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ORIGINAL RESEARCH

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The moderating role of individualism/collectivism in predicting male Chinese university students' exercise behavior using the theory of planned behavior

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Abstract

The purpose of this study was to check the moderating role of individualism/collectivism in predicting male Chinese university students' exercise behavior using the theory of planned behavior (TPB) model. The TPB model was validated through SEM (structure equation model), and the moderating effect of individualism and collectivism was validated through a hierarchical regression and simple slopes analysis using a sample collected from 115 male Chinese university students. The results showed that the product terms of individualism and TPB factors were not able to significantly predict exercise intention after inclusion in the regression equation, nor were the product terms of collectivism and PBC (perceived behavior control) able to do so. However, the product terms of collectivism and attitude, as well as collectivism and SN (subjective norm) were able to significantly predict exercise intention when included in the regression equation. That is, horizontal and vertical collectivism can significantly moderate TPB constructs, primarily by moderating the relationship between attitude-exercise intention and SN-exercise intention. This study found that the predictive validity of exercise attitudes on exercise intentions in TPB constructs is greater only at low levels of horizontal and vertical collectivism and low at high levels. The predictive validity of SN is greater at high levels of horizontal and vertical collectivism and low in the inverse case. This research serves to enrich the theoretical framework for the theory of planned behavior and provides useful information for understanding university students' exercise intentions and behaviors.

Keywords

Male Chinese university students; Theory of planned behavior (TPB); Exercise behavior; Individualism/collectivism

1. Introduction

1.1 Research justification

Insufficient exercise and an increase in static lifestyles has become a global problem and is among the most important public health concerns of the 21st century [1–3]. China is no exception to this rule, with studies showing a low overall level of interest and motivation among Chinese university students to join physical exercise, which is leading to a continuous decline in levels of stamina, strength, speed and other physical qualities in adolescent students, and the continuous rise of diagnosed obesity [4]. To aggravate this issue, The COVID-19 (Corona Virus Disease 2019) pandemic has led to an increase in active and passive isolation in the general population, and a corresponding decrease in physical activity. This persistent inactivity and sedentary state is often significantly cause-and-effect associated with poor physical and mental health and the risk of specific diseases and death [5, 6].

Using psychological and behavioral theory as a tool for predicting and intervening in decision-making regarding physical activity could be an effective means of promoting active participation in exercise [7], especially in adolescence which is a critical period for the development of athletic abilities and physically active behaviors. Getting into the habit of regular physical activity is not only closely related to the future health of university students in various growth stages, but also contributes to the formation of a lifelong habit of remaining physically active well into adulthood. Therefore, it is both necessary and urgent to intervene and promote healthy exercise behaviors among university students.

Effective intervention into university students' exercise behavior should first identify the influencing factors that predict one's likelihood to exercise, so as to provide a theoretical basis for the promotion of university students' exercise behavior. At present, the theoretical models applied in the study of exercise behavior mainly include the health belief model (HBM) [8], the theory of planned behavior (TPB) [9, 10], the transtheoretical model (TTM) [11], the self-efficacy theory, and the self-

determination theory (SDT) [12, 13]. Among them, compared with the other social cognitive theories, TPB offers more comprehensive coverage of psychosocial factors with fewer variables, and can explain a large amount of the variation in exercise intention and behavior. Each variable present in TPB can also provide meaningful predictions regarding exercise intention and behavior [14]. In light of this, the theory of planned behavior was selected as the main prediction model for this study of exercise behavior [15]. After reviewing more than 70 studies on TPB explaining exercise behavior, Hagger *et al*. [16] concluded that the significant average frequency weighted correlations of attitude and intention (r = 0.48), of SN and intention (r = 0.25), and of PBC and intention (r = 0.44). All three antecedents of TPB constructs explained 45% of the variance of exercise intention. The average correlations of exercise intention (r = 0.42) and PBC (r = 0.31) with exercise behavior were proved significant and together explained 27% of the variance of exercise behavior.

Ajzen put forward TPB theory on the basis of the theory of rational action [17]. According to TPB theory, human behavior depends on intention. Intention is determined by a combination of an individual's attitude toward a particular behavior, SN, and perceived behavioral control (PBC). This theory is well-equipped to explain the prediction mechanism of attitudes, SN, and perceived behavioral control on the formation of intention. Attitude refers to the individual's positive or negative evaluations towards the performance of a behavior. SN include the individual's perceptions of what others expect him/her to do in that situation. PBC refers to the perceived ease or difficulty of performing the behavior. Perceived behavior control can directly predict behaviors in some special cases. That is to say, when PBC well and truly reflects the degree of difficulty of the actual environment, it can be directly affect behaviors without the mediating role of behavioral intention (see the dotted line in the Fig. 1). A meta-analysis of previous empirical research related to this theory shows that attitudes, SN and perceived behavioral control have a high prediction rate for intention, but a low prediction rate for behavior. At present, the theory of planned behavior (TPB) has been used to predict a wide range of social and health-centric behaviors [18, 19] including exercise [16, 20]. TPB is a leading psychological framework for examining exercise behavior [15, 21].

In the study of exercise behavior, some scholars have included social and psychological factors in the TPB model to expand the model's theoretical framework, such as past behavior and self-efficacy [22], emotion and action control [23] online social support [24], and flow [7]. The inclusion of these factors tended to elucidate the psychological mechanisms by which TPB interacts with other variables and improved the predictive power of TPB in both behavior and behavior intentions to varying degrees.

