Factor Structure and Construct Validity of the Chinese Version of the Theory of Planned Behavior Questionnaire (TPB-Q) for Eating Disorders among University Students

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Abstract

The number of eating disorders is increasing among adolescents and young adults. Long-term serious eating disorders have been influenced these people's physical and mental health, leading to a wide variety of intention and behavioral, cognitive-emotional, and neurological problems and risks. The purpose of this study is to examine the reliability and validity of the Chinese version of the theory of planned behavior questionnaire in eating disorders among undergraduate students in China. The study chose four hundred eighty-one undergraduate randomly selected students who participated in the survey. The English version of the eating disorder-theory of planned behavior questionnaire (ED-TPB-Q) was translated into the Chinese version, through the exploratory factor analysis and confirmatory factor analysis. The results that overall Cronbach's alpha was .93 (AT= .77, SN= .85, PBC= .76, IN= .90), and the four-variable of the ED-TPB-Q structure model (31 items) was suitable for Chinese culture by the data collected from the sample. According to cross-cultural validation, the ED-TPB-Q can provide steady structural support for predicting eating disorders risk factors, and it can be an effective questionnaire to assess eating disorder behavior intention among Chinese undergraduate students, but it still needs big data to examine in further study.

Keywords: Factor-Structure, Theory of Planned Behavior, Eating Disorder, Behavior Intention

Introduction

Today, some adolescents have abnormal aesthetics on weight and body shape lead to them will adopt the diet, fasting and other intention behaviors to reduce body weight (Cheng et al., 2019). In some developed worlds, bulimia nervosa affects about 1.3% and anorexia nervosa affects about 0.4% of young females, binge eating disorder affects about 0.8% of males and 1.6% of females (American Psychiatric Association, 2013). Despite the groups have standard-weight or lighter-weight, but they are still dissatisfied with their body shape and adopt various unreasonable methods to lose weight to reduce their weight below the normal weight range, especially in Chinese females between 15 and 24 years (Yan, 2019).

At the same as, eating disorders can also cause a series of complications, such as impaired digestive system function, endocrine disorders, amenorrhea, hypoglycemia, malnutrition, or physiological damage to various organ systems, and even life-threatening. Eating disorders will not only cause the physiological functions of the body, but also a large extent of causing the mental health of patients to affect the healthy development of people's body and mind. Patients with eating disorders often show interpersonal withdrawal, unable to control their emotions well, and even lead to changes in their personality (Yan, 2019). It affects the physical and mental health of the young and incurs high medical costs in one's country (Weissman & Rosselli, 2017).

In China, there is an increase in the body mass index of Chinese adolescents, the overall risk of eating disorders in adolescents has increased, the unhealthy adolescents increase the risk of individual eating disorders (Cheng et al., 2019). Therefore, it is necessary to actively prevent the occurrence of overweight, loss weight, anorexia nervosa, bulimia nervosa, binge eating disorder, correct, and intervene in adolescent eating disorders. Based on the increased eating disorder rate among adolescents (undergraduate students), it is essential to analyze the characteristics of eating disorders in their health. The theory of planned behavior (TPB) can provide a suitable framework to predict, explain, and/or change intention behaviors.

The theory of planned behavior questionnaire (TPB-Q) was developed by Ajzen (1991) and have already been adapted to other fields (smoke, hookah, individual's energy-saving, drug abuse etc.) and cultures (Italy, Spain, Portugal, and Romania etc.) (Gao et al., 2017; Makvandi et al., 2017; Morell-Gomis et al., 2019; Zhao et al., 2019). Which have been proved toward being valid in respect of structure and content. Although the model's reliable structure and content validity have been tested and proven, no instrument is obtainable to investigate eating disorders as a behavior intention based on a theoretical model in China. Despite the fact that eating disorders have become a global phenomenon, psychometric qualities must still be double-checked. As a result, the theory of planned behavior questionnaire (TPB-Q) for eating disorders (Upadhyaya, 2018) was translated and validated in Chinese, as well as the format of the questionnaire was cross-validated. The purpose of this study is to examine the Chinese version of the theory of planned behavior questionnaire in eating disorders whether as an effective examination tool in Chinese culture.

