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# A causal model of health promoting behaviors among university students

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## ABSTRACT

In this study, the consistency of an assessment model for students' health-promoting behaviors was accessed with the empirical data. The direct and indirect effects of variables on health-promoting behaviors among undergraduate students of Loei Rajabhat University were explored. Study tools included questionnaires for health-promoting behaviors, perceptual factors, influential factors, and personal attribute factors. Data were analyzed using basic statistics and linear structural equation analysis. The causal model of health-promoting behaviors among 360 students agreed with the empirical data. Health-promoting behaviors were significantly affected by influential factors, perceptual factors, and personal attribute factors and were indirectly affected by perceptual factors and personal attribute factors. Influential, perceptual, and personal attribute factors accounted for 87.5% of the variance of health-promoting behaviors.

**Keywords:** health-promoting behavior; causal model

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## 1. INTRODUCTION

The Office of the National Economic and Social Development Board formulated the twelfth national economic and social development plan, 2017-2021 containing ten strategies. (Office of the National Economic and Social Development Council, 2017). The first strategy aimed to prepare human capital focusing on capacity development for people of all ages and all walks of life to enhance their skills, knowledge, and capabilities. This strategy sought to reduce health risks and promote health-promoting behaviors. The first strategy also sought to initiate a mechanism to formulate public policies that consider impacts on health according to the concept of health-concerning policies. Finally, the strategy sought to develop environments and innovations suitable for an aging society. The second strategy aimed to create a just society and reduce inequality by focusing on ensuring universal access to quality public services, covering the areas of education, public health, infrastructures, and public welfare in up-country regions. This provision of services should occur in such a manner as to provide perfect coverage in aspects of both quantity and quality.

A survey of the National Statistical Office found that the rate of alcohol consumption and cigarette smoking among the Thai population aged 15 years and older increased, and teenage pregnancy was a severe problem in Thai society. (National Statistical Office, 2011). As a result, Thai newborns had a higher chance to suffer from development delay and to become underprivileged or abandoned, creating additional social problems. Data from Ministry of Public Health and the United Nations report showed that Thailand's teen birth rate (among those aged 15-19 years) was higher than the desired rate set at 10% by the World Health Organization. (United Nations Children's Fund (UNICEF), 2011). These behaviors

would negatively affect both the physical and mental health of adolescents.

Studies of health-promoting behaviors can help improve health status among adolescents and students. To measure improvement, we used six variables, including health responsibility, physical activity, nutrition, interpersonal relation, spiritual growth, and stress management, based on the work of Pender et al. (2006). A questionnaire called the health-promoting life style profile II (HPLP-II), covering six aspects, is developed as follows: 1) health responsibility, assessing attention to self-care, including awareness of physical changes or symptoms, seeking useful information and knowledge, seeking health services, and avoidance of addictive substances and alcoholic beverages, to reduce exposure to health risks; 2) physical activity, referring to the movement of muscles and parts of the body that consume energy, including physical exercise and activities of daily living in a way that places health status as a primary concern. 3) nutrition, covering dining practices, food habits, and choice of diets suitable for nutritional requirements covering all five food groups; 4) interpersonal relations, referring to creating relationships with other people in a way that pursues benefits and supports from others that could help solve problems or resolve a dilemma; 5) spiritual growth, referring to activities performed by individuals to express their awareness of the importance of life, the awareness of a purpose or a plan for leading their lives and performing their activities enthusiastically to achieve a desirable goal and peaceful happiness in life; and 6) stress management, referring to activities performed by individuals to obtain relief from stress by expressing emotions in appropriate ways, using their leisure time in useful ways, and ensuring obtaining sufficient rest. Three factors affecting the development of health-promoting behaviors are developed based on the concept of the social learning theory of Bandura (1997). The theory states that outcomes of a behavior derive from cognition and emotions that are specific to such behavior; and personal attributes and individual experiences. These factors include 1) perceptual factors, measurable through three observed variables, i.e., perceived self-efficacy, perceived barriers, and perceived benefits, which (a) receive direct influence from personal attributes, (b) impose direct influence on influential factors and health-promoting behavior variables, and (c) impose indirect influence on health-promoting behavior variables; 2) influential factors, measurable through two observed variables, i.e. interpersonal influences and situational influences, which (a) receive direct influence from perceptual factors, (b) receive direct and indirect influences from personal attribute factors, and (c) impose direct influence on health-promoting behavior variables; and 3) personal attributes, measurable through two observed variables, i.e., prior related behaviors, and perceived health status, which (a) impose direct influence on perceptual factors and personal attribute factors; and (b) impose direct and indirect influences on health-promoting behavior variables.