Some scholars have also discussed moderating variables within the TPB model, such as anticipated regret [25], and intention stability [26]. Sheeran and Orbell found that anticipated regret plays a moderating role within TPB and their research showed that the interaction term between anticipated regret and behavioral intention was significant when entered into the regression equation. An 8.8% growth in variance explained by the interaction term in lottery playing behavior and reduced all other predicting variables to insignificance . Sheeran also found that that intention stability has a moderating effect on TPB while researching the study behaviors of undergraduates at a university in the UK [27]. In this study, about 42% (R^2 = 0.42) of variance in behavior among respondents could be explained by unstable intentions, while 60% (R^2 = 0.60) of variance could be explained by stable intentions.

In addition, the moderating variables between intention and its predictors (attitude, SN and PBC) have also been discussed in previous research. For example, Harris *et al*. [27] found that basic psychological needs play a moderating role within TPB while conducting a study on the dieting behaviors of university students in the UK. When entered into a regression equation, the interaction term between SN and three basic psychological needs (autonomy, competence, relatedness) were significant and the interaction term was able to explain 3.42%, 3.33%, and 11.13% of the increment in behavioral variance, respectively. Bruijn *et al*. [28] found that habit strength was able to moderate the relationship between antecedent variables of TPB (attitude, SN and PBC) and intention in a research about fruit consumption behavior. Multi-group path analyses showed that the regression coefficients of antecedent variables of TPB to intention were cognitive attitude β = 0.19*, affective attitude β = 0.30**, SN β = 0.23**, and PBC β = 0.15, respectively in the low habit group. In the medium habit group the regression coefficients were cognitive attitude β = 0.11, affective attitude β = 0.23, SN β = 0.36**, and PBC β = 0.21*, respectively. Finally in the high habit group, they were cognitive attitude β = 0.17, affective attitude β = 0.16, SN β = 0.05, and PBC β = 0.34**, respectively. The results of these analyses suggest that external variables can influence the weight of attitude, SN, and PBC as predictors of intention. As Ajzen [17] noted: "the relative weight of three antecedents in TPB including attitude, SN and PBC on intention predicting is expected to vary across different situations and behaviors". Although studies of this kind are limited, they clarify the interaction mechanism between the TPB model and other sociological and psychological factors, which has significant theoretical implications.

Recent studies have also shown that cultural value orientation is an important factor in explaining behavior [29] due to its ability to define roles for people in the social structure, and to set the guiding principles and values within an individual's life. Hofstede [30] defined Cultural value orientation as "the collective programming of the mind that distinguishes the members of one group or category of people from others". Previous researches have concluded that cultural value dimensions include masculinity, future orientation, individualism-collectivism, uncertainty avoidance, power distance, *etc*. [31]. Variations across these dimensions, especially between individualism and collectivism, may have an influence on the TPB relationship. Some studies further concluded that individuals in individualistic and collectivist cultures have different sensitivities to social norms and attitudes [32]. A study was conducted in the Netherlands to investigate individual's job searching behaviors, which later found that collectivism in TPB possesses a moderating effect on the predictive ability for successfully finding jobs [33]. This study argues that behaviors and intentions that are influenced by attitudes or SN are likely

to vary across individuals from different countries due to their differing cultural backgrounds. They suggest that researches in the future should check the generality of this finding to other countries, other behaviors, and other theoretical constructs. In addition, Wasti [34] also provided some evidence for the universality of the moderating role of individualism/collectivism, finding that SN were a better predictor of turnover intention among Turkish employees with low levels of individualism than those with high levels of individualism. They suggest that researches in future should use different notions and measures of individualism/collectivism to further investigate the role and effect of individualism/collectivism in TPB constructs.

Harry C. Triandis [35] claimed that both individualism and collectivism can be described as vertical which was emphasizing hierarchy or horizontal which was emphasizing equality and that the difference between the two had significant implications. Triandis (1998) [35] believed that the most important feature that distinguishes different types of individualism from collectivism is their consideration of the corresponding horizontal and vertical characteristics of social relations (vertical individualism, horizontal individualism, vertical collectivism and horizontal collectivism). Horizontal patterns assume that any particular individual is more or less similar to other individuals, whereas vertical patterns are made up of hierarchies, wherein individuals are distinct from each other. The way that these social factors are combined with individualism and collectivism gives rise to those four distinct patterns. People with horizontal collectivist values generally emphasize making joint efforts with others as well as the importance of mutual dependence and mutual aid. They also stressed sociability, interdependence, and hedonism. People with vertical collectivist values generally pay attention to the integrity and importance of the collective as well as the importance of adhering to authority. Their orientation generally seemed to be more authoritarian and traditional, while also stressing sociability. People with horizontal individualistic values tend to prioritize independence and they enjoy being distinguished from the group and focusing on their own priorities, but are not particularly interested in having high status and stress self-reliance. People with vertical individualistic values often prefer competition, wanting to become prominent and gain higher status through their own means. Vertical individualists emphasized competition and hedonism even more so than the horizontal individualists.

