FOOD

RESEARCH

Evaluation of a voluntary augmented reality nutrition menu labelling application (Nutrilabelapps©) usage in a university café: a cross-sectional study in Terengganu, Malaysia

[1]Zulkifli, N.F.A., [1,]*Asma', A. [1]Yusof, H.M., [1]Khairil-Shazmin, K., [1]Zakaria, N.S., [2]Mustafa, M. and [3]Mhd Jalil, A.M.

[1]*Faculty of Fisheries and Food Science, Universiti Malaysia Terengganu (UMT), 21030 Kuala Nerus, Terengganu Darul Iman, Malaysia*

[2]*Faculty of Ocean Engineering Technology and Informatics, Universiti Malaysia Terengganu, 21030 Kuala Nerus, Terengganu Darul Iman, Malaysia*

[3]*School of Nutrition and Dietetics, Faculty of Health Sciences, UniSZA, Gong Badak, 21300 Kuala Nerus, Terengganu Darul Iman, Malaysia*

Abstract

Nutrilabelapps© is an interactive augmented reality mobile application (app) providing nutrition menu labelling specifically built for Mutiara Café, a café in Universiti Malaysia Terengganu. However, no evaluation of the usage of Nutrilabelapps© has been carried out. Therefore, this cross-sectional study was aimed to determine the knowledge and attitude of nutrition menu labelling among Mutiara Café customers; the feasibility and acceptability of the app among customers; and also, the relationships between knowledge, attitude, feasibility and acceptability of this augmented reality nutrition menu labelling app. This study was conducted among 108 Mutiara Café customers who owned a smartphone and were able to download the Nutrilabelapps©. The data were analyzed using SPSS version 25. Findings showed that only 4.6% of Mutiara Café customers had good knowledge of nutrition menu labelling, while 71.3% of them had a positive attitude towards nutrition menu labelling. Nutrilabelapps© was accepted by users based on the feasibility (67.6%) and acceptability (75.9%) of the app. Remarkably, there was a significant association between knowledge, attitude, feasibility, and acceptability of the app at p < 0.05. As a conclusion, Nutrilabelapps© is highly recommended among the café customer despite their low knowledge of the nutrition menu labelling. Therefore, more education of the public about nutrition menu labelling is highly recommended.

1. Introduction

Nutrition menu labelling is imperative, as it will guide customers in selecting a healthier choice or at least allow awareness of their nutritional value needs. It is crucial for Malaysia to implement this menu labelling as the trend of consumption of food-away-from-home (FAFH) consumption has dramatically increased. The Department of Statistics Malaysia (2015) has stated that family from all income classes do allocate a portion of their monthly income to FAFH. The statistic showed that families with household incomes of RM8,000 to RM10,000 spend the highest expenditure on FAFH (4.5%), while those with household income about RM3,000 to RM5,000 spend about 3.4% on FAFH. Few restaurants in Malaysia have taken the initiative to voluntary display the menu labelling in their restaurant but it turns to be highly neglected by customer. As

reported by the Institute for Public Health (2017), 15.5% of Malaysian adolescence does not read the menu labelling during food purchasing. One of the possible factors is may be due to its appearance that may be less unattractive (van der Laan *et al.*, 2012). Another possible reason is maybe due to a lack of knowledge among the customer. Customer will tend to not ignore the menu labelling if they have adequate knowledge of how to interpret the nutrition information stated (Radwan *et al.*, 2017).

Previously, a study on the impact of icon-based menu labelling on customer behaviour was done where menu items with low fat, sugar and fibre were referred to as 'heart healthy'. Unfortunately, there has been no relationship found between healthy labels on menu items with customer's food choices (Kerins *et al.*, 2016). In another study, a program known as the Informed Dining

Program (IDP) was implemented to assess customer's awareness of nutrition information in the restaurant before and after ordering. It was carried out to promote healthy food choice, but the results showed that there were no significant changes among customers' eating habits (Vanderlee *et al.*, 2019).

Thus, to create awareness of nutritional menu labelling among customers, the Nutrilabelapps© mobile application (app) was developed by researchers at Universiti Malaysia Terengganu. This app is an interactive approach via augmented reality to display the nutritional information of the food at the Mutiara Café in Universiti Malaysia Terengganu. This newly developed app is in line with the 4th Industrial Revolution, as the customer will be able to access conveniently the nutritional information such as calories, energy, carbohydrate, protein and fat of cooked food available at the café since the cooked food does not have packaging that shows the nutritional information. The app is easy and free to be downloaded in the Google Play store (https://play.google.com/store/apps/details?id=com.Farez.MutiaraCafeandhl=en).

Therefore, this study will determine the knowledge and attitude of menu labelling usage among customer and evaluate the feasibility and acceptability of this Nutrilabelapps© application among the customers of Mutiara Café, UMT.