Overall, these are the hypotheses based on the literature review:

H1. The Chinese version of the theory of planned behavior questionnaire (TPB-Q) for eating disorders would get the same structure as the original scale. The framework of the Chinese version of the theory of planned behavior questionnaire (TPB-Q) for eating disorders would be the same as the original scale.

H2. The Chinese version of the theory of planned behavior questionnaire (TPB-Q) for eating disorders would have good reliability and validity. The Chinese version of the theory of planned behavior questionnaire (TPB-Q) for eating disorders would be valid and reliable.

Methods
Participants and Procedure

There are a total of 481 undergraduate students participated in the study. The sample included 109 males and 372 females between the ages of 18 and 24 (M = 19.94, SD = 1.04). They were full-time and on-campus undergraduate students in the university and all

the participants were from 6 universities in Lanzhou city (2), Hefei city (1), Yinchuan city (1), Baoji city (1), and Maoming city (1).

Before collecting data, written consent from all participants was obtained and delivered a formal notice outlining the study's objectives, as well as assurances that personal data would remain confidential and anonymous. Prior to data collection, all participants signed a consent form and received a formal notice detailing the study's objectives, as well as assurances that their personal data would be treated confidentially and anonymous. The measures were provided online questionnaire link by the university teacher, and the students fill in the questionnaire by themselves. All participants took part voluntarily and anonymously.

Model
Theory of Planned Behavior (TPB)

This study adopted Ajzen (1991) a part of the theory of planned behavior (TPB). The questionnaire was developed by Upadhyaya (2018) based on Ajzen (1991) theory of planned behavior (TPB) model. It was mainly to survey university students' eating disorders whether have good reliability and validity among the Chinese version of the questionnaire. The purpose of the survey was to see if the Chinese version questionnaire had good reliability and validity in terms of university students' eating disorders, including attitude, subjective norm, perceived behavioral control, and intention among eating disorders.

Figure 1
The TPB Model to the Study Model
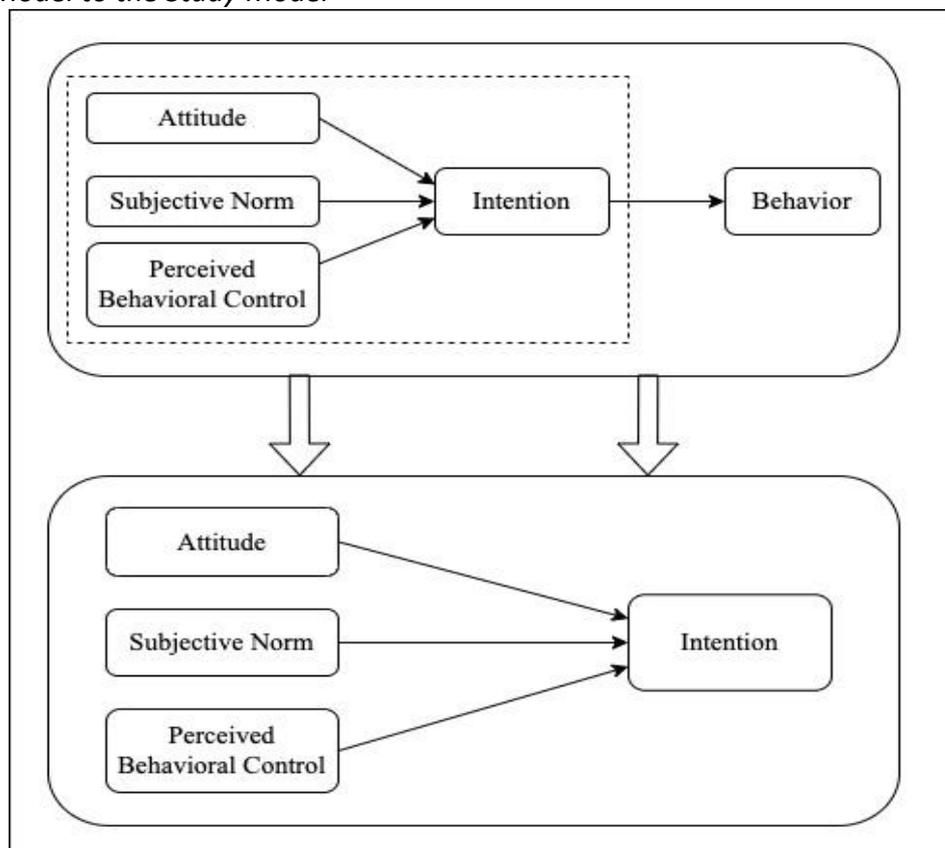
Measures