1.2 Research purpose

The present study aims to investigate the moderating role of individualism/collectivism in the TPB construct predicting exercise behavior in male Chinese university students. With the consideration of suggestions made by previous studies, our research has three purposes: first, we will extend the research findings of the moderating role of individualism/collectivism in TPB to the field of physical exercise to check the generalizability of these results. Second, we will check to see whether the observed moderating effect of individualism/collectivism is applicable in the Chinese cultural context. Third, in order to check the applicability of the moderating effect of individualism/collectivism on the TPB construct within the Chinese cultural context, we utilize the four dimensions of the individualism/collectivism scale (HI: horizontal Individualism, VI: vertical individualism, HC: horizontal collectivism and VC: vertical collectivism).

1.3 Research hypothesis

In the prediction of male Chinese university students exercise behavior using TPB constructs, individualism/collectivism plays a moderating role in the attitude-intention, SN-intention and PBC-intention relationships. A theoretical model of this hypothesis is shown in Fig. 1.

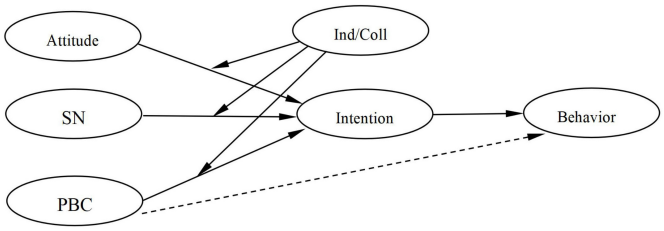

FIGURE 1. The hypothetical theoretical model. PBC: perceived behavioral control; SN: subjective norm; Ind/Coll: individualism/collectivism.

2. Materials and methods

2.1 Participants

A random cluster sampling method was used and 120 male Chinese university students were selected as participants from 2 universities located in Hebei province, China: Shijiazhuang Tiedao university and Hebei University of Science and Technology. 115 questionnaires were ultimately recovered and used in the final analysis. Of the returned questionnaires 48 (41.7%) came from urban respondents, and 67 (58.3%) came from rural respondents. Among these, 55 of the students were freshmen (47.8%), 37 were sophomores (32.2%), 20 were juniors (17.4%), and 3 were seniors (2.6%).

2.2 Measures

All English scales were translated into Chinese using the following cross-translation procedure. First, a professional English translator translated each item from the scale into Chinese. Secondly, the final translation entries were corrected by two experts in sports psychology who were proficient in English. Next, two foreign teachers who had not seen the original scale translated the items back into English. Finally, the above three steps were repeated until both the Chinese and English items matched in terms of semantics, expression, and connotation.

2.2.1 Cultural value orientation scale

The individualism/collectivism questionnaire used in this study was the one rewritten by Harry C. Triandis and his colleague [35] which has four sub-factors including HI, VI, HC and VC. The main questionnaire consists of four questions gauging HI such as “I’d rather depend on myself than others”, four questions gauging VI such as “It is important that I do

my job better than others", four questions gauging HC such as "If a coworker gets a prize, I would feel proud", and four questions gauging VC such as "It is important to me that I respect the decision made by my groups". The response criteria for all questions ranged from "totally disagree (1)" to "totally agree (7)". The Cronbach's α coefficient is 0.868 of the questionnaire, showing a high degree of scale reliability.

2.2.2 Theory of Planned Behavior scale

The TPB scale used in this study comes from Wang Lijuan [23] which has been used in previous exercise behavior research with adolescents, and exhibited a high degree of reliability [23, 36]. On this scale, the intention of exercise behavior was measured by the three items such as "I plan to do physical activities that make me out of breath for at least three or more times during my free time in the next week". Attitude was measured using an item, namely "My doing physical activities at least three or more times in the next week is...", using three responses, that is, fun-unpleasant, exciting-boring, and good-bad. Subjective norm was assessed by a single item scale: "Most people important to me think I should do physical activities that make me out of breath at least three or more times in the next week". The PBC was measured by three items such as "whether or not I participate in physical activities that make me out of breath at three or more times in the next week is entirely up to me. All the responses of the TPB scales adopt the 7-point form ranging from 1 (unlikely or strongly disagree) to 7 (likely or strongly agree). The Cronbach's α coefficient is 0.89, showing a high reliability.

2.2.3 Physical activity and exercise behavior scale

The exercise behavior was measured using the Godin Leisure Time Exercise Questionnaire (GLTEQ) [37]. According to Yin long's suggestion [38], the exercise behavior were defined in our study for all participants as exercise behaviors carried out at a moderate to vigorous strength for at least 30 minutes every week. The participants of university students' responses regarding strenuous and moderate exercise were then multiplied by 9 and 5 METs (metabolic equivalent of energy) respectively (Godin & Shephard, 1985) [37], and the scores were added to get their overall METs score.

2.3 Reliability and validity test

2.3.1 Reliablity test

This study used Cronbach's α coefficient and confirmatory factor analysis to test the reliability and validity of the scales. The Cronbach's alpha of the individualism/collectivism and the Theory of Planned Behavior scales, as seen above, were both over 0.8, which indicates a high level of reliability.

