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Model Pengukuran Rasch untuk Kesahan dan Kebolehpercayaan Instrumen Kompetensi Kemahiran Berkaitan Makanan dalam menangani Neophobia Makanan untuk Guru Prasekolah

Rasch Measurement Model for Validity and Reliability of Instrument Food Skills Competencies in addressing Food Neophobia for Preschool Teachers

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ABSTRACT

The aim of this study was to assess the validity and reliability of a newly developed instrument designed to measure food skills competencies in addressing food neophobia (FSFN) among preschool teachers. The Rasch Model Measurement was employed to analyze the validity and reliability of a159-items instrument that designed to measure FSFN of teachers working in one of Malaysian public early childhood institutions. The study included 31 teachers and assistant teachers who were selected through stratified cluster random sampling. The validity of the FSFN instrument was evaluated through four main functional analysis. Overall, both the respondents' and items' reliability values in the FSFN instrument were considered excellent and acceptable, ranging from 0.94 to 0.99 and 0.80 to 0.89, respectively. Point-measure correlation analysis revealed no negative values, and item matching analysis resulted to the elimination or revision of 22 items that did not meet the requirements. Additionally, based on the local dependence analysis, the standardized residual correlation value, detected 14 items that required removal. Thus, to enhance the FSFN instrument's functionality, a total of 36 items were removed, and 123 items remained. This study believed that by eliminating these items, the FSFN instrument's validity and reliability for the actual study would improve.

Keywords: Food skills competency; food neophobia; preschool educator; Rasch Measurement Model; validity, and reliability

ABSTRAK

Matlamat kajian ini adalah untuk menilai kesahan, dan kebolehpercayaan instrumen yang baru dibangunkan untuk mengukur kompetensi kemahiran berkaitan makanan dalam menangani neofobia makanan (FSFN) bagi guru prasekolah. Model Pengukuran Rasch digunakan bagi menganalisis kesahan, dan kebolehpercayaan 159 item instrumen yang mengukur FSFN guru yang bekerja di salah sebuah institusi pendidikan awal kanak-kanak awam di Malaysia. Kajian ini melibatkan 31 guru dan pembantu guru yang dipilih melalui persampelan rawak kluster berstrata. Kesahan instrumen FSFN dinilai melalui empat analisis fungsi utama. Secara keseluruhannya, nilai kebolehpercayaan responden dan item bagi instrumen FSFN dianggap sangat baik dan boleh diterima, dengan nilai masing-masing antara 0.94 hingga 0.99 dan 0.80 hingga 0.89. Analisis korelasi titik-ukur menunjukkan tiada nilai negatif, dan analisis padanan item mencetuskan penyelarasan semula atau penghapusan 22 item yang tidak memenuhi keperluan. Selain itu, berdasarkan analisis pergantungan tempatan, nilai korelasi baki piawaimengesan 14 item yang memerlukan penyingkiran. Oleh itu, untuk meningkatkan kefungsian instrumen FSFN, sejumlah 36 item telah disingkirkan, dan 123 item kekal.Kajian ini percaya bahawa dengan menyingkirkan item-item ini, kesahan dan kebolehpercayaan instrumen FSFN untuk kajian sebenar akan akan bertambah baik.

Kata kunci: Kecekapan kemahiran berkaitan makanan; neophobia makanan; pendidik prasekolah; Model Pengukuran Rasch; kesahan, dan kebolehpercayaan

INTRODUCTION

Food neophobia, which is the fear of trying new foods, is common among young children all over the world. However, this phenomenon is more prevalent among preschoolers than any other age group because they are at a stage of development, where they are becoming more independent and starting to make their own food choices (López-Banet et al. 2022; Wolstenholme et al. 2020). A systematic review study by Torres and colleagues (2020) found that food neophobia affects up to 12.8 to 100% of preschoolers in developed countries, with higher rates observed in some Asian countries (Kozioł-Kozakowska et al. 2018). In Malaysia, particularly, Saipudin et al. (2022) recently reported that 38.1% of preschoolers attending public preschools were food neophobic, which was mostly seen among children under the age of 5 years, girls, and normal-weight children. Food neophobia can have negative consequences for preschoolers' dietary habits and health (Torres et al. 2020). A study by Białek-Dratwa and colleagues (2022) found that food neophobic preschoolers were more likely to consume a limited range of foods, have a lower intake of fruits and vegetables, and a higher intake of unhealthy snack foods that were high in sugar and fat. This highlights the importance of addressing food neophobia in young children, particularly in the context of promoting healthy and quality dietary habits (Kozioł-Kozakowska et al. 2018).

