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Validation Short Food Literacy Questionnaire for Women: Translation and Cultural Adaptation in Indonesia

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Abstract

Food literacy is vital for public health, particularly in urban areas, as it enhances understanding of nutrition and fosters healthy eating patterns. This study aims to adapt and validate the SFLQ instrument for the Indonesian population, especially women. This study distributed the questionnaire to 968 respondents from across 16 sub-districts in Semarang City. This study validated SFLQ and modified it to fit Indonesia's condition. The 12-item questionnaire scored on a 4-point Likert scale, evaluates basic knowledge, understanding, and ability to assess nutritional information. Confirmatory Factor Analysis (CFA) determined the instrument's structure, followed by Structural Equation Modeling (SEM) for validation. Construct validity was tested by correlating SFLQ scores with health literacy, gender, and education, while internal consistency was assessed using Cronbach's Alpha. The study revealed a unidimensional structure, high internal consistency (Cronbach's Alpha = 0.891), significant factor loadings (0.400–0.730), and a strong correlation between nutritional and health literacy ($r_s = 0.606$, $p < 0.01$). Construct validity was supported by a significant positive correlation between food literacy and health literacy scores ($r_s = 0.606$, $p < 0.01$). The Jonckheere-Terpstra test also showed a trend of increasing nutritional literacy scores with higher health literacy categories ($p = 0.000$)—significant correlations with education level and health literacy supported validity. Aspects like dietary impact evaluation showed room for improvement.

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Introduction

Food literacy is a critical factor in public health and can contribute to city residents' understanding of nutrition (Palumbo, 2016). Data shows that stunting in children under five is a severe problem at the global and regional levels, including in Indonesia (Unicef & WHO, 2020). Even though there has been a slight decline in recent years, the prevalence of stunting in Indonesia is still high, including in Central Java Province and Semarang City Stunting can hinder children's cognitive and physical development, which can affect their future productivity (Mustakim et al., 2022) (Woldehanna et al., 2017).

Nutritional literacy is a determining factor in increasing understanding of nutrients in food and leading to appropriate eating patterns to meet daily dietary needs (Perry et al., 2017) (Cullen et al., 2015) (Truman et al., 2017).

Food literacy (FL) is the collection of knowledge, skills, and behaviors needed to plan, manage, select, prepare, and consume food well (Vidgen & Gallegos, 2014). Increasing FL, it is hoped that people can make better decisions when choosing and consuming nutritious and healthy foods. Food literacy has received growing attention in food and nutrition research over the last 25 years. FL is considered a critical factor in public health and a promising approach to address complex public health problems, from obesity to environmental sustainability (Palumbo, 2016). FL is a framework that aims to empower individuals, households, communities, and nations to protect the quality of their diets through change and support sustainable dietary resilience (Vidgen & Gallegos, 2014). Another approach suggests that FL can be understood as a holistic concept encompassing a wide range of skills and abilities necessary to build a healthy relationship with food and participate in and engage in a sustainable food system (Cullen et al., 2015; Palumbo, 2016; Perry et al., 2017; Truman et al., 2017).

FL is closely related to health literacy, which is understood as the ability or set of skills required for a healthy lifestyle (Kickbusch et al., 2005) (Nutbeam, 2008). The Nutbeam model, with its theoretical constructs of functional, interactive, and critical health literacy, includes reading, understanding, exchanging, and critically analyzing and using health information to gain greater control over life events and situations. This model is often used to conceptualize FL (Begley & Vidgen, 2016) (Gillis, 2016) (Nutbeam, 2008) (Nutbeam, 2000). An analysis of recent literature suggests that FL can be understood as a specific form of health literacy (Corinna Krause et al., 2018).

