunu değerlendirmek için kullanılabilir yüksek güvenilirlikte bir ölçme aracıdır. Çalışma, TRIPOD kontrol listesine dayanarak yazılmıştır.

Keywords: Fear, injection, reliability, validity

Anahtar kelimeler: Korku, enjeksiyon, güvenilirlik, geçerlilik

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INTRODUCTION

Nurses use hypodermic needles to establish intravenous, subcutaneous, intramuscular, and intradermal access for medication administration. The use of needle tips during invasive procedures can cause fear in individuals. Injection fear can occur in individuals of all age groups, from children to adults, and it has been reported to decrease with age.¹

Individuals who undergo repeated injection procedures are at an increased risk of experiencing injection fear. Duncanson et al.² found in a systematic review that the prevalence of needle fear increased with the frequency of invasive procedures in chronic diseases; the prevalence in cancers was 17-52%, in chronic kidney failures 25-47% and in diabetes 0.2-80%. Injections administered during dental treatments can also induce fear.³ Individuals with injection fear may experience anxiety and fear of death, along with psychosomatic symptoms such as palpitations, sweating, and nausea.⁴ Due to injection fear, individuals may avoid necessary procedures such as blood sampling and vaccination for diagnosis, treatment, and disease prevention.⁵ Injection fear of blood, needles, and fainting can even hinder blood donation.⁶ Fear of insulin injections and finger pricking in diabetic patients can impede treatment compliance and increase the risk of complications associated with metabolic deterioration.⁷ Therefore, it is very important to reduce individuals' fear of injection. In order to prevent the negative consequences of injection fear, it is seen that nurses carry out various studies on the fear of injection and attempt to reduce the fear of injection.^{8,9}

In order to plan interventions to reduce the fear of injection, individuals' fear of injection must first be graded. There are scales used abroad for this purpose.^{10,11} In country of research the "Blood/Injection Fear Scale," developed by Köse and Mandiracioglu⁴ focuses on the fear of blood/injection in a two dimension. Therefore, there is a need for reliable measurement tools that evaluate injection fear in different dimensions. This study aimed to assess the validity and reliability of the "Multidimensional Fear of Injection Scale" (MFIS) in Turkish, which examines injection fear in four dimensions (direct fear, indirect fear, physiological response, and avoidance).¹² This scale can assist nurses who frequently perform injection procedures in identifying individuals with injection fear.

MATERIALS AND METHODS

Type of the Research

This methodological study was conducted between January 3, 2023 and June 7, 2023. The study was conducted in four stages: 1. Adaptation of the MFIS to Turkish and back-translation of the scale into English, 2. obtaining expert opinions for the content validity of the scale, 3. conducting a pilot study and data collection, and 4. conducting psychometric analyses.

Participants

The study was conducted at a University. The study population consisted of 628 students enrolled in the University's School of Health Services. The number of samples was calculated to be at least 10 times the number of items. Considering the possibility of missing data in the sample, the scale was sent to all students in

the school online, and 224 students responded to the scale.

A total of 224 students were included in the research sample. The inclusion criteria were: (a) being a university student aged 18-45 years, and (b) agreeing to be in the study.

Data Collection Tools

Data were collected using a "Personal Information Form" and the "Multidimensional Fear of Injection Scale (MFIS)."

The Personal Information Form

This form includes three questions about age, gender, and educational status, and the questions were prepared by analyzing the researchers on the literature.^{12,13}

The Multidimensional Fear of Injection Scale

The Scale was developed by Hako et al.¹² to assess people's fear of injection. The scale has 16 items and four sub-dimensions (direct fear, indirect fear, physiological response, and avoidance), rated on a 5-point Likert scale. The items are scored between 1 (no fear) and 5 (highest fear); so total score will be between 16 and 80. If a score is high, it means higher fear. The Cronbach's alpha coefficient of the original scale is 0.89 and it indicates high reliability. Subscale Cronbach's alpha values range from 0.78 to 0.87. (Direct fear 0,84; Indirect fear 0,87; Physiological response 0,82; Avoidance 0,78).

Translation Process and Internal Validity

The translation-back translation method was used in the process of establishing the language validity of the scale. Firstly, two translators, who are native Turkish speakers and proficient in English, independently translated the scale into Turkish. The two translations were then reviewed by two expert faculty members who are proficient in English and specialized in the field, and a single scale form was created. Afterwards, two different translators independently translated the scale back into English.

Content Validity

The opinions were taken from 11 experts to assess the content validity of the scale. The experts evaluated the necessity, comprehensibility, and appropriateness of each item in the scale for measurement purposes. The experts consisted of 3 family physicians, 5 psychiatric nurses, 1 public health nurse, 1 psychologist, and 1 social worker.

