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Validation of a Food Choice Questionnaire among Adolescents in Penang, Malaysia

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ABSTRACT

Introduction: This is a validation study of the modified version of the Food Choice Questionnaire (FCQ), a multidimensional measure of food choice motives. **Methods:** Adolescents aged 15 to 17 years attending schools from three randomly selected co-educational and multiracial public secondary schools were invited to participate in this study. Data were collected using a self-administered modified version of the FCQ consisting of 58 items assessing 13 factors including health, mood, convenience, sensory appeal, natural content, price, weight control, familiarity, ethical concern, religion, parents, peers and media. Factor analysis with the extraction of a maximum likelihood and varimax rotation were performed to validate the FCQ. **Results:** A total of 306 students comprising 64.7% Malay, 19.3% Chinese and 16.0% Indian with a mean age of 16.1±0.3 years participated in this study. Based on their BMI status, a majority (71.9%) of the participants had normal weight, 8.2% were thin, 1.6% severely thin while 12.1% were overweight and 6.2% obese. Six factors (health and nutrition knowledge, price and convenience, media, mood and sensory appeal, peers, and parents), consisting of 36 items and explaining 45.9% of the variance, remained from the factor analysis. The reliability of the FCQ factors was good, with Cronbach's α coefficient values as follows: health and nutrition knowledge=0.84, price and convenience=0.82, media=0.89, mood and sensory appeal=0.79, peers=0.84, and parents=0.75. **Conclusion:** This modified version of the FCQ validated among Malaysian adolescents is recommended for future research determining food choice motives of adolescents.

Key words: Adolescents, food choice motives, food choice questionnaire, school, validation

INTRODUCTION

The Food Standards Agency (FSA) of the United Kingdom defines food choices as the selection of foods for consumption which are influenced by multiple factors ranging from sensory, physiological and psychological responses of individual consumers to the interactions between social, environmental and economic influences and food promotion activities by the food industry (Buttriss *et al.*, 2004). The food choices of adolescents are shaped by individual, social and cultural factors since childhood with some of these factors being endogenous to the individual while others are environmental (Shi *et al.*, 2005). Food choices which are shaped during childhood and adolescence may persist into adulthood.

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The Malaysian Dietary Guidelines for Children and Adolescents encourage adolescents to choose food from a combination of different food groups such as cereals, fruits and vegetables, fish, poultry, meat and legumes, and dairy products (NCCFN, 2013). However, increasing industrialisation and urbanisation in Malaysia has led to enhanced intake levels of refined carbohydrates, saturated fats and sugars among Malaysians (Ismail, 2002). At the same time, the food environment today often provides many opportunities for people to make unhealthy food choices (Mancino, Tod & Lin, 2009). For example, a study in Malaysia found that children from Peninsular Malaysia are consuming meals which are high in fat and calories, tending to buy unhealthy foods such as nasi lemak (rice cooked in coconut milk), fried noodles and chicken rice from the school canteens (Ismail *et al.*, 2003). Another study among Malaysian children showed that one of the reasons for frequent fast food consumption among children was the easy access of foods such as pizza, burgers, french fries and fried chicken in the school or at home (Ishak, Shohaimi & Kandiah, 2013).

Steptoe, Pollard & Wardle (1995) developed the original Food Choice Questionnaire (FCQ) to measure the multidimensional constructs of food choice motives. The FCQ consisted of 36 items assessing nine factors: health, mood, convenience, sensory appeal, natural content, price, weight control, familiarity and ethical concern which resulted from its validation conducted among the residents of London. A study conducted in Taiwan further validated the 36-item FCQ (Steptoe *et al.*, 1995) among students from a university resulting in a 35-item FCQ consisting of eight factors instead of the original nine factors (Sun, 2008). Another study which was conducted in Greece validated the original FCQ among household food shoppers aged 18 years and above in Greece resulting in a 24-item, eight-factor FCQ (Fotopoulos *et al.*, 2009).