Although many concepts about FL exist, comprehensive measurement tools are still rare (C. G. Krause et al., 2018). Most existing instruments focus on single abilities/skills such as reading and understanding nutritional information (nutritional literacy), nutritional knowledge, or cooking skills (Vaitkeviciute et al., 2015). Krause's short food literacy questionnaire (SFLQ) instrument measures various skills, including functional interactive elements and essential aspects of food literacy (Corinna Krause et al., 2018). The SFLQ was developed in 2018 and has been validated in adult samples. The SFLQ was initially developed in Switzerland as part of an intervention study to reduce salt consumption among workers (C Krause et al., 2016). The instrument includes access to and understanding of food and nutritional information, knowledge of the Swiss food pyramid, Swiss recommendations for fruit, vegetable, and salt consumption, the ability to prepare healthy meals, and the ability to support others. SFLQ explored the basic structure of a questionnaire with 350 respondents and identified the ideal number of SFLQ items to capture various elements of FL (C. G. Krause et al., 2018). Currently, the SFLQ can be found in an original English version (C. G. Krause et al., 2018), a German version and cross-cultural validation for Turkey, Brazil, and Poland (Zeminian et al., 2022) (Zwierczyk et al., 2022) (Durmus et al., 2019). SFLQ in Indonesia still has limitations in its application. The lack of appropriate assessment tools in Indonesia's food literacy context has resulted in a lack of data availability to comprehensively measure and monitor aspects of food literacy and address food literacy challenges in Indonesia.

Using instruments created in other countries but culturally adapted allows for comparing results and elaborating cross-cultural study models. Therefore, this research aims to present the cross-cultural adaptation process and validity of the SFLQ content so that it can be applied to the Indonesian population. Cultural adoption is important because the significance of product familiarity is strongly and positively correlated with overall attitudes toward traditional food and the consumption of food. The emphasis on convenience was inversely associated with the overall attitude toward traditional food and the consumption of food. The natural content of food exhibited a positive correlation with attitudes toward traditional food and the consumption of food. (Pieniak et al., 2009), furthermore, the function of food in organizing daily life encompasses its influence on social interactions, individual identity, and power dynamics. (Nordström et al., 2013)

This study chose women as the focus because women are seen as essential nutrition suppliers for themselves and their households, responsible for planning and managing food resources, selecting and purchasing food, preparing meals, and consuming food. (Gamez, 2018, Ahye et al., 2006)

This research is essential because the Semarang City Government has set a goal of "Zero Stunting 2024," but understanding nutrition among Semarang City residents still needs improvement. By measuring people's level of food literacy and how this relates to nutritional problems, including stunting, this research will provide valuable insight into efforts to achieve this goal. This research can also be a basis for designing appropriate programs or interventions to increase community FL.

Methods

Study Design and Setting

This study was conducted in September-December 2023. The translation and cross-cultural adaptation model of the Short Food Literacy Questionnaire (SFLQ) into the Indonesian version includes three basic steps.

In the first step, a comprehensive literature review was carried out regarding food literacy, existing food literacy measurement instruments, and Indonesian society's cultural context and characteristics, especially in Semarang. This review aims to gain an in-depth understanding of the food literacy construct and aspects relevant to the Indonesian context to facilitate the process of appropriately adapting the questionnaire.

In the second step, the original SFLQ questionnaire was translated into Indonesian by a professional translator who understands the Indonesian cultural context. After that, the translation was reviewed and verified by an expert panel consisting of nutrition experts, public health experts, and linguists to ensure the accuracy of the translation, clarity of meaning, and suitability to the local cultural context. This process also involved in-depth discussions and adjustments to questionnaire items that were inappropriate or ambiguous in the Indonesian context.

In the third step, the Indonesian-adapted version of the SFLQ (SFLQ-IDN), which has been reviewed and adjusted by experts, is empirically validated. The validation process involved 968 respondents taken randomly from the community in 16 Semarang City, Indonesia sub-districts.

These steps were taken to ensure that the resulting SFLQ-IDN instrument has conceptual, semantic, and normative equivalence with the original version and is based on Indonesian society's cultural context and characteristics, especially in the city of Semarang. It is hoped that a careful cross-cultural adaptation process involving the participation of experts and target communities can produce a valid and reliable instrument for measuring food literacy in Indonesia.

Instrument

This research questionnaire includes questions about a person's knowledge and ability to understand, access, and evaluate information related to nutrition and food so that they can make the right decisions when choosing healthy food and. Food literacy was self-assessed using 12 questions, where respondents answered a 4-point Likert scale, with options from don't know to agree strongly, very bad to very good, very difficult to straightforward, never to always.

