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Examining Associations among Motivation, Physical Activity and Health in Chinese College Students: A Self-Determination Theory Perspective

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Abstract

This study was designed to investigate the associations among motives and physical activity behaviors and health in urban college students in China. Eight hundred and eighty-seven college students (521 females; M_{age} = 20.51, *SD* = ± 1.67) were recruited from four universities in South and South-central China. Participants' motives (i.e., interest/enjoyment, competence, appearance, fitness, social) toward to physical activity behaviors were measured by the established Motives for Physical Activities Measure (Ryan et al., 1997), while physical activity behaviors were assessed via the validated International Physical Activity Questionnaires for Chinese (Macfarlane et al., 2007). The data were collected in June 2016 and 2017. Participants' total metabolic equivalent (METs) was calculated as the outcome of physical activity behaviors. On average, participants reported 412 METs (*SD* = 290.82) of physical activity for the prior week. Correlation analysis suggested that all motive components were moderately or highly correlated with one another (r = 0.37 - 0.74; $p < 0.01$), and these variables were significantly, yet modestly, related to physical activity behaviors (r = 0.12 - 0.24; $p < 0.05$). Regression analyses further indicated that the whole model explained 24.5% of the variance [F (5, 394) = 5.02, p <.01] when using motives to predict physical activity behaviors. Interestingly, participants' interest/enjoyment was the only significant and positive predictor for their physical activity (β = 0.23, $p < 0.01$). Findings suggest that Chinese college students were relatively physically active on a weekly basis. Students' interest/enjoy toward physical activity is a very important motive in promoting physical activity behavior among this population. Health professionals and educators are encouraged to offer a variety of interesting and enjoyable activities for Chinese college students with the goal of helping this population develop and maintain a physically active lifestyle.

Keywords: *Motivation, Physical activity behavior, Self-determination Theory*

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Introduction

Clear evidence has shown the considerable health benefits of physical activity. People who are physically active tend to live longer and have a lower risk for obesity, heart disease, stroke, type 2 diabetes, depression, and some cancers (CDC, 2014). However, the prevalence of physical inactivity remains high, globally (Pratt et al., 2014). Previous research has revealed that most Chinese college students report low regular physical activity participation (Sun et al., 2016; Li et al., 2015). Epidemiology evidence has indicated declined physical activity levels and increased sedentary behaviors from secondary school to college (Crombie et al., 2009; Vella-Zarb et al., 2009). Lack of motivation may be the explanation behind poor participation in sports and physical activity among college students as motivation influences students' achievement behaviors and outcomes (e.g., effort, activity choice, and engagement) (Dinger et al., 1997; Douglas et al., 1997; Patrick et al., 1997; Wiley et al., 1996). To better design and deliver effective physical activity interventions in college students, it is critical to understand the relationships among their motivation and physical activity behaviors.

Self-determination theory (SDT) is an approach to human motivation and personality that uses traditional empirical methods while employing an organismic meta-theory that highlights the importance of human's evolved inner resources for personality development and behavioral self-regulation (Ryan et al., 1997). In other words, SDT emphasizes the investigation of an individual's inherent growth tendencies and innate psychological needs that are the basis for their self-motivation and personality integration, and for the conditions for the positive process (Ryan & Deci, 2000). SDT supports three basic psychological needs (i.e., competence, relatedness, and autonomy) that must be satisfied to foster well-being and health. Specifically, the need for competence is to seek to control the outcome and experience mastery (White et al., 1959); the need for relatedness is the universal want to interact, be connected to, and experience caring others (Baumeister et al., 1995); the need for autonomy is the universal urge to be causal agents of one's own life and act in harmony with one's integrated self (Deci et al., 2004). These needs can be applied universally; however, some may be more salient than others at certain times and are expressed differently based on time, culture, or experience. The SDT motivation was comprised by three major components: intrinsic motivation, extrinsic motivation, and motivation (Ryan et al, 1997). From a regulatory perspective, the intrinsic motivation was considered as intrinsic regulation (i.e., interest, enjoyment, inherent, satisfaction); the extrinsic motivation was comprised of external regulation, introjected regulation, identified regulation and integrated regulation; Motivation was considered as non-regulation.