Using the Davis technique, the experts rated the items on a four-point scale as follows: (4) "Highly suitable," (3) "Suitable with minor changes required," (2) "Requires substantial modification," and (1) "Not suitable." Based on these ratings the content validity index was determined.¹⁴

Construct Validity

Confirmatory factor analysis (CFA) was used to determine the model fit of the scale, utilizing indices such as Root Mean Square Error of Approximation (RMSEA) and χ^2/df . Acceptable goodness of fit indices were $3 < \chi^2/sd \leq 5$ and $0.05 \leq RMSEA \leq 0.10$.¹⁵⁻¹⁸ There are studies that only conduct confirmatory factor analysis in terms of the appropriate number of factors¹⁹⁻²¹ in this study, care was taken to preserve the factors in the original scale and CFA was performed to verify the determined factors.

Data Collection

After obtaining expert opinions, a pilot study of the scale was conducted with 5 students. Following the pilot study, the scale instructions were revised to ensure that they were understandable to the students, but no changes were made to the scale items due to the students' comprehension. Student data from the pilot study were not included in the analysis.

Data collection forms were prepared using Google Forms and sent to the students online to complete. Each form was assigned a unique code. Two weeks after the initial administration, the scale was re-administered to a randomly selected sample of 113 students.

Data Analysis

For the reliability analyses of the study the SPSS 26.0 software package was used and for the confirmatory factor analysis (CFA) we choosed AMOS 21.0 software. Expert opinions were gathered using the Davis technique, and the Content Validity Index was determined. A minimum Content Validity Index of 0.80 was considered acceptable.

For item total reliability analyses, correlation coefficients were utilized, and confirmatory factor analysis was employed to assess construct validity. Cronbach's alpha coefficient was calculated to determine internal consistency. Test-retest analysis was conducted to assess the scale's consistency over time. In all statistical analyses conducted in the study, a significance level of 0.05 was considered.

The ethical standards in the 1964 Declaration of Helsinki were followed. This study was approved by the ethics committee of the University Ethics Committee. Prior permission was taken from Dr. Suzuka Hako, the developer of the scale, via email, to conduct the research. Written information about the study was sent to the participating students, and after they provided voluntary consent by indicating their agreement, they were asked to complete the forms.

RESULTS**Descriptive variables**

The participating students had an average age of 21.67 ± 2.76 , and 67.9% of them were female. Among the students, 58.5% were in their first year, while 41.5% were in their second year of education.

Validity**Linguistic validity**

The translation-back translation method was employed to establish the language validity of the scale. Two native Turkish speakers proficient in English

independently translated the scale into Turkish. Their translations were reviewed by two expert faculty members specialized in the field, resulting in a single scale form. Subsequently, two different translators independently translated the scale back into English. The English translation and the original scale were compared by the researchers, and no differences were found.

Content validity

Based on expert opinions, minor revisions were made to the scale. Eight items were expressed in the present tense, and modifications were made to five items. The content validity index of the items ranged from 0.82 to 1.00, while the overall content validity index of the scale was 0.91.

Construct validity

According to the results of the confirmatory factor analysis, the initial model did not demonstrate adequate fit. Therefore, model improvement efforts were undertaken. The three items with the highest modification indices (Items 2, 12, and 16) were removed from the structure. As a result, the final model with 13 items and 4 factors showed acceptable fit indices, as presented in Table 1.

When comparing the original version of the Multidimensional Injection Fear Scale with the results of the model improvement (after removing three items), it was observed that in the initial model, only the χ^2/df and Standardized Root Mean Squared Error (SRMR) values were within acceptable limits. However, after the model improvement efforts, all model fit indices demonstrated good or acceptable fit (Table 1). Upon examining the results of the confirmatory factor analysis for the Multidimensional Injection Fear Scale, it was observed that all items had factor loadings above 0.4 (Table 2). The path diagram illustrating the factor loading values is provided in Figure 1.

Reliability

The Cronbach's alpha coefficient for the Multidimensional Injection Fear Scale was 0.88, indicating good internal consistency. For the subscales, the Cronbach's alpha coefficients ranged from 0.60 to 0.81 (Table 3).

In the 13-item Multidimensional Injection Fear Scale, it was determined that the correlation coefficients between the items ranged from 0.363 to 0.767, and no item negatively affected the Cronbach's alpha coefficient (Table 4). The relationship between the scores obtained from the test-retest measurements