2.3.2 Validity test

Confirmatory factor analysis was performed to test the fit of the measuring model to ensure that the measured variables reliably reflected the underlying variables before the process of SEM (Structural equation model) and moderating effects testing. Table 1 shows the results of the confirmatory factor analysis. The goodness-of-fit indices of individualism/collectivism include χ^2/df = 1.856, GFI: goodness of fit index = 0.955, and IFI: incremental fit index = 0.979, NFI: normed fit index = 0.953, CFI: comparative fit index = 0.968, RMSEA: root mean square error of approximation = 0.055, and the goodness-of-fit indices of TPB include χ^2/df = 1.928, GFI = 0.936, and IFI = 0.967, NFI = 0.976, CFI = 0.978, RMSEA = 0.061. These indices were all within the threshold of recommended values. All the results of composite reliability (CR) were over 0.7, showing good reliability of this scales [39]. All the standard loadings of measuring model were over 0.7 and were significant at the 5% level, meaning that the scales had good reliability. The average variances extracted (AVE) are all over 0.5, indicating the scales have good convergent validity. Discriminant validity was shown in Table 2 that all square roots of AVEs are bigger than the correlation coefficients with other constructs, which showing good discriminant validity (see Table 2).

2.3.3 Checking for common method variance

Because our research contains only measure obtained *via* self-reporting, this could lead to common method variance. In designing our research, we tried our best to minimize common method variance by emphasizing that our research was carried out by the university authority, by properly ordering questions, and by protecting the anonymity of our research participants.

In the process of data analysis, besides reliability testing and confirmatory factor analysis, Podsakoff's Harman single-factor method was also implemented for each scale to check for common method variance. The results of unrotated principal component factor analysis indicated that all items had five common factors with characteristic root values bigger than 1, and the first factor explained 36.78% of total variance. A result of less than 40% showed that the common method variance of the questionnaire used in this study is not consequential.

3. Results

3.1 Correlation analysis

Internal consistency values for all scales ranged from 0.76 to 0.93. All the correlation coefficients between variables less than 0.70, showing that multicollinearity is not likely to exist. In addition, collinearity diagnostics also revealed that all tolerance values were above 0.20, which indicated the multicollinearity problem in our study was unlikely to be existence [40]. Table 2 showed the bivariate correlations results in our study constructs.

3.2 Structural equation modeling

To check the original TPB constructs, we implemented SEM by using AMOS: analysis of moment structures 24.0 (IBM-International Business Machines Corporation, Armonk, NY, USA). Sample covariances were analyzed and maximum likelihood was used as the method of estimation. For the TPB model, Table 3 and Fig. 2 indicated the estimated model with standardized path coefficients, respectively. The fit measures showed that the theoretical TPB model fits the data well: χ^2/df = 1.879, GFI = 0.915, RMSEA = 0.052, CFI = 0.962, NFI = 0.934 and IFI = 0.975.

TABLE 1. Confirmatory factor analysis results.

Individualism/collectivism construct	Items	Loading	AVE	CR
HI				
	HI 1	0.704	0.5923	0.8527
	HI 2	0.767		
	HI 3	0.833		
	HI 4	0.769		
VI				
	VI 1	0.785	0.6438	0.8785
	VI 2	0.790		
	VI 3	0.811		
	VI 4	0.823		
HC				
	HC 1	0.799	0.6237	0.8687
	HC 2	0.736		
	HC 3	0.832		
	HC 4	0.789		
VC				
	VC 1	0.747	0.6903	0.8687
	VC 2	0.798		
	VC 3	0.879		
	VC 4	0.891		
TPB construct	Items	Loading	AVE	CR
Intention				
	Intention 1	0.905	0.8428	0.9415
	Intention 2	0.917		
	Intention 3	0.932		
Attitude				
	Attitude 1	0.825	0.6252	0.8333
	Attitude 2	0.769		
	Attitude 3	0.777		
PBC				
	PBC 1	0.887	0.7572	0.9031
	PBC 2	0.926		
	PBC 3	0.792		

TPB: theory of planned behavior; PBC: perceived behavioral control; AVE: average variances extracted; CR: composite reliability; HI: horizontal Individualism; VI: vertical individualism; HC: horizontal collectivism; VC: vertical collectivism.

TABLE 2. Correlation analysis of research factors and discriminant validity.

Factor	M	SD	1	2	3	4	5	6	7	8
Indi										
HI	3.621	0.963	1	0.769						
VI	3.793	0.973	0.415**	1	0.802					
Coll										
HC	3.818	0.914	0.019	0.321**	1	0.789				
VC	3.624	0.981	0.270**	0.361**	0.396**	1	0.831			
TPB										
Attitude	2.802	1.434	0.082	0.007	0.189*	0.042	1	0.79		
PBC	2.644	1.482	0.001	0.013	0.098	0.017	0.688**	1	0.870	
Intention	4.959	1.698	−0.166*	−0.179**	0.075	0.289**	0.330**	0.460***	1	0.908
SN	2.736	1.488	−0.064	−0.051	−0.030	−0.056	0.358**	0.328**	0.213	1
Behavior	3.802	1.933	−0.220**	−0.020*	0.072	0.230**	0.198*	0.157	0.487**	0.070

*Note: *p < 0.05; **p < 0.01; ***p < 0.001. Values in the diagonal (bolded) represent the square root of the AVE, whereas the off-diagonals are correlations between constructs. TPB: theory of planned behavior; PBC: perceived behavioral control; SN: subjective norm; SD: standard deviation; HI: horizontal Individualism; VI: vertical individualism; HC: horizontal collectivism; VC: vertical collectivism.*

TABLE 3. TPB constructs test result.