The Eating Disorders' Theory of Planned Behavior Questionnaire (ED-TPB-Q)

The eating disorders' theory of planned behavior questionnaire (ED-TPB-Q) has 31 items consisting of four dimensions, respectively are attitude (e.g., Me always thinking too much about food is:), subjective norm (e.g., Most people who are important to me approve of me being very thin:), perceived behavioral control (e.g., I have control over maintaining/developing a thin body shape:), intention (e.g., I intend to avoid eating even when I am hungry:) (Upadhyaya, 2018).

To adapt the Chinese version of the ED-TPB-Q, the translation/back-translation procedure was adopted in the field of bilingual translators and experts to carry out through Breslin's model of translation (Brislin, 1970). Then, through the psychological specialist to further correct the questionnaire resulted. Before distributing the questionnaire, we evaluated the questionnaire's outcome version with the research group and translator in order to make sure that all of the phases in the model were accomplished. Upadhyaya (2018) shows that the questionnaires provide valid and reliable ratings, and Leung et al (2009) has already been adapted to America and China.

Data analysis

The study introduces the research's population and sampling, and use the statistical applications IBM SPSS Statistical, Amos test and SPSSAU project (2021) for collecting data are described and to examine the relationship and significance of every item by the data for refining this study (Kevin, 2015; Samuels, 2017). This study is based on a correlational study design through the English and Chinese version questionnaires method to complete the survey in a random sample of participants. The maximum likelihood estimation method of EFA and CFA to be conducted was adopted. The data have once showed a normal distribution, was reported as the default estimator. To guarantee that the items in the ED-TPB-Q are all the same, the internal consistency and the reliability will be used to assess the situation, which is Cronbach's alpha and ordinal alpha (Johnson et al., 2019).

To determine the structure of the ED-TPB-Q, we also adopted confirmatory factor analysis (CFA) to analysis. According to the variable of structure and factor model, further testing and modification of the Chinese version questionnaire in the model were performed to determine whether the CFA in the model fit criteria represents a satisfactory match, with RMSEA and SRMR less than .08 (Browne & Cudeck 1993). In addition, a parametric correlation coefficient to evaluate the association between the ED-TPB-Q was also used.

Results

Exploratory Factor Analysis (EFA)

Through item-total correlation analysis, all 31 items were found to be significantly associated with the total score and were kept. The sample was acceptable for an EFA, according to the Kaiser-Meyer-Olkin measure of sample adequacy (.917) and Bartlett's Test of Sphericity (χ2 (481) = 7978.844, p = .001). The KMO and Bartlett test was used to verify the validity. It's the KMO value is .917, and the KMO value is greater than .80. The data showed the validity is very good. If the KMO value is higher than .80, it indicates that the validity of the research data is very good. and the KMO value is less than .60, indicating that the research item information cannot be effectively expressed. Thus, all items were kept. Table 1 shows the loadings of all items on each factor, with items ordered and grouped to make comprehension easier.

Table 1

Result of the Cronbach Alpha of Attitudes, Subjective Norms, Perceived Behavioral Control, Intention

