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The Relationship between Exercise Behavioral Habits and College Students' Life Satisfaction under Data-Based Analysis: Construction of Interlocking Mediating Mole of Positive Thoughts and Body Esteem

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Abstract:
Exercise behavior habits of college students can lead to good self-health management, create a positive campus sports atmosphere, and promote the development of college sports. Distributing students' academic stress and minimizing the effects of negative emotions like anxiety and depression through the practice method of positive thinking serve a crucial role in enhancing life satisfaction. Data analysis was used in this study and 1743 university students were surveyed through stratified whole cluster sampling. The data collected from college students were analyzed by applying SPSS 26.0.(1) A strong and positive relationship was observed between exercise behavior habits and life satisfaction (r=0.383). (2) Exercise behavior habits positively predicted mindfulness (β= 0.332, t= 14.381, p<0.01). Mindfulness significantly positively predicted life satisfaction (β= 0.364, t=17.619, p<0.01) and physical self-esteem (β= 0.137, t= 5.756, p<0.01); physical self-esteem had a significant positive impact on life satisfaction (β=0.258, t=12.613, p<0.01). (3) Mindfulness and physical self-esteem significantly serve as a mediator in the connection between exercise behavior habits and life satisfaction. Exercise behavior habits can directly influence life satisfaction, but also indirectly influence life satisfaction via the individual the mediating influence of mindfulness and physical self-esteem as well as through the combined chain mediating effects of both, further explaining the factors contributing on the impact of exercise behavior habits on university students' life satisfaction, which is important for the enhancement and intervention of university students' life satisfaction.

Keywords: Data analysis, exercise behavior habit, mindfulness, physical self-esteem, life satisfaction, college students, Model construction

INTRODUCTION

The application of computer technology and data analysis to psychological research provides a new perspective for understanding the impact of physical activity on life satisfaction among college students[1]. The data include basic information about college students, frequency and type of physical activity, and scores on positive thinking, body self-esteem, and life satisfaction, etc. By integrating big data from different sources of colleges and universities, comprehensive analyses are carried out so as to reveal potential patterns and relationships, and provide data support and theoretical basis for interventions. Life satisfaction pertains to an individual's subjective assessment of their overall quality of life based on their daily experiences and interactions[2], and it is an important indicator of the positive development of university students. University students are at a critical period in their life development, and their satisfaction with life is as much abobodyut individual well-being, life and development as it is about the harmony and progress of society. Therefore, this study investigates how physical activity habits affect college students' life satisfaction and whether mindfulness and self-esteem mediate the connection between the two, aiming to provide theoretical guidance on enhancing college students' life satisfaction through the development of physical activity habits.

Exercise behavior habits are those in which physical activity becomes a need for the individual and becomes an automatic pattern of behavior [3]. Studies have concluded that exercise habits are predictive of life satisfaction[4]. Exercise behavior habits are strongly and positively correlated with life satisfaction among college students and enhancing exercise behavior habits can improve life satisfaction[4]. Physical activity is reflection of exercise behavior, and exercise behavior habits can positively predict physical activity behavior [3]. Kenneth R Fox argues that: physical activity can contribute to promoting subjective life satisfaction and treating mental illness and psychological abnormalities [5].

Therefore, we propose hypothesis 1: Exercise behavior habits can significantly and positively predict life satisfaction.

Mindfulness emphasizes openness and acceptance, experiencing and accepting all thoughts and feelings as they arise in the process from a position of knowing, accepting and non-judgement[6]. Research has shown that mindfulness as a personality trait is closely related to individual life satisfaction, and those with increased levels of mindfulness also have higher life satisfaction[7]. Other studies have suggested that mindfulness exerts a stronger positive predictive effect on life satisfaction[8]. There is a correlation between mindfulness and life satisfaction among university students, and mindfulness can directly predict life

satisfaction[9]. College students who exhibit greater mindfulness is associated with higher life satisfaction6, Research on mindfulness training has shown that mindfulness training increases the degree of life satisfaction along with the level of mindfulness in individuals[10]. Therefore, it is hypothesized that mindfulness may influence the life satisfaction of university students.

Exercise behavior habits can be strongly and positively associated with mindfulness, and exercise behavior habits can positively predict mindfulness [11]. Physical activity is a key precursor to mindfulness among university students, and the greater the level of physical activity among university students, as the level of mindfulness increases[12]. Therefore, it is inferred that exercise behavior habits can positively predict mindfulness.