Concerning participation in physical activity, intrinsically motivated behaviors are those performed purely for the satisfaction or enjoyment gained from physical activity itself. The literature indicated the primary satisfaction associated with intrinsically motivated actions were feelings of competence and interest/enjoyment (Deci &Ryan 1985; Pelletier et al., 1995; Reve & Deci, 1996; Csikszentmihalyi & Rathunder, 1993; Koestner & McClelland, 1990). In contrast, extrinsically motivated behaviors are those performed to obtain rewards or outcomes which are separate from the activity itself such as body-related motives (appearance and fitness). Nevertheless, such inquiry remains largely unanswered among Chinese college students such as the relationships among motivation, physical activity behaviors, and health.

The purpose of this study, therefore, was to investigate the associations between Chinese college students' motives and physical activity behaviors and health from a social-determination theory perspective (SDT).

Methods

Participants

A total of 887 college students (365 males; M_{age}= 20.51 years, *SD* = ± 1.67) from four universities in south and south-central China were recruited for this study. Study inclusion criteria for this study were: (1) 18-25 years old; (2) body mass index ≥ 18.5; (3) no self-reported diagnosed physical or mental disability; and (4) provided informed consent.

Demographic and Anthropometric Measurements

Participants reported age and gender on a demographic questionnaire. Trained research assistants measured participants' height to the nearest half-centimeter using a Seca stadiometer (Seca, Hamburg, Germany) and weight was evaluated afterwards using a standard digital weight scale. Finally, the body mass index (BMI) was calculated by dividing weight (kilogram) by height (meter) squared.

Outcome Measures

Physical Activity Behaviors. Participants' physical activity behaviors were assessed via a 6-item self-reported Chinese version of the International Physical Activity Questionnaire (IPAQ-SF) (Macfarlane et al., 2006). The prior 7-day physical activity recall was also obtained from the survey. According to the American College of Sports Medicine and the American Heart Association physical activity recommendations (ACSM, 2011; AHA, 2014), the estimated weekly hours of moderate- and vigorous-intensity were calculated and represented as metabolic equivalent (MET) (Haskell et al., 2007). For this study, the intensity of walking was considered as 3.3 METs, overall moderate-intensity physical activity as 4.0 METs, and vigorous-intensity physical activity as 8.0 METs. Evaluating physical activity levels were based on recommendations by the American College of Sports Medicine and the American Heart Association which recommended 30 minutes of moderate-intensity physical activity at least 5 days per week, or 20 minutes of vigorous-intensity physical activity at least 3 days per week, or a value greater than 450 METs per week when combining moderate- and vigorous-intensity physical activity (ACSM 2011; AHA, 2014).

Motivation. Physical activity motivation which aligned with SDT were evaluated using interest/enjoyment, competence, appearance, fitness, and social environment. The five motives were measured by using a 30-item scale of Motivation for Physical Activities Measure – Revised (MPAM-R) (Frederick & Ryan, 1993). Participants were asked to assess the truth of statements regarding interest/enjoyment (e.g., "…exercise makes me happy"), competence (e.g., "like activities that are challenging"), appearance (e.g., "to define muscles, look better"), fitness (e.g., "to improve cardiovascular fitness"), and social (e.g., "enjoy spending time with others doing this"). The degree of truth was measured on a 7-item scale (1: not true; 7: very true). The item mean was calculated and used as a measure of participants' perceived motives toward physical activity behaviors.

Health. Participants' health status was assessed via a validated questionnaire (Neumark-Sztainer et al., 2008). In detail, the question item was rated on a 5-point Likert scale

(1 = *strongly disagree*, 5 = *strongly agree*). The score was used as the participants' self-reported health status.

Procedures

The procedures were approved by the ethics review committees at the participating universities. Consent was also obtained prior to the start of this study. All data were collected by the primary researchers during regular college physical education classes. Data collection was completed by the end of the school year in 2016 and 2017. Participation was voluntary and no extra credit was awarded to participating students. College students interested in participation provided consent and completed questionnaires in their college physical education classes. The questionnaires were comprised of general demographic information and self-reported measures assessing physical activity levels and motivation for physical activity participation.

