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Research Article

Development Reliability and Validity of the Self-Reflection Scale for Health Sciences Students

Sağlık Bilimleri Öğrencileri için Öz-Düşünüm Ölçeğinin Geliştirilmesi Güvenilirliği ve Geçerliliği

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ABSTRACT

Objective: This study was conducted as a methodological study to develop a measurement tool to determine the self-reflection characteristics of health sciences students.

Methods: The development stages of the Self-Reflection Scale for Health Sciences Students (SrS for HSS), are Creation of the Item Pool, Surface Validity, Content Validity, Pilot Study, Construct Validity and Criterion-Related Validation, Reliability Analyses. Self-reflection and Insight Scale (SRIS) was used in concurrent validity.

Results: In this study, firstly, an item pool was created by utilizing the literature and the content validity of the scale draft was ensured. Kaiser-Meyer-Olkin (KMO) was 0.948; x2=6278.978, df=253; p<0.001 in Barlett Sphericity test. Exploratory Factor Analysis (EFA) showed that the SrS for HSS has a two sub-dimensional structure with 23 items. Confirmatory Factor Analysis (CFA) and fit index values (CMIN/DF=2.518, CFI=0.923, TLI=0.913, RMSEA=0.068, SRMR=0.047) were interpreted as "acceptable". All correlations between SrS for HSS and SRIS subscales were positive and significant. Corrected item-total correlation coefficients ranged between 0.53-0.83 for Reflection in and on Action and 0.45-0.66 for Reflection for Action, and Cronbach's Alpha values were 0.93 for Reflection in and on Action and 0.85 for Reflection for Action.

Conclusion: In this study, "SrS for HSS" was developed to determine the self-reflection characteristics of health sciences students and the scale was found to be valid and reliable.

Keywords: Health Science, Health Science Students, Scale Development, Self-Reflection

ÖZ

Amaç: Bu çalışma, sağlık bilimleri alanında öğrenim gören öğrencilerin öz-düşünüm özelliklerini belirlemeye yönelik bir ölçme aracı geliştirmek amacıyla metodolojik türde yapılmıştır.

Yöntem: Sağlık Bilimleri Öğrencileri için Öz-Düşünüm Ölçeği (SB3Ö); Madde Havuzunun Oluşturulması, Yüzeysel Geçerlilik, İçerik Geçerliliği, Pilot Çalışma, Yapı Geçerliliği ve Ölçüte bağlı Geçerlilik, Güvenirlik Analizleri aşamaları ile geliştirilmiştir. Eş zamanlı geçerlilikte Kendini Yansıtma ve İçgörü Ölçeği (KYİÖ) kullanılmıştır.

Bulgular: Bu çalışmada öncelikle literatürden yararlanılarak madde havuzu oluşturulmuş ve ölçek taslağının içerik geçerliliği sağlanmıştır. Barlett Sphericity testinde Kaiser-Meyer-Olkin (KMO) 0,948; x2=6278,978, df=253; p<0,001 bulunmuştur. Açımlayıcı Faktör Analizi ölçeğin 23 maddeden oluşan iki alt boyutlu bir yapıya sahip olduğunu göstermiştir. Doğrulayıcı Faktör Analizi ve uyum indeksi değerleri (CMIN/DF=2,518, CFI=0,923, TLI=0,913, RMSEA=0,068, SRMR=0,047) "kabul edilebilir" olarak yorumlanmıştır. SB3Ö ile KYİÖ alt ölçekleri arasındaki tüm korelasyonlar pozitif ve anlamlıdır. Madde-toplam puan korelasyon katsayıları Eylem İçinde ve Eylem Üzerine Yansıtma için 0,53-0,83 aralığında, Eylem İçin Yansıtma için 0,45-0,66 aralığında, Cronbach's Alpha değerleri Eylem İçinde ve Eylem Üzerine Yansıtma için 0,93, Eylem İçin Yansıtma için 0,85 olarak bulunmuştur.

Sonuç: Çalışma bulgularına dayanarak, öğrencilerin duygusal hemşirelik becerilerini geliştirmek için benzer çalışmalar yürütmek amacıyla hemşirelik eğitim müfredatına şefkat ve bilinçli farkındalık uygulamaları üzerine derslerin entegre edilmesi önerilir.

Anahtar Kelimeler: Sağlık Bilimi, Sağlık Bilimi Öğrencileri, Ölçek Geliştirme, Öz-Düşünüm

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Hemşirelik Bilimi Dergisi
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INTRODUCTION

Self-reflection refers to the process of reflecting on and evaluating one's own thoughts, feelings, behaviors and experiences. This process helps the individual to better understand himself/herself, learn and support personal development. It also contributes to critical thinking and problem solving skills (Bass et al., 2022; Elaldı, 2015). Self-reflection can help individuals learn from their mistakes and move towards becoming a better version of themselves, especially when faced with difficulties, to better understand the source of the problem and ways to solve it. In order to create emotional balance, emotional reactions should be controlled. It is known that individuals with self-reflection have increased awareness of emotional balance. It is also thought that they communicate better and more effectively in relationships and understand the individuals they interact with better (Aronson et al., 2012; Gathu, 2022). It is seen that individuals with high self-reflection traits are committed to lifelong learning, examining, reflecting and improving themselves, and develop personally and professionally (Bass et al., 2022).

Self-reflection has been tried to be explained with different models. In his study, Schön defined two types of self-reflection based on timing and suggested that reflection can occur after the experience (reflection-on-action) or while in the situation (reflection-in-action) (Banner et al., 2023). Killion & Todnem (1991) stated that through self-reflection, future actionable change can be planned and added a third form of reflection defined as "reflection-for-action" to this classification. "Reflection-for-action", together with "reflection-on-action" and "reflection-in-action", is a process that covers the past, present and future simultaneously (Killion & Todnem, 1991).