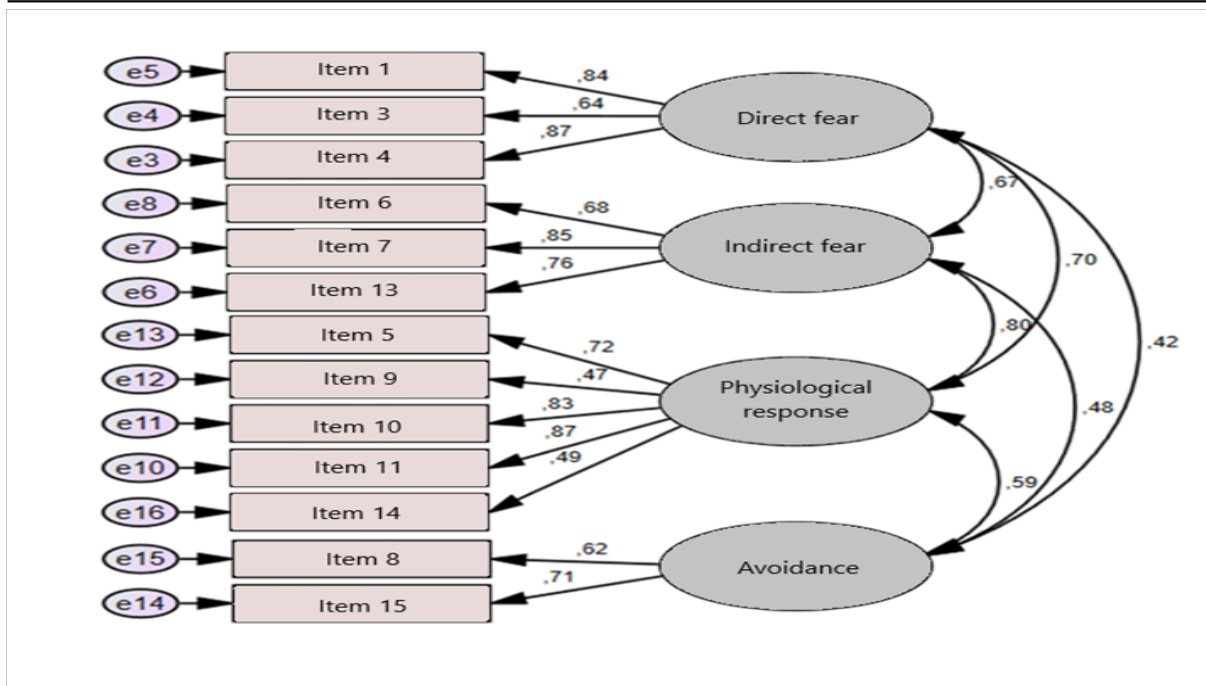
Table 1. Fit Index Values and Good Fit Values of the Measurement Model of the MFIS

	The conformity index values of the initial version of the model	Fit Index Values After Factor Extraction
χ^2/sd	3.793	2.405
GFI	0.838	0.917
AGFI	0.775	0.871
IFI	0.850	0.938
NNFI	0.815	0.916
CFI	0.849	0.937
RMSEA	0.112	0.079
SRMR	0.075	0.051

GFI: Goodness of Fit Index AGFI: Adjusted Goodness of Fit Index IFI: Incremental Fit Index NNFI: Non-Normed Fit Index CFI: Comparative Fit Index RMSEA: Root Mean Square Error of Approximation SRMR: Standardized Root Mean Squared Error

Table 2. Factor Loading Values of Items of the MFIS-TR after Confirmatory Factor Analysis

Items	Direct Fear	Indirect Fear	Physiological response	Avoidance
Item_4	0.872			
Item_3	0.636			
Item_1	0.844			
Item_13		0.763		
Item_7		0.854		
Item_6		0.684		
Item_11			0.870	
Item_10			0.835	
Item_9			0.474	
Item_5			0.718	
Item_14			0.486	
Item_15				0.708
Item_8				0.622

**Figure 1:** PATH diagram for the Multidimensional Injection Fear Scale**Table 3.** The Reliability Analysis Results of the MFIS-TR

	Number of Items	Cronbach Alpha (α)
MFIS-TR	13	0.886
Direct Fear	3	0.814
Indirect Fear	3	0.782
Physiological Response	5	0.810
Avoidance	2	0.608

Table 4. Cronbach's Alpha Values When Items are Deleted in the MFIS-TR

	Item Total Correlations	Cronbach's Alpha if Item is Deleted
Item_1	0.649	0.873
Item_3	0.553	0.882
Item_4	0.682	0.871
Item_5	0.629	0.875
Item_6	0.610	0.875
Item_7	0.687	0.873
Item_8	0.363	0.886
Item_9	0.375	0.886
Item_10	0.767	0.866
Item_11	0.752	0.868
Item_13	0.639	0.874
Item_14	0.456	0.883
Item_15	0.386	0.886

was examined using the Intraclass Correlation Coefficient (ICC), which indicated a high level of agreement among participants in their responses to repeated questions, demonstrating reliability ($ICC=0.899$; $p<0.001$) (Table 5).