Prescott *et al.* (2002) carried out a study using the 36-item FCQ among female consumers from cities in Japan, Taiwan, Malaysia and New Zealand and found that participants from Malaysia and Taiwan rated factors like health, natural content, weight control and convenience as very important food choice motives while Japanese participants rated price and New Zealand participants rated sensory appeal as very important motives when making food choices. A recent study that used FCQ in surveying food choice motives was carried out among husbands and wives from Selangor, Malaysia (Asma et al., 2010). A religion factor was added to the nine factors which resulted in a FCQ consisting of 38 items with ten factors. The participants rated religion, health and convenience as very important food choice motives.

The review of existing literature suggests that FCQ might be a valuable instrument in assessing food choice motives from multidimensional perspectives among Malaysian adolescents. Published studies on food choice motives among Malaysians are limited; none of the food choice motive studies was conducted among Malaysian adolescents. Realising that the ranking of food choice motives are influenced by age and culture, the factors of parents, peers, media and religion were added to address the role of these factors in influencing adolescents' food choices. Thus, this study aims to validate the modified version of the FCQ among Malaysian adolescents attending school so that it may be beneficial in determining food choice motives of adolescents for future studies.

METHODS

Study design

This was a cross-sectional study in which the food choice motives of adolescents were studied at only one point in time. A cross-sectional study design was selected

based on the consideration of the short time frame of the study and limited resources available. The study location was in the district of Seberang Perai Tengah, Penang where there were a total of 30 secondary schools. Inclusion criteria for the schools were co-educational and multiracial in composition. Out of the thirty secondary schools, twenty four schools fulfilled the inclusion criteria. Three schools were randomly selected from these twenty-four schools to participate in the study.

Ethical approval and permissions

Ethical approval was obtained from the Medical Research Ethics Committee of the Faculty of Medicine and Health Sciences, Universiti Putra Malaysia (UPM). The permission to conduct the study in schools was granted by the Ministry of Education (Malaysia), Penang Education Department and the principals of the selected secondary schools.

Participants

Adolescents (15-17 years old) from four form four classes of each selected school were recruited to participate in this study and were required to fill in a self-administered questionnaire. A total of 352 questionnaires was distributed; of these, 306 (86.9%) were returned.

Research instruments

The research instrument used was a questionnaire which was translated from English to Bahasa Malaysia. The questionnaire consisted of three sections as follows:

Socio-demographic characteristics

Socio-demographic information including date of birth, sex, race were self-reported. Family affluence was measured by using the modified version of Family Affluence Scale (FAS) developed by Boyce *et al.* (2006). It is an index which consists of four items whose possession is scored: whether the adolescent has his/her own bedroom (0 for No; 1 for Yes); number of cars in family (0 for No car, 1 for one car, 2 for two or more cars; number of computers (0 for None; 1 for one computer, 2 for two computers and 3 for more than two computers; and internet connection at home (0 for No; 1 for Yes). The score of family affluence was calculated by adding up the score for each item. The participants were categorised into low affluence (≤ 3 items) and high affluence (≥ 4 items).

Anthropometric characteristics

Body weight was measured to the nearest 0.1 kilogram using a TANITA digital weighing scale. Standing height without shoes was measured to the nearest 0.1 cm using a SECA body meter. BMI was calculated by dividing weight with height squared and expressed as kg/m^2. To determine their body weight status, the participants were classified into BMI categories according to WHO (2007) by age and sex: < -3SD for severely thin, < -2SD to -3SD for thin, +1SD to -2SD for normal weight, > +1SD to +2SD for overweight, and > +2SD for obese.