Several studies have shown that preschool teachers' involvement in promoting healthy eating habits may help young children overcome food neophobia and develop a positive attitude towards food (Kähkönen et al. 2018; Eller 2012; Nekitsing et al. 2018). Children who received food education from competent preschool teachers in food skills were more likely to try new foods and have a more diverse diet (López-Banet et al. 2022; Kähkönen et al. 2018). Besides that, a competent preschool teacher in food skills should be able to model healthy eating behaviours and create a positive food environment by offering a variety of healthy foods and limiting the availability of unhealthy options while at preschool (Nekitsing et al. 2018). In addition to modelling healthy eating behaviors, competent preschool teachers should be able to use various strategies to promote healthy eating habits among preschoolers. For example, they can encourage children to try new foods through food skills-related activities, such as cooking and gardening (Kähkönen et al. 2018). According to Dudley et al. (2015), preschool teachers' knowledge of healthy eating practises positively correlates with the quality of the food served and consumed in preschools.

Apparently, the important role of preschool teachers in developing food skills cannot be denied. A competent preschool teacher in food skills should not only have the knowledge, skills, and abilities to deliver a quality food pedagogy and teaching technique at the preschool but also effectively perform their duties during food preparation, food handling, and food serving at mealtimes (Malaysian Ministry of National Unity 2021; Lydia et al. 2018; Yoshikaw et al. 2016).

Since preschool children spend a substantial time and mealtimes at preschool, it is important to note that not all preschool teachers may feel competent in food skills. Some preschool teachers lacked nutrition knowledge and food handling skills, making it difficult for them to promote healthy eating habits among their students (Ovrebo 2017; Kupolati et al. 2015). As a result, a valid and reliable instrument to measure the competency gap in preschool teachers' food skills was critical. Thus, to ensure that the instruments developed have a high level of validity and reliability, this study conducted a pilot study and analyzed the data using Rasch Model Measurement (RMM). The online administered questionnaires answered by the respondents in the pilot study were reviewed, refined, and purified through four main rating scale diagnostics using the RMM, assisted by Winsteps software. Thus, the aim of this study was to assess the validity and reliability of the FSFN questionnaire instrument prior to its use in the actual study.

AIM OF STUDY

The aim of this study was to investigate the psychometric properties, as well as the validity and reliability, of a newly developed instrument to assess the food skills competencies in addressing food neophobia (FSFN) for preschool teachers.

OBJECTIVE OF STUDY

The objective of conducting this pilot study is to examine the items' functionality in terms of (1)

reliability and separation of item-respondent; (2) item polarity; (3) item fit; and (4) standardized residual correlation value in identifying the dependent items.

METHODOLOGY

RESEARCH DESIGN

This study is part of the quantitative phase of an exploratory sequential mixed methods study design done by the researcher (Fetters, Curry, & Creswell 2013). The survey technique was used to collect data using an instrument developed for preschool teachers for measuring food skill competency in addressing food neophobia. The questionnaire was distributed randomly to preschool teachers from Malaysian public early childhood institutions through an online web application, a Google Form, in early January 2023.

In this study, an instrument was developed through the adaptation of the Borich Model (1980). The Borich Model (1980) provides a useful framework for developing competency-based measuring instruments that assess the ability and importance of each competency listed. Several studies have developed instruments for assessing food-skill competency among different groups. For instance, Heather et al. (2018) developed and validated a food skills competency questionnaire for health professionals, while Fordyce-Voorham (2011) developed a food skills self-assessment tool for secondary high school students.

The list of food skills competencies in this study was developed through the qualitative phase of data collection and analysis. This include, in-depth interviews with food and education experts, an extensive literature review from various research, including Kennedy et al. (2019), Heather et al. (2018), Hollywood et al. (2017), Fordyce-Voorham (2011), and Vrhovnik (2012), as well as guidance from various competency frameworks from document analysis, including the Malaysian Standard Classification of Occupations (MASCO) for Early Childhood Educators, and the competencies identified by the Malaysian Qualification Agency (MQA) for Programme Standards in Early Childhood Education and the National Association for the Education of Young Children (NAEYC) for preschool teachers (MASCO 2020; MQA 2014; NAEYC 2009).

