

Psychometric Evaluation of a Korean Version of the Sexual Risk Behavior Beliefs and Self-efficacy Scale among Female College Students

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Abstract

Purpose: While the sexual activity of college students is more prevalent during this life stage, to the best of our knowledge, a value system capable of properly controlling and judging sexual impulses and behaviors has not been fully established. This study examined the psychometric properties of the Korean version of the sexual risk behavior beliefs and self-efficacy (KR-SRBBS) to assess the sexual behavior and self-efficacy of college students.

Participants and methods: Convenience sampling was conducted using Social Network Services. The participants were 169 female college students aged 18-25 years. The validity and reliability were examined using item analysis, factor analysis, and Cronbach's alpha. A total of 17 items were selected for the analysis.

Results: Four factors were extracted through factor analysis, explaining 63.797% of the variance. After two modifications, it showed a good model fit for the KR-SRBBS. Cronbach's alpha was 0.77.

Conclusion: Our findings indicate that the KR-SRBBS may be a suitable instrument for measuring risky sexual behavior and self-efficacy in condom use among female college students.

Background

Various efforts aimed at preventing the spread of sexually transmitted diseases (STDs) and human immunodeficiency virus (HIV) continue to be implemented worldwide, thereby resulting in fewer HIV cases. People diagnosed with STDs may be at an increased risk of contracting HIV (CDC, 2014). Nevertheless, young people continue to be at high of contracting STDs and HIV (CDC, 2017 b). Additionally, youth aged 15 to 24 years account for 10 million new STD cases in the US each year (CDC, 2017 a), and this number continues to increase steadily. Furthermore, in 2018, those between 13 and 24 years accounted for 21% of all the new HIV diagnoses, and approximately 80% of cases of new diagnoses of the 13–24 bracket involved young people aged 20–24 years (CDC, 2018). Similar results have been observed in South Korea. According to a 2020 report presented by the Korea Disease Control and Prevention Agency (2021), 1,016 people in South Korea were diagnosed with HIV and acquired immune deficiency syndrome (HIV/AIDS). According to the report, people in their 20s accounted for 33.8% (n = 343) of the total cases, followed by those in their 30s who accounted for 29.8% (n = 303) of the total cases. These results showed that young people play a significant role in preventing the spread of HIV/AIDS worldwide.

Generally, during early adulthood, sex-related value systems are not established fully, and as a result, young adults can be vulnerable to subjective judgments or choices regarding sexual behavior (Choi, 2016). Therefore, young adults are at high risk of engaging in several risky sexual activities, such as sexual intercourse with multiple partners, unprotected sex, or sexual intercourse under the influence of drugs or alcohol (Ritchwood, Ford, DeCoster, Sutton, & Lochman, 2015). Unsafe, risky, or unprotected sexual intercourse that increases the risk of STD/HIV infection. Risky behavior involves engaging in

sexual intercourse or other sexual activities without protection (AVERT, 2019). Safe sex can significantly reduce the incidence of STDs, HIV, and unintentional pregnancy (Zhao et al., 2016). Condom use has been identified as a crucial approach aimed at preventing such outcomes (CDC, 2016). Among the youth, condom use is considered a critical, cost-effective, and easily accessible approach for preventing HIV/AIDS infection (Widman, Noar, Choukas-Bradley, & Francis, 2014).

In terms of national health promotion and infection control, increasing the level of condom use among the youth is a priority (CDC, 2015). However, the level of condom use among young adults remains inconsistent or low (Kanda & Mash, 2018; Widman et al., 2014; Zhao et al., 2016). In the US, between 2011 and 2015, 47.3% of men and 59.9% of women aged 15–44 years did not use condoms while engaging in sexual intercourse in the past year (Copen, 2017). A study by Lee (2017) showed similar results, whereby only 25%–38.2% of young people used proper contraception, including condom use, in the past year. Among teenagers who do not use condoms, 17.1% reported to have contracted STDs (Park, Seo, Jeong, & Lee, 2017).

