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Development, Validation and Reliability of a Short Questionnaire on Awareness of the Availability, Perception of Health Benefits, and Intent to Purchase Pigmented Rice

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Abstract

Background: Polyphenol intake is associated with reduced cardiometabolic risk factors such as dyslipidemia, hyperglycemia, and obesity. Pigmented rice varieties such as red, purple, and black rice contain polyphenols; however, are not commonly consumed. Apart from price and sensory properties, awareness of its availability, perception of health benefits, and intent to purchase may influence consumer preference and consumption. **Objective**: This study aimed to develop and validate a short questionnaire designed to determine awareness of the availability, perception of health benefits, and intent to purchase pigmented rice. **Methodology**: The study included three phases: (1) tool development, (2) expert validation, and (3) reliability testing. Questions were initially evaluated for clarity and relevance by two Nutritionist-Dietitians and then by seven lay individuals through a focus group discussion. Following the revision, seven food and nutrition experts evaluated the face and content validity of the questionnaire. Validity was assessed via computation of Item and scale content validity indices and kappa statistics. The validated tool was then tested for internal consistency and parallel form reliability of English and Filipino versions among lay individuals (n=31) and then evaluated for reliability based on Cronbach's alpha and Intraclass correlation coefficients. **Results**: The questionnaire was found to have an acceptable face (*I-CVI*: 1.00; *S-CVI/UA*: 1.00; *K*=1.00) and content validity (*I-CVI*: 0.86-1.00; *S-CVI/UA*: 0.96-1.00; *K*= 0.85-1.00) and reliability (α= 0.96-1.00). **Conclusion**: The developed questionnaire is a valid and reliable tool for assessing awareness of the availability, perception of health benefits, and intent to purchase pigmented rice.

Key Words: *Pigmented Rice, Health Perception, Awareness on Availability*

INTRODUCTION

Cardiometabolic risk factors such as dyslipidemia,[1] hyperglycemia,[2] and obesity[3] have been associated with increased risk for cardiovascular diseases (CVDs). Incorporation of polyphenols in the diet is shown to reduce low-density lipoprotein (LDL),[4,5] glucose,[6–8] and obesity,[9–11] thereby reducing the risk for CVDs. Polyphenol intake is mainly contributed by the consumption of fruits, vegetables, and non-alcoholic beverages such as tea and coffee.[12] Additionally, pigmented rice, such as those with red, purple, or black colors, may increase polyphenol intake.[13] Pigmented rice contains anthocyanins, phenolic acids, and proanthocyanidins.[14] Several animal[15–19] and human[7,8,10,20,21] studies have demonstrated the potential benefits of pigmented rice consumption, and these have recently been summarized in a systematic review of randomized controlled trials.[22] It is therefore postulated that pigmented rice may provide added therapeutic value in preventing and managing CVDs. However, compared to white rice, pigmented rice varieties are rarely consumed.

Factors such as price,[23] sensory properties, availability and accessibility, and health/nutrition information[24] influence food choices and consumption. As such, these factors also influence rice preference and consumption.[25–27] While some studies have examined factors influencing the consumption and purchasing behavior of pigmented rice, their focus has primarily been on profiling consumer sociodemographic characteristics and preferences for rice attributes (e.g., texture, aroma, and nutrient content).[25,27–29] However, to the best of our knowledge, no studies have explored consumers' awareness of its availability, perception of its health benefits, and intent to purchase pigmented rice. Additionally, among the existing studies investigating factors influencing the consumption and purchasing of pigmented rice, none have discussed the development and validation process of questionnaires used. Consequently, there is a lack of validated questionnaires available to investigate these factors. This study aims to fill this gap by developing and validating a short questionnaire to assess awareness of the availability, perception of health benefits, and intent to purchase pigmented rice. The questionnaire will be an important tool in assessing consumers' perception of pigmented rice.

METHODS

Study Design. The study follows a classical test theory design as it measures the validity and reliability of the questionnaire based on the assumption that a participants' answer reflects what the questionnaire is intended to measure and their true answers. Over repeated administrations of parallel forms under standardized conditions, it accounts for random error, computed using correlation coefficients.[30,31] This study was conducted in three phases following the processes outlined by Tsang, Royse & Terkawi,[32] which inlcude development, content validation and reliability testing, as shown in Figure 1 and discussed in detail in the subsequent sections.

Ethics. The study was given ethical approval by the University of Santo Tomas Graduate School Review Ethics Committee (Protocol number: GS2023-003).

