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Factor-Related Health Status of University Students

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Abstract

Background and Aim: In the face of the characteristics of contemporary university students, it is urgent to use new theories to explore the promotion mechanism of university students' physical exercise behavior at the school level. However, the existing research fragmentedly explores the influencing factors of university students' physical exercise proactive behavior and lacks systematic and in-depth research. In particular, there is a lack of an exercise behavior model suitable for contemporary college students. Therefore, the main purpose of this study is to test the reliability and validity of the model.

Materials and Methods: All the screened test items are formed into a test item pool, which is evaluated by 7 experts using IOC, and representative test items are selected for testing. All experts should score each test question, and use it when the experts reach a high degree of consensus; otherwise, delete it. Then it was to perform a physical ability test. Based on the physical ability test items screened by experts, 222 university students were tested and given exercise behavior change questionnaires to fill out. Statistical analysis was then performed. Statistics used for data analysis were mean, standard deviation, Pearson's correlation, and so on.

Results: After deleting the items that did not meet the requirements using Critical Ratio (CR) and Pearson Product-moment Correlation Analysis, the remaining items were first analyzed using EFA, and their construct validity was between .736 and .916. The model demonstrated high reliability, with all coefficients exceeding 0.8. Also, the model demonstrated high validity, with all coefficients exceeding .67. All of the above coefficients successfully passed CFA verification.

Conclusion: This study pointed out that motor control includes speed, balance, reaction, and agility. Also, the constructed healthy behavioral model has high reliability and validity, with assessment results reflecting the intended constructs. It's stable and reproducible and provides a basis for further research and applications.

Keywords: Reliability; Validity; TTM; Exercise Behavioral Change; Physical Ability; University Students

Introduction

According to the spirit of "The Medium- and Long-Term Youth Development Plan (2016-2025)", issued by the CPC Central Committee and the State Council, the core of university education at this stage is to strive to improve the comprehensive quality of university students, mobilize the enthusiasm of young students for autonomous learning and develop the habit of lifelong exercise. The essence of education is to return education to human development and cultivate personal subjectivity (Feng, 2021). At present, the sub-health problems of university students are gradually emerging, and the sub-health rate has reached 64.69%. It is mainly manifested in the decline of physical exercise ability, premature decline of physical function, lack of consciousness of physical exercise, and so on. It is found that exercise behavior at the university stage is of great significance for developing lifelong sports habits. Therefore, university physical education should pay more attention to the importance of university students' proactive exercise. Youth is the future of the country and the hope of the nation. As the main force of youth, university students need to study the cultivation mechanism of their exercise and proactive behavior.

For the cultivation of exercise behavior, interdisciplinary analysis should be carried out from the perspectives of pedagogy, psychology, medicine, physical education, and other disciplines (Lu & Hui, 2020). From the perspective of individuals, the formation of physical exercise behavior needs to go through five stages in order, that is, the spiral change and development along the five stages of "unconsciousness → consciousness → preparation → action → maintenance" (Ma et al., 2023). University students who have grown up in an environment of "exam-oriented education" for a long time have not fully developed their physical exercise habits. Traditional physical education makes it difficult to stimulate university students' interest in physical exercise. It is necessary to strengthen the cultivation of self-determination motivation

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and improve university students' interest in exercise from internal mechanisms (Li, 2021). At present, the research on physical exercise behavior in the field of domestic pedagogy from the perspective of individual psychology, that is, the process from goal setting, motivation, and action to continuous cultivation, needs to be further deepened.

The group of contemporary university students has reached adulthood in age but has not yet achieved psychological independence. Due to the low willingness of subjective independent exercise and the lack of awareness of developing a healthy sports lifestyle, proactive intervention at the school level is very necessary. Therefore, how to according to the group of university students in the new era. Therefore, it is an urgent problem to find a suitable theoretical perspective, focus on the school level, and explore the effective promotion mechanism of domestic university students' physical exercise behavior.

Healthy fitness is a comprehensive concept that describes an individual's physical, mental, and social health. Physical fitness status is of great significance in maintaining daily activities, preventing diseases, and improving quality of life. The relationship between healthy physical fitness and the transtheoretical model shows that the two support and promote each other, helping to better understand and promote individual health behaviors and physical fitness levels. In practical applications, the two can be combined to improve people's physical fitness levels and promote healthy behaviors by developing personalized exercise plans and behavior change strategies.

TTM (Transtheoretical Model) is particularly suitable for college students' exercise behavior, mainly because it matches the stage characteristics of college students: TTM emphasizes that behavior change is a staged process, and college students are often at different stages in their attitudes and behaviors towards exercise. By identifying the stage, targeted strategies and support can be provided to promote the transition to a more active exercise stage. In addition, TTM not only focuses on short-term behavioral changes but also pays more attention to cultivating long-term and stable healthy behavioral habits. For college students, it is of great significance to develop a lifelong habit of exercise, and the TTM method can help achieve this goal.

