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Teachers' nutrition knowledge as a moderator on the association of habitual physical activity and quality of life among college students

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ABSTRACT

The study employed a longitudinal design over six months gathering data in three sessions spaced two months apart and comprising 329 students from five Chinese universities. The PLS-SEM (partial least squares structural equation modelling) method was used to analyse the data. The main goal of this study is to investigate the connection between exercise and college students' growth and well-being. This study seeks to identify reasons to provide colleges with focused therapy to enhance their students' overall performance. The findings of this research showed that physical activity improves students' general quality of life particularly their self-esteem, life satisfaction and positive and negative emotions. Nutrition education and teacher support can help students optimize the excellent impact of exercise on their general quality of life. These findings have ramifications for Chinese college campuses, emphasizing the importance of encouraging physical exercise and improving teachers' understanding of student nutrition. Colleges can support their students' quality of life by encouraging frequent exercise and offering nutrition knowledge.

Contribution/Originality: This research contributes to the originality of these findings and can inform the creation of targeted interventions and policies to improve college students' academic performance and overall quality of life.

1. INTRODUCTION

College is not only about academic learning but also about preparing students for life beyond graduation. Understanding the quality of life during college can help institutions prepare students for the challenges they may face in their personal and professional lives, fostering resilience and adaptability. There has been a rise in recent years in the number of people worried about college students' health (Son, Hegde, Smith, Wang, & Sasangohar, 2020). Students often confront issues such as sedentary behaviour, erratic eating habits and high levels of stress, which may harm their health (Machado et al., 2023). Researchers looked at the possible advantages of practicing

healthy diets and an active lifestyle to improve health and quality of life (Herbert, Meixner, Wiebking, & Gilg, 2020).

Numerous investigations have been made into the relationships between college students' physical activity, diet, general health and happiness (Xiaoxiao Zhang & Xu, 2020). Physical exercise enhances several areas of human health, including psychological quality of life, cognitive fitness and academic success. Appropriate nourishment is critical for college students to maintain a physical quality of life and improve intellectual capacity apart from cerebral developmental health (Bladek, 2021).

There still needs to be more in the literature on exercise and nutrition interventions aimed particularly towards Chinese college students despite past studies providing valuable insights (Liu, Guo, Zhang, & Gao, 2022; Shi & Luo, 2019; Xudong Zhang et al., 2021). More study is required to address challenges that Chinese college students face such as cultural, environmental and significant lifestyle management concerns (Fang, Zhang, & Elyas, 2020; Gong, Gao, Li, & Lai, 2021). There is an urgent need for studies tailored particularly to Chinese college students although research undertaken in various cultural contexts has yielded some valuable insights (Shen et al., 2021). Such a study would aid in creating focused interventions that better meet the population's unique needs and preferences (House, Neal, & Kolb, 2020).

It is critical to fill this vacuum in the current literature because it may give valuable insights for establishing evidence-based interventions that successfully enhance the health and quality of life of Chinese college students (Zhong & Xie, 2023). Although previous studies from different contexts can provide a basis specifically focusing on the Chinese college student demographic, it is essential to acquire a more profound comprehension of the distinct obstacles they face and devise approaches customized to their particular situation (Jiang, Yuen, & Horta, 2020; Yang, Quanjiang, Michael, Chun, & Chuang, 2021). This will enable the identification of workable methods to enhance Chinese college students' academic achievement, quality of life and well-being. This research aims to fill this gap and contribute significantly to the field by improving this group's health and quality of life.

This study illustrates the value of individualized diet and physical activity plans for college students, emphasizing teachers' role in supporting improved lifestyles (Alkazemi, 2019; Ubago-Jiménez, Zurita-Ortega, San Román-Mata, Puertas-Molero, & González-Valero, 2020). Involving teachers in the intervention process may help provide crucial assistance and direction to students (Oliveira, Grenha Teixeira, Torres, & Morais, 2021). Teachers may be important characters and providers of information for students to encourage healthy behaviours (Luthar, Kumar, & Zillmer, 2020).

In the Chinese setting, the number of college students is steadily rising, making it critical to focus on their health and quality of life (Travia, Larcus, Andes, & Gomes, 2022). Statistics show that sedentary lifestyles, poor food choices and mental health issues are on the increase among Chinese college students (Yang et al., 2020). These developments highlight the critical need for adequate exercise and nutrition intervention to address these difficulties and promote healthier lives (DeJonge, Omran, Faulkner, & Sabiston, 2020). As a result, doing research adapted to the Chinese environment is critical for gaining insights into the unique challenges faced by Chinese college students and developing methods appropriate to their unique circumstances to increase their general quality of life.

Furthermore, it is critical to examine China's cultural and educational background while studying college students' lifestyle choices and habits (Gao, Ping, & Liu, 2020). Traditional beliefs and dietary preferences might impact food choices and nutritional habits (Wang, Huang, & Wan, 2021). Furthermore, the competitive character of the educational system might lead to increased stress levels among students (Rana, Gulati, & Wadhwa, 2019). Therefore, it is vital to examine the effects of physical exercise and nutritional therapy in the Chinese context to find effective strategies that fit the complex Chinese culture and education, body and nutrition and intervention among Chinese college students (Laar et al., 2021). The specific objectives of the study are as follows: First, to examine the effects of regular exercise on student life, including measures of mental and physical health, self-

esteem, flourishing, life satisfaction and positive and negative feelings. Second, we examine the influence of teachers' nutrition knowledge on the relationship between habitual physical activity and the quality of life of the students.

Moreover, there has been a growing global interest in the overall health and quality of life of college students (Flett, Khan, & Su, 2019; Gonzales, Lanchipa-Ale, Puma, Mansilla, & Laura, 2022; Hernández-Torrano et al., 2020). Transitioning from high school to college often comes with lifestyle changes that can negatively affect students' physical and mental quality of life. Stress-related factors, sedentary lifestyles and erratic feeding patterns contribute to obesity (Wang & Bíró, 2021). Inadequate academic performance is one of the main risk factors for obesity and chronic diseases and this study will examine the potential benefits of exercise and nutritional interventions for addressing these factors.

