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Research Article
Effectiveness of Front-of-Package Traffic Light (FoPTL) Labels in Selected Young Adults' Acceptance and Comprehension

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Abstract

Background and Objective: Many studies have examined the impact of Front-of-Package Traffic Light (FoPTL) labels on consumers' acceptance and comprehension of nutritional information; however, very few have focused on Indonesia. The objective of this study was to evaluate young adult consumers' acceptance and comprehension of nutrition facts using FoPTL nutrition labels. **Methodology:** A quasi-experimental design was used for a three-week study that included 18 female employees as its treatment group. The participants' initial comprehension of nutrition was measured prior to the intervention via the use of fictitious packaging for yoghurt, instant noodles and wafer products. Subsequently, the participants attended two educational sessions as part of the intervention. One week following the second educational session, a posttest of the subjects' acceptance and comprehension of nutrition using FoPTL nutrition labels was conducted. The difference between the two variables before and after the study was analyzed using a paired t-test. **Results:** The findings revealed an improvement in the participants' comprehension of nutrition labels after the intervention (87.0 ± 9.0), which was significantly higher than their initial comprehension rate (51.5 ± 19.1). Although, subjects with high levels of label acceptance had better comprehension of nutrition labels, no significant relationship was found between the two variables. FoPTL labels enable consumers to comprehend nutrition facts disclosed on the labels. Meanwhile, labels containing a nutrition facts panel (NFP) ranked below FoPTL labels in this study. As evidenced by the t-test results, there was a significant difference between use of the FoPTL and the use of NFP labels ($p<0.05$). **Conclusion:** As such, the National Agency of Drug and Food Control of the Republic of Indonesia (BPOM RI) and the Ministry of Health of the Republic of Indonesia should consider complementing the use of FoPTL labels with NFP labels.

Competing Interest: The authors have declared that no competing interest exists.

Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

The use of nutrition labels is believed to contribute greatly to the societal health objective of implementing a healthy diet, as recommended by the World Health Organization (WHO) in its Global Action Plan for the Prevention and Control of Non Communicable Diseases 2013-2020[1-3]. In 2014, back-of-package (BoP) or side-of-package labels serving as nutrition facts panels (NFP) were the world's most commonly used format for nutrition labels[4-5]. However, several studies have documented low level of satisfaction among consumers regarding the current format of nutrition labels. This is due to the complexity of the information provided, the technical nature of the nutrition labels, the use of difficulty to understand overly scientific language and low levels of nutritional literacy[6-7].

These limitations of BoP labels led international organizations, non-governmental organizations, industry associations and companies to develop a new front-of-package (FoP) labeling[4]. Major studies have investigated the effectiveness of FoP labels. A study conducted in four European countries found that multiple-traffic-light FoP labels scored higher in all measures of consumer acceptance[8]. Front-of-package traffic light (FoPTL) labels have been proved to be more appealing to consumers with regard to the readability of nutrition labels. Moreover, their ease of use has been found to help the consumers identify healthier food products[8-10]. A study on the use of nutrition labels in Canada revealed a significant decline in the total intake of energy (5%), total fat (13%), saturated fat (14%) and salt (6%) following the implementation of TL labels[11]. In Indonesia, there have been very few studies on FoPTL labels. A study on the use of the Traffic Light Card (TLC) system in Jogjakarta showed that consumers thought the TLC contained clear information, was easy to use and might benefit them when selecting healthier packaged food products, which was associated with the prevention of degenerative disease[12].

This study was conducted to investigate the impact of FoPTL label usage on consumers' comprehension of nutrition facts and food selection. Packaged food products are selected due to their ongoing increased production and consumers' tendency to eat them out of convenience. We conducted a study among young adult consumers between the ages of 25 and 40 years in order to reflect this age group's mobility and occupations. Given the study's focus on analyzing the usage of FoPTL labels in urban areas, Depok City was deemed ideal as the research location. Our rationale for selecting this location was also based on the ease with which packaged food products can be accessed and the tendency of urban individuals of working age to consume packaged food products.