In conclusion, firstly, the existing research results of individual proactive behavior, including the concept of proactive behavior, measurement, antecedent variables, etc., provide a theoretical basis for the analysis of sports fitness proactive behavior. Secondly, in terms of research on the development of university students' physical exercise behavior, it is necessary to explore the habit formation mechanism of physical exercise behavior from the perspective of individual psychology. Thirdly, in the face of the characteristics of contemporary university students, it is urgent to use new theories to explore the promotion mechanism of university students' physical exercise behavior at the school level. Last but not least, the existing research fragmentedly explores the influencing factors of university students' physical exercise proactive behavior and lacks systematic and in-depth research. Therefore, no matter the development process of academic research or the practical need to improve the physical exercise of university students, "factors related health status of university students" is an important and meaningful topic.

Objectives

To confirm the reliability and validity of the exercise behavior model of university students.

Literature review

1. The research of the transtheoretical model on behavioral changes

The transtheoretical model was proposed by Prochaska, a professor of psychology at the University of Rhode Island in the United States, in 1979. The transtheoretical model was born out of the comparative analysis of mainstream theories in psychotherapy and behavior change. It combines many theoretical models and foundations. It was originally developed from studying the process of smoking cessation. As early as the 1950s, there were about 36 unique systems of psychotherapy, and by 1975, there were more than 130 systems. When Dr. James 0. Prochaska, a professor of psychology at the University of Rhode Island, was studying to become a psychotherapist when his father died of alcoholism and depression. He failed to help his father and did not understand why his father did not trust psychotherapy until his death. This led him to delve more into psychotherapy and eventually led to transtheoretical analysis. Following

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one of Dr. Prochaska's original works on psychotherapy systems, he conducted a comparative study of 18 major theories of psychotherapy and behavior change, including consciousness-raising from Freudian thought, Skinner's Contingency management in traditional theory, and helping relationships from Rogers' theory, etc. TTM synthesizes the essence of major psychological theories and organically combines these theories into a complete method of changing behavior. Therefore, this theoretical model adopts the term "transtheoretical". Sonstroem & Alnaral first applied the transtheoretical model in related research on changes in fitness exercise behavior. This study revealed the widespread application of the transtheoretical model in exercise and fitness behaviors.

The Transtheoretical Model (TTM) is a model of purposeful behavior change that focuses on individual decision-making abilities in behavior change rather than social and biological influences. It is a method of systematically studying individual behavior changes based on the synthesis of multiple theories. The TTM theoretical model proposes that individual behavior change is a continuous process rather than a single event. Before people change their behavior, they develop a series of dynamic cyclic changes in the stage change program. Different behavior conversion strategies should be adopted for individuals at various stages to promote their transition to the action and maintenance stages. This theoretical model attempts to explain how behavior change occurs, not just why it occurs. It describes the process of how people change an undesirable behavior and obtain a positive behavior.

The content structure of the transtheoretical model is divided into four parts: 1) the Stage of Change, 2) the process of Change, 3) Self-efficacy 4) Decisional Balance. The four components of the transtheoretical model combine three dimensions of change: stages of change, processes of change, and levels of change. The stages of change reflect when people make behavioral changes (when); the change procedures reflect people's behavior change process (how); the self-efficacy and decision-making balance throughout the change stages and change procedures reflect the impact of people's behavioral change factors (what factors), which reflect different levels of change. In the transtheoretical model, stages of change are the core organizing structure of the model, which points out a time sequence of behavioral change that confirms the dynamic nature of behavioral change and the direction toward change. Sequence of motor development. The change program describes how individuals change. It includes 10 cognitive and behavioral activities that are conducive to behavior change. Self-efficacy refers to the belief that a person can complete the necessary behaviors to achieve desired results. Decisional balance includes the positive and negative effects of behavior or the perceived benefits or barriers to change.

2. The research on healthy physical fitness

Healthy physical fitness refers to the physical ability of the human body to cope with the pressure of daily life, work, and study. It not only reflects an individual's physical health but also reflects his or her ability to adapt to environmental changes. Healthy physical fitness mainly includes the following aspects: cardiorespiratory endurance, muscular strength and endurance, body composition ratio, and flexibility (Markov et al., 2023).

Healthy physical fitness is vital to an individual's overall health and well-being. First, good health and fitness can help us better cope with the stress of daily life and work and reduce the risk of disease. Secondly, it can also improve our learning efficiency and work performance, thus improving our quality of life. In addition, healthy physical fitness can improve self-confidence and help us better cope with challenges and stress (Marques et al., 2015).