Participants. The initial development and revision of the questionnaire were conducted in English by three researchers (D.S.M-S., E.H.A., and E.V.M) with a background in food science or nutrition. The validation component was completed by a panel of seven professionals with a minimum of two years of professional experience in the fields of food science or nutrition, as recommended by Yusoff[33] (Table 1). Prior to reliability testing, the questionnaire was initially translated into Filipino by the authors and then evaluated by two professional translators and one content expert at the Sentro sa Salin of the University of Santo Tomas. Participants involved in the reliability testing were non-pigmented rice consumers aged 20-59 years who were currently healthy (without illnesses such as colds and food allergies), while pregnant or lactating females and those taking medications that may affect senses were excluded (Figure 1).

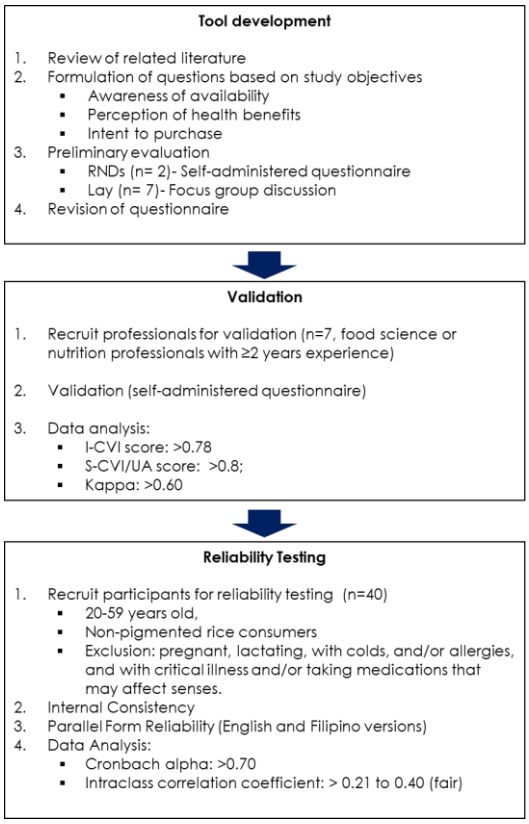

Figure 1. Summary of the Process of Questionnaire Development

Setting. The validation of the questionnaire was conducted via electronic correspondence as

participants were from different institutions. The reliability testing was conducted on campus at the University of Santo Tomas, where the questionnaires were self-administered.

Data Gathering Procedure. This study consisted of three phases: development, validation, and reliability testing of a questionnaire. The questionnaire was formulated to assess awareness of availability, perception of health benefits, and intent to purchase pigmented rice. Subsequently, the questions were evaluated by a panel of food science and nutrition professionals and then tested for reliability in a group that did not consume pigmented rice.

Phase 1: Questionnaire Development. Questions were formulated by the researchers based on the study objectives (see Figure 1) and a review of literature related to factors affecting rice preference and consumption. The options for the perception of the health benefits of pigmented rice were based on the results of a previously conducted systematic review which evaluated the effects of pigmented rice consumption on CVD risk factors[22] and a study by Wuryandani et al.[25] on consumers' perspective on pigmented rice. The initial questionnaire was reviewed and revised by two registered nutritionist-dietitians (D.S.M-S and E.V.M.). Additionally, a small focus group discussion involving seven lay individuals was conducted to evaluate the feasibility of the questionnaire. Revisions were undertaken based on the results of the pilot testing.

Phase 2: Validation. The questionnaire was evaluated for face and content validity. Face validity refers to the capacity of the instrument to be understood by the target participants and whether it represents what it is supposed to assess by its face value.[32,34] Content validity represents whether the items in the instrument are relevant to the construct it is supposed to assess.[32,34,35] The validation tool comprised six questions that aimed to evaluate formatting, presentation, clarity of instructions and items, and relevance of each item using a five-point Likert scale (1-strongly disagree, 2-disagree, 3-neither agree nor disagree, 4-agree, 5-strongly agree) based on the guidelines by Yusoff.[33] In addition, panelists were also asked to write any comments or suggestions that could further improve the questionnaire.

Phase 3: Reliability. Reliability was evaluated following the revision of the questionnaire based on the results of the validation phase. Reliability refers to the ability to get consistent results.[35] In this study, we looked into the internal consistency and parallel forms reliability by having participants complete two versions of the questionnaire, one in English and one in Filipino. The questionnaire was translated into the Filipino language since not all participants involved in sensory evaluation may understand English, which may affect the accuracy of the data. The translation was evaluated by professional translators for concept, terminology, style, and grammar. Revisions were made as required. The two versions were administered in randomized order one week apart to avoid memory recall.[35]

Data Analysis. Expert validation results are presented as means and standard deviation, and agreements in counts. Agreement was noted if the panel selected "agree" (score of 4) or "strongly agree" (score of 5) for an item. Item-level content validity index (I-CVI) was calculated as the number of experts who agreed divided by the total number of experts (n=7).[33,35] The scale-level content validity index based on the universal agreement method (S-CVI/UA) was calculated as the sum of I-CVI divided by the total number of items (n=8). An I-CVI score of >0.78 is considered valid,[33,35,36] and an S-CVI/UA of >0.8 is deemed to have excellent content validity.36 In addition to CVI, kappa (k) statistics were calculated to provide the degree of agreement beyond chance; values between 0.60 to 0.74 are considered good, and values >0.74 are considered excellent.[36] Cronbach's coefficient alpha (α) was used to evaluate whether the questionnaire items measure the same construct or are redundant. A value of >0.70 is considered to have good reliability.[37,38] Intraclass correlation coefficient (ICC) was used to assess the reliability of the English and Filipino versions of the questionnaire. An ICC value of 0.21 to 0.40 is considered to have fair agreement, 0.41 to 0.60 have moderate agreement, and 0.61 to 0.80 have substantial agreement.