This study conducted in undergraduate students, who had adjusted themselves from the adolescent period into early adulthood and had to learn to adapt behaviors and lifestyles during this turning point of life (Saravirote and Janyam, 2014). Therefore, the aim of this work was to study a causal model of health-promoting behaviors to sort out the behaviors and factors possessing direct and indirect effects on health-promoting behaviors of university students.

## 2. MATERIALS AND METHODS

### 2.1 Study population and samples

This study was a descriptive study exploring the causal relationships of health-promoting behaviors among Loei Rajabhat University students. The study population was 12,330 undergraduate students of Loei Rajabhat University in the academic year 2019. The ratio between the number of sample units and the number of parameters, to define the sample size, was 30 to 1; therefore, the sample size would be at least 360 students. The students were recruited using stratified random sampling from undergraduate students of five faculties in Loei Rajabhat University, including 94 students from Faculty of Education, 77 students from Faculty of Science and Technology, 82 students from Faculty of Humanities and Social Sciences, 94 students from Faculty of Management Science, and 13 students from Faculty of Industrial Technology.

### 2.2 Confidentiality rights

According to the principle of research ethics, the participants' rights were protected as approved by the Institutional Review Board of Loei Rajabhat University (approval number HE 024/2561 (2018), issued on 25 October 2018).

### 2.3 Study variables

The exogenous latent variables were the personal attribute factors measuring from two observed variables: 1) prior related behaviors; and 2) perceived health status.

Mediator variables included 1) perceptual factors measuring from three observed variables, i.e., perceived self-efficacy, perceived barriers, perceived benefits; and 2) influential factors measuring from two observed variables, i.e., interpersonal influences and situational influences.

The endogenous latent variables were health-promoting behaviors measuring from six observed variables, including 1) health responsibility; 2) physical activity; 3) nutrition; 4) interpersonal relations; 5) spiritual growth; and 6) stress management.

### 2.4 Conceptual framework

The causal model of health-promoting behaviors among Loei Rajabhat University students was developed (Figure 1).

### 2.5 Data collection tools

The data collection tools were four assessment questionnaires, including five-level rating scale question items, including a health-promoting behaviors questionnaire, a perceptual factors questionnaire, an influential factors questionnaire, and a personal attribute factors questionnaire. For content validation, five experts reviewed the questionnaires for consistency of each question item (for each variable) against the terms or definitions using the reviewer's index of consistency. Valid question items were those with validity values ranging from 0.50 to 1.00. The questionnaires were then adjusted according to expert recommendations and tested the questions with 200 students who did not participate in the study. The preliminary test results were analyzed to determine the corrected item-total correlation (CITC) using the Pearson product-moment coefficient correlation. The analysis results showed that CITC of health-promoting behavior questionnaire ranged from 0.395 to 0.793, and its reliability value was 0.950.