The following are the factors that influence healthy physical fitness (Mohajan & Mohajan, 2023): 1) Lifestyle habits: A healthy diet and adequate sleep are key factors in maintaining good healthy physical fitness. At the same time, regular exercise is also an important means to improve health and fitness. 2) Age: As age increases, the body's health and fitness will gradually decrease. Therefore, maintaining long-term exercise habits is particularly important to maintain healthy physical fitness in old age. 3) Genetic factors: Heredity has a certain impact on an individual's health and fitness, but through reasonable exercise and a healthy lifestyle, people can overcome the influence of genetic factors to a certain extent. 4) Environmental factors: Environmental factors include climate, air quality, life stress, etc., which will have an impact on human health and fitness. 5) Mental state: Mental state is closely related to physical health. Long-term psychological stress or depression may lead to a decline in physical function, thus affecting health and fitness.

In general, healthy physical fitness is an important reflection of an individual's overall health status and quality of life. To maintain good health and fitness, we need to develop good living habits, including a

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reasonable diet, adequate sleep, and regular exercise. At the same time, we should also pay attention to and improve environmental factors and psychological states that may affect healthy physical fitness.

3. The research on Health Action Process Approach (HAPA)

The Health Action Process Approach (HAPA) is a behavior change theory proposed by German scholar Schwarzer based on the integration of social cognition theory, rational behavior theory, and will theory (Schwarzer, 2001).

HAPA has been an influential theoretical model in the field of healthy behavior in the past 20 years. The model believes that behavior change includes at least two processes of motivation and volition, and the volition process can be subdivided into the intention stage and the action stage. The HAPA is divided into three stages, namely the pre-intention stage, the intention stage, and the action stage. The HAPA theory holds that in the pre-intent stage, individuals realize the harm of not adopting a certain health behavior, weigh the benefits of the health behavior outweigh the harm, and firmly believe that they can successfully adopt the behavior, thus forming behavioral intentions and formulating behaviors. Goals; in the intention stage, individuals firmly believe that they can deal with various obstacles encountered in the behavior process, and then prompt individuals to formulate behavior plans and try to take action to achieve goals; in the action stage, individuals generate and maintain actions under the regulation of perceived self-efficacy, various barriers and available resources influence behavioral withdrawal, maintenance and recovery (Schwarzer, 2008).

Schwazer (2008) believes that self-efficacy is a social cognitive variable that plays an important role in all stages of action change, but different self-efficacy plays a role in each stage, so self-efficacy is subdivided into action self in HAPA Self-efficacy, coping self-efficacy, and recovery self-efficacy, the effects of the three self-efficacies in the three stages are not the same.

HAPA has both continuous and phased features. The continuous part can better analyze and predict health behavior and its internal change mechanism, and the phased part can provide a better theoretical basis for intervention. The continuity of the HAPA model is reflected in two aspects: on the one hand, in the unintentional stage, the process of forming behavioral intentions is a continuum model, and the increase in self-efficacy, outcome expectations, and risk perception will all promote the formation of individual behavioral intentions; on the other hand, Behavior intention, plan, and actual action are a continuous change body. The phase nature of the HAPA model is reflected in the fact that the model divides the behavioral change process into three stages, and various social cognitive variables play different roles in different stages (Schwarzer, 2008).

HAPA is widely used in exercise and is a good predictive model. To improve the predictive power of the model on exercise intention or exercise behavior, some researchers added variables such as social support and subjective norms to the original model.

Shen (2011) integrated HAPA and the theory of planned behavior and added social support. The results showed that the original model could explain 19% of the variance of exercise intention, 16% of the variance of exercise behavior, positive outcome expectations, and action self-efficacy. Efficacy is the best predictor of exercise intention, negative outcome expectation is negatively correlated with exercise intention, exercise intention indirectly affects exercise behavior through the mediation of exercise program, the predictive effect of risk perception on exercise intention, and the direct effect of coping self-efficacy on exercise behavior. The predictive effect is not significant. After adding subjective norms and attitudes to the model, the predictive effect of positive outcome expectations and negative outcome expectations on exercise intentions becomes insignificant, and subjective norms and attitudes are the most important predictors of exercise intentions; the explanatory degree of the integrated model to exercise intentions increases To 38%, the explanation of exercise behavior remains unchanged, but the influence of social support on exercise intention and behavior is not significant.

Steca et al. (2017) investigated patients with coronary heart disease and hypertension and also showed that the path coefficient between risk perception and exercise intention was not significant, the direct predictive effect of coping self-efficacy on exercise behavior was not significant, and the model explained the variance of exercise intention 80% of the variance and 75% of the variance in exercise behavior. In the study of Bao Z.D. et al. (2012), the predictive effect of negative outcome expectations on exercise intentions was not significant, and action self-efficacy and positive outcome expectations were the most important predictors of exercise intentions, explaining 71% of the variance in exercise intentions.