Self-reflection is generally recognized as an essential characteristic for health professionals. Self-reflection in health practices ensures adaptation to the rapidly changing health system, improves the ability to observe, investigate, evaluate and discover events with a realistic eye while providing care, and thus improves the quality of care (Nguyen et al., 2014). For these reasons, self-reflection should be acquired, measured and evaluated during the teaching of health professions. However, self-reflection traits are difficult to observe and define and therefore difficult to measure quantitatively, and this has revealed the lack of self-reflection measures (Banner et al., 2023).

In the available literature, there was no measurement tool to determine the self-reflection characteristics of health professions students, including health practices. This study was conducted as a methodological study to develop a measurement tool to determine the self-reflection characteristics of students studying in Faculties of Health Sciences.

METHODS

Population and sampling

Research Design and Setting The study was conducted on students of health sciences faculties of universities in Istanbul. Inclusion criteria were determined as being over 18 years of age, health sciences and 2nd, 3rd, 4th grade students. Out-of-school students and first-year students (because they did not perform clinical practice) were excluded. The sample specific to each of the reliability and validity stages was defined and the number was determined accordingly. The number of students in each stage of this study, which was conducted with a total of 1331 students, is shown in Figure 1.

Hemşirelik Bilimi Dergisi
2025, 8 (1), 98-112
Doi: 10.54189/hbd.1551247

Creating an Item Pool

- Literature review (a 110-item scale was created).
- Obtaining opinion from a linguist.

Face Validity, Content Validity, Pilot Study

- For face validity, face-to-face interviews were held with 10 people (five health sciences students and five health sciences faculty members).
- Opinions were received twice from 16 experts (nurse, midwife, physiotherapist, social worker, medical doctor) and the number of items of the draft scale became 64. Analysis Method: Davis Technique.
- A pilot study was conducted with 35 students. Analysis Method: Examining the understandability of the items.

Validity Analyzes

- Exploratory Factor Analysis data were obtained by applying the draft Self-Reflection Scale for Health Sciences Students (SrS for HSS) to 644 students (the final version of the 2-Factor 23-Item Scale was created). Analysis Method: Kaiser-Meyer-Olkin, Bartlett Sphericity Test, Anti-Image Correlation, Principal Component Analysis and Varimax Rotation Method
- Confirmatory Factor Analysis data were obtained by applying SrS for HSS to 327 students. Analysis Method: Path diagram and model goodness of fit indices (X2/sd, CFI, NFI, RMSEA and SRMR)
- Concurrent validity data were obtained by simultaneously administering SrS for HSS and Self-reflection and Insight Scale (SRIS) to 150 students. Analysis Method: Pearson Product Moment Correlation Analysis

Reliability Analyzes

- SrS for HSS was applied to 159 students;
  - Item Total Score Correlation was examined for Internal Consistency evaluation. Analysis Method: Pearson Product Moment Correlation Analysis
  - Cronbach Alpha Reliability Coefficient was determined.
- Test-retest: The scale was applied to 50 students twice with an interval of three weeks. Analysis Method: Pearson Product Moment Correlation Analysis

Figure 1. Phases in the development, reliability and validity of the Self-Reflection Scale for Health Sciences Students

Data Collection Tools

Student Information Form (SIF): It was developed by the researchers to determine the demographic and academic characteristics of the students who participated in the study (age, gender, school of graduation, department, grade level).

Self-reflection And Insight Scale (SRIS): The Turkish validity and reliability study of the scale developed by Grant et al. (2002) was conducted by Aşkun and Çetin (2017). The scale, which has a total of 20 items, has two sub-dimensions: self-reflection and insight. Grant et al. (2002) found the Cronbach-alpha coefficient to be 0.91 for the Self-reflection subscale and 0.87 for the Insight subscale. Aşkun and Çetin (2017) found the Cronbach alpha value of the scale to be 0.80 for the Self-reflection subscale and 0.65 for the Insight subscale. In this study, Cronbach's alpha value was 0.80 for Self-reflection and 0.77 for Insight. SRIS was used to test the criterion-related validity of the scale to be developed (Self-Reflection Scale for Health Sciences Students).

Self-Reflection Scale for Health Sciences Students (SrS for HSS): It was decided to develop a scale to assess the ability of health sciences students to observe, interpret and control their own behavior. In deciding on the format of the measurement tool, it is important how the results will be interpreted. At this stage, it is a matter of selecting the appropriate one from various scale types (Thurstone, Guttman, Likert, etc.) and determining the response categories (DeVellis, 2003). Among the scale types, the Likert-type scale is most frequently preferred because it is useful and provides measurement results on an equal interval scale with increasing the level of gradation (Yeşilyurt & Çapraz, 2018). In this study, a five-point Likert-type structure graded as "(1) Strongly disagree, (2) Disagree, (3) Undecided, (4) Agree, (5) Strongly agree" was created by considering the features to be measured. The development, validity and reliability of the SrS for HSS was carried out in 4 stages (Figure 1).

Hemşirelik Bilimi Dergisi
2025, 8 (1), 98-112
Doi: 10.54189/hbd.1551247

Phase 1: Creating the Item Pool

Different methods can be used in the creation of the item pool in accordance with the purpose. If behaviors to be directly observed are to be measured, observation may be preferred, if a theory is to be taken as a basis, literature review may be preferred, and if constructs such as attitudes are to be measured, it may be preferred to have a group similar to the sample group write an essay. While creating the items, it is essential to consider all possible sub-dimensions of the construct to be measured (Bass et al., 2022; Naeimi et al., 2019; Rogers et al., 2019; Yeşilyurt & Çapraz, 2018). In this study, an item pool was created through a comprehensive literature review. For this purpose, the keywords "self-reflection", "insight" and "reflective" were used in the university's database and all the available literature between the years 2000-2023 were examined (Aukes et al., 2007). If possible, three to four times or more of the number of items designed to be used in the scale should be prepared. This is because after the items are tested on a group, there may be items that do not serve the purpose and do not have sufficient reliability and validity. In this way, the possibility of selecting items with the desired comprehensiveness and discrimination among a large number of items increases (Yeşilyurt & Çapraz, 2018). For this reason, a 110-item draft SrS for HSS was created. The developed items were presented to a Turkish language expert (a secondary school Turkish teacher) for grammatical evaluation and adaptations were made in line with the suggestions.