Food choice questionnaire (FCQ)

The food choice motives of adolescents were assessed by adapting the original FCQ (Steptoe *et al.*, 1995) which consisted of 36 items assessing nine factors. For the purpose of this study, the FCQ was modified by adding four extra factors, namely religion, parents, peers, and media. A 2-item religion factor in the study by Asma *et al.* (2010) was added to measure the religious considerations of the adolescents in making their food choices. An 8-item parents factor and 5-item peers factor adapted from the study by Vereecken *et al.* (2009) were added to measure the influence of parents and peers on adolescents' food choices. Lastly, a 7-item media factor was added to measure how the media influences the food choices of adolescents (Neumark-Sztainer *et al.*, 1999; Patrick & Nicklas, 2005; Story, Neumark-Sztainer & French, 2002;

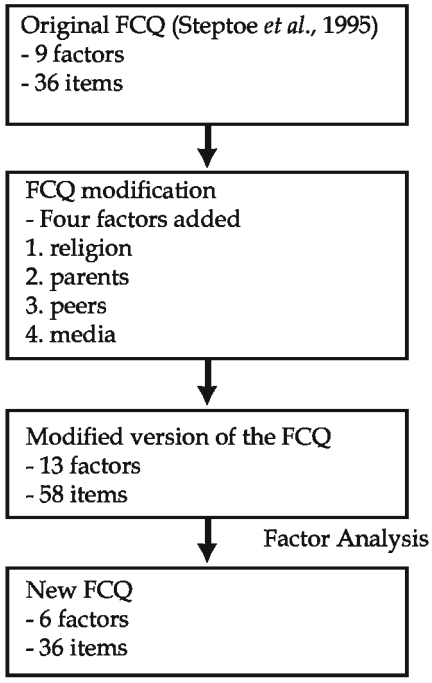

Figure 1. Food choice questionnaire modification flow chart

Taylor, Evers & McKenna, 2005). The final modified version of the FCQ consisted of 58 items assessing 13 factors. Each item of the FCQ was rated using a 5-point Likert-type scale, 1 = very important to 5 = very not important. The scores on items for each factor were calculated. Figure 1 shows the flow chart of FCQ modification. To validate this modified version of the FCQ, exploratory factor analysis was conducted.

Statistical analysis

SPSS for Windows version 19.0 was used to analyse the data. Exploratory factor analysis with the extraction of a maximum likelihood and varimax rotation was performed in validating the FCQ. The value of Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy greater than 0.6 was the criterion used to assess the sampling adequacy for factor analysis (Hair *et al.*, 2006). Significant value of Barlett's test of sphericity was used to determine the sufficiency of correlations among the variables to carry out factor analysis (Hair *et al.*, 2006). The internal consistencies of the FCQ factors were assessed by using Cronbach's alpha coefficients; a Cronbach's alpha coefficient higher than 0.6 was acceptable (Hair *et al.*, 2006). Items that did not load clearly on a single factor (either did not load on any factor or loaded on more than one factor with factor loading > 0.30) were excluded. Factor loadings for items which were greater than 0.30 were retained (Pallant, 2010).

RESULTS

Table 1 shows socio-demographic characteristics of the participants involved in validating the FCQ. A total of 306 participants comprising 64.7% Malay, 19.3% Chinese and 16.0% Indian with a mean age of 16.1±0.3 years were included in the analysis. They consisted of 41.2% males and 58.8% females. A total of 63.4%

Table 1. Socio-demographic characteristics of participants

Characteristics	*Frequency (Percentage)*	*Mean ± SD*
Sex (n=306)		
Male	126 (41.2)	-
Female	180 (58.8)	-
Age (n=306)	-	16.1±0.3
Race (n=306)		
Malay	198 (64.7)	-
Chinese	59 (19.3)	-
Indian	49 (16.0)	-
Family Affluence		
Number of items (n=295)	-	4.4 ± 2.1
Low affluence (≤ 3 items)	101 (33.0)	-
High affluence (≥ 4 items)	194 (63.4)	-