Path	TPB Model
Exercise attitude → Intention	0.328*
Norm → Intention	0.202*
PBC → Intention	0.478*
Intention → Behavior	0.479*
PBC → Behavior	0.159
Intention R^2	0.691
Behavior R^2	0.272
Goodness of fitindex	CMIN/DF = 1.879 ($p < 0.001$); GFI = 0.915; IFI = 0.975; NFI = 0.934; CFI = 0.92; RMSEA = 0.052

*TPB: theory of planned behavior; PBC: perceived behavioral control; CMIN/DF: Chi square degree of freedom ratio; GFI: goodness of fit index; IFI: incremental fit index; NFI: normed fit index; CFI: comparative fit index; RMSEA: root mean square error of approximation; *: $p < 0.05$.*

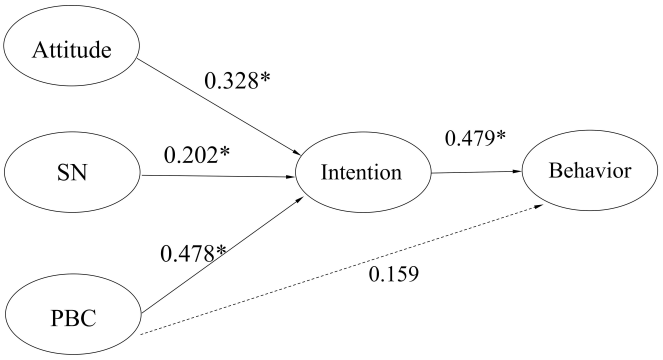

FIGURE 2. The verification results of the basic TPB model. PBC: perceived behavioral control; SN: subjective norm; *: $p < 0.05$.

3.3 Regression analyses: prediction of intention

Our research carried out Four separate moderated regression analyses to examine the effect of the TPB constructs, each of the four cultural value orientations, and the effect of the interaction of these cultural value orientations with the TPB constructs on exercise intention. According to opinion of Cohen *et al.* [42], variables were centered prior to examining interaction effects. Table 4 showed the results of the regression analyses. In the process of regression analyses, the primary effects of grade, place of origin, attitude, SN, PBC and individualism/collectivism were entered in the first step, and the interaction terms between individualism/collectivism and the TPB constructs were entered in the second step. The first step was therefore the same in all four regression analyses. It revealed that attitude ($\beta = 0.351$, $p < 0.01$), SN ($\beta = 0.212$, $p < 0.01$), PBC ($\beta = 0.485$, $p < 0.01$), HI ($\beta = -0.163$, $p < 0.05$) and VI ($\beta = -0.171$, $p < 0.05$) all can significantly predict intention. These variables explained collectively 68.2% of the variance of intention.

The addition of the interaction terms comprising the HI*attitude ($\beta = 0.073$, $p > 0.05$), HI*subjective norm ($\beta = 0.087$, $p > 0.05$), HI*PBC ($\beta = 0.068$, $p > 0.05$), VI*attitude ($\beta = 0.078$, $p > 0.05$), VI*SN ($\beta = 0.089$, $p > 0.05$), and VI*PBC ($\beta = 0.072$, $p > 0.05$) in the second step all failed to result in a significant change in explained variance ($R^2 = 0.016$, 0.018, $p > 0.05$). Attitude ($\beta = 0.350$, $p < 0.01$), ($\beta = 0.358$, $p < 0.01$), SN ($\beta = 0.212$, $p < 0.05$); ($\beta = 0.215$, $p < 0.05$), PBC ($\beta = 0.482$, $p < 0.01$); ($\beta = 0.485$, $p < 0.01$), HI ($\beta = -0.165$, $p < 0.05$); ($\beta = -0.168$, $p < 0.05$) and VI ($\beta = -0.175$, $p < 0.05$); ($\beta = -0.179$, $p < 0.05$) all remained significant predictors of intention. Neither of the interactions between HI and attitude, or SN and PBC proved to be significant.

The addition, HC*attitude ($\beta = -0.186$, $p < 0.05$), HC*subjective norm ($\beta = 0.197$, $p < 0.05$), VC*attitude ($\beta = -0.196$, $p < 0.05$), and VC*subjective norm ($\beta = 0.239$, $p < 0.05$) in the second step all resulted in a significant change in the accounted for variance (R^2 change = 0.037, $p < 0.05$); (R^2 change = 0.043, $p < 0.05$). Furthermore, attitude ($\beta = 0.363$, $p < 0.01$); ($\beta = 0.369$, $p < 0.01$), SN ($\beta = 0.21$, $p < 0.05$); ($\beta = 0.198$, $p < 0.05$), PBC ($\beta = 0.487$, $p < 0.01$); ($\beta = 0.491$, $p < 0.01$), HI ($\beta = -0.168$, $p < 0.05$); ($\beta = -0.170$, $p < 0.05$) and VI ($\beta = 0.169$, $p < 0.05$); ($\beta = 0.173$, $p < 0.05$) all remained significant predictors of intention. That is to say, the interaction of HC*attitude, HC*subjective norm, VC*attitude and VC*SN were all significant ($p < 0.05$). In summary, the results of this analysis partially validate the primary hypothesis of this study, namely, that collectivism plays a moderating effect in the relationship between SN and exercise intention. Furthermore, the moderating effect of the relationship between exercise attitude and exercise intention is supported, while the moderating role of the relationship between exercise PBC and exercise intention was not supported. In addition, all the hypotheses regarding the moderating effect of individualism on TPB constructs were not supported.

