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Validity and reliability of online questionnaire on awareness, knowledge, attitude and self-efficacy (AKAS) on healthy eating for nutrition education and promotion

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ABSTRACT

Introduction: This study entailed the process of developing an online questionnaire to determine awareness, knowledge, attitude and self-efficacy (AKAS) on healthy eating for nutrition education. Currently, there is no local validated questionnaire that can be used to assess AKAS on healthy eating among Filipino adults. **Methods:** The study developed the questionnaire based on theoretical frameworks and literature review. The draft questionnaire underwent three stages of development: (1) online modified Delphi technique composing of seven subject matter experts (SME) for content validity; (2) online cognitive debriefing with 32 participants (14 nutrition experts and 18 general public) for construct validity; and (3) online pre-testing with 35 participants (non-nutritionists) using test-retest method. **Results:** For first stage, the questionnaire contained 16 questions for awareness, 17 questions for knowledge, 17 questions for attitude, and 15 questions for self-efficacy. For second stage, significantly different scores (p-value<0.00) between nutritionist experts and general public were observed, showing good construct validity. For third stage, Spearman's correlation of test-retest method was 0.640. The questionnaire yielded Cronbach's alpha of 0.467 to 0.923 (round 1) and 0.435 to 0.923 (round 2). A second analysis was done to improve the internal consistency of the questionnaire. By combining two question categories (awareness and knowledge), the Cronbach's alpha increased to 0.659 (round 2), and by deleting three questions in attitude category, the Cronbach's alpha improved to 0.626 (round 2). **Conclusion:** The process used ensured the questionnaire's validity and reliability. Hence, this online questionnaire may be adopted by parties interested in developing and assessing nutrition education.

Keywords: cognitive debriefing, Delphi technique, nutrition education

INTRODUCTION

To have healthy eating habits, adults must consume varied, moderate and balanced meals. The *Pinggang Pinoy* (Healthy Plate Food Guide) serves as a guide for Filipinos in eating healthy meals. Based on a study by Lopez-Madrid *et al.* (2018), there is little awareness on *Pinggang Pinoy* among meal planners in the Philippines. Furthermore, based

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on the 2018-2019 Philippine dietary survey, Filipino adults ate less healthy foods like vegetables and fruits. Daily vegetables intake decreased from 145 grams in 1978 to 127 grams in 2018-2019; meanwhile, fruits intake per day decreased from 104 grams to 34 grams during the same period (DOST-FNRI, 2021).

Nutrition education was found to improve dietary intake among the general population (Blistein *et al.,* 2016). The conduct of nutrition education activities are aimed to initiate positive behavioural changes like improving one's eating behaviour.

Several Behaviour Change Theory (BCT) can explain a person's intention to change eating behaviour. For example, the Social Cognitive Theory states that personal, behavioural, and environmental factors are interrelated, and in combination, can influence behaviour change. Critical constructs of social cognitive theory are self-observation, self-evaluation, self-reaction, and self-efficacy (Espinosa-Curiel *et al*, 2020).

Another is the Theory of Reasoned Action developed by Fishbein and Ajzen in 1975, which assumes that most behaviours of social relevance (including health behaviours) are under volitional control and that a person's intention to perform a behaviour is both an immediate determinant and the single best predictor of that behaviour. The intention, in turn, is held to be a function of two basic determinants: attitude towards the behaviour or the person's overall positive or negative evaluation of performing the behaviour, and subjective norm or perceived expectations of important others concerning the individual performing the behaviour in question.

The two BCTs can be used as guides in planning, monitoring, and evaluating nutrition promotion and education activities. Nutrition promotion and education initiatives should be user-specific to be relevant and useful to targeted audiences (Zakria *et al.*, 2020). One strategy to address this prerequisite is to come-up with questionnaires that will serve as guides in developing nutrition education and promotion activities that advocate healthy eating.

Questionnaires can be used for needs assessment for programme planning and evaluation (North Carolina State University, 2017). A validated questionnaire is also a critical tool to assess current programmes and projects in place, and thus, ensures that proper measures can be enforced (Abdullah *et al.*, 2020). Proper validation and design of a questionnaire is also essential to facilitate the ease of data collection (Diedre *et al.,* 2012).

Several questionnaires on nutrition knowledge have been developed, such as those for obese adults (Feren, Torheim & Lillegaard, 2011) and for consumers (Dickson-Spillmann, Siegrist & Keller, 2011). These questionnaires were mostly on knowledge only and were constructed primarily for developed countries. Meanwhile, several questionnaires on knowledge, attitude and practices on different nutrition-related topics were formulated, like those on healthy lifestyle for Malaysian adolescents (Hiew *et al.,* 2015), and infant and young child feeding practices for Malaysian mothers (Zakria *et al.*, 2020). A questionnaire on nutrition knowledge, attitude and self-efficacy was also developed for adolescents in India (Sharma *et al.,* 2019).

Currently, there is no local, standard and culturally-appropriate questionnaire for Filipino adults that combines the domains of awareness, knowledge, attitude and self-efficacy (AKAS) on healthy eating. In addition, conduct of synchronous internet-based educational presentations like webinar

was part of the Philippine government's recommendations to adopt to the new normal caused by the COVID-19 pandemic (NEDA, 2020). Since several nutrition-related webinars were conducted during the pandemic, it is therefore important to devise a validated online questionnaire that can be used to plan, monitor, and evaluate online nutrition education and promotion programmes.

This study aimed to describe the development of an online questionnaire on AKAS on healthy eating for Filipino adults aged 19 to 59 years old. The content and construct validity and reliability of the developed questionnaire were also assessed.

MATERIALS AND METHODS

The present study adopted the methodology of Zakria *et al.* (2020) in developing a questionnaire on knowledge, attitude and practices (KAP) for infant and young child feeding (IYCF) with some modifications.