Exercise and physical activity are essential components of a healthy lifestyle that play an important role in overall health and quality of life (Luo & He, 2021). Research has shown benefits for mental quality of life, cognitive ability and academic performance, so college students must incorporate physical activity into their daily routine (Herbert et al., 2020; Tang, Broderick, Bono, Dvoráková, & Braver, 2021). Physical activity participation has been shown to reduce the chances of developing chronic diseases such as heart disease and diabetes (Anderson & Durstine, 2019). Furthermore, it has been demonstrated that physical activity reduces tension, reduces anxiety and depression symptoms and promotes positive mental health by enhancing overall mental health (Ghrouz et al., 2019).

College students often need help with physical activity despite the well-documented benefits of physical activity (Maldari, Garcia, & Rice, 2023). These challenges may include time limitations, insufficient motivation and restricted availability of recreational amenities (Rahiem, 2021). The challenges above underscore the importance of customized interventions catering to these demographics' distinct requirements and inclinations.

College students' eating habits are often described as irregular with meals eaten at different times during the day (Serin & Koç, 2020). In addition, there is a tendency to eat high-calorie fast foods which can lead to an unbalanced diet (Guiné et al., 2020). Additionally, essential fruits and vegetables and essential vitamin and mineral sources are often underutilized (Sahoo, Swamy, Rout, Wani, & Mishra, 2021). The adoption of certain dietary practices has been associated with an increased risk of malnutrition, weight gain and chronic diseases (Zavitsanou & Drigas, 2021). Poor nutrition has been found to affect more than just a person's physical quality of life significantly, but also his ideas, abilities and academic achievement (López-Olivares, Mohatar-Barba, Fernández-Gómez, & Enrique-Mirón, 2020).

It is essential to implement nutrition programmes to promote healthy eating habits among college students as this can significantly improve their overall health and quality of life (Mamurov et al., 2020). Such interventions can raise awareness of the importance of balanced nutrition, increase awareness of appropriate aspects and provide appropriate strategies for making healthy food choices while dealing with the constraints of the college lifestyle (Antonopoulou et al., 2020).

Understanding the intricate interactions between physical activity, dietary habits and quality of life is crucial in the collegiate context (Hartman, Barcelona, Trauntvein, & Hall, 2020). This information is essential for designing effective therapies that may enhance their overall health and quality of life (Rogowska, Kuśnierz, & Bokszczanin, 2020). The literature review of the present study aims to look at the present corpus of research and discuss its variances. The mental health component, the physical health component, self-esteem, flourishing, life satisfaction and positive and negative emotions are the sub-variables that make up a student's quality of life. The general growth and well-being of college students may benefit from regular physical activity. The information may be used by schools to create focused programs to improve students' general contentment, academic performance and well-being. This research clarifies a significant problem in student welfare which may have an impact on the development of more extensive and effective educational support systems. The research questions are as follows:

1. What is the nature and strength of the relationship between habitual physical activity levels and the perceived quality of life among college students?
2. How do different levels of habitual physical activity correlate with various dimensions of student quality of life?
3. To what extent does engagement in habitual physical activity predict or influence the overall quality of life reported by college students?
4. How does teacher awareness of student nutrition vary across different levels of habitual physical activity among college students?
5. In what ways does the moderating effect of teacher awareness of student nutrition impact the relationship between habitual physical activity and specific components of student quality of life?
6. Are there specific conditions or contexts where the moderating role of teacher awareness becomes more pronounced in influencing the link between habitual physical activity and student quality of life?

1.1. Hypotheses Development

H_1: Habitual physical activity has a significant impact on student quality of life.

H_2: Awareness of teachers about student nutrition moderates the relationship between habitual physical activity and quality of life among college students.

2. LITERATURE REVIEW

2.1. Habitual Physical Activity

Numerous studies have repeatedly shown regular exercise benefits (De Oliveira, Souza, Rodrigues, Fett, & Piva, 2019; Thyfault & Bergouignan, 2020; Wu et al., 2019). A rising corpus of research also points to the advantages of exercise for one's mental health (Søvold et al., 2021). Regular exercisers often feel fewer signs of anxiety and despair and may even notice changes in their general mood (Pudło, 2022). Benefits to cognitive performance, such as enhanced memory and focus have also been linked to regular exercise (Bliss, Wong, Howe, & Mills, 2021).

More confidence in oneself is another positive side effect of regularly exercising (Corazza et al., 2019). Endorphins, neurotransmitters that elevate mood and heighten sensations of pleasure are produced during exercise and contribute to these positive outcomes (Alam, 2022). In addition to assisting individuals in maintaining a healthy weight, exercise improves their cardiac health and overall fitness (Mattioli, Sciomer, Cocchi, Maffei, & Gallina, 2020). It becomes essential to explore the role of teachers in understanding and promoting students' well-being, encompassing both physical and mental health and recognizing these holistic benefits.

2.2. Teachers' Nutrition Knowledge

The importance of teachers in promoting good eating habits among students cannot be emphasized (Leger, Buijs, Mohammadi, & Lee, 2022). In this aspect, teachers may be significant people and providers of information (Boschini, Falasconi, Cicatiello, & Franco, 2020).

One must examine their degree of understanding about their pupils' nutrition to determine how successful teachers may be in encouraging good eating habits (Gómez-García, Marín-Marín, Romero-Rodríguez, Ramos Navas-Parejo, & Rodríguez Jiménez, 2020).

Teachers who understand their students' nutritional requirements can better impart important information about well-balanced diets, proper portion sizes, and the need to choose healthy food selections (Alam, 2022). Individuals' purposeful efforts may help to create an environment that encourages improved nutritional behaviours among college students (Shi, Li, & Luo, 2021).

2.3. General Quality of Life of Students

It's important to remember that various variables affect learners' happiness and achievement in life (Alam, 2022). Academic performance and general quality of life for students may be significantly impacted by the interaction of mental, physical and emotional factors (Polanin et al., 2021). Consequently, it is incumbent upon teachers and policymakers to place a premium on student welfare and implement measures to aid children in each of these domains (Murphy, Ogata, & Schoute, 2023). Critical components of a comprehensive approach to student quality of life include recognizing the interconnectedness of different aspects and presenting them in a holistic manner (Yusli, Roslan, Zaremohzzabieh, Ghiami, & Ahmad, 2021). Assessing the impact of nutrition and exercise interventions across these aspects is crucial to acquire a holistic picture of a student's quality of life (Ahmed, Zuk, & Tsuji, 2021).