Phase 2: Face Validity, Content Validity, Pilot Study

Face validity: Face-to-face interviews were conducted with 5 health sciences students (2nd, 3rd, and 4th grade) studying in different departments of the faculty of health sciences and 5 instructors working in different departments of the faculty of health sciences in order to evaluate whether the 110-item draft SrS for HSS is directed towards the trait to be measured, its comprehensibility and cultural appropriateness.

Content validity: Devis (1992) technique was used to assess the content validity of the draft SrS for HSS. According to the Devis technique, experts were asked to rate each item on a four-point Likert scale as (4) "Appropriate", (3) "The item should be slightly revised", (2) "The item should be seriously revised" and (1) "The item is not appropriate". In this technique, the number of experts who marked options (4) and (3) is divided by the total number of experts to obtain the "content validity index" (CVI) for the item and a value of 0.80 is accepted as a criterion (Yurdugül, 2005). Therefore, items with a CGI below 0.80 are removed from the scale, and there is no content validity rate for the overall scale.
In this study, the Draft SRS for HSS was e-mailed to 16 experts in HSS. These experts were six nurses, four midwives, two physiotherapists, two social workers and two medical doctors. The experts were asked to evaluate each item in terms of its suitability for the purpose of the scale. In the Devis technique, 40 items with a CGI value below 0.80 were excluded from the scale and the number of items was determined as 70 from 110 as a result of the first expert opinion evaluation. In addition, items 12, 16, 22, 23, 24, 28, 34, 35, 58, 60, 67, 68, and 70 were revised in line with the suggestions of the experts, and items 39, 42, 53, 59, 65, and 69 were removed after the second expert evaluation (14 experts). According to the final content validity analysis, the number of items of the draft scale was determined as 64. After this stage, a pilot study was conducted.

Pilot Study: It has been suggested that if the elements of the developed scale are seen as relevant and comprehensible by the target audience, it increases the likelihood of their participation in the study and therefore, participants should be included in the process of developing self-report instruments. The more effort is put into establishing validity, the greater the reliability of the instrument (Yurdugül, 2012). The pilot study was conducted face-to-face with 35 students and the results showed that there was no problem in terms of comprehensibility of the items.

Hemşirelik Bilimi Dergisi
2025, 8 (1), 98-112
Doi: 10.54189/hbd.1551247

Phase 3: Construct Validity (Factor Analysis) and Criterion-Based Validity Phase

Exploratory Factor Analysis (EFA): The 64-item scale was administered to second-, third-, and fourth-year students studying at the Faculty of Health Sciences between September and October 2023 and its construct validity was tested. Since the sample size was recommended to be between 2-20 participants per item and an absolute minimum of 100-250 people, it was decided to take a minimum of 10 people per item (Anthoine et al., 2014). Since the draft scale had 64 items, it was aimed to reach a minimum of 640 participants and 644 participants were reached. Before starting the factor analysis, Kaiser Mayer Olkin (KMO) and Bartlett's test were performed to determine the suitability of the data for factor analysis and sampling adequacy. In the next stage, principal component analysis and Varimax rotation method were used. Accordingly, a 23-item, two-sub-scale structure was formed for SrS for HSS.

Confirmatory Factor Analysis (CFA): Confirmatory factor analysis is a type of structural equation modeling that helps to determine the relationship between observed and latent variables and has an important value in scale adaptation studies (Çapık, 2014). The final SrS for HSS was administered to a sample group of 327 participants who had not previously completed the scale. IBM 23 AMOS program was used to verify the structure formed by exploratory factor analysis.

Criterion-Related Validation: It is a technique that examines the relationship between test scores and one or more external criteria. There are two types of validity: concurrent validity and predictive validity. In concurrent validity, the correlation of participants' scores on the scale to be developed with their scores on another test measuring the same behavior or a test measuring another related behavior is examined. The measurements to be compared are asked to be made at the same or close time (Karakoç & Dönmez, 2014). In this study, in order to assess concurrent validity, the SRIS, which is thought to measure similar characteristics with the SRS for HSS, was administered simultaneously to 150 students who had not previously completed the SRS for HSS and the correlation between the two scales was evaluated.

Phase 4: Reliability Analysis Phase

Reliability analyses of the final version of the SrS for HSS were conducted on 159 students who had not completed the scale before. In addition, according to the Tukey summability test, it was seen that the scale was not summable ($p<0.05$) and therefore reliability analyses were performed within the scope of sub-dimensions.

Internal Consistency: It is a good measure of how homogeneous the questions that are assumed to measure a certain area are among themselves, whether the questions go to the right address, that is, whether they measure only the desired concept (Karakoç & Dönmez, 2014). In this study, the item-total score correlation method was used to test the internal consistency of SrS for HSS

Cronbach Alpha Reliability Coefficient: Cronbach's alpha coefficient is a weighted standardized mean of variation found by proportioning the sum of the variances of the items in the scale to the overall variance (Karakoç & Dönmez, 2014). In order to test the reliability of the scale, Cronbach's Alpha values of its sub-dimensions were determined.