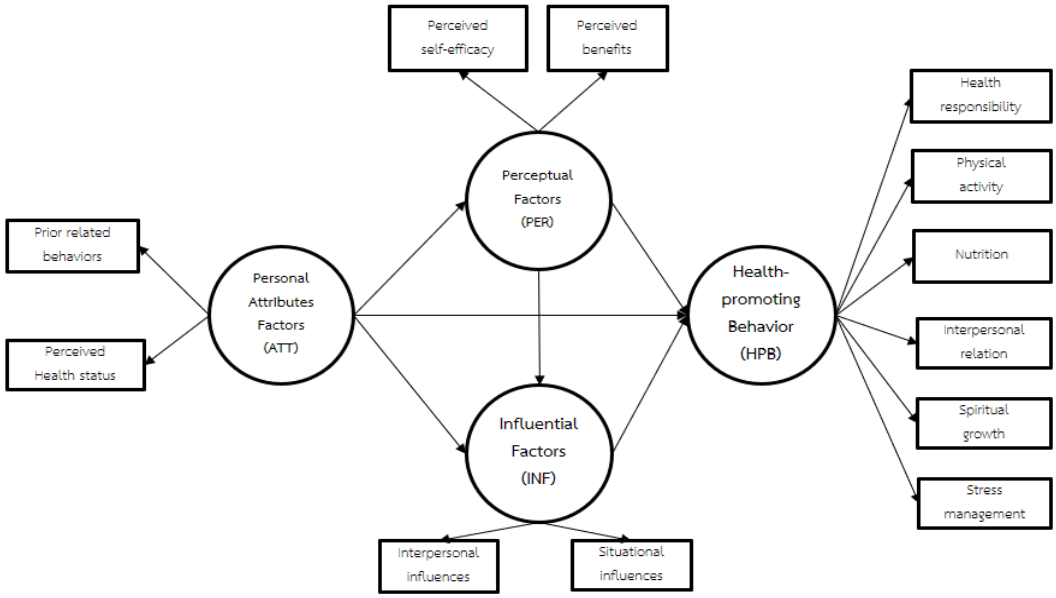


**Figure 1.** The causal model of health-promoting behaviors

Analysis showed correlations among the observed variables (29 items), suggesting that the question items correlated with one another with correlation coefficients ranging from 0.099 to 0.851, Bartlett's test of sphericity $\chi^2$ = 3720.170, p = 0.000, and df = 406. These findings suggested that the correlation matrix between observed variables or indicators was significantly different from the identity matrix. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy index = 0.936, suggesting that observed variables or indicators correlated with one another and were suitable for inputs for factor analysis. Then, confirmatory factor analysis (CFA) was performed; the measurement model was consistent with the empirical data ($\chi^2$ =346.105, df = 312, $\chi^2$/df =1.109, p = 0.089, goodness of fit index (GFI) = 0.893, adjust goodness of fit index (AGFI) = 0.851, and root mean square error of approximation (RMSEA) = 0.02, standardized root mean square residual (SRMR) = 0.053, suggesting that each factor in the measurement model represented the same latent variable. The CITC of the perceptual factors questionnaire ranged from 0.578 to 0.711, and its reliability value was 0.884. Quality assessment for question items in the measurement model for perceptual factors by analyzing correlations among the observed variables (eight items) showed that the question items correlated with one another with correlation coefficients in the range of 0.098 to 0.817, Bartlett's test of sphericity $\chi^2$ = 1101.344, p = 0.000, and df = 28. These findings suggested that the correlation matrix between observed variables or indicators was significantly different from the identity matrix. The KMO index was 0.835, suggesting that the observed variables or indicators were correlated with one another and were suitable for inputs for factor analysis. CFA results showed that the measurement model was consistent with empirical data ($\chi^2$ = 22.298, df = 17, p = 0.174, GFI = 0.974, AGFI = 0.945, RMSEA = 0.0396, SRMR = 0.095), implying that each factor in the measurement model represented the same latent variable.

