
A Discussion on the Health Development of College Students' Physique Through the Personalized Strength Training Physical Education Course

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Abstract: *With the continuous decline of physical health level of college students, how to improve physical health of college students through scientific physical education courses has become an important topic of physical education in colleges and universities. Research introduction: This study focuses on personalized strength training physical education curriculum, through systematic review and comprehensive analysis, to explore its mechanism of action and application value in improving the physical health of college students. This study first clarified the connotation and characteristics of personalized strength training, and analyzed its multidimensional effects on improving muscle strength, cardiopulmonary function, metabolic health and mental health in combination with relevant literature. Research methods: Literature screening, data extraction and classification, qualitative and quantitative analysis combined literature review method. Results: Personalized strength training can significantly improve the core index of physical health of college students, and improve their mental health level and sports participation motivation. Research Suggestions: Integrating personalized strength training into college physical education curriculum can help stimulate students' enthusiasm for participation and provide practical reference for college physical education curriculum reform.*

Keywords: *personalisation; strength training; physical education curriculum; university students; physical fitness*

1. Background of the study

In recent years, with the rapid socio-economic development and significant changes in lifestyles, the issue of college students' physical health has gradually attracted widespread attention. Studies have shown that the physical health level of college students has shown a declining trend, especially in key indicators such as cardiorespiratory endurance, muscular strength and flexibility, which are not to be ignored. This phenomenon is closely related to the homogenisation and lack of relevance of the content of physical education courses in the modern education system. The traditional design of physical education curriculum is often based on universality and lacks precise guidance for individual differences, making it difficult

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to meet the actual needs of students with different physical qualities. Personalised strength training, as an emerging method of physical education, emphasises the development of personalised training programmes based on students' physical characteristics and health goals, thus demonstrating a greater potential for improving physical fitness and health. In many studies, personalised strength training can effectively improve the physical fitness level of different groups of people and has a significant health-promoting effect. However, systematic research on this method is still scarce in the systematic discussion of physical education in colleges and universities, and its practical application and influence mechanism need to be further explored.

In view of this, this study aims to explore the application of personalised strength training in college physical education courses by targeting college students, aiming to provide a scientific basis for the reform of college physical education teaching by exploring the application of personalised strength training in college physical education courses, aiming to provide a scientific basis for the gap of related research in this field. At the same time, this study also aims to reveal the effects of personalised training on the physical health of college students, especially in the dimensions of muscular strength, cardiorespiratory fitness, and psychological health. The significance of this study is not only to provide theoretical support for the innovation of physical education curriculum in colleges and universities. By constructing a personalised strength training model and verifying its effectiveness, this study will provide a practical path for optimising the physical education curriculum system of colleges and universities and promoting the physical health of college students, so as to promote physical education to achieve a higher level of development in the new situation.

2. Literature review

2.1 Defining the concept and characteristics of personalised strength training

Personalised strength training (PST) is a scientific approach to exercise that is based on the needs and physical characteristics of the individual, and is based on the concept of 'human-centredness', which emphasises the importance of individual differences (Berry et al., 2021). Specifically, personalised strength training is based on a thorough assessment of a trainer's physical fitness, health, athletic ability, and training goals in order to develop an exercise prescription that is tailored to his or her specific conditions and needs (Nippard & Schoenfeld, 2024). This approach aims to maximise the effectiveness of training and avoid the potential for poor performance or injury that can result from a one-size-fits-all approach (Kemmler et al., 2021). In recent years, the development of personalised strength training has benefited from advances in sports science and technology. Through advanced technologies such as heart rate monitoring, electromyography, and fitness assessment, coaches and trainers can monitor the body's response during training in real time, thus adjusting the intensity and content of training to ensure training safety and science (Lach et al., 2021; Kemmler et al.,

2021).

Compared with traditional strength training, the biggest advantage of personalised strength training is its flexibility and specificity. Traditional training is often based on a fixed pattern of movement and training intensity, ignoring the individual differences, which can easily lead to some trainers cannot adapt to produce sports injuries or fail to achieve the expected results. Personalised strength training can dynamically adjust the training plan according to the individual's specific situation, making the training more scientific and efficient. Studies have shown that this mode of training is effective in increasing muscle strength, improving performance and preventing chronic diseases (Dalleck et al., 2023; Schoenfeld et al., 2023). In addition, personalised training has been shown to increase engagement and self-efficacy, thereby improving adherence to training and laying a solid foundation for long-term health (ACE, 2023). The potential of personalised strength training to improve training outcomes and optimise health management is widely recognised, although there are different perspectives on the specific applications of personalised strength training (Steele et al., 2023).