2.4. Mental Health Component

Students' quality of life psychological components such as perceived stress, emotional and cognitive efficacy were examined using psychological component scores (Firth, Cavallini, Sütterlin, & Lugo, 2019). Studies have demonstrated that regular physical exercise favour mental illness (De Oliveira et al., 2019). This is driven by a variety of factors such as reduced stress, improved mood and increased cognitive skills such as memory and concentration. Research shows that improved mental health outcomes are achieved through nutrition and balanced diet with many components linked to essential nutrients (Adan et al., 2019; Baker et al., 2022; Ievolella, Rasco, & Chan, 2022).

2.5. Physical Health Component

Ge et al. (2019) define the body composition score as a parameter to measure a student's physical health. Participating in regular physical activity benefits several areas of one's physical health, including overall fitness, levels of strength and a reduction in risk factors for chronic diseases (Alvarez-Pitti et al., 2020). It improves heart health, muscle strength, and endurance which are necessary for physical health (Alam, 2022). Regular exercise has been shown to improve metabolism and reduce the risk of chronic diseases when combined with a balanced diet (Anderson & Durstine, 2019).

2.6. Self-Esteem

Dale, Vanderloo, Moore, and Faulkner (2019) state that regular exercise is associated with better physical and mental health. Exercise helps people feel successful, competent and a part of society all of which contribute to developing positive self-esteem (Jackson, Williams, McEachern, Latimer-Cheung, & Tomasone, 2019). Exercise helps individuals perceive themselves better by providing a sense of accomplishment and physical fitness (Choi et al., 2021) because it gives people a sense of belonging, achievement and physical success which can help develop a better overall image (Mackenzie & Murray, 2021). This is because these measures offer patients a sense of choice and control over their eating habits by empowering them to make decisions (Herbert et al., 2020).

2.7. Flourishing

Optimal levels of joyful emotions, personal development and contentment are hallmarks of flourishing, a state of human functioning (Arslan, 2021). On the other hand, those who are successful are happier and more productive (Lipson, Abelson, Ceglarek, Phillips, & Eisenberg, 2019). This state of quality of life is seen as a desirable goal for humans. It is frequently associated with various favourable outcomes including improved physical health, greater interpersonal relationships and higher levels of productivity (Beckel & Fisher, 2022). According to different studies, frequent exercise might enhance one's quality of life in general (Zhang, Zhang, Ma, & Di, 2020). This is because exercise has been demonstrated to boost flexibility, happiness and general life satisfaction (Tükel & Temel, 2020).

A person's quality of life may be positively impacted by the combination of a good diet and exercise by supplying the necessary nutrients for ideal brain function and general health (Ekman et al., 2022).

2.8. Satisfaction with Life

The concept of satisfaction with life pertains to an individual's global evaluation of their quality of life and contentment with different aspects of their life (Ruggeri, Garcia-Garzon, Maguire, Matz, & Huppert, 2020). It includes a person's comprehensive evaluation of all their life areas (VanderWeele et al., 2020). According to research, people who move their bodies constantly tend to be more satisfied with their lives (Plichta, Jezewska-Zychowicz, & Gębski, 2019). This happens because exercise increases a person's strength, coordination and ability (Sugaono & Tecchio, 2020). Life satisfaction has been shown to benefit from interventions promoting healthy eating (Kumar, Kumar, Aggarwal, & Yeap, 2021). Because of this, people who are knowledgeable about nutrition are better equipped with critical information regarding which nutrients are required for optimum physical and mental health (Hosker, Elkins, & Potter, 2019).

2.9. Positive and Negative Emotions

Studies have frequently shown a relationship between regular exercise and happy feelings (Buecker, Simacek, Ingwersen, Terwiel, & Simonsmeier, 2021; Steptoe, 2019). Exercise has been linked to increased good feelings, including pleasure, joy and happiness (Alexander et al., 2021). Endorphins and other neurotransmitters are produced by the body which is also the cause of the emotional benefits that individuals experience after engaging in physical activity (Arsović, Đurović, & Rakočević, 2020). By providing the necessary nutrients for neurotransmitter synthesis and modulation, nutrition therapies that prioritize a balanced diet may increase joyful feelings (Martins et al., 2021). Additionally, studies have shown that participating in physical exercise may significantly lessen the occurrence of negative emotional states, including stress, anxiety and sadness (Pinho et al., 2021). This is a complete and adequate plan for fostering emotional quality of life (García-Carrión, Villarejo-Carballido, & Villardón-Gallego, 2019).

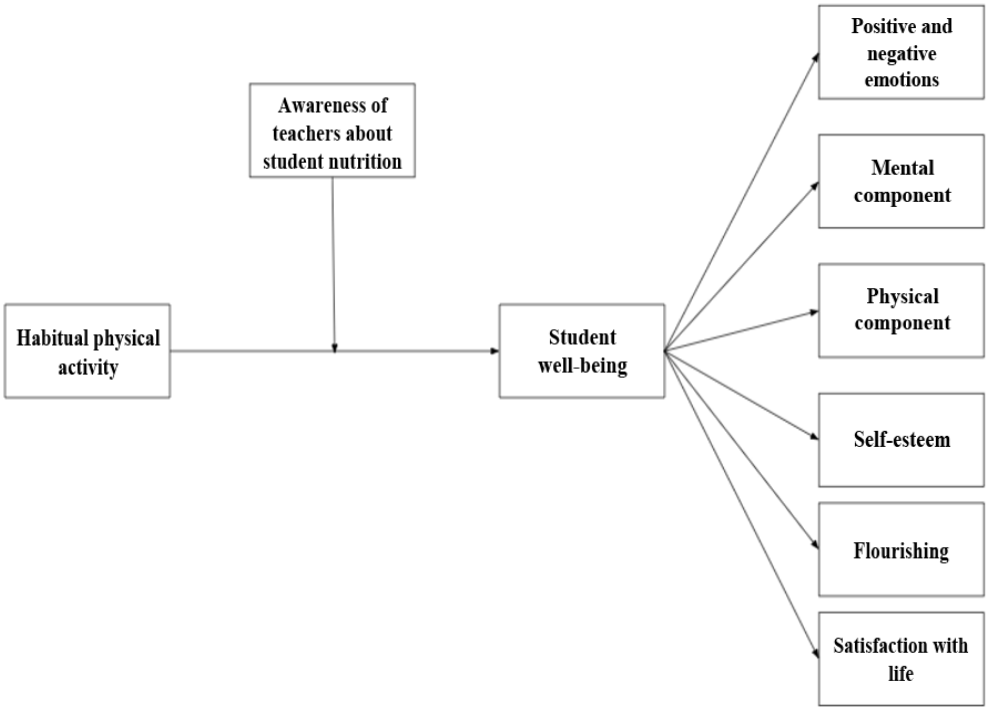

Figure 1. Conceptual framework.