2. Materials and methods

2.1 Research design

This cross-sectional study was conducted in Mutiara Café, Universiti Malaysia Terengganu. The sample size was calculated using Cochran formula at a confidence level of 95%, with 41.25% of university students having low nutrition knowledge as the proportion, and assuming 10% attrition. Thus, 108 Mutiara Café customers aged 18 to 59 years old were selected through purposive sampling. Ethical approval was obtained by Universiti Malaysia Terengganu's Human Research Ethics Committees, with the reference number of JKEPM/2019/35.

2.2 Research instrument

Nutrilabelapps© app and a self-administered questionnaire were used as the instruments in this study. The app has two key functionality specifications: 1) to scan the picture of standard food item provided at Mutiara Café; and 2) provide nutritional information of cooked food (in calorie) consists of energy, carbohydrates, proteins and fats. The bilingual questionnaire was a combination of a self-designed and modified questionnaire from the Malaysia Ministry of Health portal. The final set of the questionnaire consists of five main sections. The socio-demographic section consists of information including gender, age, ethnicity, occupation, level of education, marital status and question of menu labelling usage. The second section was knowledge of nutrition menu labelling among Mutiara Café customer. This section consists of 25 questions which consist of 14 items of recommended nutrient intake (RNI), 4 items of recommended energy intake, 4 items of recommended serving size and 3 items of food group (macronutrient) classification. The scale was treated as nominal data and points were given for each category as follows; 1-Yes; 0-No or Not sure. The point total was calculated at the end of the knowledge questionnaire section for each respondent. Scores ranging from 0-13, 14-18, and 19-25 indicated poor, moderate and good levels of knowledge (Remali *et al.*, 2019). The attitude part consists of 12 questions which were developed and modified from several studies (Piron *et al.*, 2010; Song *et al.*, 2015). A five-point Likert-type scale was used to indicate each respondent's level of agreement or disagreement towards attitude on nutrition menu labelling statement (strongly disagree, disagree, not sure, agree, strongly agree) with scores ranging from 12-60. A score of 45 or above indicates a high level of attitude on nutrition menu labelling and a more positive attitude towards menu labelling. A score of less than 45 indicates a low level of attitude on nutrition menu labelling (Marina *et al.*, 2020). The feasibility of the app section consists of 10 self-structured questions adapted from Salihah *et al.*, (2017). The score was rated on five Likert-type scale responses; 1-strongly disagree; 2-disagree; 3-not sure; 4-agree; 5-strongly agree. A score of 40 or above indicates that Nutrilabelapps© is feasible for the user (Tariman *et al.*, 2011). The acceptability of the app adapted from Salihah *et al.* (2017) indicates the experience of using Nutrilabelapps©, how enjoyable the application was to use, how helpful the application was, whether the participant enjoyed using the application, whether the participant wished to own the application, and overall satisfaction with the application (Mullen *et al.*, 2004). A score of 40 or above indicates that the Nutrilabelapps© is acceptable to the user (Tariman *et al.*, 2011). All in all, the questionnaire attained excellent internal consistency reliability for knowledge (0.925), attitude (0.862), feasibility (0.968), and acceptability (0.976). The validity for attitude, feasibility and acceptability was confirmed by convergent validity in which Spearman's correlation coefficients between scales were, on average, low.

2.3 Data collection

Data collection began by inviting the Mutiara Café customer to join the survey. Informed consent was obtained prior to the collection of data. Next, the customer was briefed on the Nutrilabelapps©, focusing on development, special features and key functionality specifications. The customer then scanned the app for about five minutes (depending on the researcher's explanation on how to scan the food and what type of foods were included). After being explained on the app, the customer completed the questionnaire. The customer was assured that their responses would remain confidential and that no personal information would be released in any way. Once the questionnaire was completed, they were given a token as a gift.

2.4 Data analysis

All data were analyzed using Statistical Package for the Social Science (SPSS) version 25. The normality test was performed using Kolmogorov-Smirnov. Frequency, percentage, mean score (SD) or median score (IQR) were used to present descriptive data. Spearman correlation's coefficient was applied to determine the relationship between knowledge, attitude, feasibility and acceptability of augmented reality nutrition menu labelling among Mutiara Café customers at $p < 0.05$.

3. Results and discussions

3.1 Socio-demographic profile

Most of the respondents were UMT students undertaking a degree; female; single; Malay; and with a mean age of 23 years old as stated in Table 1, which also shows that 75% of the respondents revealed that they knew what nutrition menu labelling was, while 68.5% customers understand the content in the nutrition menu labelling and 57.4% agreed that menu labelling influenced their food choice during purchasing. Previous research has established that the nutritional information labels provided influenced customer during decision making (Prinsloo *et al.*, 2012; Latiff *et al.*, 2013; Reale and Flint, 2016). Surprisingly, less than 30% of the respondents reported reading nutrition menu labelling when they buy or receive food. The remaining revealed that they sometimes and never used nutrition menu labelling. This is similar as reported by Jefrydin *et al.* (2019) where only about one-fourth of the secondary school adolescents that always read nutrition menu labelling. This indicates that customer always neglected to read nutrition menu labelling during purchasing. The enthralling finding in this study was that nutrition menu labelling information frequently read through by the respondents included only total energy, carbohydrate and

fat content, while salt and mineral contents were the most neglected nutrition information as per Table 1. In this study, about half of Mutiara Café customers agreed they understood the information on the nutrition label.