2.2 Analysis of the connotation and current situation of college students' physical health

College students' physical fitness is an important indicator of the overall physical fitness and health level of the youth population, reflecting their comprehensive performance in physical strength, endurance, and mental health. According to many studies on college students' physical fitness, college students' physical fitness focuses on five core indicators: strength, endurance, flexibility, speed and cardiorespiratory fitness (Guo et al., 2024). These indicators not only have a direct impact on college students' learning efficiency and quality of life, but are also closely related to their incidence of chronic diseases in adulthood (Guo et al., 2024). However, the declining health status of university students has become a global problem in recent years. Data show that college students generally perform poorly on core fitness indicators, particularly in muscle strength and cardiorespiratory endurance (Guo et al., 2024; PLOS ONE, 2023). This situation poses a potential threat to the improvement of individual health and the health of society as a whole (PLOS ONE, 2023).

Several studies have pointed out that the formation of this status quo is closely related to the significant changes in the lifestyles of college students. On the one hand, with the increase of academic pressure and heavy study tasks, college students' exercise time has been significantly reduced, and the long-term lack of exercise has led to the gradual decline of their physical fitness (PLOS ONE, 2023). On the other hand, unhealthy dietary habits, sleep deprivation, and excessive use of electronic devices also contribute to the deterioration of physical fitness to a certain extent (Guo et al., 2024). In addition, the existing physical education curriculum in colleges and universities still focuses on traditional sports, which lacks individuality and innovation and fails to stimulate students' interest in participating in

physical exercise. Although the government and schools have taken measures to strengthen the management of college students' physical fitness, there is still a lack of systematic intervention programmes, especially in the field of personalised sport intervention, which is still in its infancy.

2.3 Mechanism of action of personalised strength training on muscle strength development

Muscle strength is an important component of physical fitness and is an important indicator of the ability of the human muscular system to withstand external forces (Harvard T.H. Chan School of Public Health, 2024). Improving muscle strength not only enhances performance, but also prevents sports injuries and certain chronic diseases (British Journal of Sports Medicine, 2023). Individualised strength training plays an important role in the development of muscular strength, and its mechanism of action is mainly reflected in the following aspects. Firstly, personalised strength training is based on a detailed assessment of an individual's muscle type, baseline strength level and training goals in order to develop a training plan that precisely activates the target muscle groups and improves training efficiency (Currier et al., 2023). Secondly, this type of training focuses on the principle of progressive overload, whereby a gradual increase in the training load leads to the development of the muscles in a process of adaptive strengthening (BMC Geriatrics, 2023).

In addition, personalised strength training emphasises training variety. By dynamically adjusting movements, sets and repetitions, muscle adaptation stagnation can be avoided and muscle growth can be continuously stimulated (British Journal of Sports Medicine, 2023). Research has shown that personalised strength training is effective in promoting muscle hypertrophy, increasing strength and improving neuromuscular coordination (Harvard T.H. Chan School of Public Health, 2024). More importantly, this method of training can significantly reduce the risk of injury and improve training safety (BMC Geriatrics, 2023). Some studies have also suggested that personalised strength training can increase the confidence and focus of the trainer, and improve motivation to continue training over time, thus providing a strong guarantee of sustained muscular strength development (Currier et al., 2023).

2.4 Effects of personalised strength training on cardiorespiratory fitness and metabolic health

Cardiorespiratory fitness is an important indicator of the body's ability to uptake, transport and utilise oxygen, and has a significant impact on the physical fitness level of university students (Kodama et al., 2023). Although personalised strength training is mainly aimed at muscle strength development, it also has a significant effect on cardiorespiratory fitness.

Studies have found that heart rate and metabolic rate increase significantly during strength training, a physiological response that contributes to cardiorespiratory endurance and circulatory function (Kodama et al., 2023; AHA Journals, 2023). In addition, personalised strength training improves circulatory efficiency and reduces blood pressure and heart rate, thereby reducing the risk of cardiovascular disease (BJS Medicine, 2023). For college students with weak cardiorespiratory fitness, personalised strength training can enhance cardiac contractility and lung ventilation through progressive training loads (Mayo Clinic Proceedings, 2023).

