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Study on Physical Health and Exercise Prescription Intervention for College Students

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ABSTRACT

In recent years, university students' declining fitness—rising weight and reduced aerobic capacity—became a global public health issue. In 2022, 32.8% of China's male university students were overweight and inactive, to their physical and mental detriment. This 12-week randomized controlled trial evenly sorted 180 undergraduates into intervention and control groups by gender and body mass index (BMI). Key outcomes (BMI, vital capacity, resting heart rate, body fat percentage, Symptom Checklist-90 scores) were measured at Weeks 0, 6, and 12. The intervention group (thrice weekly 60-minute warm-up, interval running, resistance training, and relaxation sessions) showed significant improvements: vital capacity (+305 ml, $p < .01$), body fat (-2.2%, $p < .05$), BMI (-0.8 kg/m^2, $p < .05$), and lower Symptom Checklist-90 anxiety/depression scores ($p < .05$). Training compliance ($\geq$ 80%) correlated with better outcomes, confirming exercise prescriptions' enhancement of student health and supporting stratified youth models, especially in Asian higher education.

KEYWORDS

Physical Fitness, Exercise Prescription, Psychological Intervention, University Student Health, Health Promotion

INTRODUCTION

Physical fitness is a key indicator of university students' overall development, directly affecting their academic performance and psychological adjustment (Zayed et al., 2024). Data from all over the world attest to the growing physical health challenges faced by young adults today. College students in particular often have sedentary habits, and many fail to complete the recommended 150 minutes of moderate-intensity exercise each week (Vella & Nelson, 2024) which is necessary to keep their health risks in check (Castro et al., 2020; Edelmann et al., 2022). In the U.S., the Centers for Disease Control and Prevention (2022) tracked 15,000 college students and observed that, over the past decade, obesity among 18- to 24-year-olds rose by 27%; 41% did not engage in vigorous weekly exercise, and their metabolic syndrome markers were 34% higher than those of their active peers. In China, the Ministry of Education (2022) noted high sedentary rates among college students. Its physical fitness monitoring data showed the rates of overweightness/obesity had risen by 15.7% in five years, and male students' average cardiorespiratory endurance was 12.3% below national standards. Other studies found that many college students complained of persistent fatigue, often stayed up late, and had elevated GAD-7 Anxiety Scale scores (Avery et al., 2025).

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According to researchers, college students experience a "sedentary-stress" cycle: sedentary behavior lowers heart rate variability (HRV) to worsen physiological stress, while exercise eases stress by regulating the hypothalamic-pituitary-adrenal (HPA) axis (Subiron-Valera et al., 2023; Tan et al., 2020). Those with high sedentary time and low activity have the highest stress (Perceived Stress Scale scores are 3.5 points higher than active groups, $p < .001$), and only combining moderate to vigorous physical activity (MVPA; ≥ 45 minutes/day) with less sedentary time (< 6 hours/day) cuts stress by 40%; increasing MVPA alone has limited effect. Academic stress also matters: it triggers neuroendocrine disorders via the HPA axis, raising depression risk for inactive students. Zhao et al. (2022) identified a chain: "academic stress → lack of exercise → lower positive thinking → reduced sense of life meaning →depression," and DeYoung et al. (2023) found academic stress (e.g., distance learning, changed exams) increased sedentary time, cut MVPA by over 40%, and doubled depression risk 2.1-fold. This "metabolic–psychological" imbalance is a global higher education challenge, yet there is a clear gap: few large randomized controlled studies focus on Asian—especially Chinese—college students, who face unique academic pressures.

LITERATURE REVIEW

International research on fitness and exercise interventions for college students has shifted from macrological assessments to the exploration of micrological mechanisms, with studies increasingly focusing on physiological pathways and individualized responses. Bharshankar et al. (2023) assessed the correlation between the degree of obesity and pulmonary function indicators of college students through anthropometric indicators (e.g., body mass index [BMI], waist circumference, body fat percentage) and bioelectrical impedance analysis. The results of this study revealed a correlation between obesity, especially central obesity, and the decline in lung function of college students, with the most pronounced lung function decline occurring among students with high visceral adiposity. These findings suggested that the problem of obesity in college students demands attention and that controlling student body weight by means of exercise and dietary interventions may improve lung function while reducing future risk of respiratory disease.

Adolescents often face high levels of stress and anxiety during exam week, and while regular exercise has been shown to alleviate anxiety, students may have difficulty exercising regularly due to lack of time or motivation. Shaw and Lubetzky (2021) proposed that virtual reality (VR) technology could enhance the fun of exercise and increase intervention adherence. They explored the immediate effects of short bursts of exercise (with or without VR) on adolescent anxiety during exam week. Their results showed that 10-minute bursts of exercise (with or without VR) during exam week rapidly reduced adolescent stress and anxiety and enhanced cognitive performance.

The need for region-specific evidence of exercise intervention in the context of Asian higher education generally—and Chinese higher education especially—is underscored by existing findings on the unique health challenges faced by Chinese college students. Physical fitness monitoring data collected by China's Ministry of Education (2022) show rising rates of overweightness/obesity (up 15.7% in five years) and declining cardiorespiratory endurance among college freshmen (male students fall 12.3% below national standards). These figures align with global trends in sedentary behavior, but the Chinese case requires targeted solutions.Zhao et al. (2022) specifically confirmed that academic pressure—an acute issue in Chinese higher education—interacts with physical inactivity to exacerbate mental health risks for this population.This pathway highlights how academic pressure, a prominent issue in Chinese higher education, interacts with inactivity to worsen students' mental health.

While international studies have validated exercise prescriptions (e.g., Jo et al., 2020, on High-Intensity Interval Training [HIIT] vs. Moderate-Intensity Continuous Training [MICT]; Casimiro-Andújar et al., 2022, on personalized coaching), the applicability of their findings to the situation of Chinese students remains unclear. For instance, the sample from Korea studied by Jo et al. (2020) focused on hypertensive metabolic syndrome, an issue with less prevalence than