These competencies were then modified to meet the needs of preschool teachers working in Malaysian public preschool institutions. The methodology employed in this study involved the utilisation of a set of questionnaires administered through a quantitative research approach.

SAMPLING

During the administration of the pilot study, about 31 preschool teachers from the population of Malaysian public preschool teachers participated. By using RMM assisted by Winsteps 3.72 software, this study decided to opt for ± 1 logit with a 95% confidence level, where the sample size required for most purposes is only 30 respondents (Linacre, 2010). In line with the suggestion by Linacre (2002), a minimum of 10 respondents per category is also sufficient to obtain reliable estimates of item parameters for polytomous (Likert) items when using RMM.

The target respondents of this study were preschool workforces, including Teachers and Assistant Teachers. As compared to other public preschool teachers working at other institutions, both the Teachers and the Assistant Teachers in this institution required a higher competency in food skills and a higher understanding in food skill conceptualization (Saipudin et al. 2021). This is because preschool teachers in Malaysian public early childhood institutions technically have a mutual responsibility for delivering food skills-related curriculum during class and mealtime, as well as preparing and serving quality meals to the children attending their institution (Malaysian Ministry of National Unity 2021). Furthermore, Malaysian public early childhood institutions strictly adhere to the National Preschool Integrated Curriculum established by the Malaysia Ministry of Education. This institution is also well-known for strictly adhering to the Nutrition Division of the Ministry of Health's standard guidelines for menu planning, food preparation, and food serving.

Ethics approval for data collection were obtained from the Ethics Committee for Research Involving Human Subjects at Universiti Teknologi Malaysia (UTM). All the procedures were carried out in accordance with international and local guidelines, which corresponds to the survey design of this study. All the research information, rationale, and aim of the research, and if there were any risks

associated, were fully informed. The respondent's consents and confidentiality with assurances of anonymity had always been considered, and their voluntary consent to participate was recorded accordingly.

Respondents were selected through the stratified cluster random sampling method, in which this study started with stratifying the population of Malaysian public preschool teachers according to the cluster (states), and a sample (Teacher and Assistant Teacher) of these clusters were selected randomly. In this pilot study, this type of sampling and sample were incredibly appropriate because the sample accurately reflects the characteristics and diversity of the larger group that is interested in studying (Singh & Masuku 2014). This increases the validity and generalizability of the research findings and ensures the representativeness of the interest population, which in this context was public preschool teachers in Malaysia (Fox et al. 2009).

QUESTIONNAIRE

The questionnaire used in this study consisted of 159 items and aimed to measure the food skills competencies in addressing food neophobia (FSFN) of the preschool teachers. Table 1 shows the item distribution according to the five constructs. Items from the technical skills constructs comprised 51% of the questionnaire, followed by the non-technical skills construct (17%), personality traits construct (16%), self-concept construct (8%), and motives construct (8%). The Likert scale provided on the items is based on a 5-point scale that has a scoring level as follows: (1) Not at all true of me; (2) Slightly true of me; (3) Moderately true of me; (4) Very true of me; and (5) Completely true of me (Borich 1980).

TABLE 1. Items Distribution in Questionnaire

No.	Constructs	Question	Total Item
1	Technical Skills (TS)	TS1 – TS81	81
2	Non-technical Skills (NT)	NT82 -NT108	27
3	Personality Traits (PT)	PT109 – PT133	25
4	Self -concept (Attitude and Value) (SC)	SC134 - SC146	13
5	Motives (MV)	MV147 - MV159	13
			159

DATA ANALYSIS

To provide accurate instrument development analysis information, the polytomous data from the questionnaire was analyzed using the RMM. The statistical analysis conducted for the pilot stage was focused on selecting the most appropriate and best-fit items for the study (Cohen & Swerdlik 2002).

The Rasch measurement model is a type of psychometric model that is often used to analyze data from educational or psychological tests (Bailes & Nandakumar 2020). It is based on the concept of "item response theory," which posits that an individual's ability or trait can be inferred from their responses to a set of test items. The Rasch model estimates the probability of a respondent correctly answering an item based on their ability and the difficulty of the item. It can be used to create quantitative linear measures of ability or trait that are valid across different sets of test items (Bailes & Nandakumar 2020).

Table 2 outlines the four main rating scale diagnostics that the Rasch Model Measurement used to assess how well each item performed for each study construct. This approach allowed the instrument to be thoroughly evaluated, helping to ensure its validity and reliability. Thus, four main

rating scale diagnostics of RMM analysis (item and person reliability and separation; item polarity; person and item misfit; and local dependence) were used to analyze the data from food skills competency assessments for this study. This study believed that by analysing these data, the effectiveness of future professional development or training programmes aimed at improving the food skills of preschool teachers could be improved.