Table 1. Socio-demographic profile of the respondents (n=108)

Characteristics	n (%)	Median (IQR)
Gender		
Male	38 (35.2)	
Female	70 (64.8)	
Age		
18 – 29 years old	68 (63.0)	
30 – 39 years old	24 (22.2)	23.00 (13)
Above 40	16 (14.8)	
Occupation		
Student	67 (62.0)	
Staff	28 (25.9)	
Others	13 (12.0)	
Level of education		
SPM	7 (6.5)	
Undertaking Diploma	10 (9.3)	
Undertaking Degree	72 (66.7)	
Master/PhD holder	19 (17.5)	
Ethnicity		
Malay	81 (75.0)	
Chinese	3 (2.8)	
Indian	24 (22.2)	
Marital status		
Single	71 (65.7)	
Married	37 (34.3)	
Knowledge of nutrition menu labelling		
Yes	81 (75.0)	
No	27 (25.0)	
Knowledge of nutrition menu labelling content		
Yes	74 (68.5)	
No	34 (31.5)	
Nutrition menu labelling influence purchase		
Yes	62 (57.4)	
No	46 (42.6)	
Reading nutrition menu labelling during purchasing		
Yes	31 (28.7)	
Sometimes	71 (65.7)	
No	6 (5.6)	
Nutrition menu labelling information that is read through		
Total energy	53 (49.1)	
Carbohydrate content including sugar	32 (29.6)	
Fat content	12 (11.1)	
Salt or Sodium content	0 (0.0)	
Vitamin content	3 (2.8)	
Mineral content	0 (0.0)	
Food additives	2 (1.9)	
Fibre	1 (0.9)	
Other	3 (2.8)	
None	2 (1.9)	
Understanding of nutrition menu labelling		
Yes	56 (51.9)	
Sometimes	45 (41.7)	
No	7 (6.5)	

Table 2. Knowledge of nutrition menu labelling among Mutiara Café customer (n=108)

No.	Knowledge Items	Yes, n (%)	No, n (%)	Not sure, n (%)	Answered correctly, n (%)
1	Calorie is a measure of the energy in food.	97 (89.8)	1 (0.9)	10 (9.3)	97 (89.8)
2	The calorie required for sedentary women is 1500 kcal.	31 (28.7)	6 (5.6)	71 (65.7)	31 (28.7)
3	The calorie required for active women is 2000 kcal.	30 (27.8)	9 (8.3)	69 (63.9)	30 (27.8)
4	The calorie required for active men is 2500 kcal.	38 (35.2)	2 (1.9)	68 (63.0)	38 (35.2)
5	Fat contributes the highest calorie of 9 kcal per 1 gram.	38 (35.2)	4 (3.7)	66 (61.1)	38 (35.2)
6	Protein provides 4 kcal per gram of food.	36 (33.3)	8 (7.4)	64 (59.3)	36 (33.3)
7	Carbohydrate contributes 4 kcal per gram of food.	32 (29.6)	7 (6.5)	69 (63.9)	32 (29.6)
8	One plate of fried rice contains a higher calorie content than one plate of white rice.	88 (81.5)	3 (2.8)	17 (15.7)	88 (81.5)
9	The recommended daily intake of sugar is 50 grams.	35 (32.4)	12 (11.1)	61 (56.5)	35 (32.4)
10	The higher the fat content in the food, the higher the calorie content.	73 (67.6)	17 (15.7)	18 (16.7)	73 (67.7)
11	The serving size recommended for cereal and grains for a day is 4-8 servings	30 (27.8)	22 (20.4)	56 (51.9)	30 (27.8)
12	The recommended serving size for cereal and grains is 4-8 servings per day.	61 (56.5)	7 (6.5)	40 (37.0)	61 (56.5)
13	The recommended serving size for protein is 1/2 to 1 serving per day.	31 (28.7)	20 (18.5)	57 (52.8)	31 (28.7)
14	The recommended serving size for nuts and dairy products is 1/2-2 servings per day.	28 (25.9)	11 (10.2)	69 (63.9)	28 (25.9)
15	'Teh peng' contains higher calories than 'teh o'.	86 (79.6)	5 (4.6)	17 (15.7)	86 (79.6)
16	The calorie for one plate of white rice is about 240 kcal.	29 (26.9)	13 (12.0)	66 (61.1)	29 (26.9)
17	'Roti bakar' spread with jam contains higher calories than plain 'roti bakar'.	84 (77.8)	8 (7.4)	16 (14.8)	84 (77.8)
18	The recommended calorie intake for breakfast is approximately 400 kcal.	33 (30.6)	12 (11.1)	63 (58.3)	33 (30.6)
19	The recommended calorie intake for morning tea is approximately 250 kcal.	31 (28.7)	8 (7.4)	69 (63.9)	31 (28.7)
20	The recommended calorie intake for lunch is approximately 500 kcal.	28 (25.9)	8 (7.4)	72 (66.7)	28 (25.9)
21	The recommended calorie intake for teatime is approximately 250 kcal.	27 (25.0)	7 (6.5)	74 (68.5)	27 (25.0)
22	The recommended calorie intake for dinner is approximately 400 kcal.	18 (16.7)	11 (10.2)	79 (73.1)	18 (16.7)
23	'Limau ice' contains a lower calorie content than 'sirap limau.'	58 (53.7)	16 (14.8)	34 (31.5)	58 (53.7)
24	Fried chicken contains a higher calorie content than chicken curry.	36 (33.3)	30 (27.8)	42 (38.9)	36 (33.3)
25	'Fried mee' has a lower calorie content than 'mee sup.'	34 (31.5)	46 (42.6)	28 (25.9)	46 (42.6)