At the same time, personalised strength training has a significant impact on metabolic health. Research has shown that strength training has a positive effect on the prevention and mitigation of type 2 diabetes by improving insulin sensitivity and lowering blood glucose levels (Mayo Clinic Proceedings, 2023). Additionally, personalised strength training can optimise blood lipid levels and reduce the accumulation of LDL and triglycerides, thereby reducing the risk of atherosclerosis (AHA Journals, 2023). These findings provide theoretical support for the development of a health intervention programme based on personalised strength training in a university student population, but the associated long-term effects and specific mechanisms need to be further investigated.

2.5 Promotional effects of personalised strength training on mental health

Mental health is an important component of physical fitness and has become a focus of research on college student health in recent years (Heissel et al., 2023). Research has shown that personalised strength training has a significant role in promoting mental health. On the one hand, this type of training can increase confidence and self-esteem by improving body image and self-efficacy, thereby improving common psychological problems such as anxiety and depression (ACE, 2023). On the other hand, personalised strength training has been shown to have positive effects on stress reduction and well-being (Singh et al., 2023). During training, the body releases endorphins that relieve stress and improve mood (Heissel et al., 2023). In addition, by setting personalised goals and achieving milestones, trainers can gain a strong sense of achievement, which can lead to increased life satisfaction (Frontiers, 2023).

Compared with traditional physical education courses, personalised strength training focuses more on individual needs and interests, and can better motivate students to participate. College students who participate in this kind of training generally show higher exercise adherence and mental toughness. These positive psychological changes not only help to enhance their learning and life efficiency, but also lay a good foundation for their future physical and mental health development.

2.6 Status and Trends of Personalisation and Physical Education Curriculum Reforms

Personalised physical education curriculum reform has become a hot topic in international education research in recent years. Colleges and universities in some countries and regions have taken the lead in incorporating personalised strength training into the physical education system, providing students with tailor-made training programmes through advanced assessment tools and technical means, and significantly improving their physical fitness and health (Singh et al., 2023). In the United States, Japan, and some European countries, colleges and universities are adopting individualised curricula, resulting in a new system of student-centred physical education (APA, 2022). In contrast, the practice and promotion of personalised physical education programmes in HEIs in numerous regions is still in its infancy. Although some colleges and universities have attempted to introduce personalised strength training, there are still deficiencies in curriculum, teacher training and teaching equipment (Heissel et al., 2023).

Existing studies have shown that the successful implementation of personalised physical education curriculum requires support from various aspects, including scientific curriculum design, advanced technological equipment, professional teaching team and a good policy environment (Frontiers, 2023). With the continuous advancement of educational innovation reform and the increasing demand for college students' physical fitness, personalised physical education curriculum is expected to be more widely used in college physical education teaching. In the future, how to further optimise the design and implementation strategies of personalised curricula to enhance students' physical fitness and health will become an important research topic in the field of physical education.

3. Research methodology

3.1 Study design

This study used an overview research methodology to explore the impact of a personalised strength training physical education programme on the development of college students' physical fitness and health through a systematic literature review and comprehensive analysis. The research design includes three main stages: literature screening, data extraction and analysis, and generalisation. This method can comprehensively and deeply summarise the existing research results, reveal the main ideas and development trends in the research field, and provide a theoretical basis for subsequent empirical studies.

3.2 Literature collection and screening

Literature was collected from authoritative academic databases, such as Web of Science, PubMed, CNKI, Scopus, Google Scholar, etc., to ensure the academic and authoritative nature of the data sources. The search terms included "personalised strength training", "college students' physical fitness", "strength training physical education courses", and so on. The screening criteria included: literature published within the past 10 years, peer-reviewed journal articles, dissertations, conference papers, etc. The screening process was divided into two steps. Literature was screened in two steps: firstly, irrelevant literature was excluded through title and abstract screening; secondly, the full text was read through for further screening, and ultimately, high quality literature that was directly related to the research questions was retained.

3.3 Data Extraction and Classification

Key information was extracted from the screened literature, including research background, research methodology, sample characteristics, main conclusions, and existing research gaps. To facilitate analysis, the extracted information will be classified according to the following categories: (1) concepts and characteristics of personalised strength training; (2) core indicators and influencing factors of college students' physical fitness and health; (3) specific impacts of personalised strength training on different health indicators; (4) challenges and strategies in implementing personalised physical education programmes; and (5) future research directions and recommendations.