Test-retest: It is the application of a measurement tool to the same subject group twice under the same conditions and within a certain time interval. The correlation coefficient of the measurement values obtained from two applications is the reliability coefficient of the scale (Karakoç & Dönmez, 2014). In this study, SrS for HSS was administered twice with a three-week interval to 51 students who had not completed the scale before and the correlation between the results of the two applications was evaluated.

Hemşirelik Bilimi Dergisi
2025, 8 (1), 98-112
Doi: 10.54189/hbd.1551247

Data Analysis

The data obtained from the study were evaluated using the Statistical Package Program (IBM-Statistical Package for Social Science 24-SPSS 24.0) and IBM 23-AMOS. The methods used in data analysis are shown in Figure 1. In the analysis of the results, $p< 0.05$ was considered significant.

Ethical Considerations

Approval for the study was obtained from the Istanbul University-Cerrahpaşa Social and Human Sciences Research Ethics Committee (approval date: 04/04/2023; approval number: 120) and official permission was also taken from the university to conduct the study.

RESULTS

The study was conducted with 1331 participants. 55.7% (n=742) of the students were female, 44.3% (n=589) were male, and the mean age was 21.37 years (SD=2.81, Minimum=18, Maximum=51). Of the students, 78.0% (n=1038) were graduates of Anatolian/Science/Teacher High School, 4.3% (n=57) were graduates of Plain/General High School, 9.0% (n=120) were graduates of Health Vocational High School, and 8.7% (n=116) were graduates of Other/Vocational High School. According to the departments, 37.8% (n=503) in Midwifery, 18.0% (n=239) in Nursing, 11.0% (n=146) in Physiotherapy and Rehabilitation, 5.3% (n=70) in Social Work, 5.0% (n=67) in Nutrition and Dietetics, 10. 0% (n=133), 3.8% (n=51) in Health Management, 9.2% (n=122) in Audiology and 33.4% (n=444) of the students were in 2nd grade, 30.3% (n=403) in 3rd grade and 36.4% (n=484) in 4th grade. In each of the scale development stages, a different sample group was studied. EFA was conducted with 644, CFA with 327, criterion-related validity with 150, reliability with 159, and test-retest with 51 students.

Content Validity: According to the expert opinions, the items with a CVI below 0.80 were removed from the 110-item draft scale and a 64-item draft scale was obtained.

Exploratory Factor Analysis: Kaiser-Meyer-Olkin (KMO), Bartlett Sphericity Test, Anti-Image Correlation, Principal Component Analysis and Varimax Rotation Method were used. Before starting the factor analysis, the suitability of the data set for factor analysis was evaluated with KMO and Bartlet's test. The results obtained were KMO 0.948; $x2=6278.978$, $df=253$; $p<0.001$ in Barlett Sphericity test and according to these results, it was determined that the sample size was sufficient and suitable for factor analysis. In the factor analysis, 34 items whose difference between the values of an item under two or more factors was less than 0.1 and whose loadings were below 0.30 were excluded from the analysis. In the simultaneous analysis, 7 items were excluded from the scale due to low reliability and correlation coefficient below 0.20. As a result of the analysis, a structure consisting of 2 factors and 23 items was obtained. It was seen that all of the extraction values of the scale items were above 0.3, all of the diagonal values in the anti-image correlation matrix were above 0.5 and the factor loadings of the items ranged between 0.443-0.784. The items under each factor were evaluated for compliance with the theoretical structure and named as Factor 1 Reflection in and on Action and Factor 2 Reflection for Action. Factor loadings, common factor variance and variances explained by the factors are shown in Table 1.

Hemşirelik Bilimi Dergisi
2025, 8 (1), 98-112
Doi: 10.54189/hbd.1551247

Table 1. The factor loading of SrS for HSS® (N=644)

Item	F1	F2	Extraction
1. 10- I take responsibility for what I say.	0.570		0.362
2. 14- It is important for me to assess my behavior.	0.443		0.312
3. 26- I am aware of my values and my beliefs.	0.621		0.428
4. 28- I listen with interest to the individual to whom I provide health care.	0.663		0.467
5. 33- I reflect on my core values and beliefs.	0.617		0.424
6. 34- I take into account how my thoughts affect the individual to whom I provide health care services.	0.697		0.558
7. 35- I take into account the feelings of the individual to whom I provide health services in communication.	0.784		0.668
8. 36- I am aware that information can affect emotions.	0.644		0.485
9. 37- I consider my strengths while meeting the health needs of the individual/family/community.	0.541		0.426
10. 39- I critically evaluate the strategies and techniques I use in meeting the health needs of the individual/family/community.	0.488		0.354
11. 40- I would like to learn new skills to improve my ability to meet the health needs of the individual/family/community.	0.672		0.541
12. 41- Experience is important in successfully meeting the health needs of the individual/family/community.	0.633		0.463
13. 43- I evaluate my feelings.	0.508		0.404
14. 46- I want to understand myself.	0.478		0.358
15. 54- I am aware of how culture influences my perspective.	0.494		0.375
16. 50- I develop new perspectives when I talk to others about my work.		0.593	0.485
17. 51- Reflection helps me make a difference in my work.		0.652	0.527
18. 52- I develop insight into my professional identity through reflection.		0.733	0.573
19. 56- I reflect when faced with emotionally difficult situations.		0.586	0.434
20. 55- I am curious about the opinions of others (relatives, colleagues, etc.) after the interaction with the individual to whom I provide health care.		0.582	0.393
21. 57- By interviewing other people, I develop my ability to think deeply about my experiences.		0.734	0.568
22. 59- I have conversations with others to explore different perspectives.		0.638	0.476
23. 60- I reflect to assess my strengths and characteristics that need to be developed.		0.682	0.544
Eigenvalue	9.160	1.465	0.362
Variance Explanation Ratio (%)	39.828	6.368	
Cumulative Variance Explanation Ratio (%)	39.828	46.196	

® Self-Reflection Scale for Health Sciences Students

Additivity test: According to Tukey's test of additivity, it was found that the scale was not additive ($p<0.001$). Based on this result, all analyses were performed according to the sub-dimensions.