3.2 Knowledge and attitude of nutrition menu labelling among Mutiara Café customer

Referring to Table 2, it was shown that the lowest percentage of respondents answered correctly was item 22. Only 16.7% of the respondents answered correctly for item 22 where the recommended calorie intake is concerned. As McCrory *et al.* (2016) reported, only 24.4% of participants responded correctly to the recommended daily intake (Breck and Elbel, 2017). On the other hand, food calorie knowledge consists of items 8, 10, 15, 17, 23, 24 and 25, which show that more than 70 per cent responded correctly except for three items (items 23, 24 and 25) which had less than 50 per cent of respondents who were able to respond correctly. This may be due to the difficulty of estimating the calorie in the food listed. In the Calorie Estimate Study on Menu Labeling, Schwartz *et al.* (2013) stipulated that people had difficulty estimating calories in restaurants. In the meantime, item 1 received the highest percentage of 89.8 per cent, followed by item 15 and item 17 with 77.8 per cent and 79.6 per cent respectively. Overall, most customers were unaware of the nutrition information and recommended daily intake, as knowledge of the nutritional menu labelling was generally poor.

As expected, only 4.6% of Mutiara Café's customers had a good level of overall knowledge while the remaining had moderate and poor overall knowledge as depicted in Table 3. This is relatively unexpected as most of the respondents are university students. As stated in the previous study, the relationship between nutritional knowledge and the level of education is directly proportional (Cannoosamy *et al.*, 2014). People with higher education level should have high knowledge of menu labelling (Grunert *et al.*, 2010), but this cannot be seen in the community of Mutiara Café customer. The outcome on Table 3 is contrary to a previous study carried out among university student in Selangor, which stated that 90.3% had the adequate (high and medium) level of knowledge (Nurliyana *et al.*, 2011) which shows a huge difference among Mutiara Café customers. These findings have important implications for the development of more nutritional menu labelling around the UMT area, in order to increase understanding and raise awareness of the nutritional menu labelling among the UMT community, particularly among students.

Table 4 shows the attitude of Mutiara Café customer towards nutrition menu labelling. Previous studies evaluating attitude towards nutrition menu labelling observed inconsistent results on whether customers had moderate or good attitudes towards menu labelling (Norazlanshah *et al.*, 2013). Per Table 3, the most interesting finding was that 71.3% of Mutiara Café customer had positive attitudes towards nutrition menu

labelling. Only 28.7% of customers had a negative attitude of nutrition menu labelling which indicate a low level of attitude. This study confirms that attitude of nutrition menu labelling among Mutiara Café customer has expressed a positive attitude on menu labelling (Radwan *et al.*, 2017). These findings are in agreement with Marina's *et al.* (2020) findings which showed a positive attitude among customers of selected cafes provided with nutrition menu labelling.