Items	Factor Loadings				Communalities
	Factor 1	Factor 2	Factor 3	Factor 4	
AT 1	.093	-.222	.420	.391	.387
AT 2	.105	.477	.500	.038	.490
AT 3	.131	.139	.686	.138	.527
AT 4	.093	.532	.416	.148	.486
AT 5	.109	.300	.592	.183	.486
AT 6	.204	.155	.780	-.130	.691
SN 1	-.034	.226	.001	.744	.606
SN 2	.192	.608	.174	.147	.458
SN 3	-.008	.095	.291	.588	.439
SN 4	.186	.747	.221	.044	.643
SN 5	.320	.426	.477	-.210	.555
SN 6	.085	.662	.124	.224	.511
SN 7	.201	.652	.219	.090	.522
SN 8	.205	.569	.099	.313	.473
SN 9	.177	.744	.193	-.039	.624
SN 10	.272	.428	.419	-.086	.440
PBC 1	.296	-.008	-.108	.730	.633
PBC 2	.585	.284	-.003	.400	.582
PBC 3	.644	.353	-.073	.233	.599
PBC 4	.623	.069	-.100	.435	.592
PBC 5	.391	.120	-.071	.219	.220
IN 1	.609	.427	.144	.097	.583
IN 2	.641	.194	.369	-.131	.601
IN 3	.665	.268	.348	-.111	.647
IN 4	.756	.110	.133	.109	.613
IN 5	.741	.095	.318	-.093	.668
IN 6	.300	.762	-.026	-.069	.676
IN 7	.716	.094	.202	.045	.565
IN 8	.674	.278	.206	-.025	.574
IN 9	.343	.737	-.053	-.053	.666
IN 10	.650	.272	.131	.056	.517
Eigenvalues (Initial)	10.327	2.635	2.261	1.853	-
% of Variance (Initial)	33.312%	8.500%	7.295%	5.978%	-
% of Cum. Variance (Initial)	33.312%	41.812%	49.107%	55.086%	-
Eigenvalues (Rotated)	5.794	5.607	3.24	2.435	-
% of Variance (Rotated)	18.692%	18.088%	10.453%	7.854%	-
% of Cum. Variance (Rotated)	18.692%	36.779%	47.232%	55.086%	-
KMO	.917				-
Bartlett's Test of Sphericity (Chi-Square)	7978.844				-
df	465				-
p value	.001				-

Reliability Analysis

Table 2 summarizes the findings of the reliability analysis for all items. At the same time, we also discovered that the questionnaire's Cronbach's alpha value was .93, indicating strong internal consistency. Furthermore, the internal consistency of each variable was evaluated by computing Cronbach's alpha independently for each factor, which are attitude (AT), subjective norm (SN), perceived behavioral control (PBC), and intention (IN). For factors AT to IN, their Cronbach's alpha coefficients were .77, .85, .76, and .90, respectively.

Table 2

Reliability Analysis for All Items and Dimensions

Items	CITC	CAID	Cronbach α
Attitude (AT)			
AT1	.14	.82	
AT2	.59	.72	
AT3	.62	.71	
AT4	.57	.73	.77
AT5	.63	.71	
AT6	.57	.73	
Subjective Norm (SN)			
SN1	.28	.86	
SN2	.57	.83	
SN3	.30	.85	
SN4	.70	.82	
SN5	.53	.83	
SN6	.64	.82	.85
SN7	.66	.82	
SN8	.58	.83	
SN9	.67	.82	
SN10	.56	.83	
Perceived Behavioral Control (PBC)			
PBC1	.46	.74	
PBC2	.66	.67	
PBC3	.59	.69	.76
PBC4	.63	.69	
PBC5	.38	.79	
Intention (IN)			
IN1	.71	.89	
IN2	.66	.89	
IN3	.72	.89	
IN4	.62	.89	
IN5	.68	.89	.90
IN6	.58	.90	
IN7	.61	.89	
IN8	.70	.89	
IN9	.61	.89	

IN10	.64		.89
Overall Cronbach's alpha (Standardized)			
			.93

Note: CITC is Corrected Item-Total Correlation; CAID is Cronbach Alpha if Item Deleted.

Table 3
Correlation Between Factors

Factors	AT	SN	PBC	IN
AT	1			
SN	.550*	1		
PBC	.285*	.428*	1	
IN	.505*	.628*	.586*	1

* Correlation is significant at the .05 level (2-tailed).

Confirmatory Factor Analysis (CFA)

As shown in Table 3, a Pearson correlation was performed to analyze the link between AT, SN, PBC, and IN scores. Tables 3 and 4 reveal the results of the CFA. Table 4 shows that the four-factor model with residual correlation between AT and PBC was the best match for the data. The result of AT shows that χ^2 (9) = 92.558, p = .001, χ^2/df = 4.501, GFI = .94, RMSEA = .14, RMR = .13, CFI = .90, NFI = .89, NNFI = .83, IFI = .90, indicating that the AT scale has good construct validity. The result of PBC shows that χ^2 (5) = 15.323, *p* = .009, *χ^2/df* = 3.065, GFI = .99, RMSEA = .07, RMR = .05, CFI = .98, NFI = .98, NNFI = .97, IFI = .98, indicating that the PBC scale has good construct validity.