Therefore, we propose hypothesis 2: mindfulness acting as a mediator between exercise behavior habits and life satisfaction.

Physical self-esteem is a sense of self, a self-evaluation of all aspects of the body. Starting with the connection between college students' physical self-esteem and overall life satisfaction, and analysis showed that college students' physical self-esteem and life satisfaction are correlated, physical self-esteem can positively predict life satisfaction, and higher physical self-esteem is associated with greater life satisfaction[13]. Individuals with high levels of physical self-esteem have positive self-affirming attitudes, are confident and optimistic, experience more positive emotions in their life learning interpersonal interactions and have higher levels of life satisfaction. Therefore, we infer that physical self-esteem can predict life satisfaction. Correlation analysis shows that exercise behavior habits of positively related to physical self-esteem, and consistent engagement in physical exercise can change one's morphology and improve physical quality, and thus all dimensions of individual's physical self-esteem are increased[14]. Research on youth exercise habits found a positive association with physical self-esteem, indicating that exercise habits have a significant effect on enhancing physical self-esteem[15].

Therefore, we propose hypothesis 3: that physical self-esteem serves serving as an intermediary in the connection between exercise behavior habits and life satisfaction.

Research has shown that positive emotions in mindfulness positively affect self-esteem[16]. Further research has shown that positive thoughts are positively associated with self-esteem[17]. Mindfulness has a significant contribution to a person's degree of physical self-esteem, and mindfulness training is effective in increasing the degree of an individual's physical self-esteem[18]. Mindfulness was strongly and positively related to college students' physical self-esteem, and the positive self-concept and harmonious interpersonal relationships advocated by mindfulness helped to increase levels of self-esteem in individuals.

Given the above, we propose hypothesis 4 of this study: mindfulness and physical self-esteem functions as a link mediator between exercise behavior habits and life satisfaction.

In conclusion, this research focused on four primary objectives: (1) to investigate the positive predictive role of exercise behavior habits regarding life satisfaction among university students; (2) to investigate the mediating effect of mindfulness between exercise behavior habits and life satisfaction among university students; (3) to examine the mediating role of physical self-esteem between exercise behavior habits and life satisfaction among college students; (4) to explore how mindfulness and physical self-esteem serve as mediators in the connection between exercise behavior habits and life satisfaction. (as shown in Figure 1).

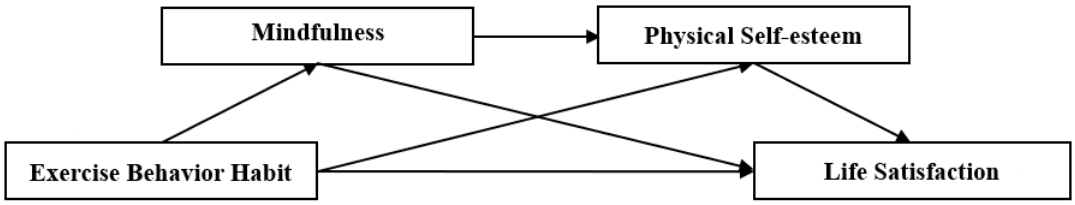

Figure 1. Conceptual framework diagram

METHOD

Participants

Based on the principle of stratified whole-group sampling, three classes were randomly selected from each year in each of the four universities in Guangdong Province, and the group was administered as a class. The questionnaires were distributed through the sample service of the Questionnaire Star website (https://wj.qq.com) and 1852 data were collected. The invalid scales were screened on the basis of "reverse question test", "response rate of less than 85%" and "responses clearly not in accordance with the facts", the final sample of 1743 valid scales was selected for analysis, achieving a valid response rate of 94.11%. Of these,

the age was (20±1.05) years, ranging in age from 18 to 23 years; 850 men and 893 women; 439 freshmen, 460 sophomores, 418 juniors and 426 seniors.

Following the Declaration of Helsinki, the study design has been approved by the Human Research Ethics Committee of Zhaoqing University (approval number: 2022-1216-01). This study uses a well-established scale for online measurement. Confidentiality is assured as all invited participants in the process are voluntary, and written informed consent was acquired from both the participants and the institution for all aspects of the study.