MATERIALS AND METHODS

The research design employed was pre-experimental with a pretest and posttest group. Ethical approval for the study was obtained from the Faculty of Public Health, Universitas Indonesia (UI). Purposive sampling was employed, with the following inclusion criteria: (1) The respondent was aged between the ages of 25 and 45, (2) The respondent was a female who was responsible for determining and selecting the majority of the food products to be consumed by herself or her family (i.e., the respondent was the primary food shopper/food purchaser) and (3) The respondent actively purchased and consumed packaged food products (a minimum of four times per week). The following exclusion criteria were also applied to the sample: (1) The respondent or any of his/her relatives worked in the health or food industry and (2) The respondent had previously attended a nutrition or culinary course. The materials used in the study were packaged food products featuring nutrition labels and educational media in the form of booklets. The NFP (BoP) labels were acquired from packaged food products available in the market. The choice of packaged food products for use in the study was based on several factors, namely, the ease with which they could be sourced, how often they were consumed and brand variety. Sales figure were used to ascertain the type of packaged food product to be used. The packaging for food products was made by a designer. The FoPTL label color scheme used was adapted from the FoPTL label guide issued by the Food Standards Agency (FSA) and adjusted in-line with the consumption recommendations set for the Indonesian people. The FoPTL label components used also conformed to the provisions established by the FSA.

The subjects' initial understanding of nutrition labels was tested at the beginning of the study (pretest) using a nutrition label use task, which featured the use of NFP labels on fictitious packaging. The first educational session on FoPTL labels was held following the conclusion of the pretest. Seven days after the commencement of the first educational session, the second educational session was held, aimed at explaining how to use the FoPTL labels to select healthier food products. One week after the last educational session, we measured the subjects' comprehension and acceptance of nutrition labels by providing them with FoPTL labels on an imaginary packaged product. We employed a Chi-square test to evaluate the association between the individual characteristics and NFP

label reading behavior. A paired t-test was used to examine the difference in the subjects' comprehension and acceptance of nutrition labels between the pre-test and post-test. An independent t-test was conducted to assess the impact of the subjects' nutritional knowledge on their comprehension at the posttest stage.

RESULTS

In terms of their educational background, most of the participants held a bachelor's degree (83.3%), while only a few were high school graduates, held a diploma and had a master's or doctoral degree. Regarding their marital status, the majority of the participants were married (66.7%). Our research participants had monthly incomes in the range of <IDR 3,000,000-IDR 5,000,000; 66.7% of the participants had monthly incomes below IDR 3,000,000 and 33.3% had monthly incomes within the range of IDR 3,000,000-IDR 5,000,000 (Table 1). The data displayed in Table 1 indicate that household composition was largely dominated by adults and adolescents (55.6%). Our findings regarding participants' perceptions of their body shape indicated that 50.0% of the subjects considered themselves normal and 5.6% believed they were obese. Our findings show that the nutritional status

Table 1: Characteristic of socio-demography, body image perception and all variable related to nutrition and health

Variables	No.	Percentage	Non-user NFP label (%) n = 14 (77.8%)	User NFP label (%) n = 4 (22.2%)	p-value
Last education					
Graduated from senior high school	1	5.6	5.6	0.0	1.000
Graduated from diploma/academy	17	94.4	72.2	22.2	
Marital status					
Single	5	27.8	22.2	5.6	0.838
Married	12	66.7	50.0	16.7	
Death divorce	1	5.6	5.6	0.0	
Monthly income (IDR)					
<3,000,0000	12	66.7	55.6	11.1	0.569
>3,000.000,00-5,000,000	6	33.3	22.2	11.1	
Household composition					
Only adult	8	44.4	33.3	11.1	1.000
Adult people and children	10	55.6	44.4	11.1	
Body image perception					
Underweight	5	27.8	22.2	5.6	0.916
Normal	9	50.0	38.9	11.1	
Overweight	3	16.7	11.1	5.6	
Obese	1	5.6	5.6	0.0	
Status gizi berdasarkan IMT					
Underweight	3	16.7	16.7	0.0	0.554
Normal	9	50.0	33.3	16.7	
Overweight	2	11.1	11.1	0.0	
Obese	4	22.2	16.7	5.6	
Health status perception					
Bad	1	5.6	5.6	0.0	0.619
Enough	7	38.9	27.8	11.1	
Good	8	44.4	38.9	5.6	
Very good	2	11.1	5.6	5.6	
Diet quality perception					
Ordinary	8	44.4	38.9	5.6	0.588
Quite healthy	10	55.6	38.9	16.7	
Healthy food consumption attitude					
Bad	12	66.7	38.9	11.1	1.000
Good	9	50.0	38.9	11.1	
Nutrition and health knowledge perception					
Bad	1	5.6	5.6	0.0	0.122
Enough	11	61.1	55.6	5.6	
Good	5	27.8	16.7	11.1	
Very good	1	5.6	0.0	5.6	
Nutrition					
Not good	8	44.4	38.9	16.7	0.588
Good	10	55.6	38.9	5.6	