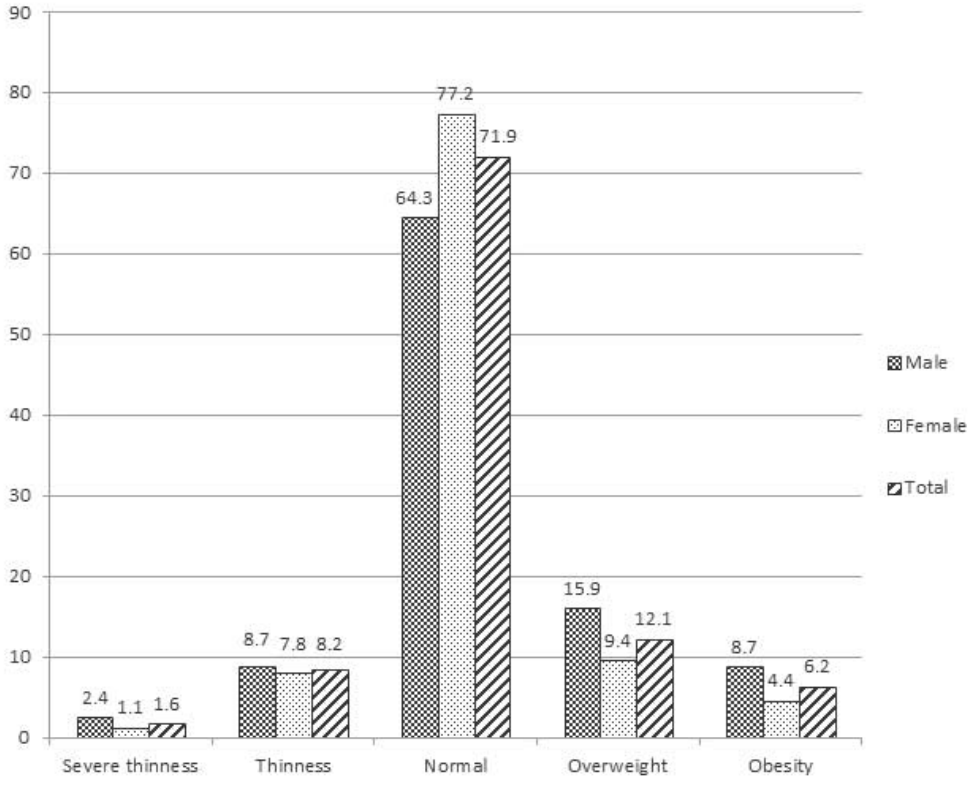

Figure 2. BMI classification of participants

of the adolescents were from high affluent families whereas 33.0% of them were from low affluent families.

The mean BMI for all the participants was 20.78±4.22 kg/m^2. BMI classifications of participants are shown in Figure 2. According to BMI-for-age growth charts (WHO, 2007), 71.9% of the participants were classified as having normal weight, 8.2% as thin and 1.6% as severely thin while 12.1% were overweight and 6.2% were obese.

Factor analysis of food choice questionnaire (FCQ)

Results of the factor analysis on the 58 items of the FCQ show that the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy was 0.843 indicating that the sample was adequate for factor analysis while the Barlett's test of sphericity (4662.463) was significant showing that the data matrix had sufficient correlations and thus was suitable for factoring (Hair *et al.*, 2006). The best solution included six factors (Eigen values greater than one) which explained 45.9% of the variance. This 36-item, six-factor (health and nutrition knowledge, price and convenience, media, mood and sensory appeal, peers and parents) FCQ is shown in Table 2.

The first factor (health and nutrition knowledge) had ten items about health, the use of natural ingredients and consumption of low calorie food. The second factor (price and convenience) included eight items concerning price of food, ease of buying and preparing food. The third factor (media) consisted of four items related to food advertising by media and how adolescents interpret the advertisements. The fourth factor (mood and sensory appeal) comprised seven items regarding coping with stress, mood, appearance, smell and taste of food. The fifth factor (peers) had four items associated with peer preferences, recommendations and encouragement. The last factor (parents) included three items concerning the roles of parents and parents' food preferences.

Based on the factor analysis performed, familiarity and ethical concern factors were excluded because their items did not load clearly on a single factor. The items for the religion factor added in the study by Asma *et al.* (2010) were also found to be not clearly loaded on a single factor in this study. In addition, several items from other factors that did not load clearly on a single factor such as health factor item (Is good for my skin/teeth/hair/nails etc.), natural content item (Contains no additives), mood factor items (Helps me cope with stress, Keeps me awake), sensory appeal factor item (Has a pleasant structure) were also excluded.