MEASURES

Exercise Behavior Habits Scale

The Behavior Habits subscale of the Exercise Attitude Scale was used to investigate the exercise behavior habits of individuals[3]. The scale consists of 10 questions and three dimensions: exercise habits (e.g., "I always exercise consciously"), exercise participation (e.g., "I enjoy participating in exercise activities"), and exercise behaviors (e.g., "During exercise, no matter what movement I am relaxed and at ease"), with higher scores reflecting greater levels of exercise behavior. A 5-point Likert scale was utilized, with scores ranging from 1 to 5 "not at all" to "completely". This questionnaire exhibits demonstrated strong relevance for Chinese university students[19]. In this research, the scale's Cronbach's alpha coefficient was 0.964, demonstrating high internal consistency.

Life Satisfaction Scale

The Life Satisfaction Scale developed by Diener et al. was used in this study[20]. There are five items in total, there are two dimensions: state of life (e.g., "I'm in a good place in my life"), and affirmation of existing life (e.g., "So far, I've gotten some of the things that I think are more important in my life"). A likert 7-point scale was used, with 1 (Strongly Disagree) to 7 (Strongly Agree) used for item scoring, with higher total scores indicating higher levels of life satisfaction. The study demonstrated that the questionnaire has good applicability in the Chinese university student cohort[21]. In this study the Cronbach's alpha coefficient for the scale was 0.937.

Mindful Attention Awareness Scale

The Positive Attention Awareness Scale created by Deng et al. was employed to assess individual positive attentional traits[22]. The scale has 15 items, there are three dimensions: cognitive (e.g., "I arrive at a place with a clear understanding of why I am here"), emotional (e.g., "I find it easier to quiet my mind and pay attention to what is currently going on"), and physiological (e.g. "Generally I will attend to the sensations in my body"). Adopting with likert6-point scoring, employing a scale from 1 (always) to 6 (never), higher total scores reflect greater levels of positive thinking. The study demonstrated that the questionnaire has good applicability in the Chinese university student population[23]. In the current study, the scale's Cronbach's alpha coefficient was 0.941.

Physical Self-Esteem Scale

The Physical Self-Worth Scale (PSW), revised by Xu Xia et al, was employed to measure physical self-esteem[24]. The scale comprises of six items, there are two dimensions: physical appearance (e.g., "Sometimes I am not proud of my size and physical abilities"), and physical and mental (e.g., "I don't feel very confident in the physical aspects of my body"). Likert 4-point scoring, 1 (fits me perfectly), 2 (fits me somewhat), 3 (fits me somewhat), 4 (fits me perfectly), and is mainly used to measure people's pride, satisfaction, positive experiences and confidence in their own bodies. Greater scoresreflect greater levels of physical self-esteem. Domestic scholars have revised the scale's Chinese adaptation developed in the university student population, and the revised physical esteem the scale exhibits strong. The study demonstrated that the questionnaire is highly applicable to the Chinese university student population [25]. In this research, the scale reported a Cronbach's alpha coefficient of 0.875.

Statistical analysis

This study used SPSS 26.0 software to provide descriptive statistics for each scale score. Pearson correlation analysis was employed to explore the relationship between exercise behavior habits, positive thinking, physical self-esteem and life satisfaction. Harman's single-factor analysis was performed to evaluate bias due to common method. The mediating role of positive thinking and physical self-esteem between exercise behavior habits and life satisfaction was examined using Hayes' SPSS macro program PROCESS model 6. The mediating effects of positive thinking and physical self-esteem were examined using the bias-corrected Bootstrap method with 5,000 replications.

RESULTS

Test for Common Method Bias

The Harman's single-factor analysis results indicated that 36 factors had eigenvalues greater than one, with the initial factor accounting for only 36.365% of the variability, which falls below the 40% threshold criterion. This suggests that there is no substantial common method bias in the study's data.

Descriptive Statistics and Correlation Analysis of the Variables

Table 1 shows that the correlation values for exercise behavior habits, mindfulness, physical self-esteem, and life satisfaction were all showed statistical significance. Relationship analysis showed that exercise behavior habits were significantly and positively correlated with mindfulness, physical self-esteem and life satisfaction; mindfulness were significantly and positively correlated with physical self-esteem and life satisfaction; and physical self-esteem and life satisfaction exhibited a significant and positive correlation. The associations among the variables provided support for examining the subsequent hypotheses.

