

## Research Article



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### Correspondence to

Ji-Yun Hwang

Major of Foodservice Management and Nutrition, Sangmyung University, 20 Hongjimun 2-gil, Jongno-gu, Sangmyung University, Seoul 03016, Korea.

Tel: +82-2-781-7521

E-mail: jiyunhk@smu.ac.kr


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### ORCID iDs

Dan Liu   
<https://orcid.org/0000-0003-2688-3908>

Seungwoo Lee   
<https://orcid.org/0000-0001-9883-4510>

Ji-Yun Hwang   
<https://orcid.org/0000-0003-4003-1293>

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There are no financial or other issues that might lead to conflict of interest.

# Factors related to the intention of healthy eating behaviors based on the theory of planned behavior: focused on adults residing in Beijing, China

Dan Liu <sup>1</sup>, Seungwoo Lee <sup>2</sup>, and Ji-Yun Hwang <sup>2</sup>

<sup>1</sup>Department of Foodservice Management and Nutrition, Graduate School, Sangmyung University, Seoul 03016, Korea

<sup>2</sup>Major of Foodservice Management and Nutrition, Sangmyung University, Seoul 03016, Korea

## ABSTRACT

**Purpose:** The theory of planned behavior (TPB) was used to investigate how the psychological constructs of attitude, subjective norms, and perceived behavioral control (PBC) affect the individual intention of behaviors in adults. Social support is also important in enabling the stability of healthy eating. This study examined the relationship between three major constructs of TPB as well as social support and the intention of healthy dietary behaviors in adults residing in Beijing, China using the extended TPB.

**Methods:** The study questionnaire was based on previously validated items and an online survey was conducted from October to November 2020. Using a total of 244 Chinese adults in Beijing, multiple linear regression analysis was used to test the relationships between three major constructs of TPB as well as the social support and intention of healthy eating.

**Results:** Among the three major constructs of TPB, subjective norms ( $p = 0.044$ ) and PBC ( $p = 0.000$ ) were significantly related to the behavioral intention of healthy eating ( $p = 0.000$ ), and the model explained 76.6% of the variance of the behavioral intention from the three constructs of TPB included in the multiple linear regression model. The additional inclusion of social support to the model did not increase the explanatory power of the model to describe the behavioral intention of healthy eating. The subjective norms ( $p = 0.040$ ) and PBC ( $p = 0.000$ ) were still significant where social support did not explain the variance of the behavioral intention adequately.

**Conclusion:** The subjective norms and PBC may be potential determinants of the behavioral intention of healthy eating in adults residing in Beijing, China. These study results can be used to promote healthy eating in Chinese adults living in urban areas. Large-scale intervention studies will be needed to determine if social norms and PBC predict the actual behaviors of healthy eating in Chinese adults.

**Keywords:** behavior, intention, healthy eating, social norms, behavior control

## INTRODUCTION

With rapid industrialization and economic growth, dietary life relies heavily on eating out due to social needs such as changes in family units and women's participation in society [1]. According to the survey data from Chinese residents' nutrition and health status in 2015, the

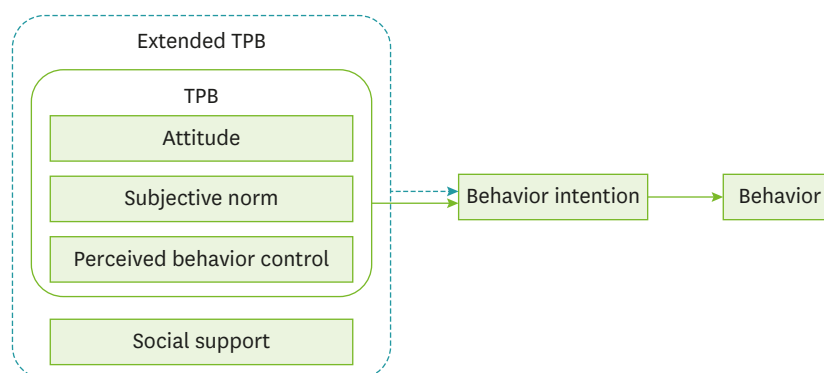
proportion of Chinese aged 6 years and over who eat out was greater in the urban (51.7%) than in the rural (39.1%) [2]. According to data from the National Bureau of Statistics, in 2017, the national catering revenue reached 4.0 trillion Yuan, a year-on-year increase of 10.7% [3]. Meals outside the home are more likely to provide high content of energy, total fat, saturated fatty acids, trans fatty acids, added sugars, and sodium [4-8] and thus those who eat out frequently or for a long time may have an increased risk of chronic diseases such as obesity and hyperlipidemia. In this era, healthy eating or intention of healthy eating is important to maintain health and prevent chronic disease risks.

