ORIGINAL ARTICLE

Validity and Reliability of the Healthier Choice Logo (HCL) Questionnaires for Consumers and Industries in Malaysia

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ABSTRACT

Introduction: The HCL implemented by the Ministry of Health 4 years ago is a great initiative to help consumers make better food choices. Thus, this study aimed to develop and validate the HCL questionnaire on acceptance and effectiveness of the HCL logo among consumers and industries in Malaysia. **Methods:** One set of HCL questionnaires for consumers (39 questions) and industry (52 questions) was designed and validated. Fourteen experts evaluated the questionnaires considering the phrases' difficulty, inappropriateness, and ambiguity. The validity of the questionnaire was determined using the Content Validity Index (CVI) and Lawshe's Content validity Ratio (CVR). Inter-item reliability (Cronbach alpha) and test-retest reliability (Intraclass Correlation Coefficient, ICC) were estimated using the Statistical Package for Social Science (SPSS) version 22.0. **Results:** Eventually 58 and 53 in the final consumer and industry questionnaires, respectively. The CVR value for most questions in the consumer questionnaire, except for one question, was above 0.79, and the CVI value of all questions in the industry questionnaire was above 0.79. The Cronbach's alpha coefficient was 0.79-0.91, and the test-retest coefficient was 0.81-0.91. The results of confirmatory factor analysis (CFA) showed the following values, Chi-square (x2): 1254.712, degree of freedom (dt): 3.456, adjusted goodness of fit index (AGFI): 0.964, the root mean square error of approximation (RMSEA): 0.072, which indicates the appropriateness of the tool. **Conclusion:** This study showed that the developed HCL questionnaire has good validity and reliability and can determine the acceptance and effectiveness of HCL among consumers and industries in Malaysia.
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INTRODUCTION

The disclosure of non-communicable diseases (NCDs) such as cardiovascular disease, diabetes, and hypertension became a worldwide threat. 41 million die due to this problem each year [1]. Likewise, NCD cases in Malaysia gradually increased with the current data from National Health and Morbidity Survey, NHMS (2021), which reported that 3.5 million Malaysian adults live with diabetes and high blood pressure. Almost half of them have hypercholesterolemia [2]. Limitations on certain nutrients such as carbohydrates and fat may be important to reduce the risk factor NCD and need to inform the consumers on the nutrient content among different products in the market. Therefore, the Malaysian government has responded by developing a voluntary front-of-pack (FOP) nutrition labelling policy to promote healthy eating practices among consumers and encourage the reformulation of a food products according to the nutritional guidelines on nutrient criteria for the Malaysian HCL [3].

To date, limited study on the FOP symbol system was done in Malaysia [4] as most of the study has limited insight into the consumer's acceptance due to readiness in adapting nutrition labels, less educated and illiterate consumers, and confusion about the nutrition

labelling schemes [5, 6, 7]. Fatimah et al. (2019), in a study of determining consumer attitude toward food labelling and perception of HCL in Malaysia, found that despite the existence of HCL as a new tool of FOP, 60% of consumers were expected to refer to the Nutrition Information Panel (NIP) at the back-of-pack on food labelling. Besides, in 2010, the Food and Drug Administration (FDA) asked for unpublished studies and information related to the proposed FOP labelling system. The agency hopes to develop a plan to help consumers make informed decisions regarding food and nutrition [8].

Given all these stated problems, this study aims to develop the Malaysian HCL questionnaires addressing the acceptance and effectiveness of HCL among consumers and the food manufacturing industry. This study intends to support the Malaysian Ministry of Health in reducing NCD prevalence and necessary improvements in implying the logo.

Fatimah et al. (2019) had mentioned in their study that the perception of HCL is relatively high and expected to impact purchasing behaviour [4]. However, there has been a lack of knowledge about the consumer's and food industry's perspectives on this logo's acceptance and effectiveness since its introduction in 2017. No research has been done to investigate these problems, perhaps because no validated questionnaire existed to address the issue. Therefore, this study aims to develop and validate the questionnaires towards HCL for both consumers and the food industry and analyse the reliability score of the questionnaire.

The data collected through this project can be used by the Nutrition Division Ministry of Health Malaysia to evaluate the effectiveness of the Healthier Choices Logo (HCL) among consumers in making healthy food decisions. In addition, to acknowledge the acceptance and barriers faced by the food manufacturing industry through the implementation of HCL. Thus, any improvement can be made to increase the efficiency of this logo. Besides, raising awareness about the use of HCL among Malaysian consumers to make better food decisions and purchase healthier food in the market can foster collaboration from the food production industry to support more beneficial eating practices and reap higher profits by applying this logo. Finally, the validated questionnaire can be used by future researchers to explore further the Healthier Choice Logo (HCL) assessment and acceptance in Malaysia.

MATERIALS AND METHODS

Research Design

This cross-sectional study developed and validated an HCL questionnaire over three phases: 1: questionnaire development, 2: content validity, and 3: reliability. Besides, the quantitative research design was adopted in this study. During the questionnaire development phase, the questions were created based on a literature review [7], findings from a previous study [4, 6, 9], and guidelines of HCL published by the Nutrition Division, Ministry of Health Malaysia [3]. Two tests were done to identify the questionnaire's appropriateness for the validity phase: Content validity index (CVI) and Content Validity Ratio (CVR). The expert panels involved in this study were food nutrition and labelling experts such as dietitians, nutritionists, and industry personnel. Next, the reliability phase assesses the internal consistency through the value of Cronbach alpha and Intraclass Correlation Coefficient (ICC) of test-retest reliability. The process of conducting the study is summarised in Figure 1.