The CITC of the influential factors questionnaire ranged between 0.700 and 0.797, and its reliability value was 0.942. Quality assessment for question items in the measurement model for influential factors by analyzing the correlation among the observed variables showed that ten question items correlated with one another with correlation coefficients ranging from 0.455 to 0.830 and Bartlett's test of sphericity $\chi^2$ = 1682.441, p = 0.000, and df = 45. These findings suggested that the correlation matrix between observed variables or indicators was significantly different from the identity matrix. The KMO index was 0.922, suggesting that observed variables or indicators correlated with one another and were suitable as inputs for factor analysis. CFA results showed that the measurement model was consistent with empirical data ($\chi^2$ = 36.255, df = 28, p =0.136, GFI = 0.965, AGFI = 0.931, RMSEA = 0.039, SRMR = 0.031), suggesting that each factor in the measurement model represented the same latent variable. The CITC of the personal attribute factors questionnaire ranged between 0.712 and 0.820, and its reliability value was 0.943. Quality assessment for question items in the measurement model for personal attributes factors by analyzing the correlation among the observed variables showed that the question items correlated with one another with correlation coefficients ranging from 0.501 to 0.787 and Bartlett's test of sphericity $\chi^2$ = 1599.866, p = 0.000, df = 45, implying that correlation matrix between observed variables or indicators was significantly different from identity matrix. The KMO index was 0.920, suggesting that observed variables or indicators correlated with one another and were suitable for factor analysis inputs. CFA showed that the measurement model was consistent with empirical data ($\chi^2$ = 35.158, df = 27, p = 0.135, GFI = 0.966, AGFI = 0.930, RMSEA = 0.039, SRMR = 0.022), suggesting that each factor in the measurement model represented the same latent variable.

## 2.6 Data analysis

The completed questionnaires were scored according to set the criteria and analyzed using basic statistics, i.e., mean, standard error, standard deviation, and maximum-minimum values. The outlier detection was done using a boxplot. Normality was tested by considering skewness and kurtosis. An analysis was done using Pearson's correlation coefficients and the consistency of the measurement model for latent

variables was determined using exploratory factor analysis and CFA. The consistency between the hypothesized model and empirical data and the index of goodness of the fitted model were determined using the LISREL 8.30 Thailand program. The causal relationship model's path coefficient was analyzed using the direct effect, indirect effect, and total effect of the variables within the model to explore the direct and indirect effects on health-promoting behaviors.

## 3. RESULTS

### 3.1 Measurement model for health-promoting behaviors

CFA showed that the measurement model was consistent with empirical data considering the following key indexes: $\chi^2$ = 275.491, df = 242, and $\chi^2$/df = 1.138 ($p$>0.05). GFI = 0.950, AGFI = 0.910, RMSEA = 0.019, and SRMR = 0.035, implying that each factor in the measurement model represented the same latent variable. In this regard, for each component: health responsibility, factor loading ($\lambda$)= 0.915, coefficient of determination ($R^2$) = 0.837, and the variation of measurement error for observed variables ($\hat{\sigma}^2(\delta)$) = 0.163; physical activity , $\lambda$ = 0.907, $R^2$ = 0.823, and $\hat{\sigma}^2(\delta)$ = 0.177; nutrition, $\lambda$ = 0.947, $R^2$ = 0.897, and $\hat{\sigma}^2(\delta)$ = 0.103; interpersonal relations, $\lambda$ = 0.776, $R^2$ = 0.602, and $\hat{\sigma}^2(\delta)$ = 0.398; spiritual growth, $\lambda$ = 0.935, $R^2$ = 0.874, and $\hat{\sigma}^2(\delta)$ = 0.126; and stress management, $\lambda$ = 0.960, $R^2$ = 0.922, and $\hat{\sigma}^2(\delta)$ = 0.078. The construct reliability of latent variables ($\rho_c$) = 0.966 and the average variance extracted ($\rho_v$) = 0.826 (Figure 2).