3.4 Simple slopes analyses

The significant interactions effect showed in the process of regression analyses were further analyzed by using simple slopes analyses according to the recommendations made by Aiken and West [41]. Regression slopes were computed for

TABLE 4. Moderated regression analyses of exercise intention on the TPB-variables, HI and VI, HC and VC, and their interactions.

	Exercise intention (β)				
Independent variable	Step 1	Step 2			
		HI	VI	HC	VC
Step 1: Main effects					
Grade	0.117	0.105	0.105	0.104	0.103
Place of origin	0.071	0.057	0.530	0.048	0.048
Attitude	0.351**	0.350*	0.358**	0.363**	0.369**
SN	0.212*	0.212*	0.215*	0.201*	0.198*
PBC	0.485**	0.482**	0.485**	0.487**	0.491**
HI	−0.163*	−0.165*	−0.168*	−0.168*	−0.169*
VI	−0.171*	−0.175*	−0.179*	−0.170*	−0.173*
HC	0.077	0.077	0.078	0.068	0.061
VC	0.078	0.079	0.082	0.053	0.059
Step 2: Interaction effects					
Attitude*HI		0.073			
SN*HI		−0.087			
PBC*HI		0.068			
Attitude*VI			0.078		
SN*VI			−0.089		
PBC*VI			0.072		
Attitude*HC				−0.186*	
SN*HC				0.197*	
PBC*HC				−0.112	
Attitude VC					−0.196*
SN*VC					0.239*
PBC*VC					−0.119
R^2	0.682	0.699	0.699	0.719	0.725
R^2 Change		0.017	0.018	0.037*	0.043*

*Note: *p < 0.05; **p < 0.01. PBC: perceived behavioral control; SN: subjective norm; HI: horizontal individualism; VI: vertical individualism; HC: horizontal collectivism; VC: vertical collectivism.*

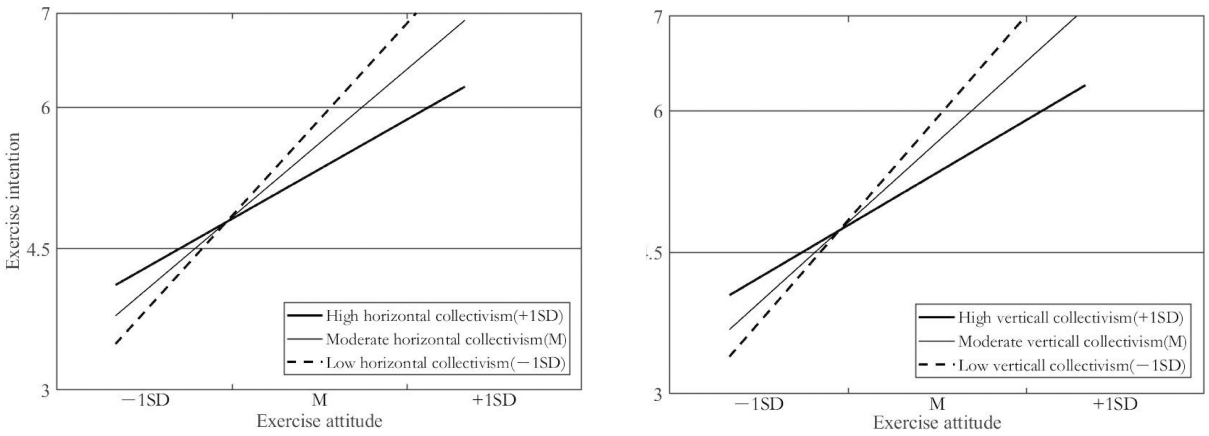

FIGURE 3. The moderating effect of collectivism on the relationship between attitude and intention. SD: standard deviation.

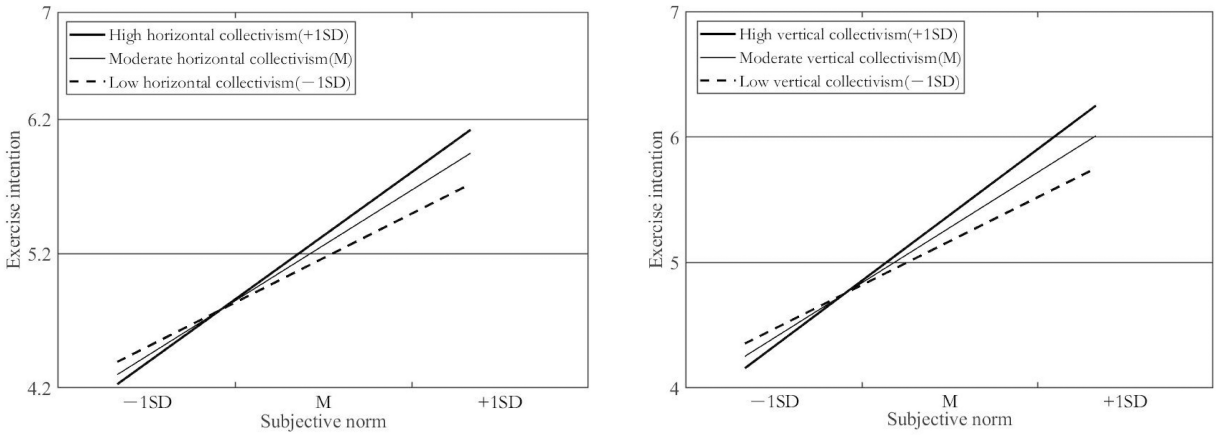

FIGURE 4. The moderating effect of collectivism on the relationship between subjective norm and intention. SD: Standard deviation.