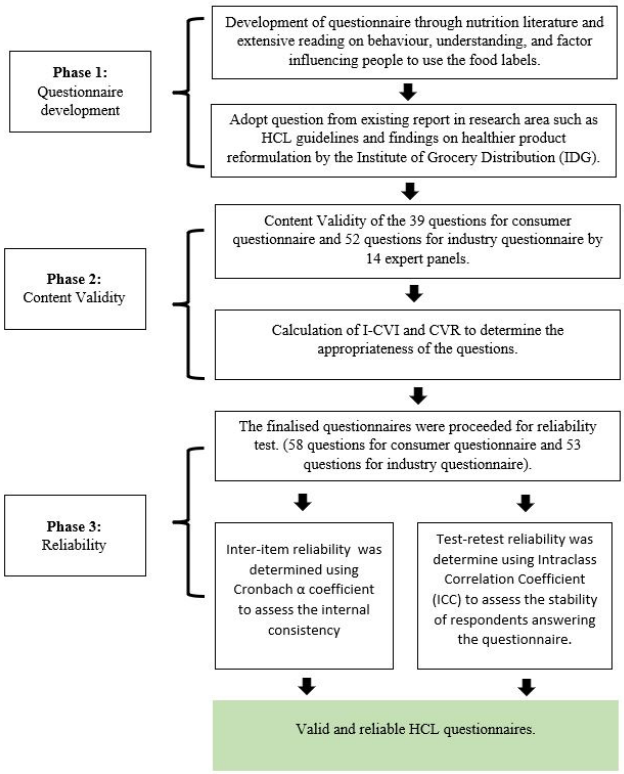

Figure 1: Flow Chart of conducting the study

Study Location

This online study was carried out in all states in Malaysia, including Peninsula, Sabah, and Sarawak.

Sampling and Data Collection

The sampling method applied in this study is purposive and convenience sampling. Firstly, the purposive sampling method selects the respondents for the validity study. Inclusion criteria of the respondents involved in this study include experts panel in nutrition and food labelling background, must be aged above 20 years old and has high English literacy as the developed questionnaires will be validated in the English language. On the contrary, exclusion criteria were set to reduce the bias of respondents answering the survey, including

non-Malaysia citizens and individuals with physical and mental disabilities.

Furthermore, the convenience sampling method is utilised to obtain respondents' data in the reliability study. There are two categories of respondents required in this study: food consumers and the food industry. The inclusion criteria for both types are Malaysian citizens aged above 15 years old and not more than 60 years old; the participants should be free from physical and mental disabilities and understand English. On the other hand, the exclusion criteria are illiterate participants, uncontrolled or unstable conditions such as dementia or mental disorder, and participants who do not have an internet connection or mobile devices (because the questionnaire will be distributed online). Besides, participants who are not in the food and beverages industry are also excluded from answering the industry HCL questionnaire.

For sample size, the determination number of experts panel had followed the recommendation by Lynn (1986), which a minimum of nine experts was sufficient to determine the appropriateness of the question with a minimum of CVI value 0.78 [10]. In addition, the sample size calculation for the reliability study was calculated using Intraclass Correlation (ICC) hypothesis testing method [11]. With the determined parameter of 0.7 for minimum acceptable reliability (R0), 0.9 for expected reliability (R1), two-tailed significant level, and 2 repetitions per subject (k). According to the formula below, the sample size for a reliability study is 23 respondents.

$$n = 1 + \frac{2(Z\alpha+Z\beta)^2\, k}{(\ln C_0)^2\ (k-1)}$$

$$C_0 = \frac{1+ k\theta_0}{1+ k\theta_1}$$

$$\theta_0 = \frac{R_0}{1 - R_0}\ ;\ \theta_1 = \frac{R_1}{1 - R_1}$$

Moreover, the data collection process will be started in July 2021 and ends in October 2021. The validity and Reliability phases will take 2 months to finish the process. Due to the current pandemic issues, our questionnaires are distributed through online platforms such as Email, WhatsApp, Facebook, Instagram, and Twitter.

Measurement

Validity

The type of validity applied in this study is content validity. Content validity refers to the extent of a measurement construct and is essential to support the newly developed questionnaire's validity [12]. The content for both sets of questionnaires will be determined by the expert panel, comprising personnel from the Malaysian Ministry of Health, lecturers of Dietetic from Universiti Teknologi MARA (UiTM), public health nutritionists, academics, and small-to-medium enterprise (SME) industries. Using a quantitative method, the experts will rate each item in the questionnaire as "1 = The item is not relevant", "2 = The item is somewhat relevant", "3 = The item is quite relevant", and "4 = The item is highly relevant" in considering the appropriateness, ambiguity, and accuracy of each item in the questionnaire. Before the calculation, the relevance rating will be recorded as 1 (relevance scale of 3 or 4) and 0 (relevance scale of 1 or 2) [12].