Table 1. Means, standard deviations, and correlations among variables

Variable	M	SD	Gender	1	2	3	4
Gender			1				
1.EBH	31.03	8.741	0.000	1			
2.M	61.02	12.178	0.017	0.331**	1		
3.PSE	13.05	3.844	0.079	0.306**	0.224**	1	
4.LS	23.10	5.679	0.005	0.383**	0.483**	0.396**	1

N =1743.** p<0.01

Mediating Effect Test for Mindfulness and Self-Esteem

Following the suggestion of Wen and Ye for a mediating effect test [26], the test for this mediating influence was completed using Model 6 in the SPSS macro degree developed by Hayes. Table 2 presents the test results. First, the direct path of exercise behavior habits on mindfulness was tested by adjusting for demographic variables (gender and age). The immediate impact of physical activity behavior habits on life satisfaction was significant (β=0.175, t=8.150, p<0.01), thus, hypothesis 1 was valid.

The function of mediation by mindfulness and physical self-esteem in the relationship between exercise behavior habits and life satisfaction was then analyzed. The direct path of exercise behavior habits to mindfulness was significant (β=0.332, t=14.381, p<0.01) and the direct path of mindfulness to life satisfaction was significant (β=0.364, t=17.619, p<0.01), hypothesis 2 was validated. The direct path of exercise behavior habits to physical self-esteem was found to be significant (β = 0.259, t = 10.614, p < 0.01) and the direct path of physical self-esteem to life satisfaction was significant (β = 0.258, t = 12.613, p < 0.01), hypothesis 3 was validated. The direct path of mindfulness on physical self-esteem was significant (β = 0.137, t = 5.756, p < 0.01), indicating the presence of a sequential mediator between mindfulness and physical self-esteem, and hypothesis 4 was supported validated.

Table 2. Regression analysis of the relationships among variables

Effect	Item	Effect	SE	t	p	LLCI	ULCI
Direct effect	EBH⇒LS	0.175	0.021	8.150	＜0.01	0.133	0.217
Indirect effect	EBH⇒M	0.332	0.023	14.381	＜0.01	0.286	0.050
	EBH⇒PSE	0.259	0.024	10.614	＜0.01	0.211	0.307
	M⇒PSE	0.137	0.023	5.756	＜0.01	0.090	0.184
	M⇒LS	0.364	0.020	17.619	＜0.01	0.323	0.404
	PSE⇒LS	0.258	0.020	12.613	＜0.01	0.218	0.298
Total effect	EBH⇒LS	0.375	0.022	16.625	＜0.01	0.331	0.419

N=1,743; EBH, exercise behavior habit; M, mindfulness; PSE, Physical Self-esteem; LS, Life Satisfaction.

The test utilized the bias-corrected percentile Bootstrap method with 5,000 iterations. The 95% confidence interval range results for the mediated effect using the Bootstrap method (see Table 3). The chain mediation model involving mindfulness and physical self-esteem in relation to exercise behavior habits and life satisfaction is shown in Figure 2.

Table 3. Mediating role and magnitude of effect

Path	Effect	The proportion of mediations in the total effect	95%Confindence interval	
			Lower limit	Upper limit
EBH→M→LS	0.120	0.120/0.197=60.91%	0.094	0.150

EBH→PSE→LS	0.066	0.066/0.197=33.50%	0.049	0.087
EBH→M→PSE→LS	0.011	0.011/0.197=5.58%	0.006	0.018
Total effect	0.197		0.166	0.235

N=1,743; EBH, exercise behavior habit; M, mindfulness; PSE, Physical Self-esteem; LS, Life Satisfaction.

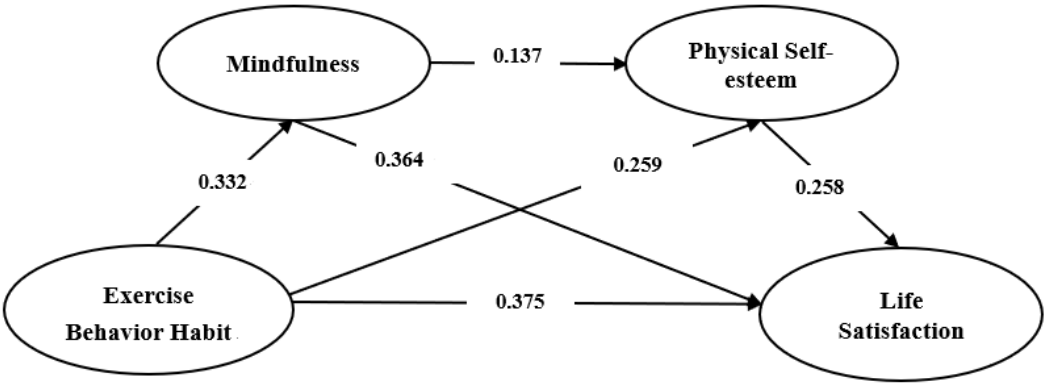

Figure 2. Chain mediation model of mindfulness and physical self-esteem between exercise behavior habits and life satisfaction