However, to the best of our knowledge, there is currently no instrument to measure the intent to use condoms among Korean college students. Therefore, in this study, an instrument for examining the intent for condom use among Korean students was adapted. This instrument could play a significant role in explaining risky sexual behavior among the youth. Further, this study aims to adapt the English version of the sexual risk behavior beliefs and self-efficacy (SRBBS) instrument cross-culturally by translating it into Korean and investigating the psychometric properties of the translated version. The SRBBS instrument was selected because it highlights specific aspects of risky sexual behaviors associated with the concepts presented in this study.

Theory of Planned Behavior

The concepts associated with the aforementioned instrument were derived from the theory of reasoned action, social learning theory, and the health belief model (Fisher, Davis, & Yarber, 2013, p. 588). The theory of planned behavior (TPB) plays a significant role in explaining the reasons for unsafe and risky sexual behaviors among Korean young adults. Most previous studies on this subject have demonstrated that young adults do not use condoms because they are unaware of the potential risks (e.g., misconceptions and/or misunderstandings) and as a result of subjective norms (e.g., cultural and/or social norms). Findings from previous studies also show that risky sexual behavior among the youth is significantly associated with their attitudes and beliefs regarding condom use (Ramiro, Reis, Matos, & Diniz, 2014).

According to the TPB, four concepts could affect sexual behaviors among young adults: attitude, subjective norms, intention, and perceived behavioral control (PBC). Because we cannot examine sexual behavior among the youth directly, the intention to use condoms will be used as a proxy for safe sexual behavior using three concepts based on the TPB. The TPB assumes that certain behaviors are predicted by the individual's intention to engage in a specific behavior (Ajzen, 1991). Furthermore, the predictors of

the intention to engage in specific behaviors include attitudes, subjective norms, and PBC. First, attitudes toward specific behaviors indicate the way in which actions seem desirable to each individual; this attribute is determined based on an individual's mindset or beliefs, especially the perceived outcomes of the behavior and the value placed on such outcomes. Second, subjective norms indicate the way in which others perceive behaviors and the way in which an individual's behavior could be influenced by significant referents' perceptions or beliefs. Third, intention indicates an individual's decision to engage in specific behaviors, such as risky or unprotected sexual intercourse. In this study, the intention to use condoms is considered a surrogate for sexual behavior. Finally, PBC can indicate an individual's ability to engage in a specific behavior, and this concept refers to perceived facilitators of or barriers to enacting a specific behavior.

Methods

Aim

This study aimed to validate the KR-SRBBS to measure the safe sexual behavior of Korean female college students. The main research objectives were to (a) examine the validity and reliability of the KR-SRBBS and (b) modify the scale and create a KR-SRBBS that is more suitable and adequate for measuring sexual behavior and self-efficacy of college students in South Korea.

Design and setting of the study

This is a methodological study that evaluated the reliability and validity of the Korean version of the sexual risk behavior beliefs and self-efficacy (KR-SRBBS). A cross-sectional survey was conducted between November 25 and December 5, 2019, using Qualtrics software. Given that sex-related topics are sensitive, we used Qualtrics to help participants feel more comfortable while responding to the survey questionnaire.

Participants

A total of 169 female college students aged 18–25 years were included in this study. The sample size was calculated using G*Power 3.1.9.2 (Faul, Erdfelder, & Buchner, 2009). The results indicated that 160 students were required to obtain reliable factors for the exploratory factor analysis. Considering 40% incomplete surveys and surveys completed in less than 5 minutes, 224 participants were recruited, and 169 samples were included in the analysis. Convenience sampling was used, and participants were recruited using social networking services.