Furthermore, content validity will be determined using Content Validity Ratios (CVR) and Content Validity Index (CVI). The CVR will be calculated using Lawshe's formula [9], as shown below:

$$CVR_i = \frac{n_e - \frac{N}{2}}{\frac{N}{2}}$$

Where,

CVR_i = value for an item on the test

n = number of experts indicating that an item is essential

N = total number of experts in the panel

Meanwhile, the CVI will be calculated averagely according to the relevance rating. The definition and calculation of the CVI value adapted in an article by Yusof [12].

Frey (2018) stated that a CVR value of at least 0.78 is necessary to evaluate whether the scale is valid [13]. However, Ramli et al. (2018) stated that if the items obtain less than 0.78, the item should be refined or considered for deletion [14].

Reliability

After determining validities, two types of reliabilities were used: inter-item reliability and test-retest reliability to determine the study's internal consistency and correlation value. The Cronbach α coefficient will be calculated for inter-item reliability of first-time respondents answering the survey. A 2-week time frame between tests is applied in this study to collect the data for the second time answering the question. It is considered sufficient for respondents to answer the question without remembering the previous responses [15]. The intraclass correlation coefficient (ICC) will be calculated to assess the similarity responses the first and second time answering the questionnaires.

Data Analysis and Statistical Analysis

The statistical analysis will be carried out using Statistical Package for Social Science (SPSS) version 22.0 (SPSS Incorporation, Chicago, IL, USA), including demographic and reliability data. Before statistical tests were carried out, the normality of the data will be tested using the Shapiro-Wilk test at a 0.05 significance level. Descriptive analysis will be used to describe the respondents' socio-demographics. Cronbach's alpha will calculate the inter-item reliability of the developed questionnaire, and Spearman's correlation coefficient will be used to identify the intraclass-correlation coefficient (ICC).

RESULT

Consumer's Questionnaire

Content Validity

The HCL questionnaire was developed and divided into 4 sections: socio-demographic background and three focused domains. Initially, 39 questions were developed with 15, 17, and 7 questions for acceptance, effectiveness, and understanding domain. The I-CVI value for all questions was above 0.79, indicating the question's appropriateness and achieving the required value of I-CVI and S-CVI/Ave for validity. Lawshe CVRs were calculated for each question. The value for most of the questions except one (in the effectiveness section) was above 0.79.

However, from 39 questions in the initial questionnaire, 58 questions remained in the final draft of the questionnaire. Firstly, domain acceptance remains with 15 questions due to high CVI and CVR values (0.99 and 0.98); thus, no question was deleted and only considered for representation. Secondly, one item was deleted in domain effectiveness because it was a repetitive question. Instead, four new questions were added according to the suggestion by the expert panels and agreed to be added in the final draft of the questionnaires. Next, seven questions in the domain understanding were reduced into three because they had a similar concept to the previous questions. Besides, it was considered deleted due to experts' comments suggesting a similar concept of the question might be confusing for respondents to answer. Moreover, one additional section was added to assess the consumer's attitudes and perceptions toward healthy eating with 10 questions each. Hence, the process of content validity retained 15 acceptance items, 20 effectiveness items, 3 understanding items, and 20 attitudes & perceptions items.

Reliability

Table I shows the socio-demographic characteristics background of the respondents in this reliability study. This phase involves 23 consumers with a mean age of 18 – 28 years old. More females (78.3%) compared to males (21.7%). The majority of the respondents were Malay (91.2%), followed by Chinese (4.4%) and Bruneian Malays (4.4%). 18 of 23 of the respondents have a Bachelor's level of education. In contrast, the other five respondents have a diploma, Malaysian higher school certificate, and Malaysian education certificate with a distribution number of three, one, and one, respectively. 43.5% of the respondent are the primary food grocer in their family. In comparison, the other 56.5% is not the primary food grocer in their family.

Table I: Socio-demographic characteristics on reliability study of consumers (N=23)

		Frequency n (%)	Mean ± S.D
Gender			
	Male	5 (21.7)	
	Female	18 (78.3)	
Age (years)			
	15 - 17	0 (0.0)	23.04 ± 2.142
	18 - 28	22 (95.7)	
	29 - 39	1 (4.3)	
	40 - 60	0 (0.0)	
Race			
	Malay	21 (91.2)	
	Chinese	1 (4.4)	
	Indian	0 (0.0)	
	Others	1 (4.4)	
Educational level			
	Lower secondary assessment	0 (0.0)	
	Malaysian certificate of education	1 (4.4)	
	Malaysian higher school certificate	1 (4.4)	
	Diploma	3 (13.0)	
	Bachelor	18 (78.2)	
	Master	0 (0.0)	
	PhD	0 (0.0)	
State			
	Federal Territory (Kuala Lumpur, Putrajaya & Labuan)	0 (0.0)	
	Northern Region (Perlis, Kedah, Penang, Perak)	3 (13.0)	
	East Coast Region (Kelantan, Terengganu, Pahang)	7 (30.4)	
	Central Region (Selangor)	9 (39.0)	
	Southern Region (Negeri Sembilan, Melaka, Johor)	2 (8.8)	
	Sabah & Sarawak	2 (8.8)	
Household income			
	RM 0 – RM 4,849[a]	14 (60.9)	
	RM 4,850 – RM 10,959[b]	7 (30.4)	
	> RM 10,960[c]	2 (8.7)	
Primary food grocer in family			
	Yes	10 (43.5)	
	No	13 (56.5)	

[a] Comparison to USD (0 – 1154.52 USD)
[b] Comparison to USD (1154.76 – 2609.29 USD)
[c] Comparison to USD (> 10960 USD)

Inter-item reliability

The Cronbach coefficient was calculated and tabulated in Table II. The results were 0.621, 0.897, 0.747, and 0.517 for domain acceptance, effectiveness, understanding, and Attitudes & perceptions, respectively. The Cronbach coefficient for the overall questionnaire was 0.88 for n=23.