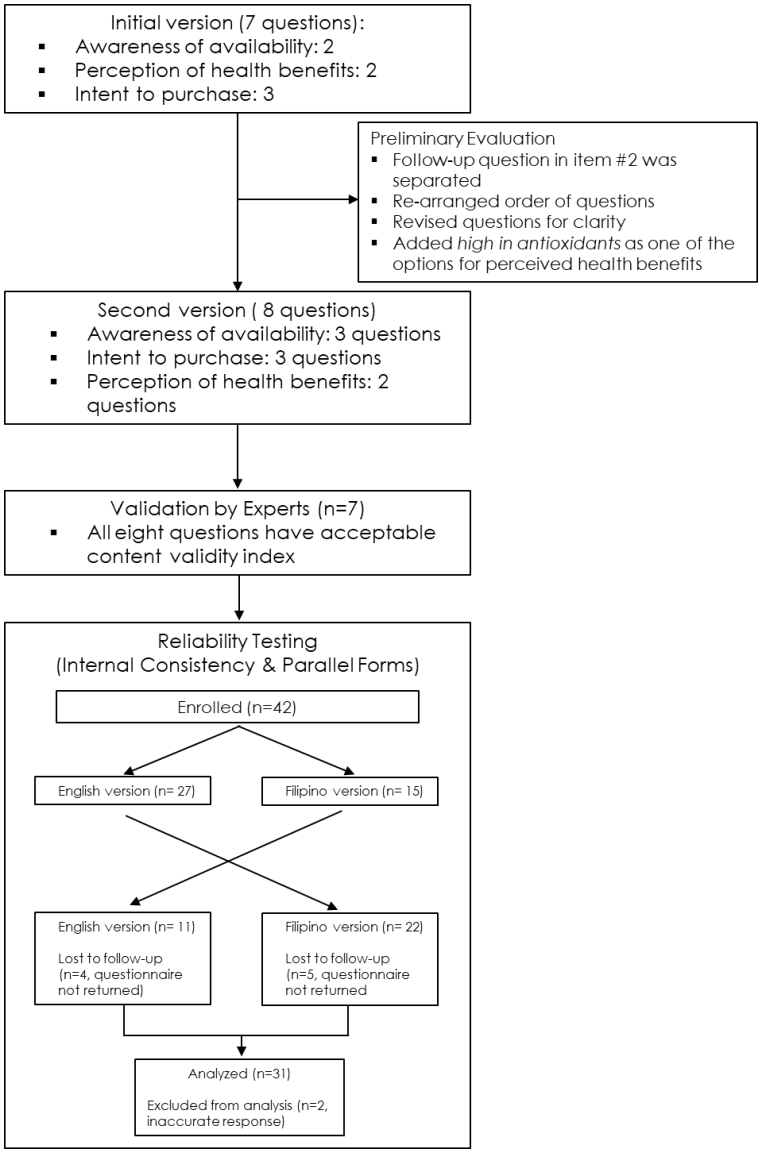

Figure 2. Process flow of item development, validation, and reliability testing

Table 1. Profile of Panel of Professionals

Panel of Professionals	Profession	Years in practice	Field of Practice	Highest Degree Attainment
1	Nutritionist-Dietitian	7	Academe	Master in Health Professions Education
2	Nutritionist-Dietitian	5	Academe	Master of Public Health
3	Food Technologist	13	Academe Food Research and Development	Master of Science in Food Science
4	Nutritionist-Dietitian	23	Clinical/Hospital Dietetics	Master of Science in Clinical Nutrition
5	Nutritionist-Dietitian	4	Food and Nutrition Research	BS Nutrition and Dietetics
6	Nutritionist-Dietitian	32	Rice Research	Ph.D. in Plant and Analytical Biosciences
7	Food Technologist	12	Academe Food Industry Consultant	Master of Science Major in Food Science