Measurement

SRBBS

The initial study conducted by Basen-Engquist et al. (1999) involved 6,213 high school students in Texas and California. The SRBBS comprises 22 items rated on a 3-point or 4-point Likert scale. Higher values for

seven of the eight scales (except barriers to condom use) reflect less intent to engage in risky sexual behavior (Unis, Johansson, & Sällström, 2015). The internal consistency reliability of the sub-categories, as indicated by Cronbach's alpha, ranged from .70 to .78 in the initial study.

Translation Procedures

The guidelines for the process of cross-cultural adaptation follow the recommendations outlined by the World Health Organization (WHO; 2008). The first step in this process is forward translation, which involves linguistic conceptual and cultural translation. This step was performed independently by two translators whose first language was Korean. In the second step, an expert panel reviewed the first forward-translated versions to identify and resolve inadequate expressions in the translated version and any discrepancies between the forward translation and the original English version. The expert panel comprised four experts, including the two translators who worked on the forward translation phase. After debriefing, we changed some words based on socio-cultural aspects, aiming to help the target population understand the content better. After approval by the expert panel, the translated version was back-translated into English in the third step. Back-translation was performed consistently using the same method applied in the first step. However, the translators were different. The fourth step involved an expert committee review. This comprised six experts from the forward translation, expert panel, and back-translation phases. In this step, the experts assessed the meaning of the translated by comparing and discussing the two version to derive the pre-final Korean version of KR-SRBBS and finally laid out the pre-final version. We discussed the clarity and appropriateness of the translated instrument in detail to ensure semantic and idiomatic equivalence as well as experiential and conceptual equivalence between the two versions. All experts, excluding the first author, computed a content validity index using the rating of item relevance to verify the content validity of the KR-SRBBS. The fifth step involved pre-testing the translated instrument. We recruited 10 Korean undergraduate college students to test their ability to read and comprehend the questions. Through this process, we determined whether the target population could answer the questionnaire in a predictable manner. After gathering students' data, one question was slightly revised. In the final version, 22 items for the KR-SRBBS were generated (Fig. 1).

The KR-SRBBS Validation Process

Content Validity

Content validity was assessed by five experts using the item-level content validity index (I-CVI), and the final version of the KR-SRBBS was completed after considering socio-cultural aspects of the word choice.

Construct Validity

Exploratory Factor Analysis. First, the most popular orthogonal rotation, that is, Varimax rotation, was performed for exploratory factor analysis (EFA) using the principal axis factoring method. Second, the Kaiser–Meyer–Olkin (KMO) and Bartlett's test of sphericity were used to assess and evaluate data factorability. Third, the scree test of eigenvalues was plotted. Fourth, the cumulative proportion (%) of the

variance was used to measure the proportion of the variance accounted for by a factor. Finally, the pattern matrix was confirmed, which included the factor loadings for each key factor of interest.

Confirmatory Factor Analysis (CFA). CFA was performed using the factors extracted from the EFA. To reveal whether the findings showed a suitable model fit, chi-square, df , and its p -value, root mean square error of approximation (RMSEA; 90% CI), and CFI were tested.

Internal Consistency Reliability. To verify the internal consistency reliability of the KR-SRBBS, the item-total correlation and Cronbach's alpha were measured.

Data Analysis

The SPSS statistics for Windows, version 26.0 (IBM Corp., Armonk, NY, USA) and AMOS statistics for Windows, version 26.0 (SPSS Inc., Chicago, IL. USA) were used for data analysis.

Results

Validity Test for KR-SRBBS

Content Validity

Five experts on maternity, women's health nursing, and child and adolescent nursing computed the I-CVI. The mean I-CVI was 1.0.

Face Validity

We recruited 10 Korean undergraduate college students to verify face validity, and a post-position-related change was made to one question to increase readability and understandability.

Construct Validity 1: Item Analysis for Internal Consistency

The item-to-total correlations of the KR-SRBBS were reasonable (Table 1). If we deleted items #14, #15, #16, and #17, Cronbach's alpha increased slightly. However, we decided to retain the items because the change was negligible.