Of the 12 self-rated items, questions 1-3 assess respondents' basic knowledge about sources of nutritional information and recommendations for fruit, vegetable, and salt consumption from the government. Question number 4 assesses respondents' understanding of various sources of nutritional value information such as leaflets, food labels, TV/radio programs, advice from professionals, and friends/family. Question number 5 assesses respondents' understanding of the government's official slogan regarding nutrition. Questions 6-7 assess the respondent's ability to select relevant nutritional information and organize a balanced menu in the family. Questions number 8-10 assess the respondent's ability to evaluate the relationship between food and health, assess whether certain foods are compatible with a healthy diet, and consider the long-term impact of diet on health. Question 11 assesses the respondent's ability to judge whether nutritional information is trustworthy. Question number 12 assesses how often respondents can help other people (family or friends) if they have questions related to nutritional value issues.

Overall, this questionnaire aims to measure a person's level of food literacy, including their knowledge, understanding, and ability to access, evaluate, and apply nutritional information in daily life to make healthy food decisions.

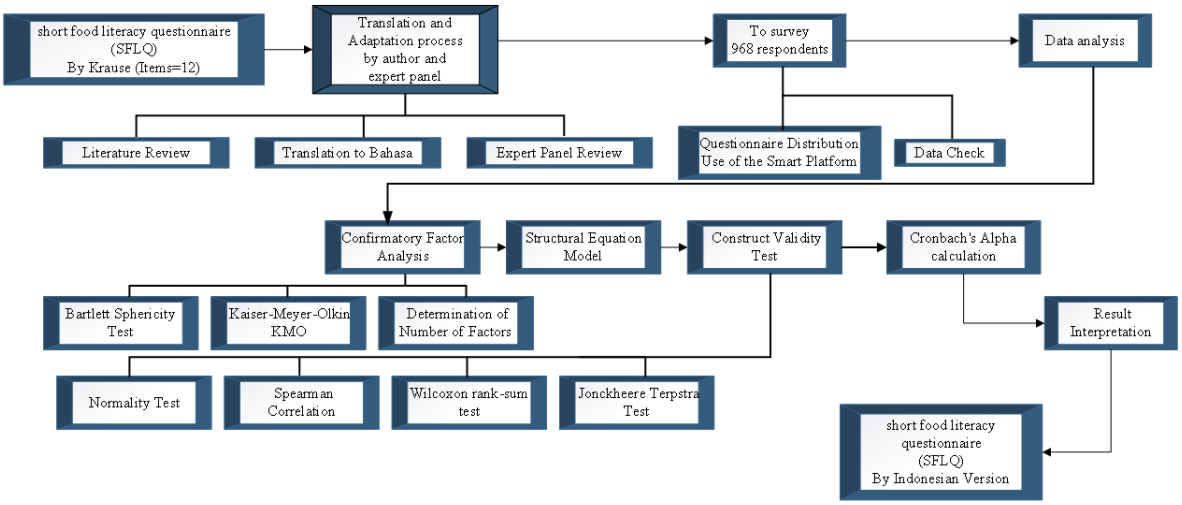

Figure 1. Diagram Showing The Flow of The Study

Data Collection

This study distributed a questionnaire to residents of Semarang City aged over 18 years from 16 sub-districts in Semarang City. The questionnaire consisted of 12 questions in electronic format and was distributed to 968 community respondents with an allocation of 100 respondents per sub-district.

The research team checked each questionnaire completed by respondents to detect missing data and inconsistencies and asked respondents to correct information if necessary. Data collection also utilizes the si-Cerdik platform, a website developed by the Faculty of Health at Dian Nuswantoro University, to measure health literacy (https://sicerdik.dinus.ac.id/).

This research has received approval from the UDINUS Health Research Ethics Committee with certificate number 000483/UNIVERSITAS DIAN NUSWANTORO/2023.

The Translation Model

The translation and adaptation process is described in Table 1. The authors translated the original validated English version of the SFLQ into Indonesian based on recommendations from Beaton et al (Beaton et al., 2000). Writers are fluent (including knowing colloquial phrases, jargon, idiomatic expressions, etc.) in the source language, and the target language is their mother tongue. The author is familiar with the source and target cultures, has lived and studied in an English-speaking country, and knows the instrument content. After discussions between the researchers and a review from an expert panel consisting of nutrition experts, public health experts, and linguists, this review and verification process also involved in-depth discussions between researchers and a panel of experts. This discussion included adjustments to questionnaire items deemed inappropriate or ambiguous in the Indonesian context.

The result of this process is the Indonesian translation of the SFLQ (SFLQ-IDN), which has been reviewed and adjusted by a panel of experts. This version has undergone a series of stages to ensure that the translation is linguistically accurate and appropriate to the Indonesian cultural context and can be understood well by local respondents.