TABLE 2. Four Main Rating Scale Diagnostics to Determine the Reliability and Validity of Items

No.	RMM Data Analysis	Aspect	Accepted Index/Range
1.	Item and person reliability and separation	Tests the reliability using Cronbach Alpha	Alpha values > 0.6
		Tests the reliability and separation of item	Value of item / person reliability > 0.8
		Tests the reliability and separation of respondent	Value of item / person separation > 2.0
2.	Item polarity	Detects the polarity (validity) of an item measuring the construct based on the value of Point Measure Correlation (PTMEA CORR)	PTMEA CORR >0.3 and no negative value (-) was detected
3.	Item misfit	Tests the fit of items measuring the construct	Accepted range of 0.5-1.5
4.	Local dependence item	Determines the dependent item based on the standardized residual correlation value	The correlation value of the two items did not exceed 0.7

Sources: Linacre (2002) & Bond & Fox (2007)

RESULTS

This section presents the demographic profiles of the respondents, and validity and reliability of the instruments utilized based on the analysis using RMM. The items' functionality findings include: (1) item and person reliability and separation; (2) item polarity; (3) item misfit analysis; and (4) local dependence.

DEMOGRAPHIC PROFILE

About 31 preschool teachers and teacher assistants tested this instrument. Of these, 18 were teachers and the other 13 were teacher assistants. In brief from Table 3, the largest proportion of respondents belonged to the age groups of 31–40 years (38.7%) and 41–50 years (38.7%). The majority of respondents (83.9%) reported teaching at the rural areas, having 9 to 15 years of experience as preschool educators (25.8%), having permission to cook in their respective preschools (54.8%), and having attended at least once or twice food skills training related to child feeding issues (51.6%).

ITEM AND PERSON RELIABILITY

The level of reliability of a study can be evaluated by interpreting Cronbach's alpha values, which range from 0.00 to 1.0. Higher values indicate better, more robust levels of reliability, while lower values reflect lower reliability. Yusof et al. (2012) have suggested that a range approaching 1.0 is considered good, high, and practical, whereas a range closer to 0.00 indicates a lower level of reliability. Table 4 displays criteria for a rating scale to assess the quality of instruments used (Fisher 2007).

To determine the value of person and item reliability in the instrument, the alpha value obtained was interpreted. Table 5 and Table 6 show the findings of Cronbach's alpha values for reliability and separation of both respondents, and items. The analysis shows all the findings qualify for determining reliability.

TABLE 3. Respondents' Demographic Profile

Demographic variables	Factors	Teacher (n=18)	Assistant Teacher (n=13)	Total (N=31)
Age (years)	20-30	4 (22.2%)	1 (7.7%)	5 (16.1%)
	31-40	5 (27.8%)	7 (53.8%)	12 (38.7%)
	41-50	2 (11.1%)	0	2 (6.5%)
	51-60	7 (38.9%)	5 (38.5%)	12 (38.7%)
Geographical Area	Rural	14(77.8%)	12 (92.3%)	26 (83.9%)
	Urban	4 (22.2%)	1 (7.7%)	5 (16.1%)
Cook Permission	Yes	10 (55.6%)	7 (53.8%)	17 (54.8%)
	No	8 (44.4)	6 (46.2%)	14 (45.2%)
Length of Services	0 – 3 years	4 (22.2%)	1 (7.7%)	5 (16.1%)
	4 – 8 years	1 (5.6%)	0	1 (3.2%)
	9 – 15 years	3 (16.7%)	5 (38.5%)	8 (25.8%)
	16 – 20 years	3 (16.7%)	3 (23.1%)	6 (19.4%)
	21 – 25 years	3 (16.7%)	2 (15.4%)	5 (16.1%)
	>26 years	4 (22.2%)	2 (15.4%)	6 (19.4%)
Food Skills Training Status	Never	3 (16.7)	1 (7.7%)	4 (12.9%)
	1 – 2 times	8 (44.4%)	8 (61.5%)	16 (51.6%)
	3 – 4 times	4 (22.2%)	1 (7.7%)	5 (16.1%)
	5 – 6 times	1 (5.6%)	1 (7.7%)	2 (6.5%)
	>6 times	2 (11.1%)	2 (15.4%)	4 (12.9%)