Table II: Inter-item reliability (Cronbach's alpha coefficient)

Domain	Number of questions	Cronbach's alpha coefficient
Acceptance	15	0.621
Effectiveness	20	0.897
Understanding	3	0.747
Attitudes & Perceptions	20	0.517

Test-retest reliability

The result of Pearson Correlation and p-value for each item in the consumer's questionnaire was met the desirable value to determine the reliability of the study area. Out of 58 items of all dimensions in the questionnaires, eventually, 53 items were met the ICC value ≥ 0.5. The correlation of items in the first dimensions ranged from r=0.479 to r=0.759. Besides, the domain effective had ICC value of r=0.471 to 1.000, understanding (r=0.623 to r=0.715), and attitudes & perceptions (r=0.437 to 0.713). The score shows that the overall result of reliability for consumers' set of questions was moderately reliable. The result was summarised in Table III.

Table III: Test-retest reliability (Intra-class correlation coefficient) of the questionnaire

Items	Intra-Class correlation (ICC), r	*p* value
Awareness & Acceptance		
1. Have you ever heard about or seen the Malaysian Healthier Choice Logo (HCL)?	0.500	0.002*
2. If yes, how did you know about the HCL logo?	0.657	0.000*
3. Do you know that the HCL logo is approved by the Ministry of Health?	0.570	0.002*
4. HCL was implemented by the Malaysian Ministry of Health. Is the HCL logo, in your opinion, reliable?	0.714	0.000*
5. In your opinion, who else do you trust if the nutrition-related logo is provided by someone other than the government?	0.502	0.007
6. I can simply locate a product with the HCL logo in the market.	0.531	0.003*
7. This logo can be found on any food or beverage product sold on the market.	0.582	0.011*
8. The designated colour of this logo is easily detected on food packaging.	0.569	0.000*
9. I prefer to purchase food products with this logo.	0.479	0.003*

CONTINUE

Table III: Test-retest reliability (Intra-class correlation coefficient) of the questionnaire (CONT.)

Items	Intra-Class correlation (ICC), r	*p* value
Awareness & Acceptance		
1. I believe that the food product with this logo has better nutritional content.	0.759	0.000*
2. I am willing to accept this logo as a healthier food choice.	0.656	0.000*
3. I can easily interpret the purpose of this logo.	0.500	0.003*
4. I can understand the language used in this logo.	0.534	0.003*
5. Food products with this logo give me the confidence to make a healthier choice.	0.549	0.001*
6. I am willing to buy a product with this logo even at a greater price.	0.593	0.000*
Effectiveness		
1. How often do you check the front-of-package label before purchasing a food or beverages product?	0.595	0.001*
2. How likely are you to consider accepting products with nutrition information such as HCL on the food packaging to help you make a purchase decision?	0.544	0.001*
3. I have nutrition knowledge.	0.738	0.000*
4. I have seen an advertisement about this logo through social media/television media etc.	1.000	0.000*
5. I have attended a workshop/ seminar/ conference on healthy eating.	0.440	0.008
6. I have medical problems such as hypertension, diabetes, obesity, etc.	0.797	0.000*
7. The price of the product.	0.556	0.002*
8. Clarity of nutritional information on the food label.	0.737	0.000*
9. Ingredients added/ removed to make a healthier product.	0.494	0.008
10. Product familiarity.	0.500	0.005*
11. Product packaging.	0.796	0.000*
12. Taste of the product.	0.511	0.002*
13. I trust that the implementation of HCL on food packages are healthier choices within that particular food category.	0.471	0.007
14. The presence of HCL on the food package help me decide to buy a healthier product in the same food category.	0.764	0.000*
15. The application of HCL on food package saved my time while purchasing a product in a market.	0.675	0.000*
16. I can understand the concept of HCL.	0.750	0.000*
17. HCL can effectively change my buying decision.	0.591	0.001*
18. I consider myself able to choose healthier food just by merely looking at the logo.	0.654	0.000*
19. I can understand the nutritional value of the HCL logo without being given food labelling education.	0.788	0.000*
20. I do purchase products with the HCL logo.	0.708	0.000*

CONTINUE

Table III: Test-retest reliability (Intra-class correlation coefficient) of the questionnaire (CONT.)