Table 3. Classification of knowledge and attitude based on total score (n = 108)

Component	n (%)	Median (IQR)
Knowledge		9.50 (7)
Poor (0 - 13 points)	81 (75.0)	
Moderate (14 - 18 points)	22 (20.4)	
High (19 - 25 points)	5 (4.6)	
Attitude		48.00 (10)
Negative (Less than 45)	31 (28.7)	
Positive (45 and above)	77 (71.3)	

3.3 Feasibility and acceptability of Nutrilabelapps© among Mutiara Café customer

Based on Table 5, the most astounding finding was most of the respondents agree and strongly agree with the statement on the feasibility of Nutrilabelapps©. Respondents also agreed that features in Nutrilabelapps© is catchy and it grabs their attention. These results reflect study by Yepes (2015) where the participants agreed that the menu application was fun, easy, useful, convenient and not difficult or time-consuming. As the participant accepted the implementation of menu labels application, Yepes (2015) suggested for the usage of mobile tablets application in restaurants for market differentiation, also to attract new customer and increase the number of customers. This overwhelming response may be due to the attraction of Nutrilabelapps© as a new intervention implemented in UMT café. In this era, there are several mobile food deliveries such as Food Panda, Grab Food, and Bungkusit. The application will show up a list of menus for selected restaurants or café. However, there is no calorie stated for each food in the menu list. This is why Nutrilabelapps© intervention was done, besides from introducing a new virtual application related to menu labelling, it also increased awareness among customer on nutrition menu labelling and following the fourth industrial revolution (IR 4.0).

According to Table 6, most of the Mutiara Café customer accept the application existence. Yet, only 0.9% of Mutiara Café customer strongly agreed that Nutrilabelapps© will help to increase nutrition knowledge of menu labelling. However, the findings of the current study do not support previous research in which all respondents (100%) agreed that Candi™

Table 4. Attitude of nutrition menu labelling among Mutiara Café customer (n=108)

No.	Attitude Items	Strongly disagree, n (%)	Disagree, n (%)	Not sure, n (%)	Agree, n (%)	Strongly agree, n (%)	Median (IQR)
1	I found nutrition menu label helpful.	6 (5.6)	0 (0.0)	9 (8.3)	48 (44.4)	45 (41.7)	4.00 (1)
2	I appreciate having nutrition menu label at the café I ate.	5 (4.6)	0 (0.0)	4 (3.7)	50 (46.3)	49 (45.4)	4.00 (1)
3	It is interesting for me to read the nutrition menu label.	5 (4.6)	2 (1.9)	15 (13.9)	44 (40.7)	42 (38.9)	4.00 (1)
4	It is worth reading the nutrition menu label before buying any food.	4 (3.7)	0 (0.0)	11 (10.2)	60 (55.6)	33 (30.6)	4.00 (1)
5	I would use calorie information to order low-calorie foods and drinks.	5 (4.6)	6 (5.6)	25 (23.1)	46 (42.6)	26 (24.1)	4.00 (1)
6	It is beneficial for me to read the nutrition menu label.	5 (4.6)	0 (0.0)	10 (9.3)	57 (52.8)	36 (33.3)	4.00 (1)
7	It is good for me to read the nutrition menu label.	4 (3.7)	2 (1.9)	5 (4.6)	54 (50.0)	43 (39.8)	4.00 (1)
8	I trust the nutritional information provided on the nutrition menu label.	5 (4.6)	4 (3.7)	22 (20.4)	47 (43.5)	30 (27.8)	4.00 (2)
9	The nutritional information provided affects my decision to purchase.	3 (2.8)	10 (9.3)	21 (19.4)	48 (44.4)	26 (24.1)	4.00 (1)
10	I prefer to eat in a restaurant with a menu label.	5 (4.6)	8 (7.4)	30 (27.8)	42 (38.9)	23 (21.3)	4.00 (1)
11	I am satisfied with the provided menu label.	5 (4.6)	2 (1.9)	12 (11.1)	57 (52.8)	32 (29.6)	4.00 (1)
12	I always read the menu label.	7 (6.5)	10 (9.3)	33 (30.6)	34 (31.5)	24 (22.2)	4.00 (1)

Table 5. Feasibility of the Nutrilabelapps© usage among Mutiara Café (n=108)

No.	Feasibility Items	Strongly disagree, n (%)	Disagree, n (%)	Not sure, n (%)	Agree, n (%)	Strongly agree, n (%)	Median (IQR)
1	Nutrilabelapps© is easy to operate	3(2.8)	1(0.9)	18(16.7)	46(42.6)	40(37.0)	4.00 (1)
2	The language used in Nutrilabelapps© is simple and easy to understand	3(2.8)	1(0.9)	10(9.3)	54(50.0)	40(37.0)	4.00 (1)
3	The colour scheme of Nutrilabelapps© is good and attractive	4(3.7)	4(3.7)	16(14.8)	50(46.3)	34(31.5)	4.00 (1)
4	The features in Nutrilabelapps© are catchy	3(2.8)	1(0.9)	17(15.7)	59(54.6)	28(25.9)	4.00 (1)
5	The language use in the Nutrilabelapps© is easy to understand	3(2.8)	0(0.0)	11(10.2)	55(50.9)	39(36.1)	4.00 (1)
6	The information stated in Nutrilabelapps© is useful	2(1.9)	0(0.0)	12(11.1)	50(46.3)	44(40.7)	4.00 (1)
7	Nutrilabelapps© is user-friendly App	1(0.9)	1(0.9)	14(13.0)	53(49.1)	39(36.1)	4.00 (1)
8	Nutri-Label App are fast loading time and high performance	1(0.9)	2(1.9)	18(16.7)	51(47.2)	36(33.3)	4.00 (2)
9	Nutrilabelapps© fulfil the user's needs for nutrition information	1(0.9)	2(1.9)	18(16.7)	48(44.4)	39(36.1)	4.00 (1)
10	I would like to use Nutrilabelapps© in the future	3(2.8)	2(1.9)	22(20.4)	47(43.5)	34(31.5)	4.00 (2)