### 3.2 Casual model of the factors affecting health-promotion

The casual model of the factors that affected health-promotion behaviors in line with the hypothesis was consistent with the empirical data ($\chi^2$ = 52.162, df = 41, p = 0.114, GFI = 0.976, AGFI = 0.955, CFI = 0.999, RMSEA = 0.027, SRMR = 0.018). Considering the direct and indirect effects (in the form of standard values) imposed on the variables of health-promoting behaviors showed that these variables received direct effects from personal attribute factors, influential factors, and perceptual factors with the effect sizes equal to 0.431, 0.359, and 0.219, respectively ($p$<0.05). HPB also received indirect effects from personal attribute factors and PER with effect sizes equal to 0.426 and 0.083, respectively ($p$<0.05). They worked together to predict 87.50% of health-promoting behaviors. Influential factors received direct effects from personal attribute factors and perceptual factors with effect sizes equal to 0.648 and 0.231, respectively ($p$<0.05). Influential factors received indirect effects from personal attribute factors with an effect size equal to 0.176 ($p$<0.05). Causal variables of personal attribute factors and perceptual factors worked together to predict 70.10% of influential factors. Finally, perceptual factors received direct effects from personal attribute factors with an effect size equal to 0.761 ($p$<0.05). Causal variables of personal attribute factors predicted 57.90% of perceptual factors (Table 1 and Figure 3).

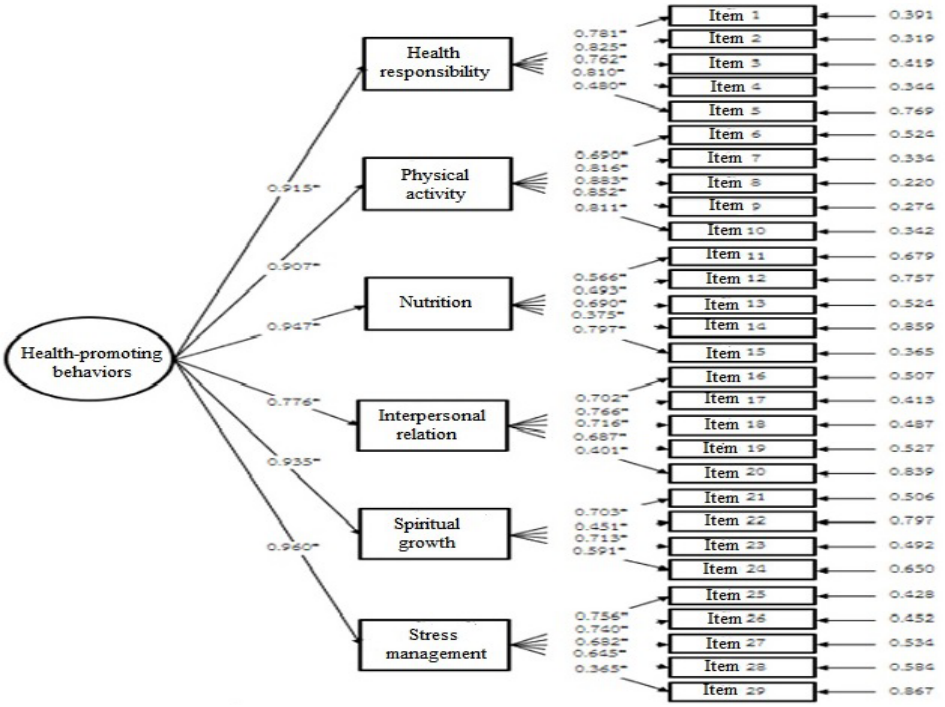


**Figure 2.** Measurement model for health-promoting behaviors

Note * $p$<0.05

**Table 1.** Direct effects, indirect effects, and total effect in the form of a standard value of the model for health-promoting behavior that received casual effects from perceptual factors, influential factors, and personal attribute factors

| Dependent variables | $R^2$ | Effects | Independent variables | | |
|---|---|---|---|---|---|
| | | | Influential factors | Perceptual factors | Personal attributes factors |
| Health-promoting behavior | 0.875 | DE | 0.359* (SE =0.048,t = 5.147) | 0.219* (SE =0.057,t = 3.369) | 0.431* (SE =0.043,t = 5.682) |
| | | IN | | 0.083* (SE =0.027,t = 2.728) | 0.463* (SE =0.047,t = 3.063) |
| | | TE | 0.359* (SE =0.048,t = 5.147) | 0.302* (SE =0.061,t = 4.298) | 0.894* (SE =0.032,t = 15.926) |
| Influential factors | 0.701 | DE | | 0.231* (SE =0.096,t = 3.067) | 0.648* (SE =0.061,t = 8.656) |
| | | IN | | | 0.176* (SE =0.047,t = 3.063) |
| | | TE | | 0.231* (SE =0.096,t = 3.067) | 0.824* (SE =0.041,t = 16.302) |
| Perceptual factors | 0.579 | DE | | | 0.761* (SE =0.037,t = 13.372) |
| | | IN | | | |
| | | TE | | | 0.761* (SE =0.037,t = 13.372) |
| $\chi^2$ = 52.162, df = 41, p-value = 0.114, $\chi^2$/df = 1.272, GFI = 0.976, AGFI = 0.955, CFI = 0.999, RMSEA = 0.027, SRMR = 0.018, CN = 445.160 | | | | | |