Table 2. Content Validity Results

Item	English Version					Filipino Version				
	Mean ± SD	**Expert Agreement (*n*=7)**	**I-CVI**	**Pc**	**K**	**Mean rating ± Standard Deviation**	**Expert Agreement (*n*=7)**	**I-CVI**	**Pc**	**K**
1. Questionnaire format	4.71± 0.49	7/7	1.00	0.01	**1.00**	4.71± 0.49	7/7	1.00	0.01	**1.00**
2. Logical presentation of questions	4.71± 0.49	7/7	1.00	0.01	**1.00**	4.71± 0.49	7/7	1.00	0.01	**1.00**
3. Clarity of instructions	4.86± 0.38	7/7	1.00	0.01	**1.00**	4.86± 0.38	7/7	1.00	0.01	**1.00**
			S-CVI/UA: 1.00					*S-CVI/UA*: 1.00		
4. Clarity of questions										
4.1 Q1 Awareness of the availability of pigmented rice in the market	4.57±0.53	7/7	1.00	0.01	**1.00**	4.57±0.53	7/7	1.00	0.01	**1.00**
4.2 Q2 Type of pigmented rice in the market	4.57±0.53	7/7	1.00	0.01	**1.00**	4.57±0.53	7/7	1.00	0.01	**1.00**
4.3 Q3 Where is pigmented rice sold	4.57±0.79	6/7	0.86	0.05	**0.85**	4.57±0.79	6/7	0.86	0.05	**0.85**
4.4 Q4 Cost of pigmented rice	4.43±0.53	7/7	1.00	0.01	**1.00**	4.14±0.69	6/7	0.86	0.05	**0.85**
4.5 Q5 Intent to purchase pigmented rice	4.57±0.53	7/7	1.00	0.01	**1.00**	4.29±0.49	7/7	1.00	0.01	**1.00**
4.6 Q6 Willingness to consume pigmented rice	4.71±0.49	7/7	1.00	0.01	**1.00**	4.57±0.53	7/7	1.00	0.01	**1.00**
4.7 Q7 Perception on whether pigmented rice has health benefits	4.86±0.38	7/7	1.00	0.01	**1.00**	4.57±0.53	7/7	1.00	0.01	**1.00**
4.8 Q8 Perception on what are the health benefits of pigmented rice	4.86±0.38	7/7	1.00	0.01	**1.00**	4.71±0.49	7/7	1.00	0.01	**1.00**
			S-CVI/UA: 0.98					*S-CVI/UA*: 0.96		
5. Relevance of questions										
5.1 Q1 Awareness of the availability of pigmented rice in the market	4.86±0.38	7/7	1.00	0.01	**1.00**	4.86±0.38	7/7	1.00	0.01	**1.00**
5.2 Q2 Type of pigmented rice in the market	4.86±0.38	7/7	1.00	0.01	**1.00**	4.86±0.38	7/7	1.00	0.01	**1.00**
5.3 Q3 Where is pigmented rice sold	4.86±0.38	7/7	1.00	0.01	**1.00**	4.86±0.38	7/7	1.00	0.01	**1.00**
5.4 Q4 Cost of pigmented rice	4.86±0.38	7/7	1.00	0.01	**1.00**	4.86±0.38	7/7	1.00	0.01	**1.00**
5.5 Q5 Intent to purchase pigmented rice	4.86±0.38	7/7	1.00	0.01	**1.00**	4.86±0.38	7/7	1.00	0.01	**1.00**
5.6 Q6 Willingness to consume pigmented rice	4.86±0.38	7/7	1.00	0.01	**1.00**	4.86±0.38	7/7	1.00	0.01	**1.00**
5.7 Q7 Perception on whether pigmented rice has health benefits	4.86±0.38	7/7	1.00	0.01	**1.00**	4.86±0.38	7/7	1.00	0.01	**1.00**
5.8 Q8 Perception on what are the health benefits of pigmented rice	4.86±0.38	7/7	1.00	0.01	**1.00**	4.86±0.38	7/7	1.00	0.01	**1.00**
			S-CVI/UA: 1.00					*S-CVI/UA*: 1.00		

Note: I-CVI: Item-level content validity index, K: Modified kappa, Mean ±SD: mean rating ± standard deviation, Pc: probability of a chance occurrence, S-CVI/UA: Scale-level content validity index based on the universal agreement method. Note: kappa values in bold are considered acceptable/excellent

Table 3. Internal Consistency and Parallel Forms Reliability Results

	English (*n*=31)		Filipino (*n*=31)		Parallel Forms
	Response	**Alpha**	**Response**	**Alpha**	**ICC**
Q1. Awareness of the availability of pigmented rice					
Yes	29	1.00	30	1.00	0.66
No	2		1		
Q2. Type of pigmented rice in the market					
Red	25	1.00	24	1.00	0.52
Purple	8	1.00	9	1.00	0.44
Black	23	1.00	23	1.00	0.50
Q3. Where is pigmented rice sold					
Palengke (Local Market)	10	1.00	15	1.00	0.57
Grocery	27	1.00	26	1.00	0.87
Online shopping (Shopee/Lazada)	15	1.00	17	1.00	0.62