DISCUSSION

Exercise Behavior Habits and Life Satisfaction

This study found that exercise habits significantly and positively predict life satisfaction, aligning with previous research findings.[27], validating hypothesis 1. The study showed that exercise habits are purposeful, planned and regular physical activities, which are the main means and ways to ensure good physical fitness of university students, and are very important in enhancing their physical fitness and enriching their spiritual and cultural life. After physical activity, the body feels comfortable and can be very emotionally stable, thus contributing to the acquisition of life satisfaction. At the same time, individuals with good exercise behavior habits are able to experience successful sports performance during physical activity is conducive to increased life satisfaction[28]. Therefore, exercise behavior habits not only enhance physical quality of university students, but also have a positive impact in improving life satisfaction.

Independent Mediating Effect of Mindfulness

This research revealed that mindfulness acts serving as a mediator in the connection between exercise behavior habits and life satisfaction, thereby supporting Hypothesis 2. This aligns with previous related research findings that exercise behavior habits had a significant positive impact on positive thoughts[12] and that mindfulness was positively associated with life satisfaction[29]. Exercise behavior habits exhibit a significant predictive effect on mindfulness. Having exercise behavior habits helps to enhance individuals' levels of mindfulness[30]. The psychological framework of exercise habits is inherently compatible with the psychological structure of mindfulness, and exercise habits should be correlated with the trait of mindfulness. Another, mindfulness can significantly predict life satisfaction. There is a strong positive correlation with mindfulness and life satisfaction, with mindfulness being a positive determinant of life satisfaction [31], which is consistent with the results of this study. Furthermore, mindfulness training as an intervention, both for patients with physical or psychological illnesses and for healthy people, can help to reduce stress and improve individual life satisfaction.

The Separate Mediating Effect of Physical Self-Esteem

This study revealed that physical self-esteem served as a mediator in the connection between exercise behavior habits and life satisfaction, validating hypothesis 3. Exercise behavior habits were significant predictors of physical self-esteem, and physical self-esteem, consequently, positively predicted life satisfaction[32].This study confirmed that exercise behavior habits were positively associated with physical self-esteem. It has been shown that a higher level of physical exercise habits is linked to a rise in level of physical self-esteem[15]. Long-term commitment to physical exercise is more effective in fostering and maintenance of college students' willpower and resilience, while prolonged physical exercise makes college students master more proficient motor skills than other college students, thus psychologically improving self-efficacy and self-confidence, thus increasing the level of physical self-esteem[14]. This research also discovered that physical self-esteem showed a positive correlation with life satisfaction. The reason for this is that when individuals are confident in their health and physical appearance,

individuals will have more positive emotions, be positive about life and the family and friends around them, and be more willing to interact with and accept themselves. At the same time, prolonged participation in sport has also enabled university students to acquire more proficient motor skills, which develop their confidence in the face of competitive situations and will significantly increase their life satisfaction.

Sequential Mediating Effects of Positive Thinking and Physical Self-Esteem

Taken together, the above pathways suggest that this study constructs a sequential mediation model. Mindfulness and physical self-esteem serve as chain mediators in the connection between physical activity behavior habits and life satisfaction; specifically, exercise behavior habits positively predict mindfulness, which are an important predictor of physical self-esteem, which further predicts life satisfaction. Research hypothesis 4 was validated. The present study found that mindfulness significantly predicted physical self-esteem[33]. Mindfulness can also buffer the effects of negative thoughts and improve negative thinking patterns on physical self-esteem, thereby increasing a person's level of self-esteem [23]. According to previous research, mindfulness a factor that has a positive moderating effect on individuals' cognitive biases and helps college students develop a positive view of self, and mindfulness education can effectively improve individuals' body self-perception biases [34]. Therefore, mindfulness training can enhance the level of body self-esteem[35].

Limitations and Prospects

First, this study collected data through a study conducted at one point in time, which makes it challenging to accurately infer causal and serial associations among variables, which could influence the study results. Follow-up studies need to be combined with experimental studies or follow-up studies at multiple time points to further validate the study in order to reveal the mechanisms of variables in greater depth. Secondly, all data for this study were gathered from self-reports provided by university students, and there may be a social approval effect, resulting in the information in the self-reports being higher than the actual level, and future research could consider gathering data from multiple sources.

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