TABLE 4. Rating Scale for Instrument Quality Criteria

Criteria	Poor	Fair	Good	Very Good	Excellent
Person and Item Reliability	< 0.67	0.67 – 0.8	0.81 – 0.9	0.91 – 0.94	> 0.94

Sources: Fisher (2007)

TABLE 5. Analysis of Reliability and Separation of Respondent

No	Construct	Person Reliability		Cronbach Alpha
		Person	Separation	
1.	Technical skills	0.98	7.05	0.992
2.	Non-technical skills	0.99	4.97	0.981
3.	Personality trait	0.96	4.88	0.973
4.	Self-concept	0.94	3.81	0.971
5.	Motives	0.94	4.08	0.970
	Total			0.995

Overall, both the respondents' and items' reliability values were considered excellent and acceptable, ranging from 0.94 to 0.99 for person reliability (Table 5) and 0.80 - 0.89 for item reliability (Table 6). There was an exception in item reliability for the "motives" construct, which was 0.71, but it was still considerable and accepted (Bond & Fox 2007). In the meantime, the separation value of respondents and items obtained shows the various strata of abilities identified within the sample group. The person separation value for all constructs is acceptable, ranging from 3.81 to 7.05.

TABLE 6. Analysis of Reliability and Separation of Item

No	Construct	Total Item	Item Reliability	
			Item	Separation
1.	Technical skills	81	0.89	2.80
2.	Non-technical skills	27	0.80	2.01
3.	Personality trait	25	0.81	2.08
4.	Self-concept	13	0.80	2.03
5.	Motives	13	0.71	1.56
	Total	159		

Meanwhile, the item separation ranged from 1.56 to 2.80. Most of the constructs were accepted because the item separation index was equal to or higher than 2, which is deemed an acceptable value. Item reliability is an index of the duplicability of the hierarchy of item difficulties, which were controlled by two factors: (1) the sample size of the persons (31 for the analysis) and (2) the spread of item difficulties (Linacre 2002). Thus, for this first diagnosis, even though the Cronbach alpha of the "Motives" construct was high 0.97, the items need to be further revised as the values of item separation and item reliability were the lowest with 1.56 and 0.71, respectively. Meanwhile, the other constructs remained satisfactory by far, as the item separation index was above 2, and item reliability was above 0.7 (Linacre 2002).

ITEM POLARITY

Polarity item analysis, as represented by the (PTMEA correlation) value, determines whether all items move in the same direction as the constructs (Fox et al. 2009; Linacre 2010). Table 7 shows that all the correlation coefficients for each of the constructs are positive, indicating that the item's ability to measure food skills competencies is valid, functioning, and parallel with the construct formed (Linacre 2002). Nevertheless, if the value is negative, it indicates that the item must be re-analysed using the correct or dropped method. This indicates that the dropped item did not prompt a question or was difficult for respondents to answer.

TABLE 7. Min and Max Value of Items Polarity

Constructs	PTMEA CORR			
	Min	Item	Max	Item
Technical skills	0.40	TC2	0.89	TC49
Non-technical skills	0.58	NT87	0.90	NT105
Personality trait	0.51	PT112	0.92	NT132
Self-concept	0.55	SC143	0.96	NT141
Motives	0.75	MV159	0.91	MV158

ITEM FIT

The item fit index demonstrates how effectively an item contributes to the meaningful construct that the test measures. Fit indices also show how well an item adheres to the model assumptions. For persons and items, Winsteps provides two types of fit indices: infit and outfit (Bailes & Nandakumar 2020). For item matching checks, the infit and outfit indices are always checked and expressed as mean-

square statistics (MNSQ). The infit item measure more closely matches unexpected answers from individuals near the estimated item difficulty, while the outfit item measure is more sensitive to outliers (Bailes & Nandakumar 2020; Azrilah et al. 2017).

The MNSQ outfit value should be in the range of 0.5–1.5 to determine the suitability of the constructed study items (Azrilah et al. 2017). If the obtained value exceeds 1.5, the item is unclear. If the value is less than 0.5, it indicates that the item is too easy for the respondents to expect. According to Bond and Fox (2015), the ZSTD outfit's value should be between -2 and +2. However, if the value of the MNSQ outfit is accepted, the ZSTD index can be ignored (Linacre 2002). As a result, if this condition is not met, the item can be considered for deletion.