Social Media platforms (FB Marketplace, FB page, Instagram)	6	1.00	7	1.00	0.52
Food Establishment (Restaurants, Cafeteria, etc)	13	1.00	9	1.00	0.46
Q4. What do you think of the cost of red, purple, or black pigmented rice?					
Affordable	4	1.00	6	1.00	0.78
Expensive	26	1.00	23	1.00	0.73
I have no idea	1	1.00	2	1.00	0.66
Q5. Rate your intent to buy red, purple, or black pigmented rice based on the scale provided: 1 Definitely will not buy 2 Probably will not buy 3 Might or might not buy 4 Probably will buy 5 Definitely will buy	3.26	1.00	3.0	1.00	0.72
Q6. Are you willing to replace your usual intake of white rice with red, purple, or black pigmented rice?					
Yes	14	1.00	13	1.00	0.54
No	11	1.00	10	1.00	0.69
Undecided	7	1.00	8	1.00	0.21
Q7. Do you think red, purple, or black pigmented rice has health benefit/s?		1.00		1.00	1.00
Yes	30		31		
No	1		0		
Q8. What do you think are the health benefit/s of red, purple, or black pigmented rice?					
Helps lower glucose levels	25	1.00	24	1.00	0.32
Helps lower cholesterol levels	17	1.00	20	1.00	0.55
Helps in weight loss	19	1.00	20	1.00	0.52
High in fiber	24	1.00	21	1.00	0.61
High in vitamins and minerals	15	1.00	19	1.00	0.50
High in antioxidants	9	1.00	13	1.00	0.75
High in polyphenols	4	1.00	4	1.00	0.71

Note: ICC= Intraclass Correlation Coefficient

RESULTS

Development. The initial questionnaire was composed of seven questions, two questions each on the awareness of availability and perception of health benefits and three on intent to purchase. The questionnaire underwent one revision during its development phase based on the preliminary review of two Nutritionist-Dietitians and seven lay individuals (Figure 2). This revision involved separating the questions on awareness of availability and type of pigmented rice they have seen being sold, re-arranging the sequence of questions, and including high in antioxidants as an option for perceived health benefits. The second version contained eight questions: three to determine participants' awareness of the availability of pigmented rice, three for the intent to purchase, and two for the perception of health benefits of pigmented rice. The sequence of questions was also re-arranged following the suggestions from lay individuals involved in the focus group discussion.

Validation. Five registered nutritionist-dietitians and two Food Technologists were recruited to the validation panel (Table 1). All agreed that both the English and Filipino versions of the questionnaire were well formatted (k=1.00), questions presented in a logical manner (k=1.00) and with clear instructions (k=1.00), thus have acceptable face validity (*S-CVI/UA*= 1.00) (Table 2). The clarity of each question was also determined to have acceptable validity, with an I-CVI range of 0.86 to 1.00 and kappa value of >0.74 for both versions. Lastly, all questions were considered relevant by all experts (7/7), thus have acceptable validity (*I-CVI*: 1.00*; S-CVI/UA*: 1.00; k=1.00) for both versions of the questionnaire.

Reliability. Forty-two (n= 42) participants were enrolled for reliability testing of the questionnaire, but only thirty-three completed this phase of the study. During the study, six participants failed to comply with the submission date, and three were not available for the second administration. Data from two participants were excluded from the final analysis due to inaccurate responses (Figure 2).

Table 3 presents the results of the internal consistency and reliability of the two versions (English and Filipino) of the questionnaire. Both the English and Filipino versions of the questionnaire have acceptable internal consistency (α= 1.00). In addition, most items have moderate to substantial agreement except for the undecided option in item number 6 (*ICC*= 0.21). Based on the low ICC, this option was deleted from the final version of the questionnaire.