The moderator is the instructors' nutrition knowledge whereas the independent variable is habitual physical activity (Romero-Blanco et al., 2020). The quality of life of the students includes many subvariants including cognitive and physical domain scores, self-esteem, quality of life, satisfaction and positive and negative emotion measures (Shaleh, Rahayu, Zubeir, & Istiqlal, 2020). This study may give practical information on improving their health and quality of life by researching the influence of physical exercise and nutrition on college students' quality of life. The present study hypothesized that habitual physical activity significantly influences the students' quality of life. The second hypothesis is that the teacher's awareness of nutrition substantially moderates the relationship between habitual physical activity and quality of life among college students. All the above literature review is explained based on a conceptual framework. Figure 1 illustrates the conceptual framework.

3. METHODOLOGY

3.1. Study Design

This analytical cross-sectional study is designed to investigate the influence of exercise and nutrition on quality of life among Chinese college students. The present study used a stratified random sampling method to select the respondents. The total population of the university is 1,000. The calculation of sample size was stratified according to body weight status which was divided into five classes: 582 "normal and below", 203 "overweight", 169 "slightly obese", 37 "moderately obese", and 9 "severely obese". The proportion for each class was calculated and used to calculate the sample size required for each class. The sample size for the present study consisted of 329 students. The teachers participated in the data collection procedure and were responsible for assigning individual codes to the replies made by their students. After the data collection phase, the information acquired from the teachers was merged to perform the ensuing analysis.

3.2. Sample

This study focuses on participant of Chinese university students from Shanxi University of Electronic Science and Technology with different academic fields, backgrounds and sociodemographic characteristics as the research objects.

Table 1. Demographic profile.

Demographic category	Frequency	Percentage
Gender		
Male	157	47.70%
Female	169	51.40%
Others prefer not to say	3	0.90%
Age distribution		
18-20 years	51	15.50%
21-23 years	101	30.70%
24-26 years	81	24.60%
27-29 years	49	14.90%
30+ years	47	14.30%
Academic fields		
Engineering	121	36.78%
Computer science	81	24.62%
Business and economics	41	12.46%
Arts and humanities	26	7.90%
Sciences	41	12.46%
Other	19	5.78%
Body weight status		
Normal and below	179	54.41%
Overweight	69	20.97%
Slightly obese	41	12.46%
Moderately obese	27	8.21%
Severely obese	13	3.95%
Teachers' participation	51	15.50%

The demographic presents a comprehensive overview of the surveyed group highlighting various key aspects. The gender distribution within the group is relatively balanced with a slightly higher percentage of females (51.4%) compared to males (47.7%) and a small percentage (0.9%) preferring not to disclose their gender or identify as other. In terms of age, the majority falls within the 21-23 age range (30.7%) while other age categories show a distribution. Academic fields reveal a predominant presence in engineering (36.78%) and computer science (24.62%) indicating a strong representation from STEM disciplines. Body weight status varies with a majority reporting a normal or below-normal weight (54.41%) while a substantial portion falls into the overweight category (20.97%). Additionally, the distribution includes respondents categorized as slightly obese (12.46%), moderately obese (8.21%) and severely obese (3.95%).

3.3. Instruments

A standard questionnaire was used to gather data for this investigation. The survey's objective was to determine how well-versed teachers were in a wide range of subjects related to the well-being and health of their students. The survey asked questions about students' overall well-being, physical activity level, mental health, and cognitive ability using Likert-type measurements collected from reliable sources in the field. The researchers used partial least squares or SmartPLS, a well-liked statistical analysis method for identifying intricate patterns in data, especially when using structural equation modelling (SEM) with latent variables for this study. Data was collected in three successive periods each separated by two months to capture any changes over time and provide a thorough examination of the dynamic interactions examined in the study. Informed permission from the participants and confidentiality were maintained addressing all ethical issues in detail. A pilot test was carried out prior to the main data collection phase to evaluate and improve the questionnaire's clarity and reliability to further ensure the validity of the study instrument.

3.4. Data Collection

The data-gathering method was completed in three consecutive periods with a two-month gap between each point allowing for the exploration of temporal variations, potential intervention effects and the stability of measured variables over time. Participants were asked to complete a series of validated questionnaires and evaluations throughout the data-gathering procedure. These surveys and tests were created to examine habitual physical activity, teachers' degree of nutrition knowledge and multiple components of their general quality of life. The study involved the participation of teachers who willingly volunteered. They were given clear guidelines and instructions on surveying their students while ensuring confidentiality by assigning unique codes.

3.5. Measurement Instruments

Researchers have employed various validated measurement instruments to assess habitual physical activity. These include a self-report questionnaire which was adapted from the study of Florindo and Latorre (2003). It depends on individuals' subjective answers to queries about their levels of physical activity and on activity trackers, which provide objective information on people's gait patterns and energy consumption. The tools used in this research were created to assess how often, how intensely and how long individuals engaged in physical activity throughout the allocated periods.

A self-report questionnaire assessed the nutrition knowledge of teachers. This survey was created based on the research of Bashir et al. (2021). The study's goal was to evaluate teachers' levels of knowledge and familiarity with concepts linked to nutrition as well as their ability to encourage and support students in making educated dietary choices that support good health.

Ritchie, Wabano, Russell, Enosse, and Young's (2014) study served as the source for the adaptation and slight modification of the student quality of life questionnaire. This questionnaire consisted of several different subscales.