the regression of intention on exercise attitude and SN at three levels of the moderator variable: the mean −1 SD (low), the mean (moderate), and the mean +1 SD (high). Simple slopes analyses indicated SN have a greater impact upon intention at higher levels of HC and VC. For example, the regression coefficient for the effect of SN on intention was higher in cases of high HC ($\beta = 0.316$, $p < 0.05$) and VC ($\beta = 0.349$, $p < 0.05$) compared to moderate HC ($\beta = 0.275$, $p < 0.05$), VC ($\beta = 0.293$, $p < 0.05$), low HC ($\beta = 0.221$, $p < 0.05$), and VC ($\beta = 0.233$, $p < 0.05$). On the contrary, simple slopes analyses revealed exercise attitude to have a greater impact upon intention at lower levels of HC and VC. The regression coefficient for the effect of exercise attitude on intention was lower at higher levels of HC ($\beta = 0.351$, $p < 0.05$) and VC ($\beta = 0.371$, $p < 0.05$) compared with moderate HC ($\beta = 0.523$, $p < 0.05$), VC ($\beta = 0.568$, $p < 0.05$), low HC ($\beta = 0.680$, $p < 0.05$) and VC ($\beta = 0.723$, $p < 0.05$).

These results reveal that, as shown in Fig. 3, the predictive validity of exercise attitude on exercise intention is greater at low levels of HC and VC, and lower at high levels of HC and VC. This indicates that exercisers with lower levels of HC and VC are more likely to base their intentions to do exercise on exercise attitude as opposed to those exercisers with higher levels of HC and VC. On the contrary, as seen from Fig. 4, the predictive validity of SN is greater at high levels of HC and VC and, lower in the case of low levels of HC and VC. This indicates that exercisers with higher levels of HC and VC are more likely to base their intentions to do exercise on SN as opposed to those exercisers with lower levels of HC and VC.

4. Discussion

4.1 The theoretical significance of this study

Our research shows that collectivism plays a significant moderating role on the relationship between SN and exercise intention and on the relationship between exercise attitude and exercise intention, while the moderating role in the relationship between exercise PBC and exercise intention proved to be insignificant. In addition, the hypotheses that stated that individualism has a moderating role in TPB constructs were not supported, which is somewhat consistent with Oyserman *et al.* [42]'s suggestion that individualism and collectivism are two separate constructs rather than opposite ends of a single continuum. These results also confirm Fishbein's [43] finding that external variables such as cultural value orientations and basic psychological needs may affect the relative weights of three antecedents of TPB (attitude SN and PBC) when predicting intention. Ajzen's [17] notion that the relative importance of attitude and SN may vary across situations is also supported by our findings. In addition, our research conclusion is consistent with Markus, Kitayama [44], Triandis [45] and Edwin A.J.Van Hooft [46] conclusions that individuals with high collectivist tendencies are more likely to rely on each other and obey authority, resulting in their behaviors being influenced more by SN than individual attitudes. That is to say, in the TPB framework, a tendency for high collective cultural values increases the subjective norm-intention relationship and decreases the attitude-intention relationship, while individuals who display a low tendency for collectivist cultural values are mostly motivated by attitude, while a minority are motivated by SN. However, unlike our conclusions, a study [32] using TPB constructs to predict halal food purchasing behavior showed that both individualism and collectivism significantly moderated the relationship between the three antecedent predictors of TPB constructs and intention. A possible explanation for the discrepancy between the two lies in the role of individualism in the TPB construct. The reasoning behind the difference in conclusions may lie in the essential differences or the differences in cultural background between the two behaviors, although the specific reason should be the subject of future study.

In terms of the value of this study, first of all, from the TPB point of view, this study deepens inquiry into the TPB theory, clarifying the psychological mechanism of TPB under the influence of different cultural values, and enriching the theoretical framework of the TPB theory. Secondly, from the individualism/collectivism, although individualism and collectivism are usually regarded as the two most basic cultural models, Triantis [47, 48] believes that there are in reality many distinct types of individualism and collectivism. He argues, for example, that American individualism is different from individualism of Swedish; similarly, the collectivism of the

kibbutz in Israel is also different from the collectivism of Korea. This study takes male Chinese university students as the research object in the wider context of Chinese culture, and uses the four-dimensional collectivism/individualism scale to investigate the interaction mechanism between individualism/collectivism and TPB constructs to predict male university students' exercise intentions and behaviors. As a result, from the perspective of collectivism/individualism, there are three additional conclusions to be drawn from our study. First, this study explored the interaction mechanism between individualist/collectivist cultural values and TPB constructs, and extended these findings to the field of physical exercise and confirmed the generality of their conclusions. Secondly, it confirmed the applicability of the moderating effect of individualism/collectivism on the TPB constructs in the Chinese cultural context. Finally, the using of the four dimensions of the individualism/collectivism scale (HI, VI, HC and VC) in this study confirmed the stability of the moderating effect of individualist/collectivist cultural values on TPB constructs.