DISCUSSION

This study aimed to develop a valid and reliable tool to assess awareness on availability, perception of health benefits, and intent to purchase pigmented rice. The developed tool was found to have acceptable validity and reliability. Validity of a questionnaire ensures that the tool represents the constructs it is supposed to assess,[32,34,35] while reliability represents internal consistency and ability to produce the same results.[35] The first set of questions focuses on awareness of availability, type of pigmented rice, and locations where it is being sold. These data provide a basis for researchers to understand if individuals are aware that pigmented rice is available for them to consider as an alternative to white rice. It also determines the most typical variety of pigmented rice consumers have seen and the location where it is marketed. As presented by previous studies, availability, ease of finding, and accessibility are considered important factors by consumers in purchasing rice.[27,28,39] Therefore, successful promotion of pigmented rice consumption is influenced by individuals' access to it, and data derived from these questions may provide a platform for creating or improving marketing campaigns. The second series of questions focuses on perception of cost, intent to purchase pigmented rice, and willingness to consume it as an alternative. This study identified that in this population of current non-consumers, price may be a factor influencing pigmented rice consumption. Price and cost are both denoted by monetary value; however, the perception of cost may vary depending on the individual's economic status or may be influenced by the perceived value or quality of a product. As such, consumers may pay more depending on how they perceive the quality of rice.[26,40] The last series of questions determines the perceived health benefits of pigmented rice, which is an important factor that can influence its consumption. Health benefits of pigmented rice influence consumers, making them more willing to pay a higher purchase price.[29] Thus, assessment of consumers' perception of the health benefits of pigmented rice may help identify gaps in knowledge which can be used as a basis for formulating education strategies, potentially leading to increased consumption. While several studies have demonstrated the potential health benefits of pigmented rice[22], it is still not widely consumed. Apart from price,[26,39] awareness of availability and perception of its health benefits may influence rice consumption. This questionnaire will enable associations between perceived health benefits, awareness of availability and intention to purchase to be evaluated, which may help promote pigmented rice consumption.

This study has several limitations. The developed questionnaire only assesses perceived cost, intent to purchase and willingness to consume pigmented rice and, therefore, cannot assess actual consumption nor if the respondent has tried or consumed pigmented rice before. In addition, while it assesses the perceived health benefits, it does not include how well these are understood. A higher understanding of how these benefits influence overall health may provide greater motivation or influence food choices. Additionally, due to questions about perceived cost and health benefits, use of the questionnaire may be impacted by income level and education, respectively. Future research may focus on assessing actual consumption, budget allocation and a more comprehensive evaluation of the perceived health benefits of pigmented rice.

CONCLUSION

The developed questionnaire was found to have acceptable validity and reliability and may be used to determine awareness of the availability, perception of health benefits, and intent to purchase pigmented rice.

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Individual Author's Contributions

D.S.M-S, E.H.A, and A.M.H. designed and finalized the research; D.S.M-S, E.H.A, and E.V.M. conducted the data gathering; D.S.M-S and E.H.A analyzed the data, D.S.M-S and A.M.H. co-wrote the paper. All authors read and approved the final manuscript.

Disclosure Statement

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Conflicts of interest

The authors declare no conflict of interest for the current study.

Supplementary Material

Supplementary Material A. Short Questionnaire on Awareness of the Availability, Perception of Health Benefits, and Intent to Purchase Pigmented Rice

References

1. Reda A, Ragy H, Saeed K, Alhussaini MA. A semi-systematic review on hypertension and dyslipidemia care in Egypt—highlighting evidence gaps and recommendations for better patient outcomes. The Journal of the Egyptian Public Health Association 2021;96(1):32. DOI:10.1186/s42506-021-00096-9
2. Goldin A, Beckman JA, Schmidt AM, Creager MA. Advanced Glycation End Products: Sparking the Development of Diabetic Vascular Injury. Circulation. 2006;114(6):597-605. DOI:10.1161/CIRCULATIONAHA.106.621854
3. Poirier P, Giles TD, Bray GA, Hong Y, Stern JS, Pi-Sunyer FX, et al. Obesity and Cardiovascular Disease: Pathophysiology, Evaluation, and Effect of Weight Loss: An Update of the 1997 American Heart Association Scientific Statement on Obesity and Heart Disease From the Obesity Committee of the Council on Nutrition, Physical Activity, and Metabolism. Circulation. 2006;113(6):898-918. DOI:10.1161/CIRCULATIONAHA.106.171016
4. Fauziyah RN, Fitriani N, Surmita. Effect of Fermented Glutinous Black Rice on LDL Levels. Jurnal Riset Kesehatan Poltekkes Depkes Bandung 2020;12(1):139-148. DOI:10.34011/juriskesbdg.v12i1.1759
5. Syarief O, Fauziyah RN, Suparman S, Pramintarto G, Hendriyani H. The Efficacy of Fermented Glutinous Black Rice (FGBR) Snack to Improve Lipid Profile Among Dyslipidemia Subjects: A Novel Finding. International Medical Journal. 2020;25(08):1229-2937..
6. Joo NS, Han SI, Kim KN, Kim KN, Kim BT, Park SB, et al. Black rice with giant embryo ameliorates serum C-reactive protein in adults with metabolic syndrome. Journal of Clinical Biochemestry and Nutrition. 2020;67(3):344-348. DOI:10.3164/jcbn.20-72
7. Anuyahong T, Chusak C, Adisakwattana S. Riceberry rice beverage decreases postprandial glycemic response, inflammatory markers and antioxidant status induced by a high-carbohydrate and moderate-fat meal in overweight and obese men. Food & Function. 2022;13(2):834-845. DOI:10.1039/D1FO03169D
8. Chusak C, Pasukamonset P, Chantarasinlapin P, Adisakwattana S. Postprandial Glycemia, Insulinemia, and Antioxidant Status in Healthy Subjects after Ingestion of Bread made from Anthocyanin-Rich Riceberry Rice. Nutrients. 2020;12(3):782. DOI:10.3390/nu12030782
9. Koch W. Dietary Polyphenols—Important Non-Nutrients in the Prevention of Chronic Noncommunicable Diseases. A Systematic Review. Nutrients. 2019;11(5):1039. DOI:10.3390/nu11051039
10. Kim JY, Kim JH, Lee DH, Kim SH, Lee SS. Meal replacement with mixed rice is more effective than white rice in weight control, while improving antioxidant enzyme activity in obese women. Nutrition Research. 2008;28(2):66-71. DOI:10.1016/j.nutres.2007.12.006
11. Jung AJ, Sharma A, Lee SH, Lee SJ, Kim JH, Lee HJ. Efficacy of black rice extract on obesity in obese postmenopausal women: a 12-week randomized, double-blind, placebo-controlled preliminary clinical trial. Menopause. 2021;28(12):1391-1399. DOI:10.1097/GME.0000000000001862
12. Bo', Bernardi, Marino, et al. Systematic Review on Polyphenol Intake and Health Outcomes: Is there Sufficient Evidence to Define a Health-Promoting Polyphenol-Rich Dietary Pattern? Nutrients. 2019;11(6):1355. DOI:10.3390/nu11061355
13. Goufo P, Trindale H. Rice antioxidants: phenolic acids, flavonoids, anthocyanins, proanthocyanidins,