Table 1
Internal consistency

Item		Item-Total Correlation	Alpha if Item Deleted
1	I believe condoms (rubbers) should always be used if a person my age has sex.	0.651	0.728
2	I believe condoms (rubbers) should always be used if a person my age has sex, even if the girl uses birth control pills.	0.471	0.743
3	I believe condoms (rubbers) should always be used if a person my age has sex, even if the two people know each other very well.	0.631	0.730
4	Most of my friends believe condoms (rubbers) should always be used if a person my age has sex.	0.652	0.726
5	Most of my friends believe condoms (rubbers) should always be used if a person my age has sex, even if the girl uses birth control pills.	0.561	0.734
6	Most of my friends believe condoms (rubbers) should always be used if a person my age has sex, even if the two people know each other very well.	0.628	0.728
7	Imagine that you met someone at a party. He wants to have sex with you. Even though you are very attracted to each other, you're not ready to have sex. How sure are you that you could keep from having sex?	0.223	0.763
8	Imagine that you and your boyfriend have been going together, but you have not had sex. He really wants to have sex. Still, you don't feel ready. How sue are you that you could keep from having sex until you feel ready?	0.265	0.760
9	Imagine that you and your boyfriend decide to have sex, but he will not use condom (rubber). You do not want to have sex without a condom (rubber). How sure are you that you could keep from having sex, until your partner agrees it is OK to use a condom (rubber)?	0.476	0.746
10	Imagine that you and your boyfriend have been having sex but have not used condoms (rubbers). You really want to start using condoms (rubbers). How sure are you that you could tell your partner you want to start using condoms (rubbers)?	0.422	0.751
11	Imagine that you are having sex with someone you just met. You feel it is important to use condoms (rubbers). How sure are you that you could tell that person that you want to use condoms (rubbers)?	0.484	0.748
12	Imagine that you use birth control pills to prevent pregnancy. You want to use condoms (rubbers) to keep from getting STD or HIV. How sure are you that you could convince your partner that you also need to use condoms (rubbers)?	0.513	0.746
13	How sure are you that you could use a condom (rubber) correctly or explain to your partner how to use a condom (rubber) correctly?	0.287	0.759
14	If you wanted to get a condom (rubber), how sure are you that you could go to the store and buy one?	0.111	0.771

Item		Item-Total Correlation	Alpha if Item Deleted
15	It would be embarrassing to buy condoms (rubbers) in a store.	0.041	0.786
16	I would feel uncomfortable carrying condoms (rubbers) with me.	0.087	0.781
17	It would be wrong to carry a condom (rubber) with me because it would mean that I'm planning to have sex.	0.182	0.798

Table 1 Here

Construct Validity 2: EFA to Identify Hypothesized Components

EFA with Varimax rotation was performed on the KR-SRBBS, and four factors were extracted, accounting for 63.797% of the variance of 17 items. The initial tool comprised 22 items, all of which were loaded onto at least one derived factor. However, we removed three items with factor loadings of < 0.30 (#2, #7, and #19). In addition, factors with only two items were removed. Items #1 and #2 loaded in more than one factor, only the factor comprising more items was retained. A total of 17 items were included in the EFA. The KMO test result was 0.807, which was reasonably acceptable for factor analysis (the closer the value was to 1, the better the prospects for factor analysis. Values at 0.80 or higher are considered satisfactory). In addition, Bartlett's test of sphericity was found to be statistically significant ($\chi^2 = 1335.466$, $df = 136$, $p < .001$), which further supports the factorability of the data. In the scree plot, a sharp decline in the slope was observed. The final version of the KR-SRBBS produced four factors with a loading range of 0.859–0.446 (Table 2).