***Confirmatory Factor Analysis*:** In the CFA analysis of the scale consisting of two sub-dimensions, path diagram and model goodness of fit indices were evaluated. Among these fit indices, x2/sd, Comparative Fit Index (CFI), Non-Normed Fit Index (NFI) (or Tucker-Lewis Index), Root Mean Square Error of Approximation (RMSEA) and Standardized Root Mean Square Residual (SRMR) were analyzed. As a result of the first level CFA consisting of 23 items and 2 sub-dimensions, model fit values were obtained as CMIN=563.951, DF=224, CMIN/DF=2.518, CFI=0.923, TLI=0.913, RMSEA=0.068, SRMR=0.047 as a result of five modifications. The values obtained were within the acceptable values and accordingly, the

Hemşirelik Bilimi Dergisi
2025, 8 (1), 98-112
Doi: 10.54189/hbd.1551247

model was expected to be compatible and acceptable (Table 2). In addition, all path coefficients of the items were statistically significant (p<0.001). The structural equation modeling of SrS for HSS is shown in Figure 2.

Table 2. Measurement model fit criteria of SrS for HSS (N=327)

Fit Measurements	Measurement Value	Acceptable Fit	Good Fit
X^2/sd	2,518	$2 \leq X^2/sd \leq 3$	$0 \leq X^2/sd \leq 2$
CFI	0,923	.90 ≤ CFI ≤ .95	.95 ≤ CFI ≤ 1.00
NNFI (TLI)	0,913	.90 ≤ NNFI ≤ .95	.95 ≤ NNFI ≤ 1.00
RMSEA	0,068	.05 ≤ RMSEA ≤ .08	.00 ≤ RMSEA ≤ .05
SRMR	0,047	.05 ≤SRMR ≤ .10	.00 ≤ SRMR ≤ .05

χ^2 /df-CMIN/DF: Ratio of Chi-square to Degrees of Freedom; CFI: Comparative Fit Index; NNFI (TLI): Non-Normed Fit Index (Tucker-Lewis Index); RMSEA: Root Mean Square Error of Approximation; SRMR: Standardized Root Mean Square Residual

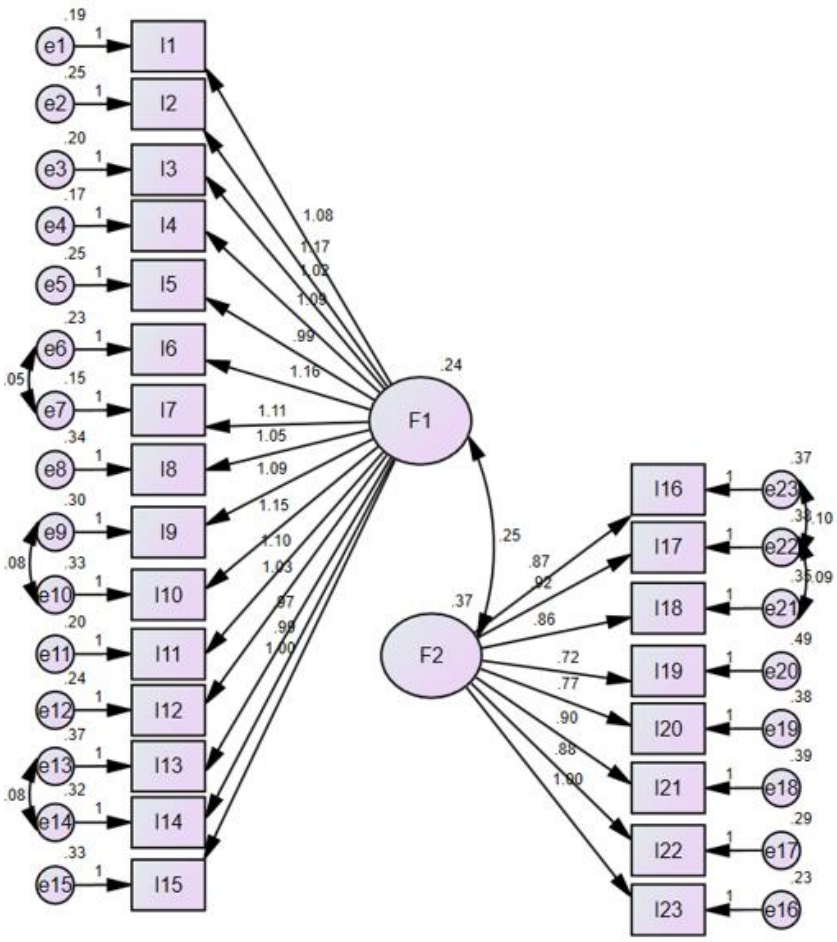

Figure 2. The structural equation modeling of Self-Reflection Scale for Health Sciences Students (N=327)

Concurrent validity: The correlation between the SRS for HSS sub-dimensions and SRIS sub-dimensions is shown in Table 3 and all correlations were positive and significant (p<0.01).

Hemşirelik Bilimi Dergisi
2025, 8 (1), 98-112
Doi: 10.54189/hbd.1551247

Table 3. Correlation of Sub-Dimensions of the Self-Reflection Scale for Health Sciences Students and Self-Reflection and Insight Scale (N=150)

		Reflection in and on Action	Reflection for Action
Self-reflection	**r**	0,560**	0,600**
	p	0,000	0,000
Insight	**r**	0,371**	0,231**
	p	0,000	0,003

**Correlation is significant at the 0.01 level (2-tailed)

Internal Consistency and Cronbach's Alpha Reliability Coefficient: The descriptive values of the SrS for HSS include corrected item-total correlation at the subscale level (ranging from 0.53-0.83 for Reflection in and on Action subscale and 0.45-0.66 for Reflection for Action subscale), Cronbach's Alpha if Item Deleted (ranging from 0. 92-0.93 for Reflection in and on Action sub-dimension and 0.82-0.85 for Reflection for Action sub-dimension) and sub-dimension Cronbach's Alpha value (0.93 for Reflection in and on Action and 0.85 for Reflection for Action) are shown in Table 4.