tocopherols, tocotrienols, γ-oryzanol, and phytic acid. Food Science and Nutrition. Published online 2014:30.

14. Mohidem NA, Hashim N, Shamsudin R, Che Man H. Rice for Food Security: Revisiting Its Production, Diversity, Rice Milling Process and Nutrient Content. Agriculture. 2022;12(6):741. DOI:10.3390/agriculture12060741
15. Bae HJ, Rico CW, Ryu SN, Kang MY. Hypolipidemic, hypoglycemic, and antioxidative effects of a new pigmented rice cultivar "Superjami" in high fat-fed mice. Journal of the Korean Society of Applied Biological Chemistry. 2014;57(5):685-691. DOI:10.1007/s13765-014-4095-z
16. Chung SI, Kang MY. Oral Administration of Germinated, Pigmented, Giant Embryo Rice (Oryza sativa L. cv. Keunnunjami) Extract Improves the Lipid and Glucose Metabolisms in High-Fat Diet-Fed Mice. Tundis R, ed. Oxidative Medicine and Cellular Longevity. 2021;2021:1-9. DOI:10.1155/2021/8829778
17. Fatchiyah F, Safitri A, Rohmah RN, Triprisila LF, Kurnianingsih N, Nugraha Y, et al. The Effect of Anthocyanin of Whole-Grain Pigmented Rice Attenuated Visceral Fat, Cholesterol, LDL and PPARγ Gene Cascade in Dyslipidemia Rat. Systematic Reviews in Pharmacy. 2020;11(10):10.
18. Han HK, Choi SS, Shin JC, Chung HS. Lipid Lowering Effect of Anthocyanin-Pigmented Rice Bran in Streptozotocin-Induced Diabetic Male Rats. Journal of Food Science and Nutrition. 2008;13(4):276-280. DOI:10.3746/jfn.2008.13.4.276
19. Zawistowski J, Kopec A, Kitts DD. Effects of a black rice extract (Oryza sativa L. indica) on cholesterol levels and plasma lipid parameters in Wistar Kyoto rats. Journal of Functional Foods. 2009;1(1):50-56. DOI:10.1016/j.jff.2008.09.008
20. Callcott ET, Blanchard CL, Snell P, Santhakumar AB. The anti-inflammatory and antioxidant effects of pigmented rice consumption in an obese cohort. Food Funct. 2019;10(12):8016-8025. DOI:10.1039/C9FO02261A
21. Muangchan N, Khiewvan B, Chatree S, Pongwattanapakin K, Kunlaket N, Dokmai T, et al. Riceberry rice (Oryza sativa L.) slows gastric emptying and improves the postprandial glycaemic response. British Journal of Nutrition. 2022;128(3):424-432. DOI:10.1017/S0007114521003494
22. Mendoza-Sarmiento D, Mistades EV, Hill AM. Effect of Pigmented Rice Consumption on Cardiometabolic Risk Factors: A Systematic Review of Randomized Controlled Trials. Current Nutrition Reports. Published online September 7, 2023. DOI:10.1007/s13668-023-00496-7
23. Herforth A, Ahmed S. The food environment, its effects on dietary consumption, and potential for measurement within agriculture-nutrition interventions. Food Security. 2015;7(3):505-520. DOI:10.1007/s12571-015-0455-8
24. Chen PJ, Antonelli M. Conceptual Models of Food Choice: Influential Factors Related to Foods, Individual Differences, and Society. Foods. 2020;9(12):1898. DOI:10.3390/foods9121898
25. Wuryandani S, Ismoyowati D, Suwondo E. Improving Pigmented Rice Farmers' Marketing Activity for Sustainable Agroindustry: Consumers' Voice to be Considered. Juwaidah, Saiyut P, Tjale MM, Rozaki Z, eds. E3S Web of Conferences. 2021;232:02008. DOI:10.1051/e3sconf/202123202008
26. Cabardo J, Depositario DP. Determinants of Buying and Consumption Patterns for Rice in CALABARZON Region, Philippines. Journal of Economics, Management & Agricultural Development.Published June 2018. Accessed January 9, 2023. https://jemad.cem.uplb.edu.ph/articles/determinants-of-buying-and-consumption-patterns-for-rice-in-calabarzon-region-philippines/
27. Charoenthaikij P, Chaovanalikit A, Uan-On T, Waimaleongora-ek P. Quality of different rice cultivars and factors influencing consumer willingness-to-purchase rice. International Journal of Food Science & Technology. 2021;56(5):2452-2461. DOI:10.1111/ijfs.14877
28. Ruekkasaem L, Sasananan M. The Factors Affecting Decisions to Purchase Rice and Consumer Perception of Organic Rice in Bangkok, Thailand. International Journal of Advances in Agriculture & Environmetal Engg. 2016;4(1). DOI:10.15242/IJAAEE.C0117028
29. Putri YR, Ismoyowati D, Jumeri. Factors Affecting Consumers' Perception and Willingness To Pay Toward Yogyakarta Local Black Rice. IOP Conference Series: Earth and Environmental Science. 2019;355(1):012031. DOI:10.1088/1755-1315/355/1/012031
30. Cappelleri JC, Jason Lundy J, Hays RD. Overview of Classical Test Theory and Item Response Theory for the Quantitative Assessment of Items in Developing Patient-Reported Outcomes Measures. Clinical Therapeutics. 2014;36(5):648-662. DOI:10.1016/j.clinthera.2014.04.006
31. Vispoel WP, Morris CA, Kilinc M. Applications of generalizability theory and their relations to classical test theory and structural equation modeling. Psychological Methods. 2018;23(1):1-26. DOI:10.1037/met0000107
32. Tsang S, Royse C, Terkawi A. Guidelines for developing, translating, and validating a questionnaire in perioperative and pain medicine. Saudi Journal of Anaesthesia. 2017;11(5):80. DOI:10.4103/sja.SJA_203_17
33. Yusoff MSB. ABC of Content Validation and Content Validity Index Calculation. Education in medicine Journal. 2019;11(2):49-54. DOI:10.21315/eimj2019.11.2.6
34. Roy R, Sukumar GM, Philip M, Gopalakrishna G. Face, content, criterion and construct validity assessment of a newly developed tool to assess and classify work–related stress (TAWS– 16). Tadesse S, ed. PLoS ONE.