The developed questionnaire was intended to be administered online for adults 19-59 years old. Thus, participants in the study, such as in the cognitive debriefing and pre-testing of the questionnaire, belonged to this age group (Refer to Figure 1 for the stages in the development of the questionnaire). Snowball technique and purposive sampling were used to identify participants in the second and third stages of development, respectively. Since all activities were conducted via the use of internet, participants came from all over the Philippines.

Emails containing informed consent forms were sent to qualified participants. After submission of signed informed consent form, instructions for cognitive debriefing and pre-testing were given to

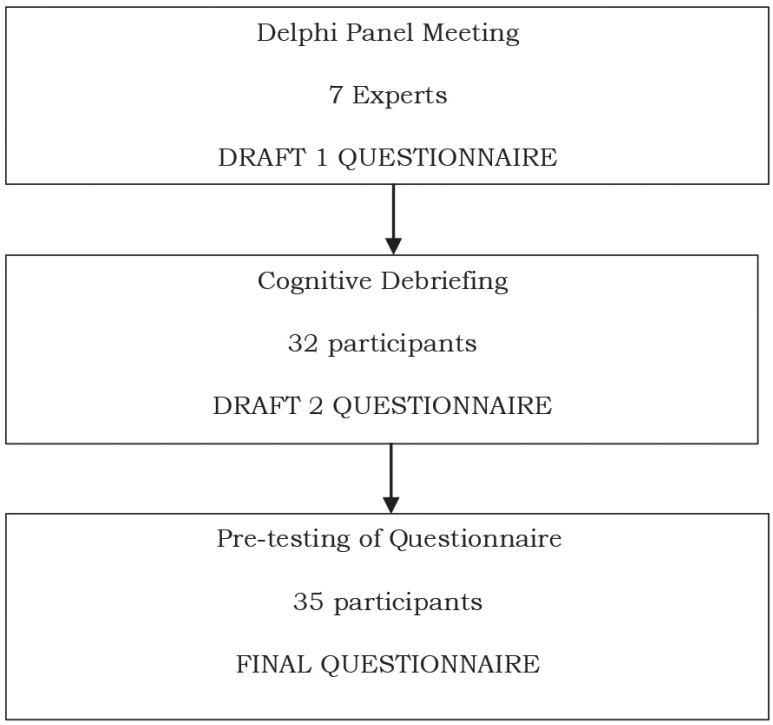

Figure 1: Steps in developing the questionnaire

the participants. No names and emails were asked in the questionnaire to ensure anonymity.

A draft questionnaire was initially developed based on literature review, the Social Cognitive Theory, and Theory of Reasoned Action. The draft questionnaire contained 16 questions for the domain of awareness, 17 for knowledge, 17 for attitude, and 15 for self- efficacy. Questions were on functions and food sources of three food groups (Go, Grow and Glow), recommended serving sizes of the *Pinggang Pinoy*, and intention to buy and eat healthy meals as recommended by the *Pinggang Pinoy*. Awareness and knowledge questions were answerable by 'Yes', 'No' or 'Don't Know' and 'True', 'False' or 'Don't Know', respectively. The attitude and self-efficacy questions were answerable by 'Agree', 'Don't Agree' or 'Neutral'.

Stage 1: Modified Delphi panel meeting

The Delphi technique was used as a guide in questionnaire development. This method is a structured anonymous communication between individuals who are experts on a certain topic with the goal of reaching consensus in areas of policy, practice, or organisational decision making (Brady, 2015).

A modified Delphi technique was used for the study. Instead of the use of questionnaires to reach a consensus, an actual online meeting was conducted to develop the questionnaire. The following steps were followed: (1) Exploration of subject by expert group (literature search, question formulation); (2) Reaching understanding of how the group viewed the questions formulated; (3) Resolving disagreements on questions formulated; and (4) Final evaluation of the questionnaire.

Five nutritionist-dietitians (NDs) and two communication specialists served as panel members, and they were involved in nutrition education and promotion activities.

In the first round, the Delphi process started with the presentation of the draft AKAS questionnaire, which served as a basis for soliciting information, comments and suggestions on content area from the Delphi subjects. The facilitator discussed each item and asked the Delphi panelists' opinions on the formulated questions.

After receiving the panelists' responses and opinions, the facilitator together with the investigator, converted the collected information into a well-structured questionnaire. The well-structured questionnaire that was revised based on comments and suggestions of Delphi panelists from Round 1 was used in Round 2 of the Delphi meeting.

In the second round, the facilitator presented the second draft of the AKAS questionnaire and asked the Delphi panelists to review the items summarised by the investigators based on information provided in the first round. The Delphi panelists were asked to rank-order items in each component of the questionnaire to establish priorities among items. Ranking of items was based on food groupings and functions of foods in the questionnaire. During the second round, there were also disagreements and agreements identified on the formulation of questions and arrangement of question items among Delphi panelists. The facilitator mediated the discussion of panelists until a consensus was reached.

In the third round, the facilitator presented the second draft of the AKAS questionnaire that included the comments and suggestions of seven Delphi panelists in the second round. The facilitator gave Delphi panelists an opportunity to make a final evaluation of the questionnaire before pre-testing. During the third round, the panelists

reached a consensus and approved the final draft of the AKAS questionnaire.

Stage 2: Cognitive debriefing

Cognitive debriefing is a qualitative method to assess respondents' interpretation of a questionnaire. It aims to identify the mental processes respondents use when completing a questionnaire. These processes usually follow a question-answer model (Ploughman *et al.*, 2010). This type of pre-testing belongs to active pre-testing method, which aims to identify problems in each of the questions (Lenzner, Neuert & Otto, 2016).