Note: DE, direct effects; IE, indirect effect; TE, total effect; SE, standard error; t, t-value; $\chi^2$, chi-square; df, degree of freedom; $\chi^2$/df, relative chi-square); GFI, goodness of fit index); AGFI, adjusted goodness of fit index; CFI, Comparative fit index; RMSEA, root mean square error of approximation; SRMR, standard root mean square residual; CN, critical N

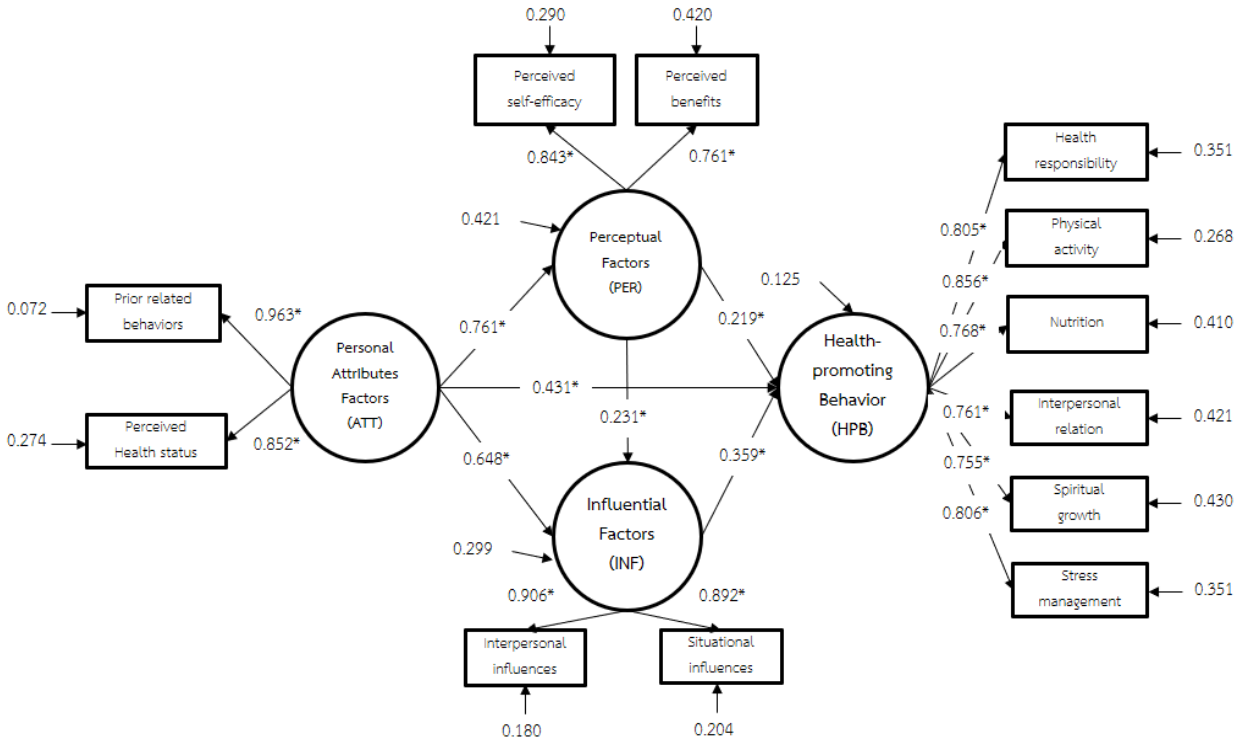


**Figure 3.** Parameter values after adjusting the model of HPB that received casual effects from perceptual factors, influential factors, and personal attribute factors
Note * $p$<0.05