Table 2
Result of exploratory factor analysis

Item		Factor			
		1	2	3	4
1	I believe condoms (rubbers) should always be used if a person my age has sex.	0.773			
2	I believe condoms (rubbers) should always be used if a person my age has sex, even if the girl uses birth control pills.	0.715			
3	I believe condoms (rubbers) should always be used if a person my age has sex, even if the two people know each other very well.	0.818			
4	Most of my friends believe condoms (rubbers) should always be used if a person my age has sex.	0.787			
5	Most of my friends believe condoms (rubbers) should always be used if a person my age has sex, even if the girl uses birth control pills.	0.802			
6	Most of my friends believe condoms (rubbers) should always be used if a person my age has sex, even if the two people know each other very well.	0.859			
7	Imagine that you met someone at a party. He wants to have sex with you. Even though you are very attracted to each other, you're not ready to have sex. How sure are you that you could keep from having sex?		0.651		
8	Imagine that you and your boyfriend have been going together, but you have not had sex. He really wants to have sex. Still, you don't feel ready. How sure are you that you could keep from having sex until you feel ready?		0.532		
9	Imagine that you and your boyfriend decide to have sex, but he will not use condom (rubber). You do not want to have sex without a condom (rubber). How sure are you that you could keep from having sex, until your partner agrees it is OK to use a condom (rubber)?		0.742		
10	Imagine that you and your boyfriend have been having sex but have not used condoms (rubbers). You really want to start using condoms (rubbers). How sure are you that you could tell your partner you want to start using condoms (rubbers)?		0.446		
11	Imagine that you are having sex with someone you just met. You feel it is important to use condoms (rubbers). How sure are you that you could tell that person that you want to use condoms (rubbers)?			0.601	

Item	Factor			
	1	2	3	4
12	Imagine that you use birth control pills to prevent pregnancy. You want to use condoms (rubbers) to keep from getting STD or HIV. How sure are you that you could convince your partner that you also need to use condoms (rubbers)?		0.588	
13	How sure are you that you could use a condom (rubber) correctly or explain to your partner how to use a condom (rubber) correctly?		0.611	
14	If you wanted to get a condom (rubber), how sure are you that you could go to the store and buy one?		0.549	
15	It would be embarrassing to buy condoms (rubbers) in a store.		0.574	
16	I would feel uncomfortable carrying condoms (rubbers) with me.		0.629	
17	It would be wrong to carry a condom (rubber) with me because it would mean that I'm planning to have sex.		0.514	
Eigenvalue	5.161	2.702	1.856	1.127
Total variance explained proportion (%)	30.356	15.891	10.919	6.630
Cumulative proportion (%)	30.356	46.248	57.166	63.797

The first factor contains six items and was titled “behavioral and normative beliefs” (eigenvalue = 5.161; variance explained = 30.356%). The second factor, containing four items, was titled “control beliefs for refusing to have sexual relationships” (eigenvalue = 2.702; variance explained = 46.248%). Next, the third factor, comprising four factors, was labeled “control beliefs for communication and using condoms” (eigenvalue = 1.856; variance explained = 57.166%). Finally, the fourth factor, comprising three items, was titled “access difficulty” (eigenvalue = 1.127, variance explained = 63.797%; Table 2).

Table 2 Here

Construct Validity 3: Appropriateness of CFA

The CFA model fit indices for the KR-SRBBS were $\chi^2 = 325.162$ ($df = 113$, $p < .001$), CMIN/DF = 2.878, RMSEA = 0.106 (90% CI: 0.092–0.119), and CFI = 0.831 (Table 3). The goodness-of-fit test revealed that the assumed model fits the data well, but some indices were unsatisfactory (RMSEA and CFI), indicating that the current model requires slightly additional reconfigurations. Therefore, we reviewed the modification indices and reset the model to increase fit.