The study followed the steps in cognitive debriefing by Campanelli *et al. (*1997), as cited in Farnik & Pierzchala (2012) and as used in the methodology of Zakria *et al.* (2020): (1) Comprehension of each question (question intent, meaning of terms); (2) Retrieval of memory of relevant information (what type of information do respondents need to recall and what types of strategies are used to retrieve information?); (3) Decision processes (do respondents devote sufficient mental effort in answering accurately or do the respondents choose an answer because they think a given answer may be expected from them?); (4) The response process (the response options should be clear and allow respondents to choose the appropriate answers); and (5) General comments (example: length of questionnaire).

Informed consent forms were accomplished upon acceptance of invitation during the recruitment stage. On the day of online cognitive debriefing, the participants were asked to accomplish the first draft of the developed AKAS questionnaire. While accomplishing the said questionnaire, participants were encouraged to take note of their comments and suggestions to improve the online questionnaire. This helped in the process of conducting the cognitive debriefing.

Cognitive debriefing was conducted online via Zoom among nutritionist experts and the general public from both rural and urban areas. A total of 14 experts comprising of nutritionists from the academe and hospitals, and 18 general public research participants consisting of students, housewives, and employees from non-health-related fields joined the sessions. For this stage, the total number of participants was 32. In a study by Perneger *et al.* (2015), a suitable number of participants for the pre-testing method of questionnaires was identified. Based on the study, 30 participants is a reasonable default value for pre-testing, as it can achieve a high power to detect a problem in the questionnaire that occurs in 5% of the population, as well as in 10% of the population. Hence, the sample size of 32 was a reasonable size to conduct the pre-testing.

A total of four online cognitive debriefing sessions were conducted. Each session lasted for one-and-a-half to two hours and was recorded for documentation. It was conducted as an interactive discussion through a structured interview. The facilitator asked questions and encouraged interaction among participants. Based on the comments and suggestions gathered, corresponding revisions were made to the questionnaire.

Construct validity of the questionnaire was assessed by comparing the scores of the experts and general public participants. Hence, an overall composite score was computed for the questionnaire. Points were given to the awareness of healthy eating habits, correct answer to knowledge questions, positive attitude, and positive self-efficacy. The total score was 79 points.

Stage 3: Pre-testing

Pre-testing is the assessment of the entire questionnaire, its administration, and encoding of its data for analysis. As compared to stage 2, pre-testing stage aims to stimulate the actual use of the questionnaire (Lenzner *et al.*, 2016). Similar to stage 2, the recommended sample size is 30.

A total of thirty-four (34) participants answered the online questionnaire twice via the test-retest method, while one participant was not able to answer the retest. Participants were asked to take the retest seven days after answering the first test. They also answered a short questionnaire regarding the comprehension of questions, format, time, and interest in answering the questionnaire.

Data processing and analysis

Summarised reports for the Delphi panel meeting and cognitive debriefing sessions were generated. For pre-testing, Google sheets were generated from the answers of the Google form.

Descriptive data were processed to describe the participants who joined the pre-testing. Non-parametric tests, such as Mann-Whitney U test, was used to compute the significant difference in the scores between nutritionists and non-experts. A significantly different score meant that the questionnaire had good construct validity. It was also used to compute the significant difference between the first round and second round of pre-testing scores.

The reliability of the instrument was tested. Reliability meant that the instrument was consistent and produced similar results when administered repeatedly (Farnik & Pierzchala, 2012). To analyse the internal consistency, reliability or the homogeneity of the instrument, Cronbach's alpha coefficient was computed.

Meanwhile, the test-retest reliability was computed using Spearman's correlation. This measured the questionnaire's consistency over time. The level of significance used in the study was alpha (α) equal to 0.05. Data were analysed using IBM SPSS Statistics for Windows version 21.0 (IBM Corporation, Armonk, New York).

Ethics approval

The study was approved by the Institutional Ethics Review Committee of the Department of Science and Technology-Food and Nutrition Research Institute.

RESULTS

Stage 1: Modified Delphi panel meeting

The first draft of the developed questionnaire, which was in English and with Filipino translation, was divided into five parts: socio-demography, awareness, knowledge, attitude, and self-efficacy. Seven panelists reviewed thoroughly the developed questionnaire. The panel met two times via Zoom to review the questionnaire before it underwent cognitive debriefing with the stakeholders. Panelists composed of communication and nutrition experts.

In the first round, discussions dwelt more on socio-economic status, such as on decisions to use proxy indicator or simply ask the family's monthly income in the questionnaire, to split question for number of actual children or total number of children in the household, and to include highest educational attainment. For awareness, knowledge, attitude, self-efficacy questions, seven panelists had the same observations on the formulation of questions, particularly on the inclusion of examples of food items in the question for easy understanding, re-statement of the question, and

translation of some English words into local terms. A total of five questions were deleted in the knowledge domain portion: three about *Pinggang Pinoy* and two about milk consumption. Based on the panel's review, these questions were just repetition of concepts already asked in other knowledge questions. For the attitude domain, one statement on milk consumption for children and two statements on *Pinggang Pinoy* were deleted due to the same reason stated for the knowledge domain.

In the second round, the panelists again reviewed the questionnaire to check if the comments and suggestions from the first round were applied. During the second round of panel meeting, majority of panelists agreed to simply ask about the monthly family income and not use proxy indicators. The employment status - either employed or unemployed – was also suggested to be included in the questionnaire. Choices in some questions, like highest educational attainment was revised to describe a broader classification of educational attainment. All members of the panel accepted the suggestion. Words used, sentence structure and construction, and the translation were revised based on the panel's consensus in the first round.