Table 1. Translation And Adaptation Process Of The Instrument
Phase 1: Translation Authors who were fluent in the source and target languages, with Indonesian as their mother tongue, familiar with both cultures and knowledgeable about the instrument's content, created an independent translation, version T-1. *Phase 2: Expert Panel Review* A multidisciplinary expert panel consisting of nutrition experts, public health experts, and linguists reviewed the translation. The authors reached a consensus on any differences, resulting in version T-1.1 *Phase 3: Final Version of SFLQ-IDN* This process ensures that the SFLQ translation into Indonesian (SFLQ-IDN) is linguistically accurate, fits the Indonesian cultural context, and can be understood well by local respondents. The entire

Table 1. Translation And Adaptation Process Of The Instrument
process involved in-depth discussions between the researchers and the expert panel, including adjustments to inappropriate or ambiguous questionnaire items in the Indonesian context.

Analysis

This study used validity construct and internal consistency reliability for SFLQ-IDN. Reliability was judged by seeing Cronbach's Alpha value >0.7 and the validity construct conducted a confirmatory factor analysis (CFA) to gain insight into the possible multivariate structure of the self-rated Food Literacy (FL) instrument. Due to ambiguity, we assigned a score of 0 to all answers that were not on an ordinal scale (e.g., "don't know," "never"). To explore the number of factors that meaningfully grouped items, the analysis was carried out several times using different numbers of factors.

To determine the number of possible underlying factors, we applied the following criteria: eigenvalue >1, steep line plot, and factor loadings >0.40 (Stevens, 2002). Factor loadings of 0.4 is an acceptable threshold, especially with a large sample (>200 samples), and no items were eliminated. (Stevens, 2002, Hair et al., 2010) and the appropriateness of the factor in terms of its substantive meaning. To assess whether the data were suitable for CFA, the Bartlett Sphericity Test (significance level 0.05) and the Kaiser-Meyer-Olkin (KMO, eligibility limit set >0.6) were used. After conducting Confirmatory Factor Analysis (CFA), we continued with Structural Equation Modeling (SEM) to test and validate the factor structure. SEM allowed us to evaluate the relationships between the identified latent constructs and test the construct validity of the food literacy measurement model.

The model was specified based on the CFA results, taking into account four latent constructs: Basic Nutritional Knowledge (BNK), Understanding of Nutritional Information Sources (UNI), Ability to Apply Nutritional Knowledge (AAN), and Evaluation of the Impact of Food on Health (EFH).

To assess construct validity, we constructed an FL total score and examined previously anticipated associations between the total score and the following characteristics: health literacy, gender, and education. We first checked the normality of FL scores using quantile-quantile plots and the Shapiro-Wilk test to select appropriate statistical analyses in assessing construct validity. Because significant deviations from normality were found, we used the Spearman correlation for continuous variables, the Wilcoxon rank-sum test for categorical variables with two groups, and the Jonckheere Terpstra test for categorical variables with more than two ordered groups. Based on the conceptual considerations presented in the introduction, we expected FL to correlate positively with the broader health literacy concept. (Palumbo, 2016).

Because nutritional knowledge can be considered as part of FL (Corinna Krause et al., 2018), we also expected a positive association between FL scores and nutritional knowledge questions. We further examined how indicated recommended salt consumption in g/day and self-rated knowledge of official salt consumption recommendations (4-point Likert scale) were related using Spearman correlation. Cronbach's Alpha was used to assess the internal consistency of the FL scale. The significance level was set at 0.05. Because there was no correction for multiple testing, all analyses were considered confirmatory.

Results

Respondent Characteristics

This research involved 968 female respondents, focusing exclusively on women's perspectives on food literacy. The decision to analyze only female respondents was based on several important considerations. In many households, especially in Indonesia, women often play a primary role in food purchasing, preparation, and family nutrition management, making their food literacy particularly crucial for family health outcomes. Interestingly, Table 2 shows most respondents were in the productive age range, namely 26-35 years (26.2%) and 36-45 years (18.3%), indicating that this research reached a strategic age group. However, it also included other age groups, from teenagers under 17 years (0.9%) to seniors over 65 years (3.8%), which reflects the diversity of respondents' ages.