## 4. DISCUSSION

The measurement model for health-promoting behavior of Loei Rajabhat University students was consistent with empirical data, suggesting that each factor in the measurement model represented the same latent variable. It is assumed that this model (by reviewing the variables related to health-promoting behavior of Pender et al. (2006) and based on a literature review regarding the six factors of health-promoting behavior) represented the same latent variables. (Sutherasan and Jumgpaiboonpatana, 2011; Wattanakitkrileart et al., 2011). As listed in a hierarchical order by their weights from the heaviest to the lightest, the standard weight of each factor in the health-promoting behavior model was as follows.

***Stress management***

When the students felt stressed, they might have used a variety of coping strategies. For example, they could speak to themselves to alleviate such feelings, do physical exercise in the form of playing sports, listen to religious teachings or practice breath control to reduce stress, tell their troubles to someone around them, or perform other activities (such as going to a movie, listening to music, playing a game). In this manner, the students could enjoy themselves and reduce the stress of studying and other daily life stressors.

***Nutrition***

Students might have engaged in acceptable dining practices. For example, they washed their hands every time before having a meal, avoided high-fat diets, ate all five food groups at every meal, declined to eat fast foods as often, and chose diets based on nutritious values.

***Spiritual factors***

The students might have viewed their lives as worth preserving despite their imperfections. Also, students lived their lives for their parents, siblings, or custodians; this way, they could lead their lives happily amidst conflicts in family or society. When they became ill, they would tend to change some habits for the better.

***Health responsibility***

Students might have taken good care of their health, remained vigilant for any abnormal symptoms, sought useful information and knowledge to promote their health, and avoided addictive substances and alcoholic beverages to remain safe from health hazards.

***Physical activity***

Students might have exercised and performed activities in daily life in a manner that took their health into account as a significant concern. They always assess the methods and regularity of their exercise. They tried to maintain a balance inside their bodies in doing various activities (i.e., not too minimal and not too excessive).

***Interpersonal relations***

The possible reason might be that the students generally socialized with friends or persons whom they liked. They felt comfortable with exchanging opinions with their friends in performing group assignments. They agreed to listen to their friends' different opinions and did not blame their friends for mistakes when doing group work.

Personal attribute factors had direct effects on health-promoting behaviors and had indirect effects on perceptual and influential factors. An explanation could be that health-promotion is essential to the practice of self-care (Panyasai et al., 2014). Because Loei Rajabhat University students have personal attributes that refer to each individual's personality, characteristics, and experiences, such attributes would affect how they would execute an action. Prior behaviors would affect current health-promoting behaviors. This finding is consistent with a study that found that prior health-promoting behaviors highly positively correlated with current health-promoting behaviors (Putthong, 2008). Perceived health status would persuade students to develop health-promoting behaviors. Such personal attribute factors also caused the students to develop influential factors (i.e., interpersonal and situational influences) as well as perceptual factors (i.e., perceived self-efficacy and perceived benefits) that would affect health-promoting behaviors as well. This might be because prior health-promoting behaviors consisted of positive negative experiences that would influence on their emotions and thoughts toward the relevant behaviors. Therefore, if the students had positive experiences performing health-promoting behaviors in the past, they would again engage in such behaviors. It might also be that the students self-assessed regarding their physical, mental, and social status and whether they had continuity of wellness and illness during a given period. This finding is consistent with Sutherasan and Jumgpaiboonpatana, (2011) who showed that prior behaviors have positive health-promoting behaviors among professional nurses. Another study on perceived health status found positive correlation with health-promoting behaviors among civil servants in the Royal Household Bureau (Oungwattanaphaisan, 2006). Based on these data, it can be concluded that if the students possessed personal attribute factors (i.e., prior health-promoting behaviors and perceived health status), this would help them develop health-promoting behaviors. Such prior experiences would also help students develop influential and perceptual factors that would contribute to the development of health-promoting behaviors.