After two rounds of Delphi panel meetings, the AKAS online questionnaire was finalised. No additional questions were incorporated by the Delphi panel members, only revision to the wordings used in the questions and statements. The final questionnaire contained 16 questions for awareness, from 17 questions to 12 questions for knowledge, from 17 questions to 14 questions for attitude, and 15 questions for self-efficacy (same number from the first round). The first two domains were answerable by 'Yes', 'No' or 'Don't Know' and 'True', 'False' or 'Don't Know', respectively. The attitude and self-efficacy questions were answerable by a three-point Likert scale - 'Agree', 'Don't Agree' or 'Neutral'.

Stage 2: Cognitive debriefing

Results revealed that the average duration in answering the online self-administered AKAS questionnaire was 14 minutes. During cognitive debriefing, choices for several items in the socio-demographic part of the questionnaire were revised, such as monthly household income, physiological status, and marital status. Moreover, some uncommon Filipino words were reverted back to English for ease in answering. The nutrition expert group commented that the questionnaire was easy to read because they were familiar with the *Pinggang Pinoy*. For responses to the questions, both nutritionist experts and the general public found it easy to answer. Furthermore, the options for attitude and self-efficacy questions were changed from a three-point Likert scale to a five-point Likert scale. There were no deletion or addition of questions in the questionnaire. The revised questionnaire based on the results of online cognitive debriefing was used for pre-testing.

The average scores from answering the questionnaire were 63.5 and 56.7, respectively, for the nutritionists and non-experts who joined the cognitive debriefing. Using the Mann-Whitney U test, there was a significant difference between the two scores ($p<0.001$).

Stage 3: Pre-testing

Table 2 presents the general characteristics of 35 pre-testing participants recruited through social media announcement. Most of the participants were female, single, employed, college graduate with an average age of 30.3 years old.

The average score of the participants for the first and second rounds were 60.9 and 60.0, respectively. Based on the Mann-Whitney U test, there was no

Table 1: AKAS questions and Cronbach's alpha of questions

Questions	*Stage 1*	*Stage 2*	*Stage 3*	*Cronbach's alpha if item is deleted*			
				Frist analysis		*Second analysis*	
				Round 1	*Round 2*	*Round 1*	*Round 2*
Awareness (answerable by 'Yes', 'No' or 'Don't Know')				0.467	0.435	0.453	0.629
1. Are you aware that GO foods are sources of energy for body activities?	/	/	/- combined as one domain knowledge and awareness questions	0.399	0.437	0.465	0.630
2. Are you aware that eating whole grains like brown rice, corn, oatmeal, and whole wheat bread can lower risk of heart disease, diabetes and other health problems?	/	/	/- combined as one domain knowledge and awareness questions	0.479	0.290	0.436	0.589
3. Check which of these you think are GO foods.	/	/	/- combined as one domain knowledge and awareness questions	0.469	0.437	0.454	0.630
4. Are you aware that GROW foods are rich in protein?	/	/	/- combined as one domain knowledge and awareness questions	0.399	0.437	0.465	0.630
5. Are you aware that eating fish, eggs, meat and drinking milk are good for building bones and muscles?	/	/	/- combined as one domain knowledge and awareness questions	0.469	0.437	0.454	0.630
6. Check which of these you think are GROW foods	/	/	/- combined as one domain knowledge and awareness questions	0.469	0.437	0.454	0.630
7. Are you aware that GLOW foods are rich in vitamins and minerals?	/	/	/- combined as one domain knowledge and awareness questions	0.399	0.437	0.465	0.630
8. Are you aware that eating GLOW foods like fruits and vegetables are for good eyesight and strong immune system?	/	/	/- combined as one domain knowledge and awareness questions	0.399	0.437	0.465	0.630

Table 1: AKAS questions and Cronbach's alpha of questions *(continued)*

Questions	*Stage 1*	*Stage 2*	*Stage 3*	*Cronbach's alpha if item is deleted*			
				Frist analysis		*Second analysis*	
				Round 1	*Round 2*	*Round 1*	*Round 2*
9. Check which of these you think are GLOW foods	/	/	/- combined as one domain knowledge and awareness questions	0.469	0.437	0.454	0.630
10. Are you aware that milk is a rich source of protein, vitamins and minerals?	/	/	/- combined as one domain knowledge and awareness questions	0.469	0.437	0.454	0.643
11. Are you aware that drinking milk everyday is good for strong bones and teeth?	/	/	/- combined as one domain knowledge and awareness questions	0.496	0.437	0.458	0.635
12. Are you aware that it is important to drink enough water everyday to stay healthy and strong?	/	/	/- combined as one domain knowledge and awareness questions	0.496	0.437	0.458	0.630
13. Are you aware that drinking milk is important for proper growth especially among young children?	/	/	/- combined as one domain knowledge and awareness questions	0.524	0.437	0.452	0.630
14. Are you aware that *Pinggang Pinoy* is specially designed for Filipinos?	/	/	/- combined as one domain knowledge and awareness questions	0.356	0.397	0.404	0.622
15. Are you aware that *Pinggang Pinoy* is a simple guide for healthy eating?	/	/	/- combined as one domain knowledge and awareness questions	0.451	0.437	0.424	0.630
16. Are you aware that half of the *Pinggang Pinoy* should contain GLOW foods like vegetables and fruits?	/	/	/- combined as one domain knowledge and awareness questions	0.386	0.095	0.415	0.594
Knowledge (answerable by 'True', 'False' or 'Don't Know')				0.538	0.594		
1. Go foods contain fibre, vitamins and minerals.	/	/	/- combined as one domain knowledge and awareness questions	0.449	0.572	0.359	0.614