In summary, HAPA can be successfully used in the field of exercise at home and abroad, and it can explain 19% to 80% of the variance of exercise intention and 16% to 75% of the variance of exercise

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behavior. However, there are still differences in the variables affecting exercise intention and exercise behavior in the structure.

Conceptual Framework

INPUT	OUTPUT
TTM Exercise Stage Change: contemplation, preparation, action, maintenance Physical Ability: motor control, flexibility, endurance, strength Model Construction	The Model of Physical Ability for University Students The Model of Exercise Stage Change for University Students

Figure 1 Conceptual Framework

Methodology

Population specification

The population used in this research will be recruited from the 3 universities. The university students aged 18 to 22 years, who are from freshman to senior year (academic year 2022-2024). The test and the scales were collected for a month. There are about 12,000 students in the 3 universities. Every university has men and women, but the gender ratio is not certain.

Samples

The research object focuses on a group of college students. To ensure the scientific and representativeness of the sample, we adopted a random sampling method to select participants. The specific operation is as follows: first, classify the target college student group according to their department, grade, etc., and then assign independent numbers to students in each category. Through the random number generator, randomly select numbers, such as selecting students corresponding to numbers ending in 8. Only those students who are available during the specific period of data collection and have the willingness to voluntarily participate in the research are recruited as participants in this study. According to the G-power calculation, the sample size shall not be less than 134 people (Figure 1). Considering the possibility of sample loss, 222 participants were collected at last.

This research has passed the Research Ethics Review Committee of the Human Research Ethics Committee board, Bangkok Thonburi University. No. 50/2567, Date of issuance 10 March 2025

Research Process

This research was divided into 4 phases as follows:

Table 1 The Details of the Research Process

Phase	Method	Subject	Output
Phase 1	Literature review	\	Scales & All tests
Phase 2	IOC	Expects	Test poor
Phase 3	Tests and surveys	University students	Data
Phase 4	Data analyze	Data	Results

Phase 1: Review literature and research, then gather ideas and consulting data to formulate conceptual frameworks.

Study the theories of the Health Action Process Approach (HAPA), Social Cognition Theory (SCT), Expectation-confirmation Theory (ECT), and so on to prove the theoretical context of university students' exercise behavioral change, construct a theoretical framework, and find theoretical deficiencies and research entry points, especially in the physical ability.

Phase 2: Constructing a questionnaire

All the screened test items are formed into a test item pool, which is evaluated by 7 experts using IOC, and representative test items are selected for testing. Since the exercise stage scale of university students has been widely used, it is not needed to test the content validity. According to the literature, relevant scales, and interview results, the test items were compiled, and 34 university students' physical ability test items were formed after analysis, screening, and processing. Five university physical education professors and two physical fitness measurement and evaluation experts were invited to evaluate the content

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of the item pool and select the test items that could reflect the university students' physical ability. The Index of IOC is an evaluation tool proposed by Rovinelli and Hambleton in 1977, mainly used for content effectiveness evaluation during the test development process, especially during the project or test project development stage. The IOC aims to assess the degree of consistency between individual items (eg, test questions or questionnaires) and specific goals set by the test developer through content expert ratings. The IOC ranges from 1 to + 1, where + 1 means that the expert meets the target, -1 means complete mismatch, and 0 indicates uncertainty or neutral attitude. The IOC was calculated based on, for each target. The calculation formula is usually as follows: $= \frac{\text{.Total Score}}{\text{Number of experts}}$

According to this study, an IOC value of 0.67 was considered to test the exercise ability of university students.

Phase 3: Physical ability test

During the data collection phase, all participants were provided with a form containing basic information about the study, including study purpose, procedures, and potential risks and benefits, to enable them to have a clear understanding of the study. They were then informed that their participation was entirely voluntary and that they were free to withdraw from the study at any time without losing any of the benefits they had enjoyed or having any impact on their careers. Potential participants independently decided whether to participate in the study by consenting. If participants agreed to participate, they were asked to sign a consent form. They are assured that their confidentiality and privacy will be maintained and that the data collected will be used for research purposes only, unless disclosure is required by law. Participants first completed the questionnaire and returned it to the researcher. Then, health and fitness-related tests are conducted, and the researchers record the results of each test.

Phase 4: Construct the model and verify its reliability and validity

Collecting the data on the Internet or on-site. If some data is filled randomly, delete it. Perform data analysis on the returned scales to verify the reliability and validity of the scales.

Results

Since BMI and WHR have covered height & weight and waist & hip circumference, respectively, only BMI and WHR were selected as representatives to explain height & weight and waist & hip circumference, which was recognized by experts. After the examination and approval of experts and modified, physical ability test items contain 18 topics, each topic according to the actual measurement results, and refer to “The National Physical Fitness Measurement Standard (2023 revision)” “The National Student Physical Health Standards”, each test item points 5 points, including “1” represents “the lowest score”, “5” represents “the highest score”.