The theory of planned behavior (TPB) is commonly used to investigate how the psychological constructs of attitude, subjective norms, and perceived behavioral control (PBC) affect individual intention of behaviors [9-11] and especially health related decision-making behaviors in adults [12-14]. The stronger the intention, the greater the likelihood that individuals will practice their actions [15]. Attitude is known as the degree to which an individual has a favorable or unfavorable evaluation of the behavior, subjective norms measure the importance others hold about performing or not performing a behavior and one's willingness to comply to those referents, and PBC describes the perceived ease or difficulty an individual has for practicing a behavior. PBC also directly affects behavior by accounting for factors outside an individual's control and especially for behaviors not under volitional control [9]. Practicing healthy eating habits are not easy and are not under complete control. In this regard, behavioral control may be an important determinant of behavior. The degree of intention of practicing healthy eating is significantly related to the likelihood of certain behavior [10]. Social support is also important in ensuring and enabling stability of healthy eating, as bridging social networks increases informal forms of support to obtain healthy food choices [16]. Therefore, as an environmental factor, degree of social support may affect individual intention to healthy eating differently. As the political, economic, and cultural center of China, people in Beijing have experienced rapid modern development. According to data of the China Statistical Yearbook, the expenditure on eating out per capita of urban households in Beijing increased 121% from 2003 to 2011 [17] with the acceleration of urbanization as well as increased income. Although these changes in dietary life style may be related to practicing healthy eating habits in people in Beijing, limited studies have existed to explore relationships between factors related to healthy eating. Therefore, this study examines relationships between three constructs of TPB as well as social support and intention of healthy eating in adults living in Beijing.

## METHODS

### Conceptual framework

In order to explain relationships between three major constructs as well as social support and the behavioral intention, the study used a conceptual framework based on the TPB suggested by Ajzen's [9,10] (Fig. 1). The study hypotheses according to the conceptual framework are as follows: first, three constructs of TPB, i.e., attitude, subjective norms, and PBC, may be related to intention of healthy eating behavior, and second, in addition to three major constructs of TPB, social support may be additionally related to intention of healthy eating behaviors, based on the extended TPB.



**Fig. 1.** A conceptual framework of the study. TPB, theory of planned behavior.

### Sampling population

The study population was Chinese adults residing in Beijing, China. From October to November 2020 an online survey was conducted using principles of snowballing and a survey link was circulated using social media such as the WeChat. A total of 250 adults living in Beijing voluntarily participated in an online self-filled questionnaire survey, 6 subjects with insufficient data were excluded, and a total of 244 subjects were finally eligible for the analysis. This study was approved by the Institutional Review Board (IRB) of Sangmyung University in October 2020 (SMUIRBC-2020-009).

### Study questionnaire

Data on age and sex were collected. Self-reported height (cm) and weight (kg) were calculated into body mass index (BMI) and categorized as  $< 18.5 \text{ kg/m}^2$ ,  $18.5\text{--}22.9 \text{ kg/m}^2$ ,  $23.0\text{--}24.9 \text{ kg/m}^2$ ,  $25.0\text{--}29.9 \text{ kg/m}^2$ ,  $\geq 30 \text{ kg/m}^2$ . Questions regarding healthy eating were obtained from previously validated items [18,19] and modification was made suitable for study population if needed. Attitudes toward healthy eating were measured by asking respondents to rate on a 5-point Likert scale for six evaluative adjectives that describe healthy eating including harmful-beneficial, useful-useless, good-bad, enjoyable-unenjoyable, boring-interesting, and desirable-undesirable [18]. The scores were reversed so that a large number represented positive attitude toward the behavior. The Cronbach alpha coefficient was 0.93.

Subjective norms were measured by asking respondents to rate on a 5-point Likert scale (1 = strongly agree to 5 = strongly disagree) for seven statements [20]: “My family think I should engage in healthy eating”, “My friends think I should engage in healthy eating”, “My classmates and/or co-workers think I should engage in healthy eating”, “Experts (doctor, nutritionists, etc.) think I should engage in healthy eating”, “The government authorities think I should engage in healthy eating”, “TV programs I watch think I should engage in healthy eating”, “Newspapers I read think I should engage in healthy eating”. We added one item regarding internet sources: “Internet information (blogs, YouTube, etc.) I read think I should engage in healthy eating.” The scores were converted so that a large number would represent positive subjective norms toward the behavior. The Cronbach alpha coefficient for eight items was 0.95.