Table 1: AKAS questions and Cronbach's alpha of questions *(continued)*

Questions	*Stage 1*	*Stage 2*	*Stage 3*	*Cronbach's alpha if item is deleted*			
				Frist analysis		*Second analysis*	
				Round 1	*Round 2*	*Round 1*	*Round 2*
2. Go foods provide energy for daily activities.	/	/	/- combined as one domain knowledge and awareness questions	0.550	0.599	0.444	0.630
3. Dried beans and legumes are examples of Go foods.	/	/	/- combined as one domain knowledge and awareness questions	0.420	0.460	0.377	0.546
4. Grow foods are rich sources of protein.	/	/	/- combined as one domain knowledge and awareness questions	0.531	0.599	0.449	0.631
5. Papaya and pechay are examples of Grow foods.	/	/	/- combined as one domain knowledge and awareness questions	0.586	0.530	0.474	0.582
6. Grow foods like eggs, cheese and milk make the body strong and healthy.	/	/	/- combined as one domain knowledge and awareness questions	0.542	0.591	0.454	0.626
7. An adult 20 to 39 years old should consume 2 to 3 servings of fruits and 3 servings of vegetables per day.	/	/	/- combined as one domain knowledge and awareness questions	0.460	0.542	0.411	0.588
8. Potato is an example of GLOW food.	/	/	/- combined as one domain knowledge and awareness questions	0.545	0.479	0.490	0.546
9. GLOW foods do not contain vitamins and minerals.	/	/	/- combined as one domain knowledge and awareness questions	0.503	0.620	0.400	0.643
10. Milk is a good source of calcium for bone health.	/	/	/- combined as one domain knowledge and awareness questions	0.542	0.599	0.454	0.630

Table 1: AKAS questions and Cronbach's alpha of questions *(continued)*

Questions	*Stage 1*	*Stage 2*	*Stage 3*	*Cronbach's alpha if item is deleted*			
				Frist analysis		*Second analysis*	
				Round 1	*Round 2*	*Round 1*	*Round 2*
11. Water is essential for health.	/	/	/- combined as one domain knowledge and awareness questions	0.542	0.599	0.454	0.630
12. The *Pinggang Pinoy* recommends drinking one (1) glass of milk everyday for children and adults.	/	/	/- combined as one domain knowledge and awareness questions	0.448	0.600	0.443	0.629
13. Milk is an example of Glow food.	†	-	-	-	-	-	-
14. Milk should be important part of a child's diet.	†	-	-	-	-	-	-
15. *Pinggang Pinoy* is a food plate model that shows the proportions of food on a per meal basis	†	-	-	-	-	-	-
16. *Pinggang Pinoy* is a food guide that shows the recommended portions by food groups such as Go, Grow and Glow on per meal basis.	†	-	-	-	-	-	-
17. *Pinggang Pinoy* is a guide that shows the kinds and amounts of food a plate should contain every meal.	†	-	-	-	-	-	-
Attitude (answerable by 'Strongly Agree', 'Agree', 'Strongly Disagree', 'Disagree', 'Neutral')				0.456	0.573	0.506	0.626
1. Go foods are good for me.	/	/	/	0.472	0.572	0.517	0.636
2. I don't like to eat whole grains like brown rice, corn, oatmeal, and whole wheat bread.	/	/	/	0.363	0.557	0.396	0.630
3. It is important for me to eat whole grains like brown rice than refined grains like white rice.	/	/	/	0.392	0.594	0.460	0.655

Table 1: AKAS questions and Cronbach's alpha of questions *(continued)*

Questions	*Stage 1*	*Stage 2*	*Stage 3*	*Cronbach's alpha if item is deleted*			
				Frist analysis		*Second analysis*	
				Round 1	*Round 2*	*Round 1*	*Round 2*
4. GROW foods are good for me to make bones strong.	/	/	†-deleted in the second analysis	0.476	0.604	-	-
5. I don't like eating dried beans and nuts because they cause arthritis.	/	/	/	0.414	0.556	0.465	0.617
6. It is important to include milk, cheese and eggs in child/ children's diet for their proper growth and development.	/	/	/	0.458	0.596	0.509	0.650
7. I believe that GLOW foods should always be in my market list.	/	/	/	0.403	0.501	0.458	0.555
8. I believe that eating the right amount of GLOW foods everyday will keep my body healthy.	/	/	†-deleted in the second analysis	0.457	0.501	-	-
9. I believe that I should consider the nutritional value of foods before I buy.	/	/	/	0.403	0.501	0.509	0.555
10. Eating GO, GROW, and GLOW foods in proper amount would help me stay healthy.	/	/	/	0.457	0.575	0.458	0.555
11. Drinking one glass of milk per day is enough for me.	/	/	/	0.411	0.560	0.455	0.640
12. I like liquid milk better than powdered milk.	/	/	/	0.468	0.584	0.547	0.658
13. I like drinking milk in small tetra packs.	/	/	†-deleted in the second analysis	0.482	0.606	-	-
14. I do not like drinking water.	/	/	/	0.457	0.575	0.509	0.632
15. It is important to include milk and milk products in children's diet for their proper growth and development.	/	/	/	0.451	0.493	0.501	0.556