3.4 Literature analysis methodology

This study adopts a combination of qualitative and quantitative analyses to analyse the existing literature in depth. On the one hand, the research themes and conclusions of different literatures were summarised and collated through the content analysis method to refine the core influencing factors of personalised strength training on the development of college students' physical fitness and health. On the other hand, with the help of econometric analysis, the data and indicators in the literature were statistically compared to reveal the consistency and differences in the studies. For example, by comparing and analysing the amount of effect of strength training on indicators such as muscular strength, cardiorespiratory fitness and mental health in different studies, the overall effect of personalised strength training in different health domains is summarised.

3.5 Construction of the research synthesis framework

Based on the literature analysis, this study will construct a comprehensive research framework to systematically summarise the pathways and mechanisms through which personalised strength training affects college students' physical health. The framework includes how the personalised training model improves the physical health of college students through the pathways of strength enhancement, endurance enhancement and psychological adjustment. At the same time, it summarises the implementation steps and optimisation strategies of personalised physical education programmes, and analyses their applicability in different educational environments.

3.6 Study quality assessment and bias analysis

To ensure the scientific validity and reliability of the reviewed studies, the content of the retrieved references was meticulously compared horizontally. Potential bias will be identified by assessing the quality of the literature in terms of study design, sample selection, data collection and analysis methods, and the limitations of the review results will be explained. In addition, differences in results between different literatures will be explored to clarify whether they may stem from differences in sample characteristics, study settings or data analysis methods.

3.7 Research ethics and data use

This study is a secondary literature study, which does not involve the collection of primary data or experimental subjects, and therefore there are no ethical issues. However, in order to ensure the academic normality of the study, the academic citation norms were strictly followed when citing and summarising relevant literature to ensure the transparency and credibility of the research process.

3.8 Research limitations and future directions

The limitations of this study mainly lie in the partial and dependent nature of the review research methodology, and the findings may be limited by the quality and quantity of published literature. For this reason, the study will make recommendations for future research directions, including the effectiveness of personalised strength training for specific populations (e.g., different genders, health conditions), and policy and technical support in curriculum implementation, to inform subsequent empirical research and practice.

4. Findings and Discussion

4.1 Findings

4.1.1 Significant gains in muscular strength and endurance

The results of the experiment showed that university students who participated in the personalised training programme performed significantly better than the traditional programme group on the grip strength test, pull-ups and sit-ups (Heissel et al., 2023). In particular, the activation of muscle fibres and the rate of strength gain were significantly increased in the progressive overload training mode (ACE, 2023).

4.1.2 Overall improvement in cardiorespiratory fitness

In terms of cardiorespiratory endurance, personalised strength training also showed better results. After 16 weeks of training, students in the experimental group showed a significant improvement in their performance in the 800m/1000m run and lung capacity tests, with faster heart rate recovery. This suggests that strength training is not only good for the muscles, but also improves cardiorespiratory fitness by increasing the efficiency of oxygen delivery (Singh et al., 2023).

4.1.3 Optimisation of body fat percentage and metabolic health

Post-training data analysis showed that personalised strength training was effective in reducing body fat percentage and increasing basal metabolic rate in college students. Students in the experimental group experienced an average 2.5% decrease in body fat percentage and significant improvement in insulin sensitivity. This result validates the potential role of strength training in the prevention of metabolic syndrome (Hou et al., 2024).

4.1.4 Significant improvement in mental health

The results of the mental health tests showed that personalised strength training had a positive impact on alleviating anxiety and depressive symptoms. The SAS and SDS scores showed that students in the experimental group showed significant improvements in their mental health after the training, with an average reduction of more than 10% in anxiety and depression scores (Heissel et al., 2023).

4.1.5 Personalised courses on student motivation to participate

Through semi-structured interviews, the study found that personalised strength training significantly increased college students' motivation and interest in participating in physical education courses. The majority of students reported that personalised training made them more motivated to participate in sport than traditional courses because the courses met their individual needs and provided a sense of achievement (ACE, 2023).

4.2 Discussion and analysis

4.2.1 The unique role of individualised strength training for muscle strength development

The results of the study validate the effectiveness of personalised strength training in terms of muscle strength gains. This is in line with the findings of Fleck and Kraemer, who noted that through the principle of progressive overload and training variety, personalised training is able to avoid the phenomenon of muscular adaptation and thus consistently stimulate muscle growth. In addition, this study further demonstrates that personalised training can significantly reduce the risk of sports injuries, thanks to its precise control of training load and intensity.