Items		Intra-Class correlation (ICC), r	*p* value
Understanding			
1.	What is your level of understanding toward the Nutrition Information Panel (NIP)?	0.709	0.000*
2.	What is your level of understanding toward Energy Icon (EI)?	0.623	0.000*
3.	What is your level of understanding toward the Healthier Choice Logo (HCL)?	0.715	0.000*
Attitudes & Perceptions			
1.	I always eat healthy foods.	0.584	0.001*
2.	I eat most of the time healthily.	0.565	0.000*
3.	I eat reasonably healthily.	0.437	0.009
4.	1 attempt to eat healthily.	0.781	0.000*
5.	I only eat healthy foods now and again.	0.607	0.000*
6.	I am not interested in a healthy diet.	0.624	0.001*
7.	Eating healthily is more expensive than eating unhealthily.	0.713	0.000*
8.	I'm happy if the product recipes are changed to healthier, but the taste should remain tasty.	0.524	0.005*
9.	Food companies should modify their recipes to make products healthier.	0.567	0.001*
10.	Food companies already offer enough healthy products, so there is no change.	0.592	0.001*
11.	Do you feel cereal products have become healthier or unhealthier in the last 5 years?	0.507	0.006
12.	Do you feel canned/frozen fruit and vegetable products have become healthier or unhealthier in the last 5 years?	0.580	0.001*
13.	Do you feel canned/frozen meat, poultry & eggs have become healthier or unhealthier in the last 5 years?	0.653	0.000*
14.	Do you feel dairy products have become healthier or unhealthier in the last 5 years?	0.627	0.001*
15.	Do you feel canned/ bottled beverages have become healthier or unhealthier in the last 5 years?	0.653	0.000*
16.	Do you feel soup, sauces, herbs & mixing recipes products have become healthier or unhealthier in the last 5 years?	0.563	0.002*
17.	Do you feel fat and oil products have become healthier or unhealthier in the last 5 years?	0.564	0.002*
18.	Do you feel legumes, nuts & seeds products have become healthier or unhealthier in the last 5 years?	0.507	0.006
19.	Do you feel ready to eat meals products that have become healthier or unhealthier in the last 5 years?	0.506	0.006
20.	Do you feel confectionery products have become healthier or unhealthier in the last 5 years?	0.522	0.003*

*$p<0.05$

Industry's Questionnaire

Content Validity

Through the development process of designing the HCL questionnaire for industry, a total of 52 questions was determined to be added with two focused domains: acceptance (17 questions) and effectiveness (35 questions). Fortunately, I-CVI and CVR values for the industry questionnaire were above 0.79, indicating the appropriateness of the questions. However, some modification to the question's structure and order was done according to the comments from experts in the final draft of the questionnaire.

In domain acceptance, questions such as "Does the designated colour of the logo is acceptable" and "Does the size regulate for this logo is acceptable" were deleted due to their inappropriateness to be asked since the Ministry of Health standardised the logo and if low acceptance among industries will not causing changing the standard. Hence, all nine questions with the same concept of asking the physical standard of HCL were deleted according to experts' suggestions and comments. Nevertheless, eight new questions were added to substitute the deleted items by asking more about the duration of HCL application, expansion of food categories under HCL, and the industry's view on whether should HCL be compulsory for certain food categories. From 17 questions in the initial process of creating the questionnaire, only 16 remained in domain acceptance.

Next, from 35 questions on domain effectiveness, eventually, only six items remained in the domain. In contrast, the other questions were dragged into a new domain named product reformulation. This action was considered to determine the next focus on industries' perceptions and planning on product reformulation for their product to make it better and healthier food choices. Consequently, two open-ended questions in which "What are the food industry's expectations towards the HCL Programme?" and "How can your company commit to ensuring the success of the HCL Programme?" were added to domain product reformulation. Hence, content validation of the industry questionnaire retained 16 acceptance questions, six effectiveness questions, and 31 product reformulation questions.

Reliability

Table IV presents the respondents' socio-demographic background in the reliability study of the industry questionnaire. The total sample size for this study is 23 respondents with a mean of medium industry type (2.04 ± 1.11). This reliability study mostly answered by manufacturer type of company with n=19 (61.3%), followed by Importer (n=7. 22.6%), distributor (n=4, 12.9%), and general trading (n=1, 3.2%). The categories of products sold by the company may have multiple categories that accumulate higher in beverages (20.6%), cereal (17.6%), dairy products (14.7%), and

soup, sauces & recipe mixes (14.7%). 34.8% of the respondents work in technical/ quality assurance, 13.0% in regulatory affairs, nutrition, research & development, and marketing/ communications/ public relations. The least of the respondents work in general management and procurement.

Table IV: Socio-demographic characteristic on reliability study of industry (N=23)

	Frequency n (%)	Mean ± S.D
Type of industry		
Large Industry	9 (39.1)	2.04 ± 1.11
Medium Industry	8 (34.8)	
Small Industry	2 (8.7)	
Micro-Enterprise	4 (17.4)	
Type of company		
Manufacturer	19 (61.3)	
Importer	7 (22.6)	
Distributer	4 (12.9)	
Other	1 (3.2)	
Category of product sold by the company		
Cereal	6 (17.6)	
Fruits & Vegetables	1 (2.9)	
Meat, Poultry, & Eggs	1 (2.9)	
Fish & Fish product	1 (2.9)	
Dairy Product	5 (14.7)	
Beverages	7 (20.6)	
Soup, Sauces & Recipe Mixes	5 (14.7)	
Fats & Oil	2 (5.9)	
Legumes, Nuts & Seeds	1 (2.9)	
Other	5 (14.7)	
Company Location		
Federal Territory (Kuala Lumpur, Putrajaya & Labuan)	4 (17.4)	
Northern Region (Perlis, Kedah, Penang, Perak)	6 (26.1)	
East Coast Region (Kelantan, Terengganu, Pahang)	0 (0.0)	
Central Region (Selangor)	11 (47.8)	
Southern Region (Negeri Sembilan, Melaka, Johor)	2 (8.7)	
Sabah & Sarawak	0 (0.0)	
Position/ discipline in the company		
Technical/ Quality Assurance	8 (34.8)	
Regulatory Affairs	3 (13.0)	
Nutrition	3 (13.0)	
Research & Development	3 (13.0)	
Marketing/ Communications/ Public Relations	3 (13.0)	
General management	2 (8.7)	
Production/ Manufacturing	0 (0.0)	
Procurement (e.g., Purchasing)	1 (4.3)	
Other	0 (0.0)	

Inter-item Reliability

Table V shows the calculated Cronbach α coefficient during the first time answering the questionnaire. The Cronbach α coefficients were 0.696, 0.854, and 0.587 for acceptance, effectiveness, and product reformulation. The domain effectiveness of the questionnaire shows the highest Cronbach α value, which indicates good reliability, followed by acceptance and product reformulation dimensions.