Table 1: AKAS questions and Cronbach's alpha of questions *(continued)*

Questions	*Stage 1*	*Stage 2*	*Stage 3*	*Cronbach's alpha if item is deleted*			
				Frist analysis		*Second analysis*	
				Round 1	*Round 2*	*Round 1*	*Round 2*
16. I can attain and maintain a healthy weight by following the *Pinggang Pinoy*.	/	/	/	0.425	0.501	0.474	0.555
17. Following the *Pinggang Pinoy* would give me adequate vitamins, minerals and energy.	/	/		0.457	0.575	0.509	0.632
Self-efficacy (answerable by 'Strongly Agree', 'Agree', 'Strongly Disagree', 'Disagree', 'Neutral')				0.700	0.923	0.700	0.923
1. I am confident that I can follow the recommended servings of GO foods based on *Pinggang Pinoy*.	/	/	/	0.718	0.914	0.718	0.914
2. I am confident that I can eat recommended servings of GO foods based on *Pinggang Pinoy*.	/	/	/	0.727	0.920	0.727	0.920
3. I am confident that I can include GO Foods in my market list.	/	/	/	0.694	0.921	0.694	0.921
4. I am confident that I can serve protein-rich foods in our daily meals.	/	/	/	0.707	0.920	0.707	0.920
5. I am confident that I can include milk or cheese in my market list.	/	/	/	0.668	0.914	0.668	0.914
6. I am confident that I can drink eight (8) or more glasses of water everyday.	/	/	/	0.693	0.927	0.693	0.927
7. I am confident that I can drink one (1) glass of milk everyday based on *Pinggang Pinoy*.	/	/	/	0.651	0.913	0.651	0.913
8. I am confident that I can always include milk in my daily diet.	/	/	/	0.616	0.910	0.616	0.910

Table 1: AKAS questions and Cronbach's alpha of questions *(continued)*

Questions	*Stage 1*	*Stage 2*	*Stage 3*	*Cronbach's alpha if item is deleted*			
				Frist analysis		*Second analysis*	
				Round 1	*Round 2*	*Round 1*	*Round 2*
9. I am confident that I can include milk in my market list.	/	/	/	0.659	0.914	0.659	0.914
10. I am confident that I can follow the recommended amounts of GROW foods in my daily diet.	/	/	/	0.676	0.917	0.676	0.917
11. I am confident that I can always include GLOW foods in my daily meal.	/	/	/	0.669	0.915	0.669	0.915
12. I am confident that I can follow the recommended daily servings of fruits and vegetables.	/	/	/	0.684	0.915	0.684	0.915
13. I am confident that I can differentiate between healthy and less healthy foods.	/	/	/	0.704	0.928	0.704	0.928
14. I am confident that I can always include vegetables in my every meal.	/	/	/	0.677	0.913	0.677	0.913
15. I am confident that me and my family can make healthier food choices with the help of nutrition labels.	/	/	/	0.704	0.924	0.704	0.924

Labels: †deleted questions; /questions retained

Table 2. General characteristics of pre-testing participants (*n*=35), *n* (%)

Characteristics	*Urban*	*Rural*	*Total*
Sex			
Male	2 (12.5)	5 (26.3)	7 (20.0)
Female	14 (87.5)	14 (73.7)	28 (80.0)
Age			
19 to 20 years old	1(6.2)	0 (0.0)	1 (2.9)
21 to 30 years old	9 (56.3)	8 (42.1)	17 (48.6)
31 to 40 years old	4 (25.0)	10 (52.6)	14 (40.0)
41 to 50 years old	1 (6.2)	1 (5.3)	2 (5.7)
51 to 59 years old	1 (6.2)	0 (0.0)	1 (2.9)
Marital status			
Single	11 (57.9)	12 (63.2)	23 (65.7)
Married	4 (21.0)	7 (36.8)	11 (31.4)
Widowed	1 (5.2)	0 (0.0)	1 (2.9)
Number of son/daughter under 18 years old living in the same household			
None	13 (81.3)	14 (73.7)	27 (77.1)
1	2 (12.5)	3 (15.8)	5 (14.3)
2-4	1 (6.3)	2 (10.5)	3 (8.6)
Number of other children in your care under 18 years old living in the same household			
None	13 (81.3)	19 (100)	32 (91.4)
1	2 (12.5)	0 (0.0)	2 (5.7)
2-4	1(6.25)	0 (0.0)	1 (2.90)
Family size			
≤ 3 household members	6 (37.5)	7 (36.8)	13 (37.1)
4-5 household members	6 (37.5)	10(52.6)	16 (45.7)
≥ 6 household members	4(25.0)	2(10.5)	6 (17.1)
Educational attainment			
High school undergraduate	1 (6.3)	0 (0.0)	1 (2.9)
High school graduate	0 (0.0)	1 (5.3)	1 (2.9)
Vocational	1 (6.3)	0 (0.0)	1 (2.9)
College undergraduate	1 (6.3)	1 (5.3)	2 (5.7)
College (BS or BA)	9 (56.3)	8 (42.1)	17 (48.6)
Masteral (MS/MA)	4 (25.0)	9 (47.3)	13 (37.1)
Family income (Php)			
≤ 6,000	0 (0.0)	1 (5.3)	1 (2.9)
6,001 –10, 000	1 (6.3)	1 (5.3)	2 (5.7)
10,001 – 20,000	1 (6.3)	4 (21)	5 (14.3)
20,001 – 30,000	2 (12.5)	6 (31.6)	8 (22.9)
30,001 – 40, 000	4 (25.0)	0 (0.0)	4 (11.4)
40,001 – 50, 000	2 (12.5)	3 (15.8)	5 (14.3)
50,001 and up	6 (37.5)	4 (21.0)	10 (28.6)
Source of income			
None	3 (18.8)	1 (5.3)	4 (11.4)
Employment	11 (68.8)	17 (89.5)	28 (80.0)
Remittance	1 (6.2)	0 (0.0)	1 (2.9)
Self-employed	1 (6.2)	1 (5.3)	2 (5.7)
Occupation			
Employees of government and special interest organisations, corporate executives, managers, managing proprietors and supervisors	8 (50.0)	4 (21.0)	12 (34.3)
Professional	1 (6.3)	11 (57.9)	12 (34.3)
Clerks, technicians and associate Professionals	1 (6.3)	2 (10.5)	3 (8.6)
Not applicable	3 (18.8)	1 (5.3)	4 (11.4)
No answer	3 (18.8)	1 (5.3)	4 (11.4)