Table 4. Item response statistics of the Self-Reflection Scale for Health Sciences Students (N=159)

Item	M	SD	Skw.	Krt.	CITC	CAIID
1. I take responsibility for what I say.	4,45	0,672	-1,345	3,283	0,533	0,926
2. It is important for me to assess my behavior.	4,43	0,642	-0,987	1,226	0,699	0,921
3. I reflect on my core values and beliefs.	4,44	0,602	-0,739	0,542	0,660	0,922
4. I listen with interest to the individual to whom I provide health care.	4,60	0,529	-0,788	0,584	0,624	0,924
5. I reflect on my basic values and beliefs.	4,39	0,674	-1,536	4,875	0,743	0,920
6. I take into account how my thoughts affect the individual to whom I provide health care.	4,45	0,653	-1,618	5,388	0,570	0,925
7. I take into account the feelings of the individual to whom I provide health services in communication.	4,51	0,615	-1,691	6,427	0,826	0,918
8. I am aware that information can affect emotions.	4,40	0,675	-1,302	3,530	0,634	0,923
9. I consider my strengths while meeting the health needs of the individual/family/community.	4,23	0,667	-0,822	2,347	0,590	0,924
10. I critically evaluate the strategies and techniques I use in meeting the health needs of the individual/family/community.	4,19	0,670	-0,888	2,715	0,677	0,922
11. I would like to learn new skills to improve my ability to meet the health needs of the individual/family/community.	4,50	0,635	-1,639	5,548	0,681	0,922
12. Experience is important in successfully meeting the health needs of the individual/family/community.	4,47	0,644	-1,524	4,948	0,651	0,923
13. I evaluate my feelings.	4,35	0,657	-1,198	3,755	0,700	0,921
14. I want to understand myself.	4,52	0,692	-1,912	5,476	0,643	0,923
15. I am aware of how culture influences my perspective.	4,24	0,775	-1,352	3,224	0,596	0,925
Reflection in and on Action (Min.: 27, Max.: 75)	**66,17**	**6,93**	**-1,619**	**6,937**		**0,927**
16. I develop new perspectives when I talk to others about my work.	4,21	0,749	-1,195	3,080	0,644	0,823
17. Reflection helps me make a difference in my work.	4,14	0,896	-1,238	1,833	0,588	0,830
18. I develop insight into my professional identity through reflection.	4,06	0,793	-0,807	1,021	0,660	0,820
19. I reflect when faced with emotionally difficult situations.	4,05	0,947	-1,234	1,597	0,639	0,824
20. I am curious about the opinions of others (relatives, colleagues, etc.) after the interaction with the individual to whom I provide health care.	4,40	0,729	-1,170	1,267	0,449	0,845
21. By interviewing other people, I develop my ability to think deeply about my experiences.	4,09	0,778	-0,738	0,900	0,631	0,824
22. I have conversations with others to explore different perspectives.	4,19	0,733	-1,103	2,498	0,504	0,839
23. I reflect to assess my strengths and characteristics that need to be developed.	4,26	0,641	-0,885	3,116	0,587	0,831
Reflection for Action (Min.: 18, Max.: 40)	**33.41**	**4,39**	**-0,581**	**0,776**		**0,848**

M: mean, SD: standard deviation,Skw.: skewness, Krt.: kurtosis, CITC: corrected item-total correlation,AIID: Cronbach's Alpha if Item Deleted.

Test-retest: The time invariance of the Self-Reflection Scale for Health Sciences Students was tested with the "test-retest" method and 51 health sciences students were administered the scale at 3-week intervals. The test-retest correlation

Hemşirelik Bilimi Dergisi
2025, 8 (1), 98-112
Doi: 10.54189/hbd.1551247

coefficients of SrS for HSS were 0.72 for Reflection in and on Action sub-dimension and 0.50 for Reflection for Action sub-dimension.

DISCUSSION

There is no measurement tool to determine the self-reflection characteristics of health sciences students, including the care of individuals in need of health care. It is known that the self-reflection characteristics of health professionals are effective in care (Nguyen et al., 2014) and this feature should be evaluated in the teaching process. In order to make this assessment, valid and reliable measurement tools are needed. Based on this point, SrS for HSS was developed and its validity and reliability were examined. For this purpose, firstly, the format of the measurement tool was decided, an item pool was created, the opinion of a Turkish language expert was obtained, Surface Validity and Content Validity were ensured, and a pilot study was conducted by interviewing 35 students face-to-face. Then, construct validity (Factor Analysis) and criterion-based validity were examined, and the final version of the scale was tested for time invariance after reliability analysis. The results obtained at each stage are discussed below, taking into account the literature.

A scale is a data collection (observation) tool prepared with reference to the characteristics of the events, phenomena, objects and entities that are the subject of scientific research. Scales make it possible to quantitatively determine certain characteristics of these events, phenomena, objects and entities that are the subject of the research. When developing a scale, the researcher(s) should use a standardized scale construction technique developed by theorists to measure "attitude, belief, perception or opinion" (Bayat, 2014).

At this stage of the study, "Likert Scaling Technique (Summated Ranking Technique)" was used. In Likert scaling, each proposition in the scale both contributes to the determination of the internal characteristic to be measured and a total score can be obtained for the internal characteristic to be measured. Therefore, Likert type scaling has a clear advantage in terms of providing information to the researcher (Bayat, 2014). For these reasons, a five-point Likert-type scale was created by taking into account the characteristics to be measured in the present study.