In terms of education, the majority of respondents had a high school education (55.5%), followed by the group with a Bachelor's/Bachelor's degree in Non-Health (16.7%) and respondents who had not completed high school (20.5%). Even though the groups with a health education background are relatively small, namely Diploma/Vocational Health (0.6%) and Bachelor/Bachelor's degree in Health (0.7%), their existence is quite interesting to investigate further regarding food literacy in this context. A detailed explanation of the characteristics of respondents can be seen in Table 2.

Confirmatory Factor Analysis

After confirming the adequacy of the sample based on the KMO value of 0.904 and Bartlett's Test of Sphericity, which was significant (Approx. Chi-Square = 6177.723, df = 66, p < 0.001), one factor emerged with factor loadings ranging from 0.400 to 0.730, supporting the unidimensional structure of the Nutritional Literacy scale. KMO (Kaiser-Meyer-Olkin Measure of Sampling Adequacy) has a value of 0.898, which is classified as very good (> 0.9) or very adequate. This indicates that the sample size is sufficient for factor analysis. The significance value of Bartlett's Test of Sphericity is < 0.001 (< 0.05), which means that the correlation matrix is not an identity matrix and there is a significant relationship between variables, so it is feasible to carry out factor analysis.

Table 2. Respondent Demographic Information (n=968)

	n	%
Gender		
Female	968	(100.0)
Age (N=1608)		
< 17 years	11	(1.1)
17-25 years	200	(20.7)
26-35 years	270	(27.9)
36-45 years	182	(18.8)
46-55 years	157	(16.2)
56-65 years	116	(12.0)
> 65 years	32	(3.3)
Education Level		
Undergraduate High School	330	(20.5)
Graduated from High School	524	(54.1)
Diploma/Vocational – Health	8	(0.8)
Diploma/Vocational – Non-Health	48	(5.0)
Master/S2-Non Health	7	(0.7)
Bachelor/S1-Health	10	(1.0)
Bachelor/S1-non-Health	142	(14.7)
Health Literacy		
Inadequate	169	(17.5)
Problematics	138	(14.3)
Sufficient	490	(50.6)
Excellent	171	(17.7)

The CFA results indicate that the 12 items contribute to a one-factor model. Factor loadings ranged from 0.400 (e.g., "How easy or difficult is it for you to organize a balanced menu in the family?") to 0.730 (e.g., "I am aware of the official recommendations from the Indonesian Government regarding fruit and vegetable consumption?"). Despite some items having relatively low factor loadings (e.g., FL7 = 0.400), all loadings were above the acceptable threshold of 0.4, especially with a large sample, and no items were eliminated.

Model fit indices showed mixed results. While the Chi-square test was significant (X^2 = 1180.426, df = 54, p < 0.001), indicating poor absolute fit, additional fit measures revealed suboptimal relative fit, with values such as CFI = 0.816, TLI = 0.775, and RMSEA = 0.147. Although the RMSEA is higher than the recommended threshold of 0.08, the SRMR of 0.065 falls within acceptable limits, and the GFI of 0.946 indicates a relatively good fit. Based on these fit indices, the model requires further refinement, but it provides an adequate starting point for evaluating Food Literacy.

In conclusion, the one-factor solution was retained due to its theoretical coherence and statistical support, highlighting that the instrument measures a single, overarching construct of Food Literacy. Further validation studies may improve the fit and refine the model for enhanced reliability and applicability.

Table 3. Retained Items, Descriptive Results, And Results From CFA (N = 968)