PBC was assessed by asking respondents to rate on a 5-point Likert scale four questions about whether they perceived that they have control over healthy eating (1 = definitely yes to 5 = definitely no). The three questions included “Will you try hard to eat healthily?”, “Do you have

enough discipline to eat healthily?” and “Do you have enough time to eat healthily?”. These questions were adapted from a previous study [18]. We added one more questions: “Do you want to eat healthy no matter what the difficulties you have?”. The scores were converted so that high score would represent high PBC. The Cronbach alpha coefficient for four items was 0.88.

Social support was assessed by asking subjects to rate on a 5-point Likert scale four statements about whether they get social support for healthy eating (1 = definitely yes to 5 = definitely no): “There are fruits and vegetables fresh and ready to eat at home”, “There are healthy snacks at home (e.g., fruits, dairy products, nuts, etc.)”, “I or my family (spouse, parents, etc.) made a healthy meal for dinner”, “My family (spouse, parents, etc.) helped me eat fruits and vegetables (when I was with my family)”, “I prepared healthy snacks (such as fruits, dairy products, nuts, etc.) or meals (when I am with my family) with my family (spouse, parents, children, etc.)”. These questions were adapted from a previous study [21]. The scores were converted so that high score would represent high social support. The Cronbach alpha coefficient for four items was 0.94.

Behavioral intention was measured by asking subjects to rate on a 5-point Likert scale four statements including one from a previous study [19] about whether they are willing to engage in healthy eating (1 = definitely yes to 5 = definitely no): “I am willing to have a healthy meal within the next 2 weeks”, “I want to have a healthy meal in the next 2 weeks”, “I have a plan to have a healthy meal in the next 2 weeks”, “I would like to recommend healthy meals to my friends, family, and co-workers”. The scores were reversed so that a large number represented higher behavioral intention. The Cronbach alpha coefficient for four items was 0.91.

### Statistical analysis

Data were expressed as means with SD (continuous) or number and percentage (categorical). Multiple linear regression analysis was conducted to examine the relationships between three major constructs of TPB as well as social support and intention of healthy eating. Statistical analyses were performed with the SPSS software (Statistical Package for the Social Science, version 21.0; IBM, Armonk, NY, USA). Statistical significance was defined as  $p < 0.05$ .

## RESULTS

### General characteristics of the subject

Of the 244 Chinese adults living in Beijing, 136 (55.7%) were females and mean age were  $33.3 \pm 9.1$  years (**Table 1**). According to BMI, 61.1% were normal weight, whereas underweight, overweight, and obesity were 18.0%, 17.2%, and 3.7%, respectively.

### Constructs of TPB and social support

The mean values of statements of attitudes toward healthy eating ranged 3.51 (desirable-undesirable) to 3.70 (useful-useless) and the total average value was 3.61 (**Table 2**). The mean average scores of subjective norms regarding healthy eating were lowest at “TV programs I watch think I should engage in healthy eating” (3.52) and highest at “My family think I should engage in healthy eating” (3.68) and the total mean value of subjective norms was 3.60. The mean values of PBC questions ranged from 3.35 (“Do you want to eat healthy no matter what the difficulties you have?”) to 3.58 (“Will you try hard to eat healthily?”) and the total average score was 3.49. The average of statements of social support was from 3.53

**Table 1.** General characteristics of the subjects (n = 244)

Variables	Values
Sex	
Male	108 (44.3)
Female	136 (55.7)
Age (yrs)	
18–19	1 (0.4)
20–29	109 (44.7)
30–39	65 (26.6)
40–49	62 (25.4)
50–59	7 (2.9)
Mean ± SD	33.3 ± 9.1
BMI (kg/m <sup>2</sup> )	
Less than 18.5	44 (18.0)
18.5–22.9	149 (61.1)
23.0–24.9	42 (17.2)
25.0–29.9	8 (3.3)
≥ 30	1 (0.4)
Mean ± SD	21.5 ± 3.2

Values are presented as number (%).  
BMI, body mass index.

(“I or my family (spouse, parents, etc.) made a healthy meal for dinner”) to 3.72 (“There are fruits and vegetables fresh and ready to eat at home”) and the total mean value was 3.63. The mean value of statements of behavioral intention was ranged from 3.38 (“I would like to recommend healthy meals to my friends, family, and co-workers”) to 3.51 (“I am willing to have a healthy meal within the next 2 weeks”) and the total average was 3.42.

### Relationship between three constructs of TPB and behavioral intention

The overall results relating 3 constructs of TPB and intention of healthy eating are shown in **Table 3**. As subjective norms ( $p = 0.044$ ) and PBC ( $p = 0.000$ ) increase, behavioral intention of healthy eating increases and the model explains 76.6% of the variance of the behavioral intention.