Table V: Inter-item reliability (Cronbach's alpha coefficient)

Domain	Number of questions	Cronbach's alpha coefficient
Acceptance	16	0.696
Effectiveness	6	0.854
Product Reformulation	31	0.587

Test-retest Reliability

Respondents who work within the food and beverages company completed pre-test and re-test questionnaires with a 100% response rate. The ICC coefficients were tabulated in Table VI and can be observed that ICC coefficients for each item was ranged between 0.5 to 1.0 which shows the acceptable value for reliability, except for 1 item in acceptance domain (r=0.252, p=0.095) and 3 items in product reformulation domain (r=0.483, p=0.010) (r=0.398, p=0.240), and (r=0.275, p=0.091). However, the overall agreement between acceptance, effectiveness, and product reformulation was moderately reliable, with r=0.880, r=0.994, and r=0.791, respectively.

Table VI: Test-retest reliability (Intra-class correlation coefficient) of the questionnaire

Items		Intra-Class Correlation (ICC), r	*p* value
Acceptance			
1.	HCL has covered most of the major food and beverages categories in the market	0.786	*0.000
2.	The online application of HCL is helpful and user-friendly	0.862	*0.000
3.	HCL nutrient criteria should be developed by independent experts (non-industry related) but still take into account the opinions and comments from the industry at the consultation stage	0.581	*0.002
4.	HCL should include positive nutrients as mandatory nutrient criteria.	0.779	*0.000
5.	There is a need to expand a new product category under HCL.	0.685	*0.000
6.	The duration of the HCL application being processed and approved is approximately 2-4 weeks. This duration is acceptable.	0.643	*0.000

CONTINUE

Table VI: Test-retest reliability (Intra-class correlation coefficient) of the questionnaire (CONT.)

Items	Intra-Class Correlation (ICC), r	*p* value
Acceptance		
7. The food analysis process may necessitate payment or a charge to the laboratory that performs the analysis. It is acceptable for your organisation to pay the analysis cost before the HCL application.	0.623	*0.000
8. Government should impose a fee for applicants to get the Healthier Choice Logo.	0.252	0.095
9. Healthy eating reduces the risk of getting non-communicable diseases (NCDs) such as diabetes, hypertension, and hypercholesterolemia. HCL can help tackle the rising prevalence of NCDs in Malaysia.	0.794	*0.000
10. HCL should be the main reference for other related government policies (e.g., sugar-sweetened beverage taxation, marketing policy, etc.)	0.886	*0.000
11. There is a need to harmonise HCL nutrient criteria and logo among ASEAN countries (label sharing).	0.888	*0.000
12. There are still a few food categories not yet covered under HCL.	0.812	*0.000
13. Would you mind specifying the food mentioned above category?**		
14. HCL should be made compulsory for certain food categories.	0.835	*0.000
15. Would you mind specifying the food mentioned above category? **		
16. Which of these is the appropriate revision period for HCL nutrient criteria?	0.567	*0.002
Effectiveness		
1. Have any of your products obtained the Healthier Choice Logo (HCL)?	1.000	*0.000
2. If your product has obtained the logo, do the situation(s) below apply to your company? Product has already existed on the market and has complied with the HCL criteria.] [Existing non-complying products were reformulated to comply with the HCL criteria.] [A new product was developed that complied with the HCL criteria.]	0.973	*0.000
3. How many of your products are innovated or reformulated to meet the HCL nutrient criteria?	0.955	*0.000
4. Referring to all your products that have obtained the HCL, which of these following categories do those products belong to?	0.929	*0.000
5. Does the company widely run HCL product marketing?	0.815	*0.000
6. Is there an increase in sales revenue for products that have obtained the HCL logo?	1.00	*0.000

CONTINUE

Table VI: Test-retest reliability (Intra-class correlation coefficient) of the questionnaire (CONT.)