No	Item	Min-Max	Mean (SD)	Factor Loading
1	When I have questions related to health nutrition. I know where I can find information related to this issue	Don't Know = 0 to Strongly Agree = 4	3.01 (0.806)	0.532
2	I am aware of the official recommendations from the Indonesian Government regarding fruit and vegetable consumption	Don't Know = 0 to Strongly Agree = 4	2.89 (0.948)	0.730
3	I know the official recommendations from the Indonesian Government regarding salt consumption	Don't Know = 0 to Strongly Agree = 4	2.52 (1.249)	0.666
4	In general, how well do you understand the nutritional value information below: • leaflet contains nutritional value information • Food label information • TV radio program on Nutritional Value • Verbal recommendations regarding nutritional value from professionals • Nutritional advice from family members or friends	Very Bad = 1 to Very Good = 4	2.87 (7.508)	0.538
5	How well do you understand the Official Slogan of the Indonesian Government: *Isi Piringku* (The balance consumption consists of 50% fruit/vegetable, 50% carbohydrate, and protein)	Very Bad = 1 to Very Good = 4	2.02 (1.370)	0.688
6	There is so much information related to healthy nutrition nowadays. How well do you select the information that is appropriate for you?	Very Bad = 1 to Very Good = 4	2.85 (0.902)	0.584
7	How easy or difficult is it for you to organize a balanced menu in the family?	Very Difficult = 1 to Very Easy = 4	2.82 (0.759)	0.400
8	Commercial advertisements often link food and health. How easy is it for you to assess whether these connections are appropriate or not?	Very Difficult = 1 to Very Easy = 4	2.83 (0.787)	0.612
9	How easy can you evaluate if certain foods are related to a healthy diet?	Very Difficult = 1 to Very Easy = 4	2.61 (0.909)	0.727
10	How easy is it for you to evaluate the long-term impact of your diet on your health?	Very Difficult = 1 to Very Easy = 4	2.80 (0.800)	0.622
11	How easy is it for you to judge if information relating to nutrition issues is trustworthy?	Very Difficult = 1 to Very Easy = 4	2.94 (0.685)	0.510
12	In the past, how often have you been able to help a family member or friend if they had a question related to nutritional value issues?	Never = 0 to Always = 4	2.25 (1.258)	0.644

Structural Equation Model

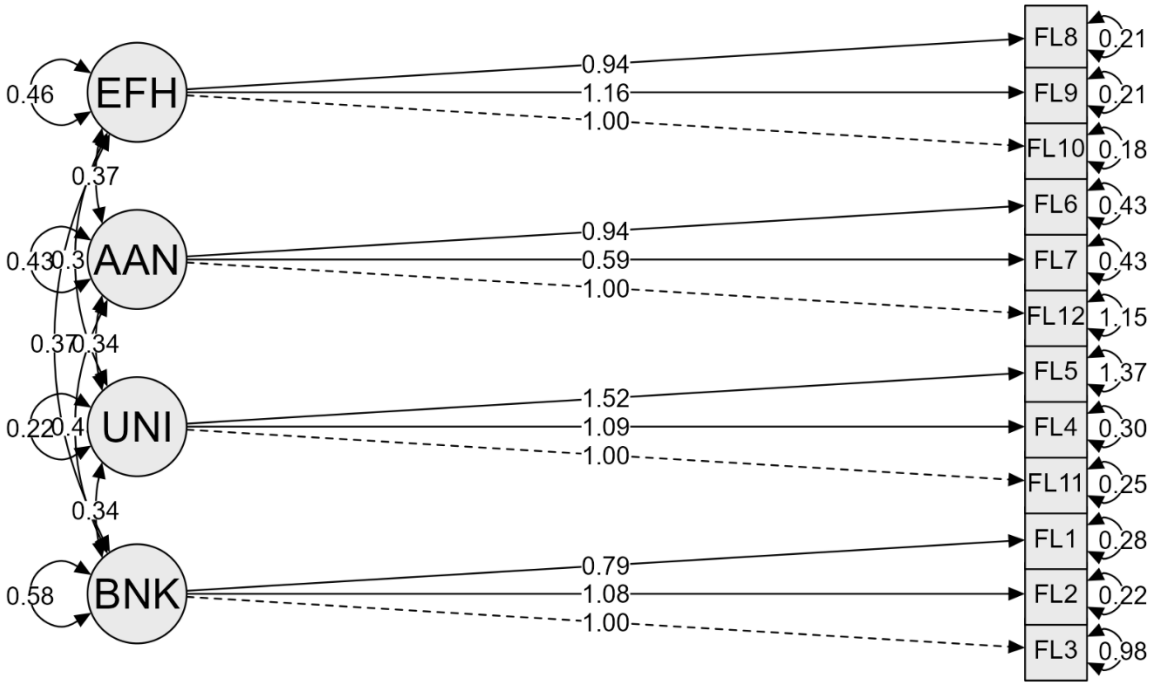

Figure 2. Path Diagram

Structural Equation Modeling (SEM) analysis was conducted to test the relationship between the proposed nutritional literacy constructs. The model shows four latent constructs: Basic Nutrition Knowledge (BNK), Understanding Nutrition Information Sources (UNI), Nutrition Knowledge Application Ability (AAN), and Evaluation of the Impact of Food on Health (EFH).