### Relationship between three constructs of TPB as well as social support, and behavioral intention

Additional inclusion of social support to the model did not increase the explanatory power of the model to explain behavioral intention of healthy eating (**Table 4**). Subjective norms ( $p = 0.040$ ) and PBC ( $p = 0.000$ ) were still significant where social support did not significantly explain variance of the behavioral intention.

## DISCUSSION

This study investigated the relationships between the constructs of TPB as well as social support and intention of healthy eating behavior in adults residing in Beijing, China through an online survey. We found a strong relationship between major constructs of TPB and intention of healthy eating. Subjective norms ( $p = 0.044$ ) and PBC ( $p = 0.000$ ) were significantly related to behavioral intention of healthy eating ( $p = 0.000$ ) and the model explains 76.6% of the variance of the behavioral intention from the three constructs of TPB included in the multiple linear regression model. Social support was not significant and did not explain additionally of the variance of the behavioral intention. Our results suggest that subjective norm and PBC may be independent predictors for likelihood of actual healthy eating behaviors.

**Table 2.** Descriptive statistics of constructs of the theory of planned behavior of healthy eating and social support

Constructs	Statements or questions	Values
Attitude	A healthy diet is generally beneficial.	3.68 ± 1.15
	A healthy diet is generally useful.	3.70 ± 1.11
	A healthy diet is generally good.	3.67 ± 1.15
	A healthy diet is generally enjoyable.	3.54 ± 1.17
	A healthy diet is generally interesting.	3.57 ± 1.19
	A healthy diet is generally desirable.	3.51 ± 1.20
	Total	21.67 ± 6.97
	Mean	3.61 ± 1.00
Subjective norms	My family think I should engage in healthy eating.	3.68 ± 1.13
	My friends think I should engage in healthy eating.	3.55 ± 1.18
	My classmates and/or co-workers think I should engage in healthy eating.	3.59 ± 1.17
	Experts (doctor, nutritionists, etc.) think I should engage in healthy eating.	3.64 ± 1.13
	The government authorities think I should engage in healthy eating.	3.60 ± 1.14
	TV programs I watch think I should engage in healthy eating.	3.52 ± 1.23
	Newspapers and magazines (including what I see on the internet) I read think I should engage in healthy eating.	3.59 ± 1.22
	Internet information (blogs, YouTube, etc.) I read thinks I should engage in healthy eating.	3.61 ± 1.15
	Total	28.78 ± 9.36
	Mean	3.60 ± 1.00
PBC	Will you try hard to eat healthily?	3.58 ± 1.15
	Do you have enough discipline to eat healthily?	3.53 ± 1.17
	Do you have enough time to eat healthily?	3.50 ± 1.12
	Do you want to eat healthy no matter what the difficulties you have?	3.35 ± 1.12
	Total	13.96 ± 4.55
	Mean	3.49 ± 0.98
Social support	There are fruits and vegetables fresh and ready to eat at home.	3.72 ± 1.27
	There are healthy snacks at home (e.g., fruits, dairy products, nuts, etc.).	3.71 ± 1.25
	I or my family (spouse, parents, etc.) made a healthy meal for dinner.	3.53 ± 1.32
	My family (spouse, parents, etc.) helped me eat fruits and vegetables (when I was with my family).	3.60 ± 1.28
	I prepared healthy snacks (such as fruits, dairy products, nuts, etc.) or meals (when I am with my family) with my family (spouse, parents, children, etc.).	3.58 ± 1.24
	Total	18.14 ± 6.36
	Mean	3.63 ± 1.14
Behavior intention	I am willing to have a healthy meal within the next 2 weeks.	3.51 ± 1.12
	I want to have a healthy meal in the next 2 weeks.	3.40 ± 1.17
	I have a plan to have a healthy meal in the next 2 weeks.	3.39 ± 1.21
	I would like to recommend healthy meals to my friends, family, and co-workers.	3.38 ± 1.23
	Total	13.68 ± 4.73
	Mean	3.42 ± 1.05

Values were expressed as mean ± SD.

PBC, perceived behavioral control.

**Table 3.** Relationship between 3 major constructs of theory of planned behavior and intention of healthy eating based on a multiple regression model

Factors	β <sup>1)</sup>	SE	p-value	Adj. R <sup>2</sup>	F-value (p-value)
Intercept	0.02	0.13	0.904	0.766	266.33 (0.000)
Attitude	0.12	0.09	0.171		
Subjective norm	0.19	0.09	0.044		
Perceived behavioral control	0.66	0.07	0.000		

R-squared means coefficient of determination for a final model.