Table 4
CFA Results of Differential Models

Variables	Chi-Square	*df*	*p*-value	GFI	CFI	TLI	RMSEA [90% CI]	SRMR
AT	92.558	9	.001	.94	.90	.83	.11~ .17	.05
SN	366.577	35	.001	.86	.82	.77	.13~ .15	.09
PBC	15.323	5	.001	.99	.98	.97	.03~ .10	.03
IN	797.937	35	.001	.77	.73	.66	.20~ .23	.10

Discussion and Conclusion

This study mainly discusses the Chinese version of the ED-TPB-Q structure and its psychometric properties in a small little city in China, to explore the difference of undergraduate students eating disorders behavior whether with the English version. According to the above results, the hypotheses were supported. The structure comprises 31 items that are divided into four components, identical to the Chinese version and the original version's measurement. In the structure of the questionnaire, the four original factors (attitude (AT), subjective norm (SN), perceived behavioral control (PBC), and intention (IN)) were consistent with the original questionnaire. And their validity analyses and internal consistency to assessing eating disorders behavior is reliable and valid among Chinese culture, but still have two items that were unsuitable in the questionnaire. Despite earlier studies, this is the first time the ED-TPB has been validated in the Chinese environment.

The Upadhyaya's (2018) original questionnaire, adopted the theory of planned behavior to develop, its initial questionnaire was original the Garner et al. (1982), The

Upadhyaya's (2018) use the theory of planned behavior to extend. The initial questionnaire has already been validated in Australia, Belgium, Canada, China, Italy, Japan, Spain, and the U.S (Sicilia et al., 2020) and Polish (Brytek-Matera, 2021) cases. But the questionnaire will because of the corresponding cultural differences have some other adaptations, such as deleting several items to suitable their culture. In the original questionnaire, it was supported among the more-factor model (Upadhyaya, 2018), and found that the items were significantly positively correlated with eating disorders among young adults. According to its reliability analysis, Cronbach's alpha was above .6 for every dimension of the scale. In this study, Cronbach's alpha was .93 in all items, including the internal consistency coefficient. It was showed the questionnaire exhibited excellent internal consistency. Through this study results analysis, there are 241 undergraduate students (37.4% females, 12.5% males) who suffer from eating disorders, like anorexia nervosa (AN), bulimia nervosa (BN), binge eating disorder (BED). Thus, serious attention and intervention is crucial in order to curb the eating disorder phenomenon.

In the eating disorder theory of planned behavior development, the item might be different from the culture and sample. At the same time, the study has limitations that should be noted. We only surveyed 481 undergraduate students, other groups also should be diverse ages, large-sample-size and backgrounds of participants was researched in the future. In addition, the test-retest reliability was not reported, and the numbers of each sex sampling were unbalanced (female more than male participants). Despite the faults mentioned above, the Chinese adaptation is important. Under the theory of planned behavior, the Chinese version of the ED-TPB-Q can be a useful tool for assessing eating disorder behavior intention. As a screening tool for Chinese version eating disorder, we aimed to further study eating disorder risk factors and consequences for individuals' physical and mental health, for the administration of further prevention measures through the eating disorder risk factors.

The theory of planned behavior (TPB) demonstrated that causal attribution has an impact on a variety of factors, including consistency across occasions, objects, and actors, the uniqueness of behavioral effects, and the ability to perceive behavior desirability, probability, and perceived decision freedom (Fishbein & Ajzen, 1975). The TPB was developed including AT, SN, PBC, IN, and behavior (BE) by (Ajzen, 1991). McEachan et al (2011) discuss that TPB model can prediction of health-related intention and behavior using the TPB. Whatever from physical exercise to drug use, from eating to disorders, from body health to mental health, from recycling to choice of travel mode, from safer sex to consumer behavior, the TPB has been successfully utilized to explain and predict behavior in a multitude of behavioral domains (Albarracin et al., 1997; Armitage et al., 1999; Armitage et al., 2002; Damghanian & Alijanzadeh, 2018; Hagger et al., 2002; Hirschey et al., 2020; McDermott et al., 2015; Pickett et al., 2012; Riebl et al., 2015). Currently, the Chinese version of the ED-TPB-Q still doesn't have scholars to do research, it played an examination tool role in assessing eating disorder behavior intention. As a screening tool for Chinese version eating disorder, we aimed to further study eating disorder risk factors and consequences for individuals' physical and mental health, for the administration of further prevention measures through the eating disorder risk factors.