Table 8 displays the implications of the measurement results from the MNSQ value (Linacre 2002, p. 878). Values much lower than 0.5 indicate a lack of adequate variability in the data. Values much greater than 1.5 indicate excessive variability. Values ranging between 0.5 and 1.5 are considered a good fit for self-reporting RMM data (Bailes & Nandakumar 2020; Linacre 2002; Azrilah et al. 2017).

TABLE 8. Implications of Measurement Results from MNSQ Values

MNSQ Values	Implications of measurement
>2.0	Distorting or weakening the measurement system probably due to only one or two observations
1.5 – 2.0	Less successful for measuring construct but not debilitating.
0.5 – 1.5	Successful enough for measurement
< 0.5	Less successful for measurement but not debilitating. Likely to result in confusing reliability and separation coefficients.

Sources: Linacre (2002, p. 878)

Table 9 shows the summary of the analysis of a misfit item using Outfit-Mean square (MNSQ) for the instrument. There was a total of 22 items that needed to be revised because the outfit MNSQ value was greater than 1.4 and less than 0.6, and the outfit ZSTD values were outside the range of -2 to +2 ZSTD values. A value greater than 1.5 indicates that the item on the measurement scale is not homogeneous with other items. Through this diagnosis, these items needed to be revised or dropped: technical skill construct (7), non-technical skill construct (5), personality trait construct (5), self-concept construct (3), and motives construct (2).

STANDARDIZED RESIDUAL CORRELATIONS

The standardized residual correlation values measurement is used to identify if there are items that overlap or are not unique. When the residual correlation value between two items is high (above 0.7), it means that the items are dependent and not unique. This can be because the items have similar characteristics or because they combine multiple shared dimensions. Linacre (2010) suggests that when two items have a correlation value above 0.7, only one item should be kept, and the others should be removed. Item selection is also based on the MNSQ value, which should be close to 1.00 to maintain a unidimensional measurement construct. Independent or singular items are used to create unidimensional measurement constructs (Wright & Masters2002).

In Table 10, there were 14 pairs of items that needed to be revised or dropped because the correlation values obtained were higher than 0.70. A high correlation value between these two items indicates that they are highly related. Therefore, this study decided to drop all these 14 items as they failed to meet the requirements in this diagnosis.

TABLE 9. Misfit Items

No	Item	Outfit- MNSQ	Statement	Construct
1.	TC2	3.28	*I have knowledge in FIFO and LILO principles in utilizing food or raw ingredients supplies*	Technical skills
2.	TC3	2.19	*I am skilled in monitoring the temperature of food served to the children*	
3.	TC6	3.64	*I am skilled in disposing unsafe raw ingredients*	
4.	TC11	3.21	*I can manage good financial records (cash books, receipts book, payment vouchers, and stock register books)*	
5.	TC33	0.39	*I know food that are beneficial and the food that need to be reduced for health*	
6.	TC37	1.83	*I know ingredients that may cause allergies*	
7.	TC79	0.39	*I am able to cook ingredients sparingly during food preparation*	
8.	NT87	2.31	*I can communicate effectively with parents or caretaker from various backgrounds*	Non-technical skills
9.	NT90	0.19	*I can respect other people's culture, way of life and point of view*	
10.	NT95	0.18	*I know how to deal with parents or outsiders who are not satisfied with the service provided*	
11.	NT105	0.27	*I am able to execute work according to the plan*	
12.	NT107	1.56	*I comply myself to a strict time management*	
13.	PT109	1.82	*I am willing to share my opinions with others*	Personality trait
14.	PT110	1.69	*I prefer work that is routine*	
15.	PT112	2.57	*I always have a sense of curiosity*	
16.	PT114	2.7	*I am not affected by other's criticism*	
17.	PT119	0.37	*I demonstrate a lot of enthusiasm*	
18.	SC134	4.34	*I believed that healthy children are the country's hope*	Self-concept
19.	SC141	0.11	*Commitment to produce quality meals products*	
20.	SC143	2.96	*I am willing to spend money to buy teaching or cooking materials*	
21.	MV158	0.251	*I have a high interest in job*	Motives
22.	MV159	1.64	*To me, being a preschool educator is the best*	

REMOVING AND REFINING ITEMS FOR THE ACTUAL STUDY

The pilot study analysis revealed a total of 36 items should be dropped because they did not meet the analysis conditions required to determine the reliability of items to be used in the actual study. As a result, 123 items remained. Table 11 summarises the functionality examination of the questionnaire.