We found that the best way to improve the fit is to define a correlation between error terms e3 and e5. After the modification, the statistics were run again, and the result showed that the model fit was slightly

improved as the RMSEA dropped to $< .10$. However, the CFI should ideally be > 0.90 to be acceptable (Modified Model 1), and it was 0.876. Therefore, we added another route (correlation between the error terms e_4 and e_9) to the model so that it could be improved (Modified Model 2) (Fig. 2). Finally, the modified model yielded acceptable results (Hooper, Coughlan, & Mullen, 2008), thereby showing good model fit, indicating $\chi^2 = 233.064$ ($df = 111$, $p < .001$), CMIN/DF = 2.100, RMSEA = 0.081 (90% CI: 0.066–0.095), and CFI = 0.903 (Table 3).

Table 3
Model's goodness of fit

Model	Chi-square	<i>df</i>	Chi-square <i>p</i> -value	CMIN/DF	RMA	RMSEA (90% CI)	CFI
Model 1	325.162	113	$< .001$	2.878	0.040	0.106 (0.092–0.119)	0.831
Modified Model 1	267.408	112	$< .001$	2.388	0.040	0.091 (0.077–0.105)	0.876
Modified Model 2	233.064	111	$< .001$	2.100	0.039	0.081 (0.066–0.095)	0.903

Reliability for KR-SRBBS

Cronbach's alpha values were 0.77 for the 17 items of the KR-SRBBS. The reliability values for each factor were 0.91 for "behavioral and normative beliefs" (Factor 1), 0.71 for "control beliefs for refusing to have a sexual relationship" (Factor 2), 0.74 for "control beliefs for communication and using a condom" (Factor 3), and 0.59 for "access difficulty" (Factor 4). These results are considered to have high to moderate reliability.

Discussion

This study determined the validity and reliability of the KR-SRBBS by assessing its content validity, construct validity, and reliability coefficients for the scale and its subscales. The content validity was established by conducting face validity, using subject matter experts, and determining the I-CVI while construct validity was assessed through EFA and CFA. The overall reliability of the KR-SRBBS was evaluated using Cronbach's alpha for the subscales and total scale.

Content validity is critical in determining whether the items in the tool adequately represent the domains that the instrument purports to measure (Waltz et al., 2017). Ten Korean college students assessed the face validity of the KR-SRBBS. While face validity is not a true measure of validity, it is crucial as a preliminary step to ascertain how the tool appears to a potential participant. The use of five subject matter experts (SME) on the topic of interest is essential in judging the importance and adequacy of the

items in the tool. The I-CVI, which quantifies the extent of agreement of the five SMEs, reflected that they unanimously agreed on the relevance of all items included in the tool.

Construct validity evaluates the extent to which the items and domains are consistent with theoretical constructs as operationally defined in the tool (Waltz et al., 2017). The use of EFA and CFA factor analyses provided an expedient approach to assess construct validity of the KR-SRBBS (Polit, 2010; Waltz et al., 2017). EFA is a data-driven statistical tool to determine association of items and constructs in a tool and allows for hypotheses generation during the early phase of instrument development (Tabachnick & Fidell, 2013). On the other hand, CFA is a theory-driven, more complex statistical approach to establish construct validity (Waltz et al., 2017).

EFA resulted in a four-factor solution with 17 items. EFA simple structure guidelines were followed in determining the four factors of the KR-SRBBS. Each factor generated a minimum of three items and except for three items with a factor loading of < 0.30 , all other items have a factor loading of at least 0.40, satisfying the assumptions of using EFA. Further, to establish correlations and sampling adequacy of the items, the KMO test and Bartlett's test of sphericity were done (Polit, 2010). Determining item correlations provides information about factorability of the items, where items with low correlations indicate non-factorability. The item-to-total correlations, KMO, and Bartlett's test allowed sufficient factorability of the items in the KR-SRBBS.

Further, to determine whether CFA provided evidence of theoretical appropriateness of the tool, various model fit indices such as Chi-square, CMIN/DF, RMSEA, and CFI, were used. The initial model resulted in unsatisfactory fit indices (i.e., RMSEA and CFI), which prompted two modifications until all model fit indices showed satisfactory acceptability.