FULL PAPER

Table 6. Acceptability of the Nutrilabelapps© among Mutiara Café customer (n=108)

No.	Attitude Items	Strongly disagree, n (%)	Disagree, n (%)	Not sure, n (%)	Agree, n (%)	Strongly agree, n (%)	Median (IQR)
1	Nutrilabelapps© will help to increase nutrition knowledge of menu labelling	1(0.9)	10(9.3)	55(50.9)	41(38.0)	1(0.9)	4.00 (1)
2	Nutrilabelapps© will help improve my dietary intake	1(0.9)	0(0.0)	16(14.8)	60(55.6)	31(28.7)	4.00 (1)
3	Nutrilabelapps© will be beneficial to me	1(0.9)	0(0.0)	12(11.1)	62(57.4)	33(30.6)	4.00 (1)
4	Nutrilabelapps© attracts my attention	1(0.9)	2(1.9)	15(13.9)	57(52.8)	33(30.6)	4.00 (1)
5	I would like to own Nutrilabelapps© in the future	2(1.9)	0(0.0)	21(19.4)	54(50.0)	31(28.7)	4.00 (1)
6	I like Nutrilabelapps©	1(0.9)	1(0.9)	20(18.5)	54(50.0)	32(29.6)	4.00 (1)
7	Nutrilabelapps© can help people on diet	1(0.9)	1(0.9)	14(13.0)	44(40.7)	48(44.4)	4.00 (1)
8	I will recommend Nutrilabelapps© to my friends	1(0.9)	0(0.0)	16(14.8)	54(50.0)	37(34.3)	4.00 (1)
9	I hope that Nutrilabelapps© will be available on each café in UMT	1(0.9)	0(0.0)	10(9.3)	50(46.3)	47(43.5)	4.00 (1)
10	Overall, I think Nutrilabelapps© is a good application	3(2.8)	3(2.8)	9(8.3)	47(43.5)	46(42.6)	4.00 (1)

application would help the user to improve their nutrition knowledge (Salihah *et al.*, 2017). Table 6 shows that more than half respondents agreed Nutrilabelapps© will help them to improve their dietary intake because Nutrilabelapps© show up the energy in calorie for each food at Mutiara Café. These results are in line with previous studies where it showed that application implemented was effective for menu labelling learning and the application might help customer to control the daily food intake (Juan *et al.*, 2019). About 19.4% of Mutiara Café customer was not sure on whether they will own Nutrilabelapps© or not as they were unwilling to explore new things. In contrast, 44.4% respondents strongly agreed that Nutrilabelapps© will help people who are on a diet as this application can be tools for them to control their calorie daily intake as most of the people admit that application related to health is reliable and need to be developed more to help people in daily life activities such as exercise, diet, calorie counting and BMI (Payne *et al.*, 2012). These findings are in line with a previous study where most of the user would use the application if it were available on each café in UMT and found Nutrilabelapps© is a good application overall.

As illustrated in Table 7, the overwhelmingly positive feedback was received as the majority of Mutiara Café customers agreed to accept the application at 67.6% and 75.9% in terms of feasibility and acceptability rate. A study stated the acceptance measurement by users can be used in research or clinical practice to evaluate acceptability and usability of computer-based assessment (Tariman *et al.*, 2011). It could say that Mutiara Café customer does accept the existence of Nutrilabelapps© as a new intervention. But, studies in the intervention of application related to nutrition menu labelling need to be increased as for now only application regarding diet-related disease has been implemented in Malaysia.

As expected, this study has been able to demonstrate significant relationships among knowledge, attitude, feasibility and acceptability of augmented reality nutrition menu labelling application usage among Mutiara Café customers as can be seen in Table 8. The finding showed that feasibility and acceptability of Nutrilabelapps© are linked, as most of Mutiara Café's customers agreed with the implemented of Nutrilabelapps© at Mutiara Café as a new intervention.