Furthermore, seven factors in the original FCQ were now regrouped into three new factors. The health factor, natural content factor and weight control factor of the FCQ were grouped together in a single factor known as health and nutrition knowledge factor because these factors correlated strongly or moderately with each other. The weight control factor strongly correlated with the health factor ($r=0.53$; $p<0.01$) while the natural content factor correlated moderately with the health factor ($r=0.48$; $p<0.01$). The same phenomenon was found for price and convenience factor which were grouped into a single factor known as price and convenience factor because the price factor strongly correlated with the convenience factor ($r=0.56$; $p<0.01$). Similarly, the mood factor and sensory appeal factor were grouped together into a single factor known as mood and sensory appeal factor because the mood factor strongly correlated with the sensory appeal factor ($r=0.55$; $p<0.01$).

Reliability

The reliability for the factors of the original FCQ and the modified version of the FCQ is shown in Table 3. For the original FCQ, the Cronbach's alpha coefficients for the factors of health, natural content, and

Table 2. Factor loadings and reliability estimates for food choice questionnaire items

It is important to me that the food I eat on a typical day	*Standardised factor loadings*	*Internal consistency*
Health and nutrition knowledge		0.84
15 Contains a lot of vitamins and minerals	0.77	
8 Is nutritious	0.67	
7 Is high in fibre	0.66	
19 Is high in protein	0.57	
16 Contains no artificial ingredients	0.56	
2 Is low in calories	0.55	
6 Is low in fat	0.55	
14 Helps me control my weight	0.54	
21 Keeps me healthy	0.52	
4 Contains natural ingredients	0.46	
Price and convenience		0.82
10 Is cheap	0.68	
5 Is not expensive	0.68	
9 Is easily available in shops/supermarkets	0.60	
20 Takes no time to prepare	0.54	
13 Can be cooked very simply	0.53	
24 Can be bought in shops near to where I live/study	0.49	
1 Is easy to prepare	0.45	
25 Is good value for money	0.41	
Media		0.89
34 Is the focus showed in advertisement	0.85	
35 Is as promoted in the advertisement in media	0.83	
33 Is advertised in the media (television, radio, internet etc.)	0.74	
36 Is suitable for the image as advertised in media	0.69	
Mood and sensory appeal		0.79
22 Makes me feel good	0.68	
11 Cheers me up	0.61	
18 Helps me relax	0.61	
12 Smells nice	0.59	
17 Looks nice	0.55	
23 Helps me cope with life	0.41	
3 Tastes good	0.31	
Peers		0.84
31 Is recommended by my friends	0.77	
30 Is preferred by my friends	0.68	
32 Similar to those consumed by my friends	0.66	
29 Is encouraged by my friends	0.60	
Parents		0.75
27 Is preferred by my father/mother	0.69	
28 Is recommended by my father/mother	0.68	
26 Is prepared by my father/mother	0.62	

Table 3. Reliability for the factors of original FCQ and modified version FCQ

Factors (original FCQ)	*Internal consistency*	*Factors (modified version FCQ)*	*Internal consistency*
Health	0.79	Health and nutrition knowledge	0.84
Natural content	0.57		
Weight control	0.75		
Price	0.68	Price and convenience	0.82
Convenience	0.76		
Media	0.89	Media	0.89
Mood	0.74	Mood and sensory appeal	0.79
Sensory appeal	0.50		
Peers	0.84	Peers	0.84
Parents	0.75	Parents	0.75

weight control ranged from 0.57 to 0.79. The range of Cronbach's alpha coefficients for the factors of price and convenience ranged from 0.68 to 0.76 while the range of Cronbach's alpha coefficients for the factors of mood and sensory appeal ranged from 0.50 to 0.74. For the modified version of the FCQ, the reliability was good, with Cronbach's α coefficients as follows: health and nutrition knowledge=0.84, price and convenience=0.82, media=0.89, mood and sensory appeal=0.79, peers=0.84, and parents=0.75.