The reliability of KR-SRBBS was established by determining the Cronbach's alpha of the four factors or subscales. This approach is suitable in establishing the reliability of any instrument because it assessed the multidimensionality of the tool (Waltz et al., 2017). That is, the reliability of each of the factors was ascertained. Although the reliability coefficient of Factor 4 was higher than the other factors, this is a good start in measuring the reliability of KR-SRBBS since reliability testing does not involve a single measurement, but a continuous testing over time (Waltz et al., 2017).

Conclusions

The findings provide baseline knowledge of the KR-SRBBS as an assessment tool for measuring the intention to use condoms, which can be used as an outcome measure for evaluating the impact of future intervention studies aimed at reducing the spread of STDs and HIV. The KR-SRBBS has significant implications to nursing practice and research. In the absence of a Korean version to measure college student's self-efficacy and intention to engage in high-risk sexual behaviors, the KR-SRBBS can be potentially used as tool to address this issue, with the long-term goal of reducing the spread of STDs and HIV. The tool can be used by nurses in clinical practice, particularly school nurses or those who are working with adolescent population, to assess determinants of high-risk sexual behaviors. In nursing

research, establishing the psychometric properties of KR-SRBBS helps ensure the adaptability and relevance of the tool to the Korean adolescent population. As the study that adapted the first tool of this nature from its original English version, this psychometric research adds to the methodological studies that determined the appropriateness of an instrument to the target population. Further studies are required to further assess the psychometric properties in terms of validity, reliability, and sensitivity in the intention for condom use among Korean college students.

Abbreviations

AIDS acquired immune deficiency syndrome

CFA Confirmatory Factor Analysis

EFA exploratory factor analysis

HIV human immunodeficiency virus

I-CVI item-level content validity index

KMO Kaiser–Meyer–Olkin

KR-SRBBS Korean version of the sexual risk behavior beliefs and self-efficacy

PBC perceived behavioral control

RMSEA root mean square error of approximation

SME subject matter experts

SRBBS sexual risk behavior beliefs and self-efficacy

STDs sexually transmitted diseases

TPB theory of planned behavior

Declarations

Ethics approval and consent to participate

This study was approved by the institutional review board of University of North Carolina. The information sheet was posted on the first page of the Qualtrics survey, detailing the basic eligibility requirements and instructing students to click on the link if they were willing to participate.

Consent for publication

Not applicable.

Availability of data and material

The data presented in this study are available on request from the corresponding author. The data are not publicly available because it contains the participants' personal information.

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Authors' contributions

Conception and design of this study: J.M.L.; Provision of study materials or participants: J.M.L.; Data collection: J.M.L.; Performing statistical analyses and drafting the manuscript: J.M.L. and M. J.; Critically reviewing the manuscript and supervising the entire study process: J.M.L. and M.J.; and Final approval of the version to be published: J.M.L. and M.J.

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Competing Interest

The authors declare that they have no competing interests.

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Figures

Forward Translation	<ul style="list-style-type: none"> • English to Korean translation. • Two translators whose first language is Korean.
Expert Panel Review	<ul style="list-style-type: none"> • Four experts including two from the first step. • Discussion about social and cultural aspects took place.
Back Translation	<ul style="list-style-type: none"> • Korean to English translation. • Two different translators from the first step, who were fluent in English.
Expert Review	<ul style="list-style-type: none"> • Six experts from each step. • Five experts measured the content validity index (CVI), excluding the first author.
Pre-testing	<ul style="list-style-type: none"> • Face validity • Ten undergraduate college Korean students were involved.
Final KR-SRBBS	<ul style="list-style-type: none"> • One question was slightly revised after the fifth step. • A total of 17 items of the KR-SRBBS were produced.