Data analysis

Descriptive statistics analysis was used to describe the participants' demographic characteristics (i.e., Age, Height, Weight, BMI), and total physical activity, health, motivation variables, including interest/enjoyment, competence, appearance, fitness and social influence. The Pearson correlation coefficient examined the associations among motivation variables, physical activity, and overall health status. Furthermore, the regression analysis revealed the predictive relationships among motivation components, physical activity, and health.

Results

Table 1 provides descriptive statistics of participants' demographic information (i.e., Age, Height, Weight, BMI) and study outcome variables (interest/enjoyment, competence, appearance, fitness, social, total physical activity, and health). On average, participants reported moderate levels of motivation and health; the means ranged from 3.96 to 5.21 (out of 7) for motivation components and 2.56 (out of 4) for health. Participants also averaged 389.91 METs (SD = 244.05) of physical activity in the prior week.

Table1. Descriptive statistics for outcome variables (N = 887)

Variables	*Mean*	*SD*
Age (years)	20.5	1.7
Height (cm)	166.5	8.7
Weight (kg)	57.9	12.2
BMI	20.9	5.1
Interest/enjoyment	4.3	1.3
Competence	4.4	1.2
Appearance	4.7	1.1
Fitness	5.2	1.1
Social	3.9	1.2
Total physical activity (METs)	389.9	244.0
Health	2.6	0.7

Note. Standard deviation = SD

Table 2 details Pearson correlation coefficient analysis among outcome variables. Correlation analysis suggested that all motivation components were moderately or highly related to one another (r = 0.46 - 0.79; $p < 0.01$). Motivation variables were significantly, yet modestly, associated with physical activity (r = 0.12 - 0.28; $p < 0.01$) and health (r = 0.07 - 0.23; $p < 0.05$). Specifically, interest/enjoyment (r = 0.27, $p < 0.01$; r = 0.23, $p < 0.01$), competence (r = 0.28, $p < 0.01$; r = 0.20, $p < 0.01$), appearance (r = 0.14, $p < 0.01$; r = 0.07, $p = 0.03$), fitness (r = 0.18, $p < 0.01$; r = 0.1, $p < 0.01$), and social (r = 0.12, $p < 0.01$; r = 0.16, $p < 0.01$) were statistically correlated with total physical activity and overall health status.

Table2. Pearson correlation analysis among outcome variables

Variables	interest	competence	appearance	fitness	social	total PA
interest	-					
competence	.786**	-				
appearance	.457**	.539**	-			
fitness	.554**	.634**	.710**	-		
social	.657**	.624**	.497**	.468**	-	
total PA	.272**	.275**	.142**	.184**	.123**	-
health	.230**	.203**	.072*	.100**	.156**	.178**

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Regression analysis for physical activity further suggested that the whole model explained 9% of the variance, F (5, 743) = 14.73, $p < .01$. Interest/enjoyment ($\beta = 0.19$, $p < 0.01$) and competence ($\beta = 0.18$, $p < 0.01$) emerged as the positive predictors, while social ($\beta = -0.11$, $p < 0.05$) emerged as the negative predictor for physical activity. Table 3 shows regression analysis results between motivation components and total physical activity level. Table 4 details the regression analysis results between motivation components and health. The results indicated the whole model explained 6% of the variance, F (5, 866) = 10.51, $p < .01$. Participants' interest/enjoyment was the only significant and positive predictor for health ($\beta = 0.19$, $p < 0.01$).