Items	Intra-Class Correlation (ICC), r	*p* value
Product reformulation		
1. Where are your company on the reformulation journey?	0.891	*0.000
2. Is HCL authentication the reason for your company to do product reformulation?	0.885	*0.000
3. Which of the following nutrient content(s) were reformulated in your products to comply with the HCL nutrient criteria? [Fat] [Total sugar] [Dietary fibre] [Whole grains] [Protein] [No reformulation needed as the product has complied with HCL nutrient criteria]	0.750	0.006
4. How are your company enabling healthier products? [Replacing ingredients] [Fortifying with additional ingredients] [Removing/reducing certain ingredients] [Applying a new technology] [Changing the cooking production method] [Portion-sized packaging] [Other]	0.857	*0.001
5. Do any of the factors below motivate your company to apply for this logo? [meet consumer demand]	0.660	0.006
6. Do any of the factors below motivate your company to apply for this logo? [Responding to the government's call]	0.684	*0.003
7. Do any of the factors below motivate your company to apply for this logo? [Improve brand/ business image]	0.769	*0.001
8. Do any of the factors below motivate your company to apply for this logo? [Application of HCL by other brands]	0.673	*0.005
9. Do any of the factors below motivate your company to apply for this logo? [Improve public health]	0.815	*0.000
10. Do any of the factors below motivate your company to apply for this logo? [Prediction of increase in sales]	0.888	*0.000
11. Do any of the factors below motivate your company to apply for this logo? [Producing healthy or healthier products is a part of the company's vision]	0.882	*0.000
12. Do any of the factors below motivate your company to apply for this logo? [Cost saving]	0.822	*0.000
13. Do any of the factors below motivate your company to apply for this logo? [The company feel that it is the right thing to do]	0.815	*0.000
14. The following factors are reformulation challenges for your company [Product suitability to be reformulated]	0.823	*0.000
15. The following factors are reformulation challenges for your company [Consumer acceptability]	0.749	*0.000
16. The following factors are reformulation challenges for your company [The healthier option is consumer choice, and companies should not interfere]	0.483	0.010
17. The following factors are reformulation challenges for your company [Budget limitation]	0.922	*0.000

CONTINUE

Table VI: Test-retest reliability (Intra-class correlation coefficient) of the questionnaire (CONT.)

Items	Intra-Class Correlation (ICC), r	*p* value
Product reformulation		
18. The following factors are reformulation challenges for your company [Limited technical resources or expertise (Research & Development, Nutrition, Quality Assurance etc.)]	0.770	*0.000
19. The following factors are reformulation challenges for your company Difficulty in sourcing ingredients]	0.749	*0.000
20. The following factors are reformulation challenges for your company [Shelf life]	0.890	*0.000
21. The following factors are reformulation challenges for your company Difficulty in maintaining taste, colour, or texture]	0.893	*0.000
22. The following factors are reformulation challenges for your company [It is not our company's priority to produce a healthier product]	0.865	*0.000
23. Do you think any of the factors below might encourage your company to reformulate products in the future? [More awareness of public health priorities]	0.397	0.240
24. Do you think any of the factors below might encourage your company to reformulate products in the future? [More awareness regarding nutrition labelling and existing logo]	0.275	0.091
25. Do you think any of the factors below might encourage your company to reformulate products in the future? [More awareness on national nutrition targets or standards in line with national health agenda]	0.591	*0.001
26. Do you think any of the factors below might encourage your company to reformulate products in the future? [More technical knowledge]	0.589	*0.001
27. Do you think any of the factors below might encourage your company to reformulate products in the future? [Supported by consumer testing]	0.713	*0.000
28. Do you think any of the factors below might encourage your company to reformulate products in the future? [Improving internal communication]	0.670	*0.000
29. How likely would your company be to carry out more product research and development associated with reformulation if the government were to give you financial and fiscal incentives?	0.842	*0.000
30. What are the food industry's expectation towards HCL Programme?**		
31. How can your company commit to ensure the success of the HCL Programme?**		

*$p<0.05$
**Open-ended question

DISCUSSION

The Ministry of Health Malaysia (2016) reported that non-communicable diseases (NCD) become the main cause of global death, and no less than 36 million people die every year [16]. The surged number of deaths caused by NCD was suggested by the evolution of the food industry and urbanisation when the global food system started to focus on producing processed, cheaper, and easily accessible food, which influences people to overconsume unhealthy food and drinks [17, 18]. Corresponding to that, the Malaysian Ministry of Health adopts the nutrition labelling policy to create a healthy food environment and encourage better food choices among consumers by implementing the HCL as the latest FOP scheme in Malaysia. This study was aimed to evaluate the acceptance and effectiveness of HCL among consumers and food industries by developing a set of questionnaires.

The procedures of completing the questionnaires were required several steps such as content development, validation, and reliability. These questionnaires were self-administered by a large scale of socio-demographic backgrounds, including diverse races, multiple levels of education achievement, diverse economic circumstances, and various levels of position in the company. Therefore, the question attained from this study was reliable to measure the credibility of HCL in reducing NCDs issues in Malaysia.

Content development was through nutrition literature and extensive reading on behaviour, understanding, and factors influencing people to use the food labels, similar to the questionnaire's development process by Liu et al. (2021) [19]. Some of the questions were adapted from a previous study on the food label to assess consumers' awareness, readiness, and comprehensibility toward food and nutrition labels [4, 6, 9, 20]. In addition, questions in the industry questionnaire were mostly adapted from the HCL guidelines [21] and a study on healthier product reformulation by the Institute of Grocery Distribution [22].

For content validity, the selected number of experts has followed the suggestion by Lynn (1986) [10]. In this study, the total number of expert panels was 14. According to Lynn, the acceptable content validity index (CVI) value for experts of at least 9 was 0.78. Consequently, the CVI value for all questions in both questionnaires was above 0.79. The CVR value for most questions in the consumer questionnaire, except for one question (C5), was above 0.79.