The analysis results show that all constructs have a positive covariance relationship with each other, indicating a link between aspects of nutritional literacy. Each latent construct positively influences the indicators, with path coefficients ranging from 0.18 to 1.47. All constructs show positive covariance relationships with each other, indicating a significant link between the various aspects of nutritional literacy. For example, the covariance between BNK and UNI is 0.22, between BNK and AAN, is 0.43, and so on. FL2 (Understanding of fruit and vegetable consumption) is highly influenced by BNK with a path coefficient of 1.08. FL5 (understanding of the government's official slogan regarding nutrition) is significantly influenced by UNI with a path coefficient of 1.52. FL7 (Ability to prepare a balanced menu) is significantly influenced by AAN with a path coefficient of 0.59. FL9 (Ability to assess the suitability of food for a healthy eating pattern) is notably influenced by EFH with a path coefficient of 1.16. This SEM model effectively illustrates the multidimensional structure of nutritional literacy. It underscores that nutritional literacy encompasses not only basic knowledge but also the capacity to understand, apply, and evaluate nutritional information in a health-related context. The positive covariance relationships among the constructs highlight the interconnected nature of these literacy components.

Construct Validity Test

Based on the normality test, significant deviations were found (p-value < 0.05). So, the data distribution was not normal and continued by carrying out the Spearman rank test and the Jonckheere-Terpstra and Mann-Whitney U tests. The Spearman correlation coefficient showed that the 12 items were consistent and positively correlated with each other (rs values ranged from 0.233 to 0.492). We made a total score of the 12 items (maximum score of 48) to provide a simple survey measure. The average score was 32.40, ranging from 0 to 48.

Cronbach Alpha Calculation

The Cronbach's Alpha coefficient for the scale with 12 items was 0.914. We did not delete any items because no “Cronbach's Alpha if Item Deleted” value for any single item was more significant than the overall Cronbach's Alpha of the scale (0.891). In other words, because removing any individual item would decrease the overall reliability of the scale, all 12 items were retained in the scale.

Result Interpretation

Based on the loading factor values presented, it can be seen that the majority of statements have relatively high loading factors, ranging from 0.400–0.730. This indicates that these statements contribute significantly to measuring the construct in question, nutritional literacy. The statement with the highest loading factor is "I am aware of the official recommendations from the Indonesian Government regarding fruit and vegetable consumption," with a value of 0.730. The statement " How easy can you evaluate if certain foods are related to a healthy diet?" also has a high loading factor, namely 0.727.

Meanwhile, the statement with the lowest loading factor is " How easy or difficult is it for you to organize a balanced menu in the family? " (0.400), and the item " How easy is it for you to judge if information relating to nutrition issues is trustworthy?" (0.510). Even though the value is still relatively high, these two statements have a slightly lower contribution in measuring the food literacy construct than the other statements. Overall, the factor loading values , which are pretty high for most of the statements, indicate that these statements are quite valid and contribute generously to measuring the nutritional literacy construct in question.

Discussion

After ensuring sample adequacy and data appropriateness, confirmatory factor analysis revealed a unidimensional structure. The KMO value of 0.898 and the significant Bartlett's test (Approx. Chi-Square = 6177.723, df = 66, $p < 0.001$) indicate that the sample size is adequate for factor analysis. Even though the Chi-Square is significant, this study still accept the fit because the chi-square is sensitive for the large sample, the larger samples the result will tend to be significant. This study used 968 samples so that the significance of Chi-square can not be avoidable. Factor loadings ranged from 0.400 to 0.730, supporting the unidimensional structure of the Nutritional Literacy scale. The model showed mixed fit indices, with Chi-square = 1180.426 (df = 54, $p < 0.001$), CFI = 0.816, TLI = 0.775, RMSEA = 0.147, SRMR = 0.065, and GFI = 0.946. While some fit indices were suboptimal, the one-factor solution was retained due to its theoretical coherence and statistical support.

Construct validity was tested by analyzing the association between nutritional literacy scores and health literacy. There was a significant positive correlation between nutritional literacy and health literacy scores ($rs = 0.606$, $p < 0.01$), providing initial evidence for construct validity. This finding aligns with previous research showing a positive relationship between health literacy and nutritional literacy (Corinna Krause et al., 2018) (Poelman et al., 2018). However, the Jonckheere-Terpstra test finds strong evidence for a trend toward increasing or decreasing nutritional literacy scores as categories in health literacy increased ($p = 0.000$).