Items Analysis

The purpose of item analysis is to further check whether the topic has a certain difficulty and discrimination effect, to provide a basis for the selection of topics. In this study, the critical ratio was used for difficulty analysis, and Pearson product-moment correlation analysis was used for discrimination analysis.

Critical Ratio (CR)

Critical ratio analysis is used to find the CR of each item. The method is to arrange the total scores of all subjects in order from high to low. The top 27% scorers are in the high group, and the bottom 27% scorers are in the low group. If the subjects in the high and low groups are in the low group, find the average score of each question of the subjects in the high and low groups, and then conduct a significance test of the difference. If the CR value of the item reaches the significance level, it means that the item can identify different subjects. If the CR value of an item does not reach the significance level, it will be the primary consideration for item deletion. In this study, the CR values of A2 and B1, B2, B3, B5, and B8 did not reach the significance level, so they were deleted.

Pearson Product-moment Correlation Analysis

The Pearson product-moment correlation formula was used to calculate the correlation coefficient between each item and the total score as the discrimination index, and the questions with low discrimination were deleted (i.e., the correlation coefficient between the item and the total score was less than. 3). In this study, the correlation coefficients between A1 and B4, B6, B7, and B11 were less than .3, so they were deleted.

Exploratory Factor Analysis (EFA)

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When compiling a test or scale, if the measured behavioral trait is unclear, exploratory factor analysis can help people answer which factors are included in this trait. Although the Scale of Exercise Stage is a mature scale that is widely used, some of its questions were eliminated in the previous analysis, so it is necessary to re-analyze it. The results of the sphericity test of the sports ability test and the exercise phase scale show that the Kaiser-Meyer-Olkin (KMO) values are .821 and .913 respectively, and the p values are both less than .001, indicating that the correlation coefficient matrix of the factors is a non-unit matrix, which can extract the least factors while explaining most of the variance, so it is suitable for factor analysis.

The data were analyzed by principal component analysis to obtain the initial factor loading matrix. According to the principle that the eigenvalue is greater than 1, the common factors were extracted respectively, and the rotation factor loading matrix was obtained by the maximum orthogonal rotation method. According to the slope diagram of the factor structure, combined with the eigenvalue and the research concept, the items with factor loading less than .5 were deleted (no items were deleted). The 16 items of the physical ability test belonged to four factors respectively, and the 15 items of the exercise stage scale also belonged to four factors respectively, which explained 82.165% and 84.659% of the total variance, respectively. The structure was clear and easy to explain. Finally, the items of the physical ability test and the exercise stage scale were re-coded. The rotation factor matrix diagram and re-coding of the physical ability test are shown in Table 2.

Table 2 Factor Loading Matrix and Recoding of Physical Ability Test

Item	Factors				Re-coding
	motor control	endurance	flexibility	strength	
A3				.902	a1
A4				.898	a2
A5				.850	a3
A6			.949		a4
A7			.941		a5
A8			.903		a6
A9	.879				a7
A10	.894				a8
A11	.841				a9
A12	.929				a10
A13	.860				a11
A14		.859			a12
A15		.908			a13
A16		.847			a14
A17		.861			a15
A18		.883			a16
Total	4.071	4.017	2.661	2.397	
% of Variance	25.444	25.108	16.634	14.979	
Cumulative %	25.444	50.552	67.186	82.165	

The rotation factor matrix diagram and re-coding of the exercise stage scale are shown in Table 3.

Table 3 Factor Loading Matrix and Re-coding of Exercise Stage Change

Item	Factors				Re-coding
	preparation	maintenance	action	contemplation	
B9				.886	b1

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Item	Factors				Re-coding
	preparation	maintenance	action	contemplation	
B10				.866	b2
B12				.882	b3
B13	.874				b4
B14	.857				b5
B15	.914				b6
B16	.868				b7
B17			.765		b8
B18			.804		b9
B19			.773		b10
B20			.747		b11
B21		.771			b12
B22		.736			b13
B23		.828			b14
B24		.775			b15
Total	3.717	3.339	3.251	2.393	
% of Variance	24.777	22.257	21.675	15.95	
Cumulative %	24.777	47.034	68.709	84.659	

Confirmatory Factor Analysis (CFA)

Goodness of Fit Test of CFA Model for Physical Ability Test and Exercise Stage Scale

According to the model fit test results, CMIN/DF (chi-square self-degree ratio) = 1.237, which is within the range of 1-3, and RMSEA (root mean square error) = .051, which is within the good range of <.08. The test results of IFI, TLI and CFI all reached an excellent level of >.9. Therefore, the comprehensive analysis results of this time can show that the CFA model of sports ability test has a good fit. Besides, according to the model fit test results, CMIN/DF (chi-square self-degree ratio) = 2.443, which is within the range of 1-3, and RMSEA (root mean square error) = .079, which is within the good range of <.08. The test results of IFI, TLI and CFI all reached an excellent level of >.9. Therefore, the comprehensive analysis results of this time can show that the CFA model of sports ability test has a good fit. The details are shown in Table 4.