BS: Bachelor of Science; BA: Bachelor of Arts; MS: Master of Science; MA: Master of Arts

Table 3. Frequencies of answers of the feedback form about the questionnaire (n=35)

Questions	*Yes, n (%)*	*No, n (%)*
1. Do you understand what is being asked?	35 (100.0)	0 (0.0)
2. Do you understand the terminology used in the questions?	35 (100.0)	0 (0.0)
3. Was there any response for the answers you think maybe missing in the questions?	1 (2.9)	34 (97.1)
4. Was there any question that is offensive?	0 (0.0)	35 (100.0)
5. Was there any question that is difficult to understand?	0 (0.0)	35 (100.0)
6. Did you feel that some questions are biased?	3 (8.6)	32 (91.4)
7. Was there any question that should not be included?	0 (0.0)	35 (100.0)
8. Did the flow and language of the questionnaire seem logical and natural?	34 (97.1)	1 (2.9)
9. Did the time taken to answer the questionnaire seem reasonable?	35 (100.0)	0 (0.0)
10. Is the font size in the questionnaire too small?	0 (0.0)	35 (100.0)

significant difference between the two scores (p=0.390).

Test-retest reliability was computed using Spearman's correlation. The result showed that the Spearman's correlation coefficient was 0.620 (p<0.001), indicating moderate correlation.

Cronbach's alpha was used to analyse the internal consistency of the questionnaire. Results of the analysis can be found in Table 1. For the first round, the Cronbach's alpha ranged from 0.467 to 0.700; while for the second round, it ranged from 0.435 to 0.923. The awareness and self-efficacy categories showed the lowest and highest Cronbach's alpha, respectively.

Since the Cronbach's alpha computed was considered unacceptable, thus, a second analysis was done to improve the Cronbach's alpha of the questionnaire. In the second analysis, the awareness and knowledge questions were combined. In addition, attitude questions numbers 4 and 13 were deleted. Based on the first analysis, deletion of these questions may lead to a higher Cronbach's alpha.

Table 3 presents the frequencies of answers of the feedback form about the questionnaire. Based on the answers, the participants found the questionnaire easy to understand, inoffensive, and unbiased. The format of the questionnaire was also acceptable.

The average duration for answering the questionnaire was 17.3 minutes for the first round and 12.0 minutes for the second round.

DISCUSSION

The study developed an online questionnaire on AKAS on healthy eating for Filipino adults aged 19 to 59 years old. The content and construct validity and reliability of the questionnaire were assessed.

The *Pinggang Pinoy* was used as the basis for questionnaire development. *Pinggang Pinoy* is a healthy food plate guide for Filipinos that is used to promote healthy eating. It identifies the right proportions of Go (carbohydrate-rich foods), Grow (protein-rich foods), and Glow (vitamins and minerals-rich foods) food groups on a per meal basis. The *Pinggang Pinoy* promotes balance and variety wherein half of the plate

represents Glow foods consisting of fruits and vegetables. One sixth of the plate shows proportion for Grow foods and one third of the plate for Go foods. The *Pinggang Pinoy* was developed based on the usual dietary pattern of Filipinos. The Philippine national food consumption survey showed that rice, fish, and vegetables are the usual Filipino diet (FNRI-DOST, 2016). Fruit was added in Pinggang Pinoy as there is a decreasing consumption of fruits among Filipinos (FNRI-DOST, 2016).

The final version of the questionnaire developed was composed of three components, namely awareness and knowledge, attitude, and self-efficacy. Questions on awareness and knowledge on functions and sources of Go, Grow and Glow food groups were formulated. There were also questions on recommended number of serving portions based on the *Pinggang Pinoy* for adults. For awareness and knowledge components, 28 questions were answerable by 'Yes' or 'No' or 'True' or 'False'. Attitude and self-efficacy questions were about intention and confidence, respectively, of respondents to follow the *Pinggang Pinoy* as a guide in healthy eating. Attitude questions were about believing in the importance of following the *Pinggang Pinoy* for good health. Meanwhile, self-efficacy questions were about the confidence of an individual if he/she can follow the *Pinggang Pinoy* recommendations. The attitude component had 17 questions and self-efficacy component had 15 questions. Both components were answerable by a five-point Likert scale.

Content validity of the questionnaire was evaluated through the conduct of Delphi panel meeting. Content validity refers to the process of evaluating a new survey instrument to ensure that it contains all of the necessary items, while excluding those that are not relevant to the questionnaire being developed. This involves literature reviews and evaluation by experts (Taherdost, 2016).

During the Delphi panel meeting, panelists ensured correct technical content, relevant and understandable questions. Panel members were nutritionist-dietitians and communication specialists involved in the development and led the promotion of *Pinggang Pinoy*. Hence, they were considered experts in their respective fields and could evaluate the content validity of the questionnaire. According to Shariff (2015), there are no clear guidelines on the appropriate number of sample size for a Delphi panel, and that heterogenous sample size of experts from different fields can be five to ten per professional group. In this study, there were only seven Delphi panelists from two different fields – nutrition and communication. Furthermore, sample size for Delphi panel can vary according to the purpose of the study, its complexity and resources (Shariff, 2015). For this study, Delphi panel meeting was only the first stage of questionnaire development. Although the sample size for the expert panel was small, there was still a second stage of questionnaire development wherein nutrition experts and non-experts commented on the questionnaire.

Meanwhile, cognitive debriefing assesses the understanding of target respondents on the developed questionnaire. Categorising or grouping of responses by the cognitive debriefing participants was used as the technique in the analysis of the questionnaire modifications to be considered. From the responses, modifications were done in terms of shortening the questions and restructuring of questions for easy comprehension. Misunderstanding of questions by respondents may weaken the content validity of the questionnaire. Incorrect responses and skipped items may be due to irrelevant responses to

the question or misunderstanding of question instructions relevant to them (Ploughman *et al.,* 2010).