Most of the statements had relatively high factor loadings, indicating a significant contribution to measuring the nutritional literacy construct. The statements with the highest factor loadings were "I am aware of the official recommendations from the Indonesian Government regarding fruit and vegetable consumption" (0.730) and "How easy can you evaluate if certain foods are related to a healthy diet?" (0.727). These findings align with previous research that emphasizes the importance of obtaining, understanding, and evaluating nutritional information in the context of nutritional literacy (Velardo, 2015) (Zoellner et al., 2009).

However, some statements had lower factor loadings, mainly "How easy or difficult is it for you to organize a balanced menu in the family?" (0.400), with the lowest factor loading among all items. A factor loading of 0.4 is frequently regarded as the minimum threshold for acceptability; however, it may be deemed fair within the framework of Confirmatory Factor Analysis (CFA) when utilizing a substantial sample size. It is crucial to assess both the statistical significance and the substantive importance of the items concerning the underlying construct. (Tabachnick et al., 2013)

This suggests that practical meal planning may contribute less to measuring nutritional literacy than other aspects, such as awareness of dietary guidelines and the ability to evaluate nutritional information. This finding contrasts with previous studies that emphasize the importance of practical food planning skills in nutritional literacy (Poelman et al., 2018) (Vaitkeviciute et al., 2015). The discrepancy might be explained by cultural differences in food preparation practices or varying definitions of meal planning across different populations. For instance, meal planning might be more communal or traditional in some cultures rather than based on explicit nutritional guidelines (Fieldhouse, 2013). Additionally, Krause et al. suggest that while meal planning is essential, it may be more strongly associated with food literacy than nutritional literacy specifically, which could explain the lower factor loading in our nutritional literacy scale (Corinna Krause et al., 2018).

Conclusion

This research conducted the cross-cultural adaptation process and validity of the short food literacy questionnaire (SFLQ) in the Indonesian context (SFLQ-IDN). Confirmatory factor analysis revealed a unidimensional structure with one factor explaining most of the variance. The final questionnaire consisted of 12 items with good factor loadings, ranging from 0.400 to 0.730, and showed good internal consistency (Cronbach's alpha = 0.891).

Construct validity was tested by analyzing the relationship between nutritional literacy scores and health literacy. There was a significant positive correlation between nutritional literacy and health literacy scores, providing initial evidence of construct validity. The statements with the highest factor loadings were related to government nutritional recommendations (0.730) and the ability to evaluate foods about a healthy diet (0.727), indicating these are critical components in measuring food literacy among Indonesian women. However, some statements had lower factor loadings, particularly regarding practical meal planning (0.400), suggesting this aspect might be less central to the construct as measured in the Indonesian female population.

Although the translated and culturally adapted Short Food Literacy Questionnaire demonstrates adequate psychometric properties in assessing Indonesian women's capabilities in understanding and evaluating nutritional information, this instrument does not fully capture food literacy's social and contextual aspects. Further efforts are needed to assess food literacy's cultural, political, and societal factors, particularly considering the unique role of women in Indonesian food culture and household nutrition management. Future research should add modifications to this SFLQ by adding new questions related to it.

Overall, while the Indonesian version of the Short Food Literacy Questionnaire shows promise as an instrument for measuring food literacy among Indonesian women, with factor loadings ranging from 0.400 to 0.730 and acceptable model fit indices (GFI = 0.946, SRMR = 0.065), it still has limitations and needs further development. Future refinements should focus on strengthening the practical application components and incorporating broader sociocultural dimensions of food literacy specific to Indonesian women's roles and experiences in food preparation and nutrition management.

Author Contributions

Conceptualization, H. and E.R.; methodology, E.R.; validation, H., E.R. and H.P.S.; formal analysis, E.R.; investigation, H.P.S.; resources, E.R. and H.P.S.; data curation, E.R.; writing—original draft preparation, H.; writing—review and editing, H, T, F and E.R.; visualization, H.; supervision, E.R. and H.P.S.; project administration, O.S, F.D, H.P.S.; funding acquisition, E.R. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement

The study was approved by the Health Research Ethics Committee of Universitas Dian Nuswantoro (protocol code 000483/UNIVERSITAS DIAN NUSWANTORO/2023).

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The authors declare no conflict of interest.

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