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Conflict of Interest

There isn't any chance of a conflict of interest. On behalf of all authors declares that there is no conflict of interest.

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Appendix 1

English and Chinese Version of the Questionnaire on Attitudes, Subjective Norms, Perceived Behavioral Control, and Intentions

No.	Items
AT1	Me always thinking too much about food is
	我总是想太多食物是
AT2	Me feeling extremely guilty after eating is
	我饭后感到非常内疚
AT3	Me being terrified about being overweight is
	我害怕超重
AT4	Me avoiding eating when hungry is
	我饥饿时避免进食
AT5	Me being preoccupied with thoughts of having fat on my body is
	我全神贯注于我身上有脂肪的想法
AT6	Me being preoccupied with a desire to be thinner is
	我全神贯注于想变得更瘦
SN1	Most people who are important to me approve of me being very thin:
	大多数对我重要的人都赞同我变的非常瘦
SN2	Most people important to me approve of me eating very little:
	大多数对我重要的人赞同我吃的非常少
SN3	Most people important to me approve of my preoccupation with food:
	大多数对我重要的人赞同我对食物的关注
SN4	Most people important to me approve of my feelings of guilt after eating:
	大多数对我重要的人赞同我饭后的内疚感
SN5	Most people important to me approve of my desire to be very thin:

	大多数对我重要的人赞同我想变瘦的愿望
SN6	Most people like me eat too little:
	大多数人像我一样吃得太少
SN7	Most people like me think that food controls their life:
	大多数人像我一样认为食物控制了他们的生活
SN8	Most people like me are thin:
	大多数人像我一样瘦
SN9	Most people like me feel guilty after eating:
	大多数人像我一样饭后感到内疚
SN10	Most people like me are preoccupied with the desire to be thin:
	大多数人像我一样全神贯注于想变瘦
PBC1	I have control over maintaining/developing a thin body shape.
	我有掌控保持/发展苗条的体型
PBC2	I have the self-control to avoid eating when I am hungry.
	我有自制力去避免饥饿时进食
PBC3	I have control over working out for 60 minutes a day to lose or maintain my weight.
	我有掌控一天锻炼60分钟以减轻或保持体重
PBC4	I can control what I eat (both the quality and quantity of food).
	我可以控制我吃的东西(食物的质量和数量)
PBC5	I have control over obtaining medicines (such as laxatives, diet pills, etc.) that help me in controlling my weight or body shape.
	我有掌控药物(如泻药、减肥药等)来帮助我控制体重或体型的
IN1	I intend to avoid eating even when I am hungry
	即使我饿了，我打算避免进食
IN2	I intend to eat less in order to maintain a thin body shape
	为了保持苗条的体型，我打算少吃
IN3	I intend to avoid food that have high carbohydrate content such as bread, rice, potatoes, etc.
	我打算避免高碳水化合物的食物，如面包、米饭、土豆等
IN4	I intend to exercise 30-60 minutes a day in order to maintain my desired body weight or body image
	我计划一天锻炼30-60分钟，为了保持我想要的身体重量或身体形象
IN5	I intend to avoid high-calorie foods, ones which have high fat and high sugar content
	我打算避免高热量的食物，即高脂肪和高糖的食物
IN6	Whenever possible, I intend to vomit after a meal
	只要有可能，我打算饭后呕吐
IN7	I intend to engage in strict dietary behaviour

	我计划从事严格的饮食行为
IN8	I intend to display strong self-control around food
	我企图对食物展现出强烈的自制力
IN9	I intend to use laxatives, diet pills or diuretics (water pills) to control my weight or shape
	我企图用泻药、减肥药或利尿剂（水丸）来控制我的体重或体型
IN10	I intend to display self-control when others pressure me to eat
	当别人逼我进食时，我打算展示出自我控制力