The mental component score, physical component score, self-esteem score, flourishing scales, life satisfaction scales and assessments of positive and negative emotions were among these measurements. The measures used in this research were created to assess several facets of students' quality of life to fully understand the effects of dietary and activity interventions.

3.6. Data Analysis

This study adhered to all the prerequisites for using partial least squares structural equation modelling (PLS-SEM). These included considering the sample size verifying that there was no common technique bias and examining the measurement model. We looked at the impact of regular exercise on students' health (H1) and the moderating influence of teachers' knowledge of their students' nutritional needs (H2) to assess the two hypotheses. PLS-SEM allowed researchers to examine both direct and indirect correlations between variables revealing several connections within the study's framework.

3.7. Ethical Considerations

This study follows human participant research ethics criteria. Before the study began, all participants were informed of the research goals and methods and given the chance to ask questions. The research included only individuals who gave express agreement and all participants were guaranteed that their names and personal information would remain secret. The institutional ethics committee approved the research protocol and methods. Data processing and storage protocols ensure privacy and security.

4. RESULTS

The findings of the reliability analysis test in this study showed that the internal consistency of the variables examined in the research was adequate (see Table 2). The knowledge of teachers regarding student nutrition demonstrated a high degree of reliability with a Cronbach's alpha coefficient of 0.870. The quality of life variables physical component, self-esteem, flourishing, mental component, life satisfaction and positive and negative emotions exhibited good to strong internal consistency with Cronbach's alpha coefficients ranging from 0.809 to 0.866. Habitual physical exercise similarly demonstrated outstanding internal consistency with a Cronbach's alpha coefficient of 0.887. The physical component score indicated adequate dependability but had a somewhat lower internal consistency with a Cronbach's alpha coefficient of 0.743. These results indicate that the objects contained in every construct reliably assessed the targeted concepts, boosting the validity of the information gathered for the study's subsequent analysis and interpretation.

Table 2. Cronbach alpha.

Constructs	Cronbach's alpha
Awareness among teachers about student nutrition	0.870
Flourishing	0.840
Habitual physical activity	0.887
Mental component	0.846
Physical component	0.743
Positive and negative emotions	0.866
Satisfaction with life	0.850
Self-esteem	0.809

The variable "habitual physical activity" had an excellent composite reliability of 0.913 and a high average variance extracted (AVE) of 0.603 showing that the items within this variable accurately measured the construct. Similarly, the variable "awareness of teachers about student nutrition" had an acceptable composite reliability of

0.898 and a moderate AVE of 0.527 indicating that the items assessing teachers' awareness of student nutrition were reliable and explained significant variance in the construct (see Figure 2).

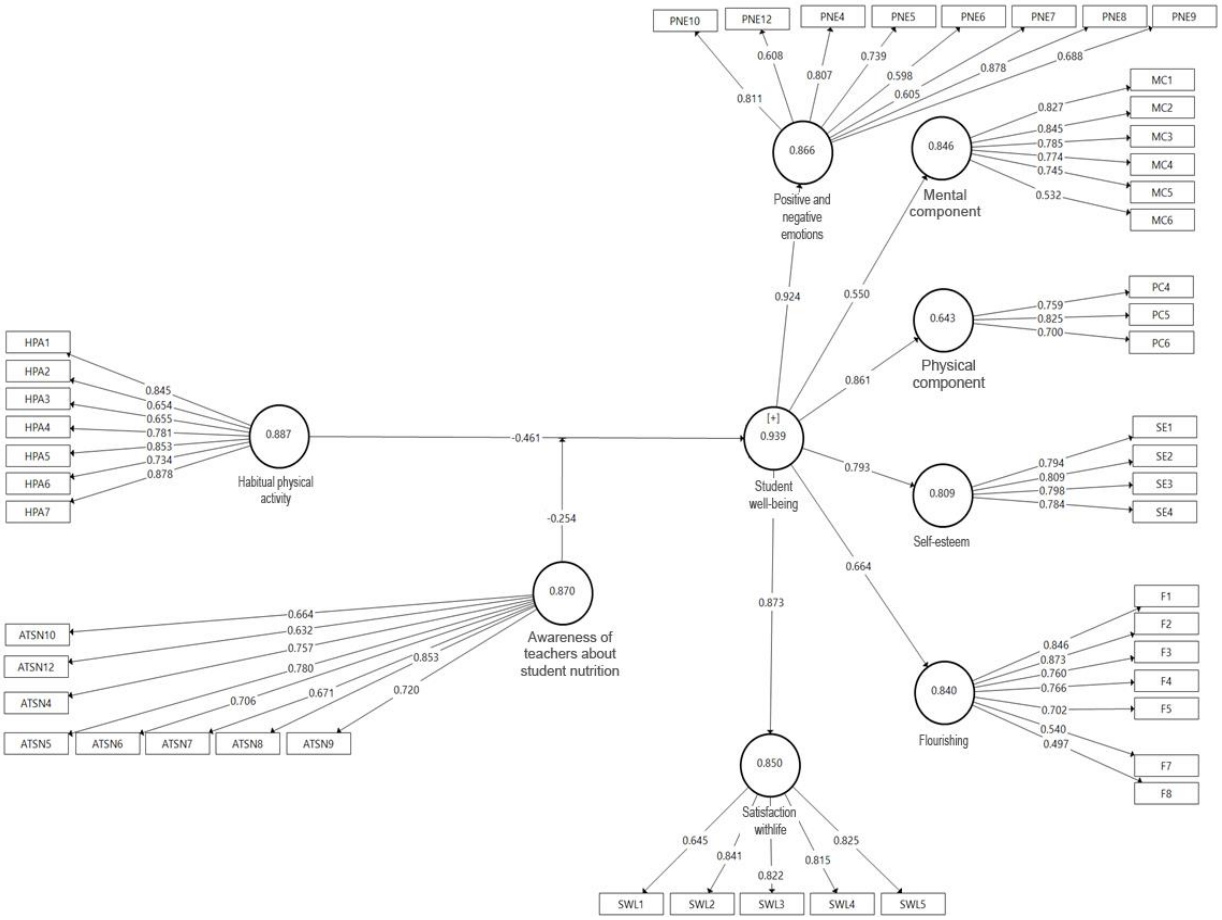

Figure 2. Structural model.