2023;18(1):e0280189. DOI:10.1371/journal.pone.0280189

35. da Cunha de Sá-Caputo D, Sonza A, Bachur JA, Bernardo-Filho M. Development, validation and reliabilty of a questionnaire to evaluate the changes on the level of physical exercises and in daily life habits due to COVID-19 pandemic social distancing. Acta Bio Medica Atenei Parmensis. 2020;91(3):e2020004. DOI:10.23750/abm.v91i3.9888
36. Rodrigues IB, Adachi JD, Beattie KA, MacDermid JC. Development and validation of a new tool to measure the facilitators, barriers and preferences to exercise in people with osteoporosis. BMC Musculoskeletal Disorder. 2017;18(1):540. DOI:10.1186/s12891-017-1914-5
37. Tavakol M, Dennick R. Making sense of Cronbach's alpha. International Journal of Medical Education. 2011;2:53-55. doi:10.5116/ijme.4dfb.8dfd
38. Taber KS. The Use of Cronbach's Alpha When Developing and Reporting Research Instruments in Science Education. Research in Science Education. 2018;48(6):1273-1296. DOI:10.1007/s11165-016-9602-2
39. Wahyudi A, Kuwornu JKM, Gunawan E, Datta A, Nguyen LT. Factors Influencing the Frequency of Consumers' Purchases of Locally-Produced Rice in Indonesia: A Poisson Regression Analysis. Agriculture. 2019;9(6):117. DOI:10.3390/agriculture9060117
40. Ab Samat NH, Saili AR, Yusop Z, Abdul Fatah F, Aziz ASA. Factors Affecting Selection of Rice among the Consumer in Shah Alam, Selangor. IOP Conference Series: Earth and Environmental Science. 2022;1059(1):012005. DOI:10.1088/1755-1315/1059/1/012005