Construct validity refers to whether the combination of items in a specific construct provides a good measure. One way to assess construct validity is by comparing two groups - one group composing of nutrition experts, while the other group consisting of the general public. The expert group should score significantly higher, which can be tested using independent samples *t*-test (Feren *et al.,* 2011). A significantly higher score means the questionnaire is able to distinguish the level of knowledge between experts and non-experts; hence, a well-constructed questionnaire.

A number of studies utilised this method in assessing the construct validity of nutrition knowledge questionnaire. In the nutrition knowledge questionnaire for obese adults (Feren *et al.,* 2011), significantly different scores were obtained from nutrition and non-nutrition students. This was also used in the dietary fibre-related questionnaire in Turkey, which showed significantly different scores between nutrition and engineering students (Deniz & Alsaffar, 2013). In this study, participants of cognitive debriefing sessions who were grouped into nutrition experts and the general public answered the questionnaire. Using non-parametric test, it showed significantly different scores, consistent with the results of other studies.

Spearman's rank correlation was used to assess test-retest reliability. The test-retest correlation coefficient for the overall score of the questionnaire was 0.62, which indicated moderate correlation (Akoglu, 2018). Overall, correlation coefficients of between 0.4 and 0.7 indicate moderate correlation, while those between 0.7 and 0.9 indicate strong correlation (Lee, Yim & Kim, 2018). Several factors were identified to affect test-retest reliability. One was the administration of the first test, which may influence participants' answers in the retest. They may have acquired knowledge after the first test that might have improved their scores in the retest. Another disadvantage was the reactivity, which is the act of measuring a person's attitudes that may lead to increased awareness of the phenomenon being studied. As a result, it may change a person's attitude in retesting and lower the correlation coefficient (Karras, 1997). The questionnaire developed was on healthy eating and it may be easy for participants to change their answers in the retest stage due to reactivity or actual changes in eating habits. This may explain the moderate correlation coefficient. The main aim of the questionnaire was for it to be used as a baseline and end line questionnaire for nutrition education interventions, hence, a strong correlation was not expected.

An alpha of 0.60 and above is indicative of good reliability (Lee *et al.,* 2018); a nutrition knowledge questionnaire is recommended to have a Cronbach's alpha of 0.70 (Deniz & Alsaffar, 2013). In another nutrition knowledge questionnaire reliability study in Turkey (Alfassar, 2012), Cronbach's alpha ranged from 0.80 to 0.90. One study in India (Sharma *et al.,* 2019) assessed nutrition-related knowledge, attitude and self-efficacy of adolescents using a questionnaire. The internal reliability of the questionnaire used was 0.70, close to the internal reliability of the present study. A 20-item questionnaire developed by Kumari *et al.* (2020) to assess lifestyle-related behaviours of individuals showed a satisfactory validity and good internal consistency, with a Cronbach's alpha value of 0.72, which was likewise close to the internal reliability of the present study.

Another study that had almost the same Cronbach's alpha with the overall Cronbach's alpha of the present study was a study by Reethest *et al.* (2019), showing the KAP developed questionnaire with 42 items categorised under three domains, namely Knowledge (14 items-0.75), Attitude (15 items-0.75), and Practice (13 items-0.63), had good internal consistencies. The lower Cronbach's alpha reported in this study compared to other studies may also be attributed to the lack in variation in the answers of the respondents since 85% of the respondents had an educational attainment of either college or postgraduate degree. This may reflect very high knowledge in good nutrition practices. Hence, most of the answers were correct or positive, producing a very homogenous sample. The Cronbach's alpha value is highly affected by homogeneity of subject responses (Pike & Hudson, 1998). Although there was a low variation in answers, the calculated Cronbach's alpha was still within the acceptable range after a second analysis was done to conform with the recommended value of Cronbach's alpha.

CONCLUSION

The questionnaire development underwent rigid process. It utilised both qualitative and quantitative methods to ensure that the content of the questionnaire was valid and reliable. A limitation of the questionnaire is that it is available only in English and Filipino, hence not considering other dialects in the country. The questionnaire is intended for online use. In addition, this is the first local study which attempted to validate an online questionnaire on the AKAS on healthy eating. With the digitalisation brought about by the COVID-19 pandemic, it is important to develop validated questionnaire that can be used to plan and assess the conduct of online nutrition education and promotion activities. Overall, the developed questionnaire was found to be valid and reliable, and can be used in assessing AKAS of participants of nutrition education for healthy eating. For future studies, it is recommended to pre-test and print the developed questionnaire for face-to-face survey to assess its content and construct validity and reliability.

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Authors' contributions

Gonzales MS, principal investigator, conceptualised and designed the study, served as critique during Delphi meeting; reviewed the drafts and final manuscript before submission to the Malaysian Journal of Nutrition; Glorioso IG, co-investigator, assisted in the conceptualisation and designing the study, led in the conduct of Delphi meeting, assisted in the conduct of cognitive debriefing, prepared the draft and final manuscript, revised the manuscript based on comments of reviewers, reviewed the final manuscript before submission to the Malaysian Journal of Nutrition; Navarro CAJ, co-investigator, led in the conduct of pre-testing (test and re-test), data analysis and interpretation, assisted in drafting of the manuscript, revised the manuscript based on the comments of reviewers, reviewed the final manuscript before submission to the Malaysian Journal of Nutrition; Jolejole TKB, co-investigator, data analysis and interpretation of the highlights of cognitive debriefing, assisted in drafting of the manuscript, proofread the manuscript and assist in the revision of manuscript based on the comments of reviewers.

Conflict of interest

The authors declare no conflict of interest.

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