In terms of student quality of life, the variable "flourishing" demonstrated a high composite reliability of 0.882 and an AVE of 0.525 showing excellent internal consistency and a significant amount of variance explained by the items. Additionally, the "mental component" variable showed a high composite reliability (0.889) and an AVE of 0.575 demonstrating that the items measuring mental health were reliable and contributed significantly to the construct's variance. On the other hand, the "physical component" variable demonstrated acceptable composite reliability (0.806) and an AVE of 0.582, indicating satisfactory internal consistency and a considerable amount of variance explained.

Variable AVEs ranged from 0.524 to 0.634 while composite reliabilities ranged from 0.806 to 0.913. These findings imply that the items within these variables accurately measured the target constructs and accounted for a significant percentage of the variance.

In a nutshell, the findings show that the variables tested in the study had acceptable levels of reliability and validity such as 0.5 for AVE (Hair, Black, Babin, Anderson, & Tatham, 2009), >0.7 for Cronbach's alpha (Bland & Altman, 1997), 0.7 for composite reliability (Alarcón, Sánchez, & De Olavide, 2015) and 0.9 for Heterotrait-monotrait ratio of correlations (HTMT) ratios (Ab Hamid, Sami, & Sidek, 2017). The findings provide confidence in measuring these constructs demonstrating that the items reliably measured the intended concepts and accounted for a substantial variance in each construct.

Table 3 shows the reliability of variables.

Table 3. Variable reliability.

Variables	Constructs	Items	Original sample	Composite reliability	Average variance extracted
Student quality of life	Habitual physical activity	HPA1	0.845	0.913	0.603
		HPA2	0.654		
		HPA3	0.655		
		HPA4	0.781		
		HPA5	0.853		
		HPA6	0.734		
		HPA7	0.878		
	Nutrition knowledge of teachers	NKT10	0.664	0.898	0.527
		NKT12	0.632		
		NKT4	0.757		
		NKT5	0.780		
		NKT6	0.706		
		NKT7	0.671		
		NKT8	0.853		
		NKT9	0.720		
	Flourishing	F1	0.846	0.882	0.525
		F2	0.873		
		F3	0.760		
		F4	0.766		
		F5	0.702		
		F7	0.540		
		F8	0.500		
	Mental component	MC1	0.827	0.889	0.575
		MC2	0.845		
		MC3	0.785		
		MC4	0.774		
		MC5	0.745		
		MC6	0.532		
	Physical component	PC4	0.759	0.806	0.582
		PC5	0.825		
		PC6	0.700		
	Positive and negative emotions	PNE10	0.811	0.896	0.524
		PNE12	0.608		
		PNE4	0.807		
		PNE5	0.739		
		PNE6	0.598		
		PNE7	0.605		
		PNE8	0.878		
		PNE9	0.688		
	Self-esteem	SE1	0.794	0.874	0.634
		SE2	0.809		
		SE3	0.798		
		SE4	0.784		
	Satisfaction with life	SWL1	0.645	0.894	0.629
		SWL2	0.841		
		SWL3	0.822		
		SWL4	0.815		
		SWL5	0.825		

The model assessment results reveal essential insights into the predictive quality and accuracy of the constructed models for the different constructs. The model for "flourishing" demonstrates a moderate ability to predict the observed values, with a Q^2 predict value of 0.532. Additionally, the small Root Mean Square Error of Approximation (RMSE) of 0.057 and mean absolute error (MAE) of 0.066 indicate a relatively low average difference between the predicted and observed values. The R-square value of 0.441 suggests that the model explains 44.1% of the variance in flourishing. Although specific values are not provided for the Q^2 predict, RMSE or MAE

for the other constructs, the R-square values indicate that the models explain a significant portion of the variance. The models for the mental component, physical component, positive and negative emotions, satisfaction with life, self-esteem and overall student quality of life explain approximately 30.2%, 74.2%, 85.5%, 76.2%, 63.0% and 62.6% of the variance, respectively. These findings highlight the models' predictive power and overall fit for each construct, providing valuable insights into their performance (see Table 4).

Table 4. Model fitness.

Constructs	Q^2predict	RMSE	MAE	R-square
Flourishing	0.532	0.057	0.066	0.441
Mental component				0.302
Physical component				0.742
Positive and negative emotions				0.855
Satisfaction with life				0.762
Self-esteem				0.630
Student quality of life				0.626

The Fornell-Larcker criterion was used to assess the discriminant validity of the measurement model. The results indicate that all the constructs in the study have satisfactory discriminant validity. Each construct's average variance extracted (AVE) is higher than its correlation with other constructs suggesting that they measure distinct aspects of the intended concepts. The constructs including "awareness of teachers about student nutrition", "flourishing", "habitual physical activity" , "mental component", "physical component", " positive and negative emotions", " satisfaction with life" and "self-esteem" exhibit good internal consistency capturing a significant portion of the variance within their respective constructs. These findings confirm the reliability and distinctiveness of the measurement model, further strengthening the validity of the study's results (see Table 5).

Table 5. Fornell-Larcker criterion.

Constructs	1	2	3	4	5	6	7	8
Nutrition knowledge of teachers	0.726							
Flourishing	0.483	0.725						
Habitual physical activity	0.786	0.265	0.776					
Mental component	0.269	0.786	0.398	0.758				
Physical component	0.499	0.416	0.325	0.237	0.763			
Positive and negative emotions	0.550	0.435	0.366	0.254	0.713	0.724		
Satisfaction with life	0.448	0.300	0.410	0.276	0.745	0.779	0.793	
Self-esteem	0.415	0.329	0.370	0.271	0.661	0.704	0.751	0.797

The findings of the HTMT ratios show that they are all less than the required threshold of 0.9 indicating that the constructs have discriminant solid validity. The HTMT ratios (Heterotrait-monotrait ratio of correlations) for constructs like "awareness of teachers about student nutrition" and others varied from 0.321 to 0.665 demonstrating that they are unique and assess various characteristics.