Table 4 Model Fit Test of Physical Ability Test and Exercise Stage Change

Index	Reference Standards	Physical Ability Test results	Exercise Stage Change
CMIN/DF	1-3 is excellent, 3-5 is good	1.237	2.443
RMSEA	<.05 is excellent, <.08 is good	.051	.079
IFI	>.9 is excellent, >.8 is good	.980	.964
TLI	>.9 is excellent, >.8 is good	.975	.954
CFI	>.9 is excellent, >.8 is good	.980	.964

Convergent Validity and Combined Reliability Test of Each Dimension of Physical Ability Test and Exercise Stage Scale

Under the premise that the CFA model has a good fit, the convergent validity (AVE, Average Variance Extracted) and composite reliability (CR) of each dimension of the test or scale will be further tested. The test process calculates the standardized factor loads of each measurement item on the corresponding dimension through the established CFA model. Then, the convergent validity value and

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combined reliability value of each dimension are calculated through the formula of A, and according to the standard, the minimum AVE value is required to be Openh .5, and the minimum CR value is required to reach .7, which can indicate good convergent validity and combined reliability. The formula is as follows: $E = \frac{\sum \lambda^2}{n} R = \frac{.(\sum \lambda)^2}{(\sum \lambda)^2 + \sum \varepsilon}$

Among them, λ repres. The standardized factor load, n represents the number of questions, and epsilon represents the standard error of measurement.

According to the analysis results, it can be seen that in this physical ability test validity test, the AVE values of each dimension have exceeded .5, and the CR values have reached above .7. It can be concluded that each dimension has good convergent validity and combined reliability.

Besides, according to the analysis results, it can be seen that in this exercise stage scale validity test, the AVE values of each dimension have exceeded .5, and the CR values have reached above .7. It can be concluded that each dimension has good convergent validity and combined reliability.

Discriminant Validity of Each Dimension of Physical Ability Test and Exercise Stage Scale

According to the analysis results in Table 5, it can be seen that in the discriminant validity test of the physical ability test, the standardized correlation coefficients between each dimension are less than the square root of the AVE value corresponding to the dimension, which means that each dimension has good discriminant validity.

Table 5 Discriminant Validity of Each Dimension of Physical Ability Test

variable	strength	flexibility	motor control	endurance
strength	.694			
flexibility	.012	.826		
motor control	.221	.027	.755	
endurance	.131	.230	.337	.742
square root of AVE	.833	.909	.869	.861

Besides, according to the analysis results in Table 6, it can be seen that in the discriminant validity test of the exercise stage scale, the standardized correlation coefficients between each dimension are less than the square root of the AVE value corresponding to the dimension, which means that each dimension has good discriminant validity.

Table 6 Discriminant Validity of Each Dimension of Exercise Stage Change

variable	contemplation	preparation	action	maintenance
contemplation	.664			
preparation	.095	.851		
action	-.019	.655	.791	
maintenance	.135	.649	.872	.778
square root of AVE	.815	.922	.889	.882

CFA Model Diagram of Physical Ability Test and Exercise Stage Scale

The CFA model diagram of the physical ability test is shown in Figure 2, while the CFA model diagram of the exercise stage scale is shown in Figure 3.

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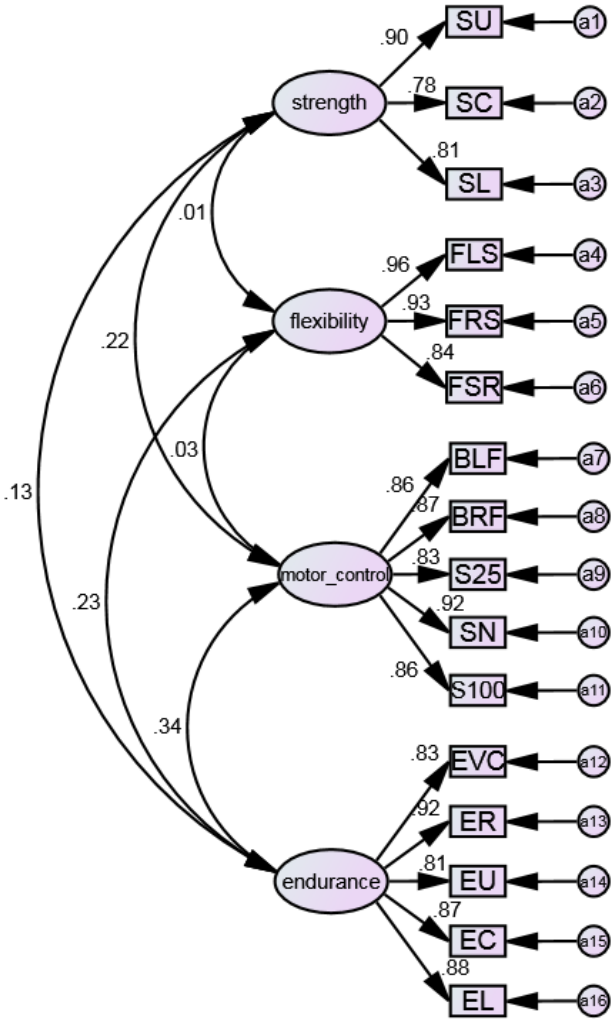