DISCUSSION

The nine factors of the original FCQ explained 49.5% of the variance (Steptoe *et al.*, 1995). In contrast, the six-factor modified version of the FCQ in our study explained 45.9% of the variance. These six factors were renamed health and nutrition knowledge, price and convenience, media, mood and sensory appeal, peers, parents.

Familiarity, ethical concern and religion factors were excluded in this study based on the factor analysis performed. The exclusions of familiarity and ethical concern factors were similar to the suggestion of the FCQ revisited study (Fotopoulos *et al.*, 2009) which found that the familiarity factor was one of the least important considerations when choosing food especially among young and single consumers. In addition, Eertmans *et al.* (2006) found an item in the ethical concern factor (the packaging of food in an environmentally friendly way) did not load clearly on any factor among a Canadian sample and Fotopoulos *et al.* (2009) also suggested to exclude the ethical concern factor as it was found problematic because of its low internal consistency. On the other hand, the items of the religion factor added in the study by Asma *et al.* (2010) did not load clearly on a single factor in our study.

Besides, several items including a health factor item (Is good for my skin/teeth/hair/nails etc.), natural content item (Contains no additives), mood factor items (Helps me cope with stress, Keeps me awake), and a sensory appeal factor item (Has a pleasant structure) were excluded in this study. This is consistent with a previous study in which the item: Keeps me awake/alert did not load in the mood factor (Eertmans *et al.*, 2006) while the items: Is good for my skin/teeth/hair/nails etc., Helps me cope with stress, and

Has a pleasant structure were deleted to improve the reliability of each factor (Fotopoulos *et al.*, 2009).

Seven factors from the original FCQ, health, natural content, weight control, price, convenience, mood and sensory appeal, were combined into three factors in this study. Combination of the original factors which increased the factors' reliability was in line with the suggestion from the FCQ revisited study to reduce the dimensions of the FCQ (Fotopoulos *et al.*, 2009). The health factor, weight control factor and natural content factor from the original FCQ were grouped together in the same factor now known as health and nutrition knowledge. Roos, Lehto & Ray (2012) reported that health and natural content factor tend to load in the same factor, but the weight control factor was loaded as a separate factor. Likewise, the price factor and convenience factor were grouped together in the same factor while the mood factor and sensory appeal factor were grouped into the same factor because the factors correlated strongly with each other. The combinations of the factors in this study are similar to the ones suggested by Fotopoulos *et al.* (2009) which fulfilled the desirable condition that the combined factors should be strongly correlated.

The range of Cronbach's alpha coefficients (0.75-0.89) for the modified version of the FCQ showed good reliability in this study. These values are consistent with the range of Cronbach's alpha coefficients for the nine factors in the original FCQ (0.70-0.87) (Steptoe *et al.*, 1995) and the eight-factor FCQ (0.70-0.91) from the study among Taiwanese college students (Sun, 2008). In addition, the reliability of the combined factors increased as compared to the reliability for each factor separately.

Malaysian adolescents from the three major ethnic groups (Malay, Chinese and Indian) in Peninsular Malaysia were involved in this validation study. This study further explored research on food choice motives for another age group; earlier studies were conducted among adults living in urban areas (Prescott *et al.*, 2002) and among married couples (Asma *et al.*, 2010). Besides, the participants in this study were multiracial in composition as compared to the ethnicities of the participants in the previous studies which involved only Chinese (Prescott *et al.*, 2002) or Malay (Asma *et al.*, 2010). The modified version of the FCQ is applicable to school-going adolescents but is limited to adolescents between 15 and 17 years old. Future validation of the FCQ among students should include lower secondary and upper secondary school students from other districts throughout Malaysia.

CONCLUSION

Factor analysis conducted on the modified version of the FCQ resulted in a FCQ consisting of six factors and 36 items. Further FCQ validation research should include lower secondary and upper secondary adolescents from other districts throughout Malaysia using the new FCQ.

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