The HTMT ratios (Heterotrait-monotrait ratio of correlations) between other constructs, such as "flourishing", "habitual physical activity", "mental component", "physical component", "positive and negative emotions", "satisfaction with life," and " self-esteem" are also within acceptable bounds. These findings confirm the constructs' discriminant validity and imply that they successfully evaluate various aspects of the intended ideas, boosting the overall robustness of the study's findings (see Table 6).

Table 6. HTMT criteria.

Constructs	1	2	3	4	5	6	7	8
Nutrition knowledge of teachers								
Flourishing	0.560							
Habitual physical activity	0.603	0.321						
Mental component	0.326	0.626	0.462					
Physical component	0.665	0.574	0.417	0.309				
Positive and negative emotions	0.634	0.518	0.413	0.297	0.786			
Satisfaction with life	0.527	0.360	0.471	0.326	0.416	0.614		
Self-esteem	0.492	0.413	0.427	0.331	0.435	0.837	0.898	

The path analysis of the study shows significant relationships between the studied variables. With a coefficient of -0.461, the relationship between "habitual physical activity" and "student quality of life" shows a substantial adverse influence (see Figure 3). Accordingly, increased levels of regular physical exercise are linked to better student quality of life. The t-statistic of 4.761 (p 0.001) from the statistical study supports the relevance of this link. Additionally, the "moderating effect 1" path representing the moderating influence has a negative value of -0.254. This suggests that the moderating factor significantly affects students' quality of life. The significance of the moderating impact is further supported by the highly significant t-statistic of 7.588, p 0.001. These results illuminate the links between habitual physical activity, student quality of life, and the moderating variable, highlighting their critical roles in encouraging beneficial outcomes in college students.

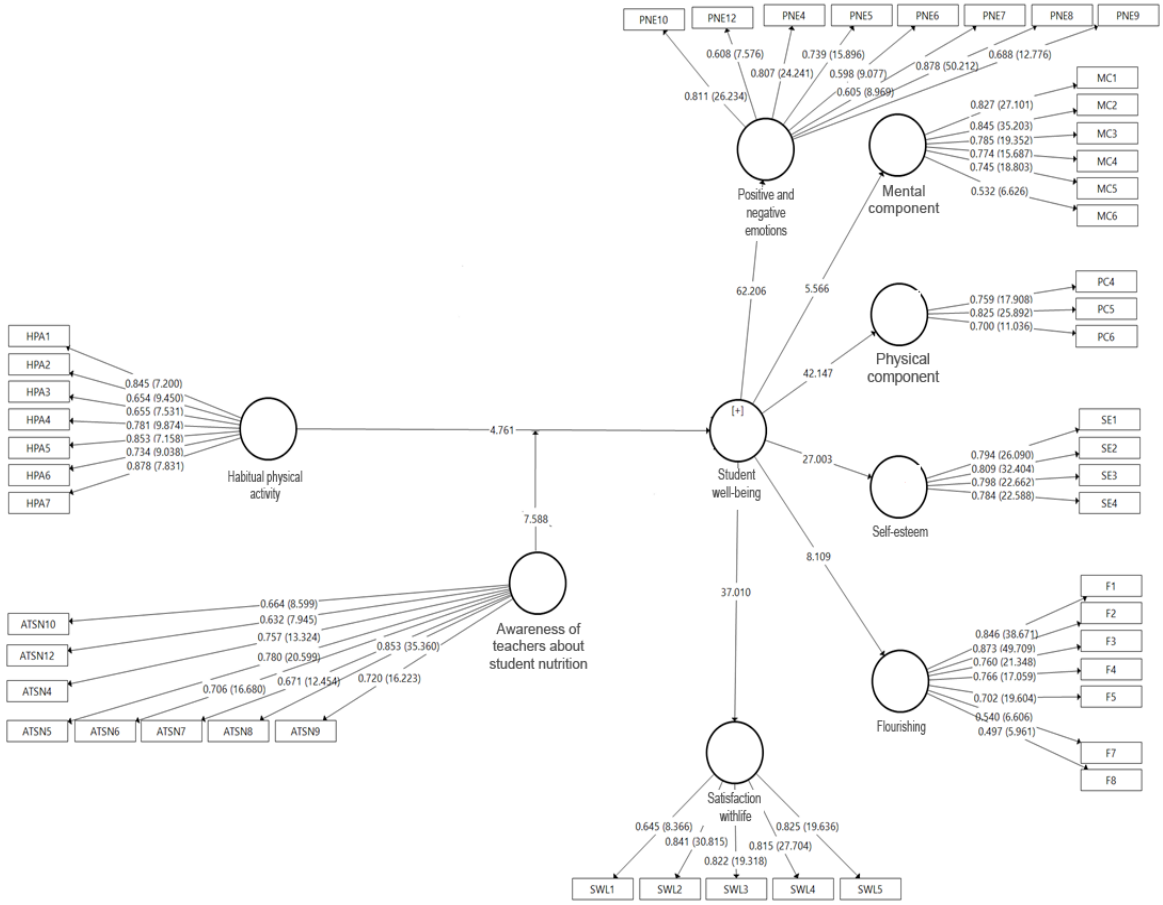

Figure 3. Path analysis.

The statistically significant information on the relationship between habitual physical activity, moderating effect 1 and student quality of life is displayed in Table 7. The results for habitual physical activity show a clear trend with very little room for error the standard deviation (SD) is just 0.097. When examining the relationship

between students' quality of life and frequency of physical activity, there seems to be a significant difference between the groups (t-statistics = 4.761). Students' happiness and well-being appear to be significantly impacted by frequent physical exercise as seen by the statistically significant association and minuscule p-value of 0.000. The extremely low standard deviation (SD) of 0.033 for moderating effect 1 suggests that responses to this component are consistent. The higher t-statistics value of 7.588 indicates a significant difference between the groups emphasizes the importance of moderating effect 1 regarding student quality of life. The remarkably low p-value of 0.000 indicates the significant impact of moderating effect 1 on students' well-being.

Table 7. Path analysis results.

Hypothesized paths	Original sample	Standard deviation	T-statistics	P-values
Habitual physical activity -> Student quality of life	-0.461	0.097	4.761	0.000
Moderating effect 1 -> Student quality of life	-0.254	0.033	7.588	0.000

5. DISCUSSION

The study's findings confirm that regular physical exercise greatly influences students' quality of life. The path analysis's negative coefficient (-0.461) implies that greater levels of habitual physical exercise are related to increased quality of life among college students. The inference is consistent with other studies highlighting the benefits of exercise for both physical and mental health (Meyer et al., 2020).