DISCUSSION

The aim of this study is to validate an instrument, called the Food Skills Competency in Addressing Food Neophobia (FSFN), for assessing preschool teachers' food skills competency in Malaysian early childhood education institutions. To accomplish this, the researchers employed a Rasch measurement model (RMM) to examine the functionality of the items from the perspective of reliability and isolation of items and respondents. Prior to the actual study, this approach helps to determine if the instrument is capable of producing a set of questionnaires that consistently and accurately measures the food skills competency of different respondents among preschool teachers.

TABLE 10. Value of The Standardized Residual Correlation

No.	Corr Value	Entry number item		Statement	Entry number item		Statement	Drop Item	Construct
1.	0.78	TC40	(1.21)	*I need to avoid preparing food that has a high sugar content*	TC41	(1.27)	*I need to avoid preparing food that has a high salt content*	TC41	Technical Skills
2.	0.78	TC54	(0.78)	*I am skilled in selecting suitable teaching aids and equipment for the student*	TC55	(0.73)	*I am skilled in preparing suitable teaching aids and equipment for the student*	TC55	
3.	0.77	TC13	(0.70)	*I have knowledge on the importance of hygiene when handling food*	TC14	(0.71)	*I comply to hygiene rules when handling food*	TC13	
4.	0.76	TC52	(1.11)	*I am able to teach children about food*	TC53	(0.67)	*I am able to teach children about healthy eating*	TC53	
5.	0.72	TC39	(1.47)	*I am aware of the ban on serving carbonated drinks to students*	TC40	(1.21)	*I need to avoid preparing food that has a high sugar content*	TC39	
6.	0.72	TC44	(0.60)	*I am able to design food with interesting shape variations*	TC45	(0.68)	*I am able to decorate dishes with interesting color variations and patterns*	TC44	
7.	0.71	TC8	(0.76)	*I have knowledge in managing cooked food procurement line with requirement*	TC9	(0.71)	*I am skilled in choosing cooking ingredients*	TC9	
8.	0.79	NT93	(0.95)	*I am able to represent the organization for work purposes*	NT106	(1.00)	*I am able to manage multiple tasks systematically*	NT93	Non-Technical Skills
9.	0.77	NT85	(0.47)	*I can communicate effectively with children*	NT89	(0.44)	*I have the ability to cooperate in team*	NT89	
10.	0.73	NT83	(0.55)	*I am able to boost children's motivation to learn*	NT92	(0.35)	*I practice work ethic skills*	NT92	
11.	0.72	NT85	(0.47)	*I can communicate effectively with children*	NT86	(1.02)	*I can communicate effectively with colleagues*	NT85	
12.	0.82	PT125	(1.27)	*I respect other's opinions*	PT126	(0.89)	*I think positively and considerately towards others*	PT125	Personality
13.	0.74	PT131	(0.42)	*I am focus in completing job task*	PT132	(0.33)	*I have a strong determination to excel*	PT132	
14.	0.79	MV153	(0.59)	*I give full commitment in every training / course attended*	MV155	(0.52)	*I am always ready to attend courses to improve competence and skills*	MV155	Motives

TABLE 11. Summary of Questionnaire Functionality Examination

Construct	Items Remained	Total remained items	Items Removed	Total items removed
Technical Skills	TC1, TC4 - TC5, TC7 - TC8, TC10, TC12, TC14-TC32, TC34 - TC36, TC38, TC40, TC42 -TC52, TC54 TC56 - TC78, TC80 - TC81	67	TC2, TC3, TC6, TC9, TC11, TC13, TC33, TC37, TC39, TC41, TC44, TC53, TC55, TC79	14
Non technical Skills	NT82 – NT84, NT86, NT88, NT91, NT94, NT96 – NT104, NT106, NT108	18	NT85, NT87, NT89, NT90, NT92, NT93, NT95, NT105, NT107	9
Personality traits	PT111, PT113, PT115 – PT118, PT120 – PT124, PT126 – PT131, PT133	18	PT109, PT110, PT112, PT114, PT119, PT125, PT132	7
Self-concept	SC135 – SC140, SC142, SC144 -SC146	10	SC134, SC141, SC143	3
Motives	MV147 – MV154, MV 156 – MV157	10	MV155, MV158, MV159	3
Total of Items Remained		123	Total of Items Removed	36

The researchers conducted item analysis by examining four aspects: item and person reliability and separation, item polarity, item misfit analysis, and the correlation value of the standardized residue to determine the dependent item. The study results show that the instrument had excellent item and person reliability and separation values, indicating that the measures were well-separated compared to errors. Except only for the items in the "Motives" construct, which need to be further rephrased due to the lowest value reported for item separation and item reliability. Items measuring "motives" should be incorporated with the heading phrases focusing on the motives of the preschool teacher in addressing the food neophobia issue. This heading phrase should be stated clearly for items MV147 through MV159. Nonetheless, the instrument's person reliability interpretation is nearly equivalent to Cronbach's alpha, which is 0.9.