In contrast, all questions in the industry questionnaire obtained CVR above 0.79. Fortunately, C5 was remained in the final draft of the questionnaire due to its relevancy to be asked in determining the effectiveness of HCL [14]. The determination of acceptable value for CVI and CVR was followed by Yusoff [12] and Frey [13] to determine the appropriateness of the questions. Hence, the result attained from the validation study for both questionnaires was appropriate and had high validation score.

The content experts of this study consist of personnel from the Malaysian Ministry of Health, lecturers from Universiti Teknologi MARA (UiTM) and Universiti Kebangsaan Malaysia (UKM), public health nutritionist of Nutrition Society Malaysia (NSM), and small-to-medium enterprise (SME) corporation. In the meantime, comments and suggestions were collected from the experts for revision and improvement of the questionnaires. For the consumer questionnaire, most of the questions were acceptable. However, some required to be deleted due to repetitions and gain several suggested questions to be added in the final draft of the questionnaire. In addition, the industry questionnaire received some suggestions to rephrase the questions due to elusive and complex sentence structure. Similar procedures were also applied by Koo et al. [23] when they took the suggestions and advice from expert panels to review and amend their questionnaires to develop a questionnaire in their research study.

Internal consistency reliability of the present questionnaires was determined among 23 samples from each target of respondents. Cronbach's alpha coefficient was used to analyse the internal consistency during the pre-test period for both sets of questionnaires [23]. Cronbach's alpha coefficient of <0.5 was considered low, 0.5 – 0.8 was interpreted as moderate, and > 0.8 was identified as high and excellent reliability [24]. The result of Cronbach's alpha value of both questionnaires was ranged between 0.6 to 0.9 and 0.5 to 0.9 for consumer and industry questionnaires, respectively. Therefore, the results obtained indicate that the reliability coefficient complies with a moderate to excellent Cronbach's alpha value.

The test-retest reliability of the awareness & effectiveness of HCL questionnaires was determined by the correlation between the first and second administration in the two-week interval. This duration was suggested by Kennedy et al. [15] as a two-week time frame between tests was considered appropriate for respondents to minimise changes in their perceptions toward HCL and sufficient for the respondents not to remember their first responses. Increasing the re-test period such as 14 days instead of only seven days, will result in higher reliability values. Intra-class correlation coefficient (ICC) was used to analyse the consistency and stability of the questionnaires [24]. From the result, it was found that most ICC scores for both questionnaires were ranged from r=0.50 (moderately reliable) to r=1.00 (excellent reliability) [25].

Furthermore, there were open-ended questions designed in the industry questionnaire. It allows respondents to give more information and suggestion on the application of HCL by the food industry. There were two open-ended questions in domain acceptance and product reformulation. One of the questions in domain acceptance was required respondents to specify the food group that has not yet covered by HCL. Out of 23 respondents, only 34.8% answered this question and stated that ice confectionary such as ice cream, ready-to-eat sauces such as pasta sauces, and cook paste were not covered under HCL. In addition, there was also a suggestion for the Ministry of Health to include small and medium enterprise (SME) products such as traditional foods to be included under the HCL food category.

Additionally, the open-ended question in domain product reformulation was about the food industry's expectation of HCL programs. The finding shows that many of the respondents expected that the application of HCL to their food products could increase the brand image, acquire brand recognition for the higher products market and strengthen the public awareness of healthy eating practices. Similarly, a study on voluntary Front of Package (FOP) nutrition schemes in UK food innovation was a quick response by the food manufacturer to reformulate their product, perhaps to appeal to the health-conscious among consumers and promote brand reputation [26]. In addition, the application of the FOP nutrition label is recommended as policy coherence to encourage a healthier diet and social responsibilities to reduce the prevalence of NCD [27, 28].

Furthermore, the next question is how the company can commit to ensuring the HCL program's success. Less than 50% of the respondents answered this question and suggested that the local government provide an incentive scheme for industries that applied the HCL products, such as reducing the fee of applying this logo or increasing the certificate validity period. The HCL application is a voluntary action by the food industry. The MOH standardised several regulations before the company could utilise the logo on their food packaging, including nutrition inspection and food quality. Also, there is a fee to apply the logo and receive the certificate of HCL products. Therefore, considering the recommendation of an incentive scheme by local food industries may encourage them to apply the HCL and help reduce the burden of NCD in Malaysia by producing healthier food products. Besides, the industry agreed to support the HCL program by reformulating their product to make them healthier and by applying for the HCL certificate.

There were several limitations and recommendations of this study that should be addressed to improve the result

and structure of the questions. First, the mean age of respondents answering the consumer questionnaire was 18 – 28 years old and had little feedback from adolescents and older adults. This situation might be challenging for future researchers to adopt this questionnaire as the age gap may influence the needs and acceptance of HCL. Furthermore, in the final draft of both questionnaires, respondents need at least 30 minutes to answer all questions. It may be tough for respondents to keep patient and answer all questions. Future research can conduct preliminary and principal component analysis to reduce the items in the questionnaire. Therefore, a higher number of responses might be achieved in future research.

CONCLUSION

In conclusion, the validation and reliability of the questionnaire remained a total number of 58 and 53 questions in the final consumer and industries questionnaires, respectively. Both questionnaires have obtained appropriate CVI and CVR values to achieve validity of the questionnaires. Besides, it has rational Cronbach alpha and ICC values for reliability tests. Therefore, this study showed that this HCL questionnaire has good validity and reliability and can determine the acceptance and effectiveness of HCL among consumers and industries in Malaysia.

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