Additionally, as suggested by the second hypothesis, our research looked at how students' frequent physical activity and quality of life relate to their teachers' understanding of their dietary habits. The path analysis findings suggest that teachers' awareness considerably moderates this association with a negative coefficient (-0.254). This suggests that teachers' knowledge of student diet is important in determining the influence of physical exercise on quality of life. The results imply that when teachers are more aware of their students' diet and give appropriate assistance, the favourable impact of physical activity on quality of life becomes more prominent.

These findings have far-reaching ramifications for educational institutions and policymakers. Improving students' quality of life by encouraging habitual physical exercise should be stressed. Efforts should be made to raise teachers' understanding of student nutrition. Colleges may create a culture supporting students' overall quality of life by creating wellness initiatives that encourage physical activity and nutrition education.

This study's results are consistent with past studies. The consistent positive impact of regular physical exercise on student quality of life across various studies can be attributed to biological mechanisms such as the release of endorphins and stress reduction. Improved sleep quality, social interaction and the establishment of healthy habits during the student years also contribute. Additionally, the relationship between exercise and academic performance further supports the notion that engaging in physical activity enhances both mental and physical well-being (Bowler, Buyung-Ali, Knight, & Pullin, 2010; Bray & Born, 2004; Herbert et al., 2020). These results support known ideas such as the self-determination theory and the biopsychosocial model which stress the role of physical activity in fostering general quality of life (Guay, 2022; Johnson, Cronin, Huntley, & Marchant, 2022). Furthermore, past research has shown the importance of social support and contextual variables such as teachers' understanding of students' nutrition in affecting health habits (Baria & Gomez, 2022; Katz, Mercer, & Skinner, 2020).

Finally, this research offers empirical evidence for the beneficial impact of frequent physical exercise on students' quality of life. It emphasises the critical moderating function of teachers' knowledge of student nutrition. The results underline the need to boost physical exercise and raise nutrition knowledge in school settings to improve students' quality of life. Colleges may contribute to their students' holistic development and success by recognizing important components including social interaction, mental health assistance and physical activity. Emphasize the importance of collaboration between departments, counselling services, and extracurricular

activities. Early detection methods, wellness programs and customized therapies tailored to each student's unique needs should all be included in the proposed curriculum redesign. Stress the need for creating a supportive environment on campus evaluating program effectiveness on a regular basis and allocating finances for sustained support. The final point to make is that these comprehensive growth strategies have the potential to be successful in the long run.

The results add to existing theoretical frameworks by providing empirical proof of the beneficial effects of frequent physical exercise on students' quality of life. The self-determination theory and the biopsychosocial model, two well-known frameworks that emphasize the significance of physical exercise in enhancing mental and physical health are supported by these results. The results show the role that instructors' knowledge of students' diets plays in regulating behaviour which adds to the theoretical framework of social support and environmental factors in affecting health behaviours. By revealing these relationships, this research contributes to a more complex theoretical understanding of health promotion and student quality of life.

The study's conclusions have significant ramifications for teachers, legislators and medical professionals concerned about children's health. The findings stress the need to promote and ease access to regular physical activity among university students. Practical strategies such as providing students with easy access to fitness centres, establishing physical activity programmes and promoting active commuting are all options for schools looking to increase students' regular physical activity. Teachers might also help students make healthier food choices if they were informed about and prepared for their students' unique nutritional requirements. By working together, medical professionals and teachers may improve children's health in many ways, including by implementing intervention programmes encouraging healthy food and regular activity. The practical implications may improve Chinese university students' health and living conditions.

6. CONCLUSION

This research sheds light on the possible influence of dietary and physical activity modifications on Chinese university students' health and quality of life. The research also highlights the critical moderating impact of student nutrition knowledge. The findings show that teachers' understanding of the link between physical exercise and quality of life had a substantial effect on the association underlining the importance of teachers in encouraging healthy habits and generating favourable outcomes among students. The favourable impacts of physical exercise on quality of life were magnified when teachers were better aware of student nutrition and gave appropriate assistance.

These results have far-reaching consequences for educational institutions and policymakers. Prioritizing physical activity promotion and raising teachers' understanding of student nutrition may help to establish an atmosphere favourable to improving college students' general quality of life. Colleges may play a critical role in promoting students' overall development and success by creating comprehensive intervention programmes that target both exercise and nutrition.

7. LIMITATIONS AND FUTURE RECOMMENDATIONS

7.1. Limitations

This study's findings also came up with some limitations indicating how to proceed further. One of the study's flaws is that it lacks generalizability. The results may not be relevant to other cultural situations since they were produced using a particular sample of Chinese college students. To address this limitation, future studies may investigate how exercise and food interventions affect college students from other countries considering cultural differences and contextual factors.

Another limitation is self-report measures which are susceptible to bias and social desirability effects. Future studies should use objective metrics such as wearable technology or biomarkers to properly quantify physical activity levels and nutritional health to increase data quality and dependability.

7.2. Future Direction

The long-term impacts of nutrition and exercise therapy may be the focus of future research. Follow-up with participants over time may reveal information on the long-term durability of the claimed gains in quality of life. The complex interactions between physical exercise, diet and quality of life may reveal their processes. We may better comprehend these relationships by studying the physiological markers and psychological variables that underlie them.

Considering social and environmental factors in nutrition and exercise may also be helpful. Exploring how social support networks, environmental signals and contextual variables affect healthy behaviours may help build more comprehensive and focused therapies.

In a nutshell, studying the complex relationships between physical exercise, nutrition and quality of life and the interaction of physiological, psychological, social and environmental aspects may provide new insights and research paths. Building more thorough and efficient quality of life initiatives may benefit from investigating the connections between individual actions and social support, environmental cues and governmental interventions.

It is critical to recognize the study's limitations which include the small sample size drawn from certain Chinese institutions and the dependence on self-reported measures. Future studies should incorporate more varied samples, objective measures of physical activity and quality of life and other contextual variables to enhance the results.

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