Table 7. Classification of feasibility and acceptability based on total score (n=108)

Component	Frequency n (%)	Median (IQR)
[a]**Feasibility**		40.00 (9)
Unacceptable by user (Less than 40 points)	35 (32.4)	
Acceptable by user (40 points and above)	73 (67.6)	
[b]**Acceptability**		40.50 (7)
Unacceptable by user (Less than 40 points)	26 (24.1)	
Acceptable by user (40 points and above)	82 (75.9)	

[a]Acceptability (minimum = 10, maximum = 50)
[b]Feasibility (minimum = 10, maximum = 50)

4. Conclusion

This study provides better insight into the relationships between knowledge, attitude, feasibility and acceptability towards nutrition menu labelling among Mutiara Café customer. This study has identified Mutiara Café's customers had poor knowledge but a positive attitude towards nutrition menu labelling. The application of Nutrilabelapps© has been accepted by Mutiara Café's customers, as they agreed on the feasibility and acceptability of augmented reality nutrition menu labelling application. Mutiara Café's customers demonstrated the significant relationships between knowledge, attitude, feasibility and acceptability on augmented reality nutrition menu labelling application. However, there were several limitations in this study which the findings cannot be generalized to all café's customers, as the data was derived from Mutiara Café customers only. The age of the respondents should be increased to establish significance association between knowledge and attitude,

Table 8. Relationship between knowledge, attitude, feasibility and acceptability of augmented reality nutrition menu labelling among Mutiara Café customer (n=108)

		Knowledge	Attitude	Feasibility	Acceptability
Knowledge	Correlation Coefficient	1	0.370*	0.334*	0.329*
	p-value		0.00	0.00	0.00
Attitude	Correlation Coefficient	0.370*	1	0.655*	0.545*
	p-value	0.00		0.00	0.00
Feasibility	Correlation Coefficient	0.334*	0.655*	1	0.723*
	p-value	0.00	0.00		0.00
Acceptability	Correlation Coefficient	0.329*	0.545*	0.723*	1
	p-value	0.00	0.00	0.00	

*significant at $p < 0.05$

feasibility, acceptability on augmented reality nutrition menu labelling application among Mutiara Café customer. Further work is imperative to determine whether there are any similarities between the findings.

References

Breck, A. and Elbel, B. (2017). Knowledge of Recommended Daily Caloric Intake Among Fast Food Customers. *SSRN Electronic Journal*, 2017, 3001393. https://doi.org/10.2139/ssrn.3001393

Cannoosamy, K., Pugo-gunsam, P. and Jeewon, R. (2014). Customer Knowledge and Attitudes Toward Nutritional Labels. *Journal of Nutrition Education and Behavior*, 4(5), 334-340. https://doi.org/10.1016/j.jneb.2014.03.010

Department of Statistics, Malaysia. (2015). Report on household expenditure survey: Malaysia 2014. Putrajaya, Malaysia: Percetakan National Berhad.

Grunert, K.G., Wills, J.M. and Fernández-Celemín, L. (2010). Nutrition knowledge, and use and understanding of nutrition information on food labels among customers in the UK. *Appetite*, 55(2), 177–189. https://doi.org/10.1016/j.appet.2010.05.045

Jefrydin, N., Nor, N.M. and Talib, R.A. (2019). Nutrition labelling: An exploratory study on personal factors that influence the practice of reading nutrition labels among adolescents. *Malaysian Journal of Nutrition*, 25(1), 143–154. https://doi.org/10.31246/mjn-2018-0123

Juan, M.-C., Charco, J.L., García-García, I. and Mollá, R. (2019). An Augmented Reality App to Learn to Interpret the Nutritional Information on Labels of Real Packaged Foods. *Frontiers in Computer Science*, 2019, 00001. https://doi.org/10.3389/fcomp.2019.00001

Kerins, C., Cunningham, K., Finucane, F. M., Gibson, I., Jones, J. and Kelly, C. (2016). Effects of an icon-based menu labelling initiative on customer food choice. *Perspectives in Public Health*, 137(1), 45–52. https://doi.org/10.1177/1757913916640826

Latiff, Z.A.A., Mohamed, Z.A., Rezai, G. and Kamaruzzaman, N.H. (2013). The Impact of Food Labeling on Purchasing Behavior Among Non-Muslim Customers in Klang Valley. *Australian Journal of Basic and Applied Sciences,* 7(1), 124–128.

Marina, M., Asma', A., Jaafar, S.N.A., Abdul Wahab, M.R. and Wan Zainal Shukri, W.H. (2020). Nutrition menu labelling in Terengganu: a cross-sectional study of knowledge, attitudes, perception and their relationship with healthy food choices. *Food research*, 4(5), 1573-1581. https://doi.org/10.26656/fr.2017.4(5).138

McCrory, C., Vanderlee, L., White, C.M., Reid, J.L. and Hammond, D. (2016). Knowledge of Recommended Calorie Intake and Influence of Calories on Food Selection Among Canadians. *Journal of Nutrition Education and Behavior*, 48(3), 199-207.e1. https://doi.org/10.1016/j.jneb.2015.12.012

Insitute for Public Health. (2017). National Health and Morbidity survey (NHMS) 2017: Key Findings from the Adolescent Health and Nutrition Surveys. Kuala Lumpur, Malaysia: Institue for Public Health, National Institutes of Health, Ministry of Health Malaysia.