The Cronbach's alpha coefficient in our study was 0.88, indicating high reliability. The Cronbach's alpha coefficients for the subscales ranged from 0.60 to 0.81. In the original scale, the Cronbach's alpha coefficient was 0.89, with subscale alpha values ranging from 0.78 to 0.87.¹² All item correlations in our study were above

Table 5. Intraclass Correlation Coefficient between Test-Retest Scores of the MFIS-TR

	ICC	95% Confidence Interval for ICC	p
MFIS-TR	0.899	0.744-0.870	<0.001
Direct Fear	0.892	0.843-0.926	<0.001
Indirect Fear	0.784	0.687-0.851	<0.001
Physiological Response	0.820	0.738-0.876	<0.001
Avoidance	0.571	0.377-0.704	<0.001

ICC=Intraclass Correlation Coefficients

p=Significance Level

DISCUSSION

In this study, the Turkish version of the Multidimensional Injection Fear Scale (MFIS-TR) was administered to university students to assess its validity and reliability. The original scale consists of 16 items and four factors (direct fear, indirect fear, physiological response, and avoidance). According to Schermelleh-Engel, Moosbrugger, and Müller¹⁵ model fit is considered acceptable if $0.05 \leq RMSEA \leq 0.10$. Additionally, a criterion of $3 < \chi^2/sd \leq 5$ indicates acceptable fit, while $0 < \chi^2/sd \leq 3$ indicates good fit.¹⁶⁻¹⁸ According to our confirmatory factor analysis (CFA) results, it is observed that the model only shows acceptable values for χ^2/sd and SRMR, indicating that it does not demonstrate sufficient fit. It is believed that this situation may be attributed to cultural differences. In order to improve model fit, modification of the model is recommended.²²

As a result, the three items with the highest modification indices (Items 2, 12, and 16) were removed from the structure. The revised model showed acceptable fit indices, with an RMSEA value within the acceptable range (RMSEA=0.079; $\chi^2/df=2.405$). In comparison, the RMSEA value in the original scale was also within acceptable limits (RMSEA=0.096).¹² Bani et al. In his study on the validity and reliability of the Injection Phobia Scale, he determined that the model provided structural fit with RMSEA = 0.063¹¹.

The factor loadings of the Turkish version of the 13-item Multidimensional Injection Fear Scale indicated that the direct fear subscale (Items 1, 3, 4) had loadings ranging from 0.64 to 0.87, the indirect fear subscale (Items 6, 7, 13) had loadings ranging from 0.68 to 0.85, the physiological response subscale (Items 5, 9, 10, 11, 14) had loadings ranging from 0.47 to 0.87, and the avoidance subscale (Items 8, 15) had loadings ranging from 0.62 to 0.71. All factor loadings were above 0.4, indicating moderate to high factor loadings for each item.²³ It is worth noting that only two items in the physical response subscale had factor loadings below 0.6. In the original scale, factor loadings ranged from 0.43 to 0.94, but unlike in our study, it was observed that two items in the direct fear and indirect fear subscales, as well as the physical response subscale, had factor loadings below 0.6.¹² Factor loadings in the Blood/Injection Scale, which consists of 20 items and 2 factors, are between 0.39-0.88⁴.

0.3. Berge et al. determined that In their study on the validity and reliability of the Intra-Oral Injection Fear scale, the item total correlation was 0.59 to 0.88.¹⁰

The relationship between the students' initial measurements and retest scores was examined using the Intraclass Correlation Coefficient (ICC), indicating a high level of agreement between the first and second application scores ($p<0.001$), demonstrating consistent responses for reliability.

Turkish version of the Multidimensional Fear of Injection Scale can be used safely in the clinic to determine patients' fear of injection. On the other hand, by using MFIS-TR in the education of student nurses, students' awareness of the fear of injection can be increased. It is seen in the literature that many studies have been conducted on nurses' fear of injection.^{1,5} Therefore, research conducted using MFIS-TR can contribute to scientific data.

CONCLUSION

This study determined that this version of the 13-item Multidimensional Injection Fear Scale is a valid and reliable measurement tool. It is considered to be a guiding instrument for healthcare professionals in assessing individuals with injection fear. This scale can assist nurses in identifying individuals' fear of injections and implementing interventions to reduce fear during procedures. Therefore, it can be utilized as a significant tool in the development of professional practice and healthcare policies.

Limitations

In our study, the limitation arises from the removal of three items in order to achieve model fit in the Turkish version of the Multidimensional Injection Fear Scale.

Ethics Committee Approval: Ethics committee approval was received for this study from the Ethics Committee of Hakkari University (Date:03.01 2023, Number: 2023/1).

Informed Consent: Permission to conduct the research was obtained via e-mail from Dr. Suzuka Hako, who developed the scale. Written and/or verbal consent was obtained from participating in the study.

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Author Contributions: Concept-HS, ZKS; Design- HS, ZKS; Supervision- HS, ZKS; Resources-HS; Materails-HS; Data Collection and/or Processing- HS; Analysis and/or

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