Table3. Regression analysis for physical activity

	SE	B	t	Sig.	95% CI	
					Lower	Upper
interest	11.29	0.192	3.269	0.001	14.742	59.07
competence	12.24	0.18	2.939	0.003	11.949	60.007
appearance	10.765	0.009	0.172	0.863	-19.278	22.991
fitness	12.072	0.012	0.223	0.824	-21.007	26.393
social	9.743	-0.113	-2.362	0.018	-42.141	-3.888

Note. 95%CI = 95% Confidence Interval

Table 4. Regression analysis for health

	SE	B	t	Sig.	95% CI	
					Lower	Upper
interest	0.032	0.186	3.258	0.001	0.041	0.165
competence	0.034	0.094	1.588	0.113	-0.013	0.121
appearance	0.03	-0.045	-0.916	0.36	-0.087	0.032
fitness	0.033	-0.039	-0.751	0.453	-0.091	0.04
social	0.027	0.018	0.38	0.704	-0.043	0.064

Note. 95%CI = 95% Confidence Interval

Discussion

This study explored the associations among Chinese college students' motivation, physical activity behaviors and health from a self-determination theory perspective. Driven by SDT, the relationships between the five major motivation components (i.e., interest, competence, appearance, fitness, and social), physical activity behaviors and health status were examined. In general, students displayed relatively low levels of physical activity as verified by self-reported METs. The Pearson correlation coefficient revealed a statistically significant, yet modest, association between physical activity behavior and health status. Further regression analysis suggested interest/enjoyment and competence were positively associated with physical activity, while the social component was negatively associated with physical activity. Also, only interest/enjoyment was positively associated with health status among participants.

Consistent with previous studies, the findings of the current study supported the predictive strength of interest/enjoyment and competence for physical activity. Ryan et al. also found that interest/enjoyment and competence were primarily instances of intrinsic motivation to the extent that these motives were focused on inherent aspects of the physical activity (i.e., interest value, desire for challenge, exercise of skills) (Ryan et al., 1997). In addition, there was no predictive association between appearance and fitness for physical activity behaviors. The present study did not distinguish between the types of physical activity, like sports or exercise, which may account for this result. In the previous study, Frederick and Ryan classified activities into sport activities and exercise/fitness activities, then examined the associations of enjoyment, competence, and body-related factor between sports and exercise participation. The findings indicated greater enjoyment and competence in sports participation, and greater body-related motive in exercise/fitness participation (Frederick & Ryan., 1993). Body-related motivation was considered extrinsically focused as it concerned a reward or outcome for the participation of physical activity. In this study, appearance and fitness failed to predict the physical activity behaviors of Chinese college students. The previous study indicated that body-related motives mainly accounted for fitness exercise activity. Other studies indicated that extrinsic motives such as appearance and fitness may only account for the initial motivation for exercise; whereas, intrinsic motives such as enjoyment and competence are critical for exercise adherence (Brawley & Vallerand, 1984). Moreover, Wankel et al. suggested that the spontaneous enjoyment from activity lead to increased adherence and positive psychological feelings (Wankel et al., 1993). Future researchers, when addressing the motivation components and

physical activity, should classify the types of physical activity in order to obtain consistent findings. The present study provides new empirical evidence to support self-determination theory based motives in the field of physical activity and health among Chinese college students.

The social motive for physical activity participation was addressed by Wankel as a potential contributor to exercise enjoyment. The present study found a negative association between social motive and physical activity. These findings do not support previous statements regarding the potential contribution to physical activity interest/enjoyment and adherence provided by social motives (Spink & Carron, 1992; Wankel, 1993). Because this study was investigated among Chinese college students, the potential cultural differences regarding the social interaction of physical activity may need to be addressed by future research.

This study has several strengths and limitations. A major strength of the study is the inclusion of a large sample of Chinese college students, an understudied population in the developing countries, and the exploration of associations among motivation, physical activity and health. In addition, the present study examined those associations based on the self-deamination theory. A major limitation of this study is the use of a self-reported physical activity questionnaire to assess college students' prior 7-day physical activity behavior. Considering the validity of physical activity measurement, objective measuring instruments such as accelerometers should be adopted in future studies. In addition, the present study did not distinguish gender differences in motivation of physical activity and health among Chinese college students.

Conclusion

The present study examined the associations among Chinese college students' motivation, physical activity behaviors, and health, based on the self-determination theory framework. Findings indicated that Chinese college students had overall moderate levels of physical activity and health. Students' interest/enjoy and competence were very crucial in promoting physical activity and health among this population. Educators of Chinese college students are recommended to offer a variety of interesting and enjoyable activities and to help students successfully complete the tasks.

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