Mullen, K.H., Berry, D.L. and Zierler, B.K. (2004). Computerized symptom and quality-of-life assessment for patients with cancer part II: acceptability and usability. *Oncology Nursing Forum*, 31(5), E84-E89. https://doi.org/10.1188/04.ONF.E84-E89

Norazlanshah, H., Muhammad, I., Hasmira, M.D., Mashita, M., Norfazlila, M.R. and Fazlyla, N. M.F. (2013). The Use of Nutrition Label on Food Purchasing Decision among University Students in Kuantan, Malaysia. *Health and the Environmental Journal*, 4(1), 1–10.

Nurliyana, G., Norazmir, M.N. and Anuar, M.I.K. (2011). Knowledge, Attitude and Practices of University Students Regarding the Use of Nutritional Information and Food Labels. *Asian Journal of Clinical Nutrition*, 3(3), 79–91. https://doi.org/10.3923/ajcn.2011.79.91

Payne, K.F.B., Wharrad, H. and Watts, K. (2012). Smartphone and medical related App use among medical students and junior doctors in the United Kingdom (UK): A regional survey. *BMC Medical Informatics and Decision Making*, 12, 121. https://doi.org/10.1186/1472-6947-12-121

Piron, J., Smith, L.V., Simon, P., Cummings, P.L. and

Kuo, T. (2010). Knowledge, attitudes and potential response to menu labelling in an urban public health clinic population. *Public Health Nutrition*, 13(4), 550–555. https://doi.org/10.1017/S1368980009991303

Prinsloo, N., Merwe, D., Van Der Bosman, M. and Erasmus, A. (2012). A Critical Review Of The Significance Of Food Labelling During Customer Decision Making. *Journal of Consumer Sciences*, 40, 83–98.

Radwan, H., Faroukh, E.M. and Obaid, R.S. (2017). Menu labeling implementation in dine-in restaurants: The Public's knowledge, attitude and practices. *Archives of Public Health*, 75(1), 1–7. https://doi.org/10.1186/s13690-017-0177-9

Reale, S. and Flint, S.W. (2016). Menu labelling and food choice in obese adults: A feasibility study. *BMC Obesity*, 3, 17. https://doi.org/10.1186/S40608-016-0095-3

Remali, R., Ali, A., Zakaria, N.S. and Yusof, H.M. (2019). Assessing knowledge, attitude, practice towards type ii diabetes mellitus and their blood glucose level among public in selected areas of Bachok district, Kelantan. *Malaysian Applied Biology*, 48(1), 145–155.

Salihah, N., Lua, P.L., Ahmad, A. and Nerus, K. (2017). "Candi™": A Malaysian-Tailored Dietary Smartphone App For Cancer Patients And Survivors. *Malaysian Journal of Public Health Medicine*, Special Volume(2), 32-40.

Schwartz, M.B., Brownell, K.D. and White, M.A. (2013). Calorie estimation accuracy and menu labeling perceptions among individuals with and without binge eating and/or purging disorders. *Eating and Weight Disorders - Studies on Anorexia, Bulimia and Obesity*, 18, 255–261. https://doi.org/10.1007/s40519-013-0035-x

Song, J., Huang, J., Chen, Y., Zhu, Y., Li, H., Wen, Y., Yuan, H. and Liang, Y. (2015). The understanding, attitude and use of nutrition label among customers (China) | El conocimiento, la actitud y el uso de la etiqueta nutricional entre los consumidores (China). *Nutricion Hospitalaria*, 31(6), 2703–2710. https://doi.org/10.3305/nh.2015.31.6.8791

Tariman, J.D., Berry, D.L., Halpenny, B., Wolpin, S. and Schepp, K. (2011). Validation and testing of the Acceptability E-scale for Web-based patient-reported outcomes in cancer care. *Applied Nursing Research*, 24(1), 53–58. https://doi.org/10.1016/j.apnr.2009.04.003

van der Laan, L.N., de Ridder, D.T.D., Viergever, M.A. and Smeets, P.A.M. (2012). Appearance matters: Neural correlates of food choice and packaging aesthetics. *PLoS ONE*, 7(7), 0041738. https://doi.org/10.1371/journal.pone.0041738

Vanderlee, L., White, C.M. and Hammond, D. (2019). Evaluation of a voluntary nutritional information program versus calorie labelling on menus in Canadian restaurants: A quasi-experimental study design. *International Journal of Behavioral Nutrition and Physical Activity*, 16(1), 1–10. https://doi.org/10.1186/s12966-019-0854-x

Yepes, M.F. (2015). Mobile Tablet Menus: Attractiveness and Impact of Nutrition Labeling Formats on Millennials' Food Choices. *Cornell Hospitality Quarterly*, 56(1), 58–67. https://doi.org/10.1177/1938965514546371