Table 2: Mean difference of nutrition label use task category at pre-post test

Variables	Mean±DS	Value Minimum	Value Maximum	Mean±DS (difference inter measurement)	p-value
Mathematical manipulation					
Pre-test	76.4±29.0	0.0	100.0	9.7±22.9	0.090
Post-test	86.1±19.6	50.0	100.0		
Nutrient content interpretation					
Pre-test	30.6±28.2	0.0	87.5	60.4±28.2	0.000*
Post-test	91.0±13.4	62.5	100.0		
Single nutrient quality assessment					
Pre-test	44.4±37.9	0.0	100.0	50.0±42.0	0.000*
Post-test	94.4±16.3	50.0	100.0		
Two product quantitative comparison based on the single nutrient					
Pre-test	73.2±19.9	50.0	100.0	13.9±18.3	0.005*
Post-test	87.0±15.7	50.0	100.0		
Two products comparison based on whole nutrient quality					
Pre-test	35.2±2.3	33.3	39.6	43.9±6.1	0.000*
Post-test	79.2±5.2	66.7	86.7		
Total					
Pre-test	51.5±19.1	13.0	82.6	35.5±15.7	0.000*
Post-test	87.0±9.0	69.6	100.0		

*Significance level at $p < 0.05$

of the majority of the research participants (83.3%) was normal (50.0%), overweight (11.1%) and obese (22.2%). Most of the participants assumed that their health was good (44.4%), while 5.6% of participants considered their health to be at risk. Meanwhile, in terms of the quality of their diet, 55.6% of the participants reported consuming a healthy diet and 44.4% reported an inadequate diet.

Table 1 shows that half of participants consumed healthy food in order to maintain their health and fitness and that only a small percentage reported a preference for food taste and price. Based on the data for perception of nutritional and health knowledge, it was evident that most of the participants (61.1%) had a sufficient level of nutritional knowledge but very few claimed to have either a very good or poor level of nutritional knowledge. Overall, the results of the statistical analysis revealed no significant relationship between any of the individual characteristics and the use of NFP labels. Nonetheless, the data demonstrated that the subjects who used NFP labels were highly educated, married, had an adequate nutritional status and normal body shape and had good health, healthy diet quality and a good perception of nutritional knowledge.

As depicted in Table 2, the participants' comprehension of nutrition facts labels, as demonstrated by the reduction in all categories of the nutrition label use test. The mean difference in nutrition label comprehension was most visible on several questions, namely, the interpretation of nutrition contents (60.4±28.2), measurement of health status from one type of nutrient (50.0±42.0), comparison between two products based on a single nutrient (13.9±18.3) and comparison between two products according to overall

Table 3: Acceptance level of FoPTL

Category	No.	Percentage
Low (<mean)	7	38.9
High (>mean)	11	61.1
Total	18	100

nutrition quality (43.9±6.1). Participants found the questions on comparing two products based on overall nutrition quality and selecting healthier products to be too complex and no participant achieved the maximum posttest score of 100.0. Table 2 also shows the significant difference between the pretest and posttest scores. The acceptance measure was divided into three aspects: likability (which consisted of four statements), attractiveness (which also involved four statements) and perceived cognitive workload (also with four statements). The analysis found that 10 out of 13 questions were positive statements, while the remaining questions were negative statements.