To ensure the quality of the developed instrument, the researchers also examined the item polarity, which is indicated by the PTMEA CORR value, and the misfit analysis of the instrument (Linacre, 2008; Bond & Fox, 2015). According to the findings of the study, no item with a PTMEA CORR value less than 0.4 needed to be dropped. The results of the study suggest that the developed instrument has appropriate fit items.

Proper fit items reflect an instrument's quality and can be used to describe the instrument's precision (Bailes & Nandakumar 2020). In general, the diagnoses of item fit statistics adhere to the criteria of infit/ outfit MNSQ between 0.6 and 1.40 logits (for polytomous scale) and a value of -2 for outfit ZSTD. All of the constructs examined in this study were consistent with the recommended conditions, indicating that the risk of construct irrelevant variance was low. The instrument in this study found that most items were moving in a parallel direction; however, some items failed to measure constructs. Throughout the local dependence item analysis, 14 items, to be exact: TC41, TC55, TC13, TC53, TC39, TC44, TC9, NT93, NT89, NT92, NT85, PT125, PT132, and MV155, should be discarded to avoid the items collecting redundant information.

Finally, based on the whole analysis, this study identified a total of 36 items that needed to be revised or dropped, while 123 items were retained to ensure the high validity and reliability of the instrument. The new and revised items from the findings can be used to form a FSFN competency framework for preschool teachers, and the validated instrument can be applied consistently and reliably to measure food skills competency accurately. In conclusion, this study validates an instrument for assessing the food skills competency of preschool teachers and provides insights into the reliability and validity of the developed instrument. These findings have practical implications for researchers and practitioners in early childhood education.

CONCLUSION

Following the analysis of the data, each item was reviewed based on the index standards and the conditions that must be met to meet the Rasch Measurement Model's validity and instrument

reliability standards. Expert opinions and evaluations are consulted and considered when removing and refining items. The food skills competencies in addressing food neophobia (FSFN) of preschool teachers have a quality that can be used, according to this pilot study examining the validity and reliability of the instrument. These implications can assist researchers in developing instruments that meet the desired criteria. This pilot study is the first step in assisting researchers in identifying the competencies truly required for preschool teachers to implement food skills concepts and elements into their food-related tasks and activities at work. With that, the issue of incompetent teachers in food skills could be addressed in line with the improvement of the preschool children's eating behaviour towards more sustainable food wellbeing.

RECOMMENDATIONS

The findings of this study produced an instrument with high reliability for measuring preschool teachers' food skills competency in addressing food neophobia (FSFN) in public early childhood institutions. However, this study only focused on a few constructs in food skills competency in addressing the issue of food neophobia for preschool teachers, rather than the entire competency for the preschool teacher profession or food skills that address any other health-related behaviour. Future research is expected to investigate additional food skills elements and food issues that may exist within and between the food skills competencies. Thus, it is crucial to conduct additional food skills studies, either with different variables or with the same research subject but at different educational levels or with different samples and populations. It is hoped that future research will yield instruments with various constructs and elements. Therefore, the food-related skills, education, and training sector in Malaysia could be improved and continue to produce a high-quality, and competent workforce.

LIMITATIONS

The results of this study should be interpreted in light of the fact that the pilot study design puts a lot of limits on what can be done. This has a direct effect on how widely the results can be used. First, the Rasch model as implemented by Winsteps was used in this study. If two- or three parameter logistic models were used instead, it appears likely that the sample size required for satisfactory estimation precision would be greater simply due to the additional parameters being estimated. Second, the number of items is considerably larger with 159 items. Future research might utilize item sets with fewer items to evaluate the impact on other item functioning analysis such as the root-mean-square deviation (RMSD) and the number of outlier items. Each of the limitations listed above limits the generalizability of these findings. Despite these limitations, this study employs a practical methodology that provides useful guidelines and sources for instrument testing procedures.

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