Creation of the item pool

When developing a scale, the scope of the scale should be determined and items should be created (Koçak & Demirdel, 2023). In this study, a comprehensive literature review was conducted by adopting the deductive method and items were created by examining existing similar scales. While creating the items (Bayat, 2014);

- To be directly related to individuals' self-reflection characteristics,
- To be at a level that can reveal the differences between individuals in terms of self-reflection characteristics,
- That the trait of self-reflection has become sufficiently pure to make it possible to distinguish it,
- A sufficiently large number (a quorum) to eliminate random errors that could be due to incompleteness (an insufficient number to reduce representativeness) (110 items were generated),
- That propositions do not refer to the past,
- The absence of statements based on/interpreting real events,
- Avoiding vague/ambiguous/too many interpretations,
- Not to include statements to which everyone can give the same answer,
- The language used is simple and understandable,
- Sentences should be short and not exceed 20 words

Hemşirelik Bilimi Dergisi
2025, 8 (1), 98-112
Doi: 10.54189/hbd.1551247

- Not to use frequently used words such as "All", "Always", "Never" and "None" that lead the respondent to uncertainty,
- That each proposition contains only one idea (meaning),
- That propositions do not consist of compound sentences,
- Not using terminology that respondents would not understand,
- Care was taken not to use two negative expressions together.

Content Validity

Content validity can be examined with Lawshe technique and Davis technique (Yurdagül, 2005). In the development of the Self-Reflection Scale for Health Sciences Students, the 110-item scale was presented to 16 experts using the Davis technique. According to the expert opinion, items with a Content Validity Index (CVI) below 0.80 were removed (40 items) and some items with a CVI above 0.80 were asked to be revised. After the necessary corrections were made to the items, the draft SrS for HSS with 70 items was given to 14 experts for the second time. This time, six items had a CGI value below 0.80, and thus, the 64-item draft SRS for HSS was given to 644 students and EFA was performed.

Explanatory Factor Analysis

In the factor analysis phase of the developed scale, exploratory and confirmatory factor analyses were performed. Before starting EFA, the suitability of the sample size and whether there is a relationship between the variables should be evaluated with KMO and Bartlett's Sphericitiy tests (Orçan, 2018). It is stated that a KMO value above 0.70 is sufficient to start EFA analysis and the result of Barlett's Sphericit test should be $p<0.05$ (Taherdoost, 2022). In the present study, KMO was 0.948 and the result obtained from Barlett's Sphericity test was significant ($x2=6278.978$, $df=253$; $p<0.001$). These values showed that the sample size was adequate and the data were suitable for factor analysis.

EFA is used to determine the structure between items or to determine how many factors there are in the structure and which items measure which factors (Orçan, 2018). There are different methods for determining the number of factors or components (Çolakoğlu & Büyükekşi, 2014). In this study, principal component analysis and Varimax orthogonal rotation method, eigenvalues, factor loadings and percentages of total variance explained by each factor were used as methods. As a result of the Varimax vertical rotation method, the items were divided into 2 factors and the total variance ratio was found to be 46%. In the literature, total variance values between 40% and 60% are considered sufficient for social sciences (Aksoy, 2016). The total variance ratios of SrS for HSS were interpreted as sufficient. In addition, when the total variance explained by each factor was examined, it was found to be above 5% in line with the literature (DeVellis, 2014).
In factor analysis, it is recommended that the factor loadings of the items should be above 0.30. Accordingly, the lower limit of item factor loadings was 0.30 and the difference between two factor loadings of the same item was at least 0.10 (Karagöz & Bardakçı, 2020). According to these criteria, a 2-factor structure consisting of 23 items with factor loadings (0.443-0.784) at the recommended level was formed.

The items under each factor were evaluated for their conformity with the theoretical structure and named as Factor 1 Reflection in and on Action and Factor 2 Reflection for Action. Self-reflection can be realized in different ways and these are shaped according to when and why the reflection is done (Balaman, 2023). Reflection for Action covers the past, present and future and contributes to planning for actionable change in the future (Killion & Todnem, 1991). Reflection in Action refers to real-time reflection during practice/experience and occurs during the real-time implementation of an activity (Ishino, 2018). It encompasses the real-time feelings, thoughts and reactions of participants or the observable interventions

Hemşirelik Bilimi Dergisi
2025, 8 (1), 98-112
Doi: 10.54189/hbd.1551247

of co-participants (e.g.: colleagues) as actions take place in situ. Reflection on Action is retrospective reflection after the practice/experience (Ekin & Balaman, 2023). For example, if reflection occurs after the individual's health needs are met, it is called Reflection on Action. When the items in the sub-dimensions formed as a result of EFA of the Self-Reflection Scale for Health Sciences Students were examined, it was seen that the first 15 items (Factor 1) included reflective statements during and after action (Reflection in and on Action), while the other eight items (Factor 2) were statements for planning actionable change in the future (Reflection for Action).

Confirmatory Factor Analysis

CFA, which is considered as an extension of EFA, evaluates the underlying structure of the data. While EFA tries to provide information about the hypothesis, CFA is used to test whether there is a sufficient level of relationship between these factors, which variables are related to which factors, whether the factors are independent of each other, and whether the factors are sufficient to explain the model. CFA is a type of structural equation modeling (SEM), which is called a research method in itself. The aim of CFA analysis is to verify the previously determined structure and to determine the appropriateness of this structure to the theoretical knowledge (Çapık, 2014; Kline, 2005; Şimşek, 2007). In the present study, path diagram and model goodness-of-fit indices were evaluated in the CFA analysis of SrS for HSS, which consists of two sub-dimensions. Multiple fit indices such as Ratio of Chi-square to Degrees of Freedom ($\chi 2$/df-CMIN/df), CFI, NFI, RMSEA and SRMR were used in CFA. The values of $2<\chi 2/df\leq 5$, $0.90\leq$CFI, $0.90\leq$NNFI, $0.05<$RMSEA≤ 0.10 and $0.05\leq$SRMR indicate acceptable fit (Aksu et al., 2017). As a result of the first level CFA of the SrS for HSS, which consists of a total of 23 items and 2 sub-dimensions, model fit values were obtained as CMIN=563.951 DF=224, CMIN/DF=2.518, CFI=0.923, NNFI(TLI)=0.913, RMSEA=0.068, SRMR=0.047 as a result of five modifications. It was determined that the values obtained were within acceptable values and accordingly, the model showed good fit.