Figure 2 CFA Model Diagram of Physical Ability Test

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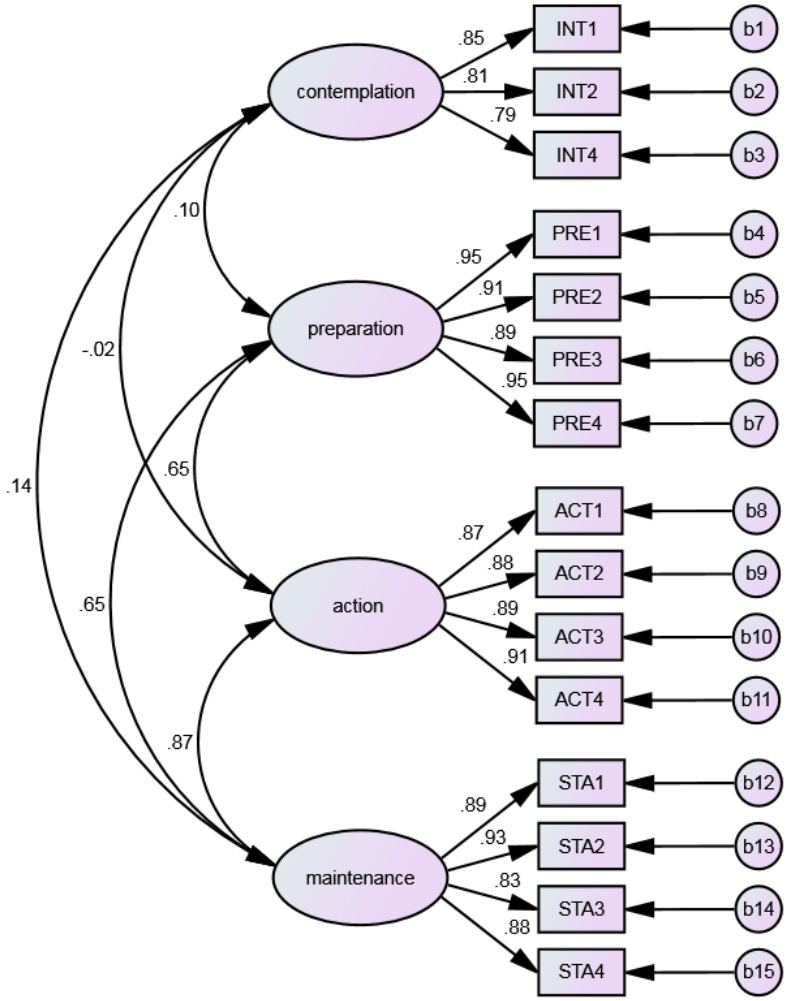

Figure 3 CFA Model Diagram of Exercise Stage Change Scale

Reliability Analysis

In this study, the main factors were measured in the form of scales, so testing the data quality of the measured results is an important prerequisite to ensure the significance of subsequent analysis. The internal consistency of each dimension was first analyzed by the Cronbach α reliability test method. Cronbach α values range between 0 and 1; the higher the Cronbach α value, the higher the reliability. A Cronbach α below .6 is generally considered unreliable, and the questionnaire needs to be redesigned or try to the data re-collected and analyzed again. Cronbach α is credible between .6 and .7, more credible between .7 and .8, very credible between .8 and .9, and very credible between .9 and 1.

In this analysis, the results of the reliability analysis are shown in Table 6, and the reliability coefficients of the physical fitness and exercise stage and the overall secondary dimensions are within the range of .8-1. Therefore, it shows that both the scale and the test scheme used in this study have good internal consistency and good reliability.

Table 6 Reliability Analysis of Physical Ability & Exercise Stage Change

variable	Cronbach α	N
strength	.869	3

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variable	Cronbach α	N
flexibility	.931	3
motor control	.938	5
endurance	.935	5
physical ability	.860	16
contemplation	.853	3
preparation	.958	4
action	.938	4
maintenance	.932	4
exercise stage change	.929	15

Discussion

Drawing on the research results of predecessors, this study created a physical ability test for college students, which has good content validity after evaluation and modification by experts. Then, based on the preliminary investigation, item analysis and exploratory factor analysis were used to complete the question screening, and a formal physical ability test and exercise stage scale for college students was made. Finally, confirmatory factor analysis was used to test the conceptual validity of the model, and the internal consistency method and split-half method were used for reliability testing. The test results showed that the test or scale has good reliability and validity. This test or scale follows the principles and methods of psychological scale and test compilation in the compilation process and has good reliability and validity. Therefore, it can be used as a tool for physical ability tests and exercise stage scales for college students.