DISCUSSION

A large proportion of the participants responded correctly to <50% of the questions at the pretest. The question that had more than 50% correct responses was 'mathematical manipulation and quantitative comparison of two products to determine the product which had the lowest nutrients. This figure was supported by the mean value of the pretest score in the two categories of the aforementioned question and was larger than those for the other categories. The results of the measurement of nutrients facts labels in a study of preschool employees were similar to those of a study conducted in the USA in which the majority of the respondents were able to

perform a simple calculation of nutrition facts based on the quantitative information displayed on the nutrition label (3.9±1.6). This figure exceeded that for the respondents' ability to determine whether or not the nutrition contents presented on the nutrition labels were correctly measured (3.2±0.7)[13].

Another study on nutrition labels affirmed the ability of consumers to manipulate the information the labels contained. In this study, 150 respondents in the USA aged 25-45 years were capable of performing this task (4.66±0.7)[14]. A previous study on also revealed a similar figure, where 80% of the respondents were able to easily identify the difference between the nutrition contents of two products. The participants' performance on the nutrition label use task and familiar categories was robust. However, it was reduced when categories became more complex[15]. The participants low comprehension on the 'evaluation/interpretation of nutrients' section might have been influenced by their nutritional knowledge even though there was no difference in the mean knowledge pretest scores between the groups on the pretest score despite the groups having different levels of nutritional knowledge. The root cause of this phenomenon was the absence of a question concerning nutritional knowledge in the questionnaire. Moreover, the low comprehension was influenced by the participants' lack of knowledge regarding recommended nutritional intake, which would have enabled them to compare the nutrient content displayed on the labels with what was actually contained within the package[15-16].

Aside from their nutritional knowledge, a lack of education on nutrition also served as a contributing factor to the consumers' low comprehension of the information displayed on the nutrition labels. This hypothesis was proven by the participants' responses stating that they did not frequently access seminars or lectures on nutrition. The participants' knowledge of nutrition improved after the intervention. This improvement was strongly evident in their knowledge on the nutrition label use task, which demanded a higher rate of information processing. Hence, the education and design of the nutrition facts label employed in the present study proved to be effective in helping consumers to comprehend the information displayed on nutrition labels. Moreover, our results revealed a high acceptance rate of FoPTL labels. A study of nutrition labels in the USA demonstrated that good nutritional education is highly associated with increased comprehension of nutrition labels. The study results revealed a spike in accuracy in the three tests performed (describing information disclosed on the nutrition labels, finding specific information and selecting healthier products)[17].

A study on FoPTL labels in the United Kingdom found that those containing the TL colors, percentage of Recommended Dietary Allowance (RDA) and an interpretation of the text had the highest performance and capability in terms of helping consumers to evaluate the products' nutrient content as well as the overall nutrition quality of a product. Overall, mixed findings have been reported for studies that assessed the impact of FoPTL and NFP labels on consumers' selection of healthy food products. A study reported that FoPTL labels rank lower than NFP labels on the ability to help consumers make healthier food product selections[18]. However, several studies have reported the contrary, with FoPTL labels being better than NFP labels in ensuring that consumers select healthier food products[19-21]. The TL colors and interpretation text were components of the FoPTL label that made them stand out from the other nutrition labels. This labeling format demanded a lower cognitive workload (i.e., time and complexity to process information) due to the intuitive nature of the color-coding[22-23].

CONCLUSION

In summary, this study on the impact of FoPTL nutrition labeling on young adult consumers' acceptance and comprehension found that education and the FoPTL label format can help consumers process and comprehend information displayed on nutrition labels. Critically, this finding demonstrates that FoPTL labels are more informative than the conventional NFP labels. Furthermore, the high acceptability of FoPTL labels signals their applicability for practical use and their potential to help achieve the implementation of nutrition labels, which in turn can assist consumers in choosing healthier food products. We hope that this study will significantly help policymakers (National Agency of Drug and Food Control of Republic of Indonesia (BPOM RI) and Ministry of Health of Republic of Indonesia) to create a pro-nutrition labeling policy for use with packaged food, as well as to provide educational media for all age groups. Furthermore, we hope that this research will encourage producers of packaged food to evaluate the nutritional quality of their products to ensure that it complies with the RDA stipulated by the government.

SIGNIFICANCE STATEMENT

This study found that the FoPTL is associated with higher levels of acceptance and comprehension among young adult females. This study will help researchers to uncover a critical area of food labeling that many have not explores. Thus, a new theory on this type of nutrition labeling may be developed.

ACKNOWLEDGMENTS

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