Concurrent validity

Considering that the SRIS is similar to the SrS for HSS, whose psychometric properties were tested, the correlation between SRIS and SrS for HSS scores was examined for concurrent validity. The first sub-dimension of the SRIS is self-reflection "examining and evaluating one's thoughts, feelings and behaviors", while the other sub-dimension is insight "clarity of understanding one's thoughts, feelings and behaviors" (Silvia et al., 2023). The fact that all correlations between SrS for HSS sub-dimensions and SRIS sub-dimensions were positive and significant as expected indicates the concurrent validity of SrS for HSS.

Internal Consistency and Cronbach's Alpha Reliability Coefficient

The internal consistency of measurement instruments is a concept based on the assumption that the instrument consists of independent units for a specific purpose and that they have known and equal weights within the whole. It is the reliability that determines that all units of the scale are capable of measuring the variable of interest. Cronbach's Alpha Coefficient and Item-Total Score Correlation are the methods used to test internal consistency reliability (Evci & Aylar, 2017).

Item-total score correlation coefficient is used to determine the ability of each item in a scale to measure what is intended to be measured. A correlation coefficient of 0.25 or less defines a very weak relationship; 0.26-0.49 defines a weak relationship; 0.50-0.69 defines a moderate relationship; 0.70-0.89 defines a high relationship; and 0.90-1.0 defines a very high relationship. Although there is no specific standard for the item-total score correlation coefficient, it is recommended that the correlations should not be below 0.25 or 0.30 and should not be negative (Özdamar, 2013). The corrected item-total

Hemşirelik Bilimi Dergisi
2025, 8 (1), 98-112
Doi: 10.54189/hbd.1551247

correlation coefficient of the SrS for HSS ranged between 0.53-0.83 in the Reflection in and on Action subscale and 0.45-0.66 in the Reflection for Action subscale. As a result, it can be said that the scale items are distinctive in terms of the features they measure and the items that make up the scale are reliable.

Another widely used method to determine the reliability of a scale is to determine the Cronbach's Alpha Coefficient, and in this method, 0.70 and above is the acceptance limit (Büyüköztürk, 2011). In the present study, Cronbach's Alpha value was 0.93 for Reflection in and on Action and 0.85 for Reflection for Action, and these results showed that the values obtained regarding the reliability of the scale were sufficient.

Test-retest

The time invariance of the Self-Reflection Scale for Health Sciences Students was tested with the "test-retest" method and 51 health sciences students were administered the scale at 3-week intervals. The test-retest correlation coefficients of SrS for HSS were 0.72 for Reflection in and on Action sub-dimension and 0.50 for Reflection for Action sub-dimension. This correlation value shows both the stability of the test scores and the fact that the measured feature does not change much between the two measurements depending on time.

CONCLUSION

Self-reflection which is an important personal characteristic that contributes to a positive change in one's own thoughts and behavior, is the individual's observation and interpretation of his own behavior; is the ability to control. There are scales that allow determining the general self-reflection characteristics of individuals. However, scales to determine self-reflection in health care were not available. In this study, a self-reflection scale was developed primarily for students studying in health sciences. In the next project, the ability to use SrS for HSS in determining the self-reflection characteristics of healthcare professionals will be examined.

The SrS for HSS is a five-point Likert type scale rated as "Strongly Agree (5), Agree (4), Undecided (3), Disagree (2), Strongly Disagree (1)". It has two sub-dimensions: “Reflection in and on Action” and “Reflection for Action”. Items 1-15 constitute the Reflection in and on Action sub-dimension, and items 16-23 constitute the Reflection for Action sub-dimension. There are no items in the scale that need to be reverse coded. Since the scale is not collectible, an overall score cannot be obtained. The lowest score that can be obtained from the Reflection in and on Action sub-dimension of the scale is 15, the highest score is 75. The lowest score that can be obtained from the Reflection for Action subscale is 8 and the highest score is 40. A high score indicates that health sciences students have high self-reflection characteristics.
In the validity-reliability study of the scale, the mean score of the Reflection in and on Action sub-dimension was 66.17 (SD=6.93), Cronbach's Alpha value was 0.927; The mean score of the Reflection for Action subscale was 33.41 (SD = 4.39), and the Cronbach's Alpha value was 0.848.

Self-reflection in healthcare practice ensures adaptation to the rapidly changing healthcare system, improves the ability to observe, investigate, evaluate and explore events realistically while providing care, and thus improves the quality of care. As a result the Self-Reflection Scale for Health Sciences Students (SrS for HSS) is a valid and reliable scale that measures self-reflection traits of Health Sciences students.

Araştırmanın Etik Yönü/Ethics Comittee Approval: Approval for the study was obtained from the Istanbul University-Cerrahpaşa Social and Human Sciences Research Ethics Committee (approval date: 04/04/2023; approval number: 120) and official permission was also taken from the university to conduct the study.

Hemşirelik Bilimi Dergisi
2025, 8 (1), 98-112
Doi: 10.54189/hbd.1551247

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Hemşirelik Bilimi Dergisi
2025, 8 (1), 98-112
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