

The Effectiveness of Exercise Prescriptions for Weight Loss in Chinese University Students: A Systematic Review and Meta-analysis

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Systematic Review

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The Effectiveness of Exercise Prescriptions for Weight Loss in Chinese University
Students: A Systematic Review and Meta-analysis

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List of Abbreviations

BF-Body Fat

BMI-Body Mass Index

BP-Blood Pressure

BW-TC-The Eight-Method Five-Step Tai Chi Chuan

CEI-Cardiorespiratory Endurance Index

CG-Control Group

HIIT- High Intensity Interval/ Intermittent Training

HR-Heart Rate

MICT-Moderate-Intensity Continuous Training

MIIT-Moderate Intensity Interval Training

MM-Muscle Mass

RCT-Randomized Controlled Trial

SIT-Sprint Interval Training

TC- Tai Chi

TG- Triglyceride

TH-TC-Traditional Japanese-style Tai Chi Chuan

VO_{2 max}-peak oxygen consumption

WHO-World Health Organization

Abstract

Background

This study aim is a systematic review of exercise prescriptions for the weight of obese/overweight university students in China through literature searching. And do meta-analysis for the main research indicators. Summarize and evaluate the effects of exercise prescriptions.

Method

Used PubMed、Embase and Web of Science database, the literature searched was proceeded on PRISMA protocol. Used searching keywords included (Exercise or activity), (prescription * or intervention *), (weight loss or overweight or obesity or obese), (university or college) and (student *). Used Boolean operator to integrate search words. The inclusion and exclusion criteria are set in PICO format: 1) Population: Chinese obesity or overweight university student have to be evaluated as healthy, the average age between 18 and 30, the articles related to disease were excluded. 2) Intervention: exercise prescription, 3) Comparison: non-exercise or non-targeted exercise prescription intervention, 4) Outcome: all the research results have to include the changes of BMI before and after exercise prescription. The extracted data form recorded relevant data with inclusion studies. Used RoB2 scale evaluates the risk of bias. Used software RevMan 5.4 to do meta-analysis for BMI, BF and TG these main indicators around before and after intervention. And to do narrative review due to results.

Result

Eight RCT studies are included in this review. 681 research subjects participated. Compared with the control group, the exercise prescription group was significant improved BMI, meanwhile observed effectively exercise intensity (HR 40% ~95%, VO2max 50% ~ 90%), the frequency is continued for each week (3 to 5 times), duration (28 to 60 minutes), and cycle for 8 weeks or 12 weeks, exercise pattern (HIIT and aerobic exercise). Some research observed groups also have improved BF, TG or other indicators.

Conclusion

It is provided an effective starting point for weight loss and improve body health. Exercise prescription should be three to five times per weeks, 28 to 60 minutes per times, about maximum heart rate 40% to 95% or VO2 50% to 90%, around 8 weeks or 12 weeks for intervention cycling. It should be recommended individual exercise prescription to university students.

Keywords: Exercise Prescription, Weight Loss, Obesity, Chinese University Student, BMI

Main text introduction

Obesity is a chronic and complex disease defined by excessive fat deposition that may cause health damage (WHO, 2025). Obesity increases the risk of developing type 2 diabetes (American Diabetes Association, 2019) and heart disease (Finkelstein, et al., 2012) and certain cancers (Xu, 2024). Obesity can also cause musculoskeletal disorders (De Lorenzo, 2019) that affect activity and lead to decreased quality of life. Body Mass Index (BMI) is calculated by measuring a person's weight and height: $\text{weight (kg)} / \text{height}^2 (\text{m}^2)$. Overweight is defined when $\text{BMI} \geq 25$; A BMI of 30 or above is defined as obesity (WHO, 2025).

Obesity has become a serious global public health epidemic, it is also one of the five main causes of death (Mahmood Safaei, 2021). As of 2022, more than 2.5 billion adults were classified as overweight, of which more than 890 million were considered obese. The prevalence of overweight among adults increased significantly from 25% to 43% between 1990 and 2022 (WHO, 2025). According to the China Obesity Epidemiological Survey, the proportion of obese university students is gradually increasing (Cui, 2024). One study found that about 23.5 percent of male and 11.9 percent of female university students in China are classified as overweight or obese (Xiaobin Chen, 2020). As the proportion of obese university students in China continues to increase, especially in 2023, and has exceeded 47.63 million (Cui, 2024), solving the obesity problem in this population will have great public health significance.

The lack of attention to and effective interventions for obesity may negatively affect more aspects of university students (Lipson; Sonnevile, 2017; Duan, 2022; Tomiyama, 2018). The obesity trend established in university often persists into adulthood, leading to long-term health problems (Ili M, 2024; Hayes, 2023). Overweight and obesity are caused by the imbalance between energy intake (diet) and energy expenditure (physical activity) (WHO, 2025). Due to the lack of recreational facilities on campus, time constraints, lack of motivation and the need for social support, more university students face obstacles to regular exercise (LaCaille, 2011). Moreover, sustaining interest in physical activity for long periods of time is often difficult because repetitive daily activities may lead to disengagement and eventual cessation of exercise (Zhao, 2024).

The study has shown that exercise has a positive intervention effect on inhibiting and

improving movement disorders caused by overweight university students and related obese people (Davis, 2011). Regular exercise can lower rates of obesity, thus improve blood lipid (Ouerghi, 2017), reduce the potential risk factors associated with overweight, and help to improve the overall health status. Under the same energy consumption, high intensity exercise is better than low intensity exercise to improve body composition, reduce abdominal fat (Lee et al., 2012). High-intensity interval training (HIIT) has been shown to be a feasible and effective strategy to promote the physical and mental health of adolescents (Sun, 2022). But the properties of high strength may increase the risk of sports related injuries, especially for beginners or individuals with poor physical quality (Zili Zuo, 2025). Furthermore, most inactively overweight/obese individuals are unlikely to maintain continuous aerobic exercise at high intensity for long periods of time (Ekkekakis, 2003). Therefore, it is necessary to provide effective exercise intervention strategies for obese university students in different situations and motivate university students to manage their weight and improve their health through continuous participation in physical activities.

An exercise prescription is a specific program of fitness related activities designed for a specific purpose. It is typically formulated by a fitness or rehabilitation specialist for clients or patients who need to stay fit and want to understand the amount, frequency, and type of exercise needed to stay fit. This intervention can improve body composition and reduce lipid concentration (Guo, 2021). The exercise prescription was first proposed by the American physiologist Peter Kapovic in the 1950s and was officially adopted by the World Health Organization in 1969 (Tipton, 2008). Exercise prescription techniques can effectively reduce the incidence of chronic diseases and sports injuries (Li, 2024). The formulation of exercise prescriptions can improve