This study believes that motor control covers four abilities: speed, balance, reaction, and agility. This definition provides a clear framework for a deeper understanding of the role of motor control in overall sports performance.

Speed, as an important component of motor control, directly affects the performance of athletes in competitions. Fast movement speed can help athletes occupy a favorable position or complete an action in a short time. However, the pursuit of excessive speed may lead to a decrease in movement accuracy and an increase in the risk of injury. Balance ability is essential for maintaining body stability during exercise. Good balance helps athletes maintain posture in complex and changing sports situations and reduces the possibility of falls and errors. However, the development of balance ability may be limited by the individual's body structure and nervous system coordination. Reaction ability determines the speed and accuracy of an athlete's response to external stimuli. A fast and accurate reaction can enable an athlete to gain an advantage in a fast-changing game. However, the improvement of reaction ability may be affected by factors such as psychological stress and fatigue. Agility is reflected in the athlete's ability to change direction and adjust movements quickly. High agility helps athletes to flexibly respond to the opponent's movements in competitive sports. However, the cultivation of agility requires a combination of diverse training methods; a single training method may have limited effects.

Compared with other studies, the exercise stage of this study only has 4 stages. It is speculated that the possible reason is that the corresponding college student group is mainly college students with a certain sports background, which leads to the fact that not all the respondents are in the unconscious stage. By focusing on the transtheoretical model, we can better understand the process of change in college students' physical activity behavior and adopt targeted strategies and measures to promote their active participation in physical exercise. University programs and public health fields should work closely together, and educators and policymakers should work together to create a good physical activity environment for college students, cultivate their lifelong exercise habits, and lay a solid foundation for improving the health level of the whole people.

Since the main research subjects of this study are general university students, further testing is needed to determine whether the conclusions of this study can be extended to the general public. In addition, longitudinal research is recommended to explore whether behavioral changes persist over time or whether different interventions can further improve the effectiveness of the model.

About the academic contribution of this study: Firstly, systematically study the proactive behavior of university students' physical exercise, explore the formation mechanism and effective promotion

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mechanism of university students' physical exercise proactive behavior, and enrich the theory of physical exercise. Besides, the introduction of individual proactive theory into the study of university students' sports behavior will help to broaden the discipline's vision and practice system of school physical education and provide a broader space for interdisciplinary cooperation.

Conclusion

This study pointed out that motor control covers four abilities: speed, balance, reaction, and agility. Speed affects competition performance, but excessive pursuit may affect the accuracy of movement and increase the risk of injury; balance is key to maintaining body stability during exercise, and its development is limited by the individual's body structure and nervous system coordination; reaction ability determines the response to external stimuli and is easily disturbed by psychological pressure and fatigue; agility reflects the ability to change direction and adjust movement, and its cultivation requires diversified training, and a single method has limited effect.

In addition, this study also discovered that the constructed healthy behavioral model demonstrated an excellent level of reliability and validity. The assessment results consistently and precisely reflected the intended constructs and measurements. The model was shown to be stable and reproducible across different testing scenarios and sample groups. Its validity was confirmed through rigorous comparisons with established benchmarks and theoretical expectations. The high reliability and validity of the model provide a solid foundation for further research and practical applications in the field of health behavior. This also shows that the impact of physical ability on the exercise stage is predictable.

Recommendation

1. For the physical fitness test and sports stage scale for university students, it is recommended to further optimize the method and process of question screening to improve the accuracy and applicability of the scale. Additionally, incorporating recommendations on how technology, such as wearable fitness trackers, can help collect more precise data will modernize approaches to data collection.

2. Future studies explore the impact of external environmental factors, such as socio-economic background or geographical differences, on university students' physical fitness behavior. This would encourage further academic inquiry and help contextualize the findings within a broader societal framework. It would be helpful to include policy-level recommendations for educational institutions or governments. These could focus on incorporating the study's findings into physical education policies or programs that foster long-term healthy behaviors. By bridging the gap between research and policy implementation, the recommendations would have broader societal relevance.

3. When explaining the four abilities of motor control, more data and cases of empirical research can be added to more clearly show the characteristics and influencing factors of each ability.

4. When studying the relationship between motor control and behavioral changes in each stage of the exercise, it is recommended to increase the consideration of variables such as environmental factors and individual psychological characteristics to more comprehensively understand its mechanism of action.

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