Figure 1

The KR-SRBBS Validation Process

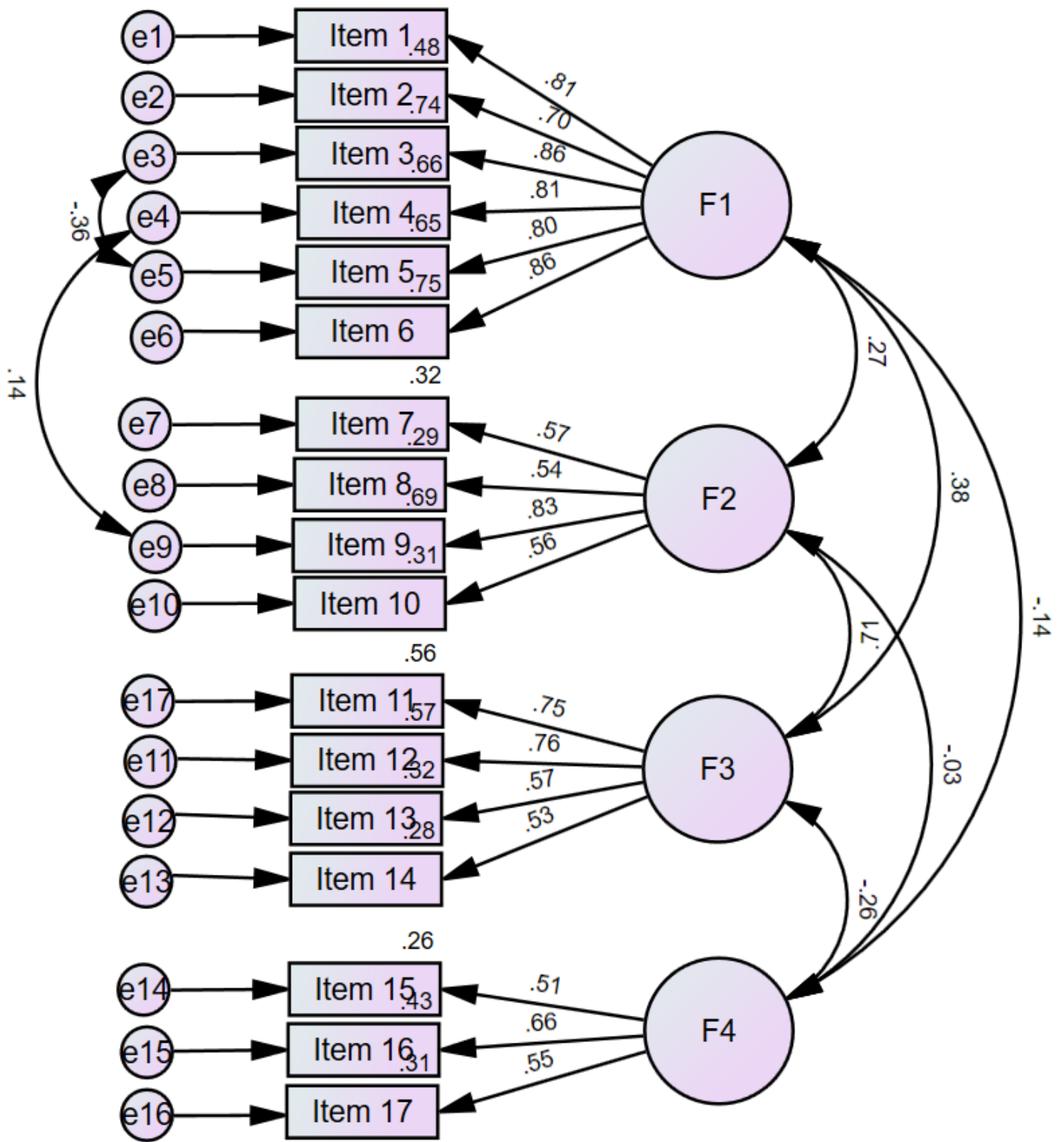


Figure 2

Reliability for KR-SRBBS