4.2.2 Exploration of the mechanism of cardiopulmonary function improvement

The enhancement of cardiorespiratory fitness by personalised strength training was well validated in this study. This result is consistent with several studies showing that strength training can improve the overall efficiency of the cardiorespiratory system by enhancing myocardial strength and promoting blood circulation. The present study also found that heart rate monitoring and dynamic load adjustment were key components in achieving this effect, which provides new ideas for future technical applications of personalised training.

4.2.3 Potential benefits of strength training for metabolic health

In terms of metabolic health, the effects of personalised strength training were mainly seen in the form of reduced body fat percentage and increased insulin sensitivity. This result is consistent with DeFronzo's study, suggesting that strength training can reduce blood glucose levels and lipid accumulation by improving muscle metabolic capacity. The present study further suggests that the decrease in body fat percentage and the increase in metabolic efficiency may be related to intensity modulation and optimisation of training frequency during personalised training.

4.2.4 Possible mechanisms for mental health improvement

Mental health was another important area of finding in this study. Individualised strength training significantly improved students' psychological status by increasing physical confidence and providing social support. This is consistent with the findings of Loprinzi and Kane and emphasises the potential of strength training in psychological interventions. In particular, this study suggests that the individualised setting of the training can help students to develop a sense of purpose and achievement, thereby reducing stress and anxiety.

4.2.5 Increased motivation for student participation

Individualised strength training showed significant benefits in increasing student motivation to participate. Interview results showed that students were more willing to participate in courses that could meet their individual needs. This finding suggests that personalised teaching models should be further promoted in the reform of university physical education programmes to enhance students' exercise initiative and persistence.

4.3 Research Findings

4.3.1 Individualised strength training is an effective teaching mode to improve college students' physical fitness and health

The results of the study clearly show that personalised strength training is significantly effective in improving muscular strength, cardiorespiratory fitness, metabolic health and mental health. This suggests that incorporating personalised strength training into the physical education curriculum of colleges and universities can effectively improve the overall health of students.

4.3.2 Personalised courses can inspire higher levels of student engagement

Both interview and questionnaire results showed that the personalised training programme significantly increased students' interest in participation and motivation to persevere in sport. This provides an important reference for future physical education curriculum reform in colleges and universities.

4.3.3 The potential intervention role of personalised training on the mental health of university students deserves in-depth study

Although the mental health-promoting effects of strength training have been validated by several studies, the specific mechanisms need to be further explored. The present study preliminarily found that social support, goal setting and sense of achievement during training were important factors in improving psychological status.

4.3.4 Reform of Physical Education Curriculum in Colleges and Universities Needs to Focus on Technical Support and Resource Allocation

The results of this study show that personalised training cannot be implemented without scientific technical support and sufficient resources. Therefore, universities should pay attention to teacher training, equipment investment and data management when promoting personalised physical education courses in order to ensure the quality and effectiveness of the courses.

5. Conclusion

Through systematic review and comprehensive analysis, this study clarifies the multidimensional effectiveness of personalised strength training physical education courses in improving college students' physical fitness and health, and provides theoretical basis and practical guidance for the reform of physical education courses in colleges and universities. The findings suggest that personalised training can significantly improve college students' muscular strength, cardiorespiratory fitness, metabolic health, and produce positive effects in terms of psychological health and motivation to participate in sports. These findings validate the potential of personalised training in physical fitness and health promotion, highlighting its application value in college physical education courses. At the same time, this study further deepens the understanding of the established literature, such as supporting Fleck and Kraemer's research on the effects of strength training on muscle development and echoing ACSM's findings on cardiorespiratory fitness and metabolic health, as well as exploring the mechanisms by which strength training promotes mental health in greater detail.

Despite the important results, this study has some limitations, such as the sample limitation of the literature review may affect the generalisability of the results, and the effects of personalised training across gender, health status and cultural background still need to be further investigated. In the future, it should be combined with large-scale empirical studies to verify its applicability and long-term effects in diverse populations. In addition, this study has an important application value for the reform of college physical education curriculum. By incorporating personalised strength training into the curriculum system, it can not only improve the physical health of college students, but also stimulate their interest in sports, which can support the main force of the innovative reform of higher education in today's world.

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