Influential factors had direct effects on health-promoting behaviors. The students might possess influential factors related to latent capabilities such that they could pursue anything as they wished or achieve self-determined goals. These capabilities could convince others to agree with them or to imitate their actions (i.e., interpersonal and situational influences). In this manner, students might develop positive health-promoting behaviors. Interpersonal influences included reinforcement and support for the development of health-promoting behaviors from families, relatives, friends, public health workers, and related agencies and the expectations of people important to them. Such persons acted as role models and social exemplars. This finding is consistent with those of a study on factors affecting health-promoting behaviors, which found that interpersonal influences directly affect health-promoting behaviors (Isalam, 2014). Another study found that interpersonal influences have a moderate level of positive correlation with health-promoting behaviors (Konkaew et al., 2011). Nevertheless, another found that interpersonal influences positively correlate with health-promoting behaviors among professional nurses (Sutherasan and Jumgpaiboonpatana, 2011).

Situational influences among the students derived from the perceived condition that served to support fulfilling their needs and ensuring the smoothness of the environment for their performance. The students would choose to perform an activity that appeared to be compatible with their lifestyle, environment, and the feeling of being safe and secure while performing health-promoting behaviors. This finding is

consistent with those of a study that found that situational influences have indirect effects on health-promoting behaviors among older adults (Isalam, 2014). Another study found that situational influences have a moderate level of positive correlation with health-promoting behaviors (Konkaew et al., 2011). Based on all these findings, it can be concluded that if the students encountered interpersonal and situational influences, they would develop good health-promoting behaviors.

Perceptual factors had direct effects on health-promoting behaviors and indirect effects through influential factors. The students might possess perceptual factors related to psychological status underpinning their expressing their knowledge and thoughts derived from a process of receiving and interpreting stimuli based on previous experiences and personal attributes (i.e., perceived self-efficacy and perceived benefits). These factors would help the students develop good health-promoting behaviors, leading to decreased health-risk problems (Khamhaengphol et al., 2017). This finding is consistent with Isalam (2014) who found that the factor with the most decisive influence on health-promoting behaviors is perceived self-efficacy, and it imposed direct effects in a positive way. Konkaew et al. (2011) found that perceived self-efficacy has a moderate level of positive correlation with health-promoting behaviors. Another study found that perceived self-efficacy towards health-promoting behaviors has a significant positive correlation (Putthong, 2008). Such perceptual factors also served as causes for students to develop influential factors (i.e., interpersonal and situational influences) that would further impact health-promoting behaviors. It happened like this because perceived self-efficacy referred to students' belief toward their abilities to manage and pursue any activities until achieving success. Perceived self-efficacy did not involve any matters related to skills, but only their self-assessment of what they could do based on their existing abilities. The perceived benefits were sufficient stimuli for students to realize the benefits of health-promoting behaviors. If they perceived the benefits, they would perform health-promoting behaviors more actively. This finding is consistent with previous study (Konkaew et al., 2011) who found that the perceived benefits of performing the behaviors have low levels of positive correlation with health-promoting behaviors. Putthong (2008) found that health-promoting behaviors' perceived benefits positively correlate with health-promoting behaviors. Therefore, if the students possessed perceptual factors (i.e., perceived self-efficacy and perceived benefits), they could develop good health-promoting behaviors. These factors would also cause the students to develop influential factors that would further boost health-promoting behaviors.

## 5. CONCLUSION

The developed casual model of health-promoting behaviors of Loei Rajabhat University students was consistent with the empirical data. health-promoting behaviors received significant direct effects from influential factors, perceptual factors, and personal attribute factors and significantly received indirect effects from perceptual factors and personal attribute factors. The variables of influential, perceptual, and personal attribute factors worked together to describe 87.50% of the variance of health-promoting behaviors.

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