4.2 The practical significance of this study

As seen from the results of this study, both HC and VC had a significant moderating effect, while neither form of individualism had any observable influence. The moderating effects of collectivism were further confirmed in that the exercise intention of university students with high collectivist values were more strongly motivated by social pressures and less so by personal exercise attitudes, compared to those participants with low collectivist values. The exercise intentions of university students with low collectivist values were more strongly motivated by their exercise attitudes and less by their perceptions of social pressure than people with high collectivist values. That is to say, the TPB constructs had differing influences depending on participants' cultural value orientations.

Among the two forms of collectivism, vertical collectivists showed a greater affinity for authoritarianism than valued sociability, while the horizontal collectivists prioritized sociability, interdependence, and hedonism. In addition, both vertical and HC had a significant moderating effect on the ability of TPB factors to predict the exercise intention of male Chinese university students, with the former having a greater effect than the latter. That is to say, conformity may be more common among vertical collectivist cultures than among horizontal collectivist cultures because of the former's emphasis on sacrificing the needs of the individual for the benefit of the group.

The main insight of this research is that emphasizing the interaction effect of SN and high collectivism should be considered an important approach to promoting exercise intention among those with high horizontal collectivist values from the point of view of university sports administration. For example, male Chinese university students with high vertical collectivist values stress the importance of the collective, the authority of leadership, and the integrity of the group. They are glad to sacrifice their own interests for the collective goals of the team and emphasize the importance of team cohesion. If the interests of the collective are in conflict with those of the individual, and the individual's interests are damaged, they are still more likely to obey the will of the collective. So if the goal is to encourage rates of exercise participation, the best approach would be to adopt methods that take the form of an executive order, setting a collective goal, highlighting collective honors and seeking the encouragement of leaders, teachers, parents and other figures of authority to promote exercise intention and behavior among Chinese university students with a high vertical collectivist cultural value orientation. Meanwhile, for students with a low VC cultural values orientation, the best approach for promoting exercise intention and behavior would be *via* issuing an executive order, setting a collective goal, highlighting collective honors and combining a health-minded attitude with an awareness of exercise. Male Chinese university students with high horizontal collectivist values emphasize the pursuit of goals shared with others, the importance of interdependence and mutual help, beliefs about organizational equality, but are unlikely to yield to authority. With these individuals, the best approach for encouraging exercise intention and behavior is fostering a collective atmosphere of equality, solidarity and mutual support in combination with encouragement from leaders, teachers, parents and other figures of authority. On the other hand, for those students with low horizontal collectivist values, the best approach to promoting exercise intention and behavior is *via* fostering a collective atmosphere of equality, solidarity and mutual support in combination with establishing a health-minded attitude and an awareness of exercise.

5. Conclusions

HC and VC can significantly moderate TPB constructs, mainly by moderating the relationship of attitude-exercise intention and SN-exercise intention. Our research has enriched the theoretical framework for the theory of planned behavior and provided useful information for the understanding of university students' exercise intention and behavior. The results of this study only concern only the male university student population and so cannot be generalized beyond this population.

6. Limitations and suggestions for future study

This study explored the psychological interaction mechanism between cultural values and TPB constructs in predicting exercise intention and exercise behavior of university students. However, the research results show that the interaction between the two is mainly limited to the moderating effect of collectivism between attitude and intention, as well as between SN and intention. In summary, the main conclusions of this study are primarily useful in understanding exercise intention rather than behavior, which limits the practical significance of this study. In addition, although our study provides valuable information, our cross-sectional analysis was not able to establish causality. In future research, experimental studies and longitudinal designs could be used to test the findings of this study and test for causality.

In this study, we examine the moderating role of individualism/collectivism on the TPB constructs, ignoring the dimensions of other cultural values. Future study could explore whether individual differences among the dimensions of other

cultural values, such as power distance, masculinity, future orientation, or uncertainty avoidance, influence the predictive effects of TPB constructs on intentions and behavior.

ABBREVIATIONS

SEM, structure equation model; TPB, theory of planed behavior; Ind, Individualism; Coll, Collectivism; SN, subjective norm; PBC, perceived behavior control; HI, Horizontal Individualism; VI, vertical individualism; HC, horizontal collectivism; VC, vertical collectivism.

AVAILABILITY OF DATA AND MATERIALS

All the data contained in this study can be obtained by contacting the corresponding author. Readers can also inquire part of the original data and the results of data processing in this paper.

AUTHOR CONTRIBUTIONS

HTF—contributed to topic selection, literature consultation, literature review and article drafting; JG—contributed to writing-review, editing, revision, proofreading; LH—contributed to the questionnaire survey, performed the data analyses and wrote the manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

There was no unethical behavior in this study, as this study was limited to a questionnaire survey. Since this study did not involve human clinical trials or animal experiments, according to Chinese laws and regulations and scientific research guidelines, this study does not require ethical approval, and so was orally approved by the scientific research institution of Hebei University of Science and Technology. In addition, all subjects gave written informed consent in accordance with the Declaration of Helsinki. The subjects of the investigation were ensured the rights to confidentiality and anonymity. All participation was voluntary.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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