<sup>1)</sup>Regression coefficient for intention of healthy eating for each factor.

Our finding is consistent with previously reported results [12-15,18,19]. As shown in Danish adolescents [19] as well as young adults in Hong Kong [12], PBC is the strongest factor related to behavioral intention of healthy eating than any other constructs [19]. There have been limited studies investigating relationships between constructs of TPB and intention of healthy eating in adults. However, in other similar studies, PBC was the most significant factor for predicting intention to travel [22], to promote physical activity [12], and to purchase healthy food [23,24] in adults. PBC describes the perceived ease or difficulty an

**Table 4.** Relationship between 3 major constructs of theory of planned behavior as well as social support and intention of healthy eating based on a multiple regression model

Factors	$\beta^1$	SE	p-value	Adj. R <sup>2</sup>	F-value (p-value)
Intercept	0.12	0.15	0.424	0.767	200.95 (0.000)
Attitude	0.12	0.09	0.155		
Subjective norm	0.19	0.09	0.040		
Perceived behavioral control	0.67	0.07	0.000		
Social support	-0.04	0.03	0.172		

R-squared means coefficient of determination for a final model.

<sup>1</sup>Regression coefficient for intention of healthy eating for each factor.

individual has for practicing a behavior. Therefore, strategies to promote healthy eating need to enhance PBC of individuals.

Nonetheless, some studies have also shown incompatible results. In our study, subjective norms were also significantly related to intention to eat healthy, as shown in a previous study [12]. Subjective norms measure the importance others hold about practicing or not performing a behavior and one's willingness to comply to those referents. The social norm was not a significant predictor of healthy eating in Danish adolescents [19] but was a significant one in young adults in Hong Kong [12]. However, attitude, which is known as the degree to which an individual has a favorable or unfavorable evaluation of the behavior, was a significant predictor of intention to eat healthy in Danish adolescents [19] not in young adults in Hong Kong [12] and in our study population. Attitude is the degree to which an individual has a favorable or unfavorable evaluation of the behavior and subjective norms refer to the belief that a significant person or group of people will support a certain behavior [9]. Subjective norms are decided by the perceived social pressure from others for an individual to act in a certain manner and their motivation to meet with those people's views [25]. In countries like China due to its own culture, intention to behavior and/or behavior may be affected by what others expect he or she would like to do rather than by what he or she would like to do. In this regard, cultural or/and ethnic characteristics need to be considered for interpreting results, although a direct comparison is not possible due to differences in the study condition as well as in the nature of study design and sampling frame. In our study, social support was added in the Extended TPB model to investigate whether degree of social support may affect individual intention of healthy eating differently, as shown previously [16]. However, social support was not significantly related to intention of healthy eating. The use of different measurements for social support and/or degree of social support for healthy eating across study populations could lead to variable results for intention of healthy eating.

Our study had several limitations that should be addressed in further studies. Due to the epidemic of coronavirus disease 2019, we obtained data from self-reports of subjects, these data may not be as accurate as those obtained from face-to-face interviews. However, detailed description of survey items may reduce some errors of the study. Furthermore, we observed a relationship between constructs of TPB as well as social support only in a cross-sectional setting. Therefore, we were not able to determine whether subjective norms and PBC are causes or consequences of intention of healthy eating, although our study was based on the evidence- and theory-based framework. The causality needs to be evaluated in a further study in the Chinese population. Moreover, our findings need to be interpreted with caution because of the poor generalizability due to the nature of convenience sampling method. Although Beijing is currently the political, economic, and cultural center of China, collecting samples from limited areas of China lacks generalizability as well. Several factors related to intention of healthy eating were not included in our study. In addition, questions regarding

the TPB were validated previously in adolescents [18,19,21] not in adults and questions regarding social support were based on social cognitive measures [21] although reliability of survey questions ranged from 0.88 to 0.95 suitable for capturing factors related to healthy eating. Nonetheless, our study had several advantages. To the best of our knowledge, this study is the first study to investigate constructs of TPB as well as social support for healthy eating in China.

## SUMMARY

In summary, subjective norms and PBC may be potential determinants of behavioral intention of healthy eating in adults residing in Beijing, China. Our study results could be used for promoting healthy eating to Chinese adults living in the urban areas. Nutrition intervention or education needs to enhance social norms and PBC for healthy eating in the study population. Large-scale intervention studies are warranted to evaluate whether social norms and PBC predict actual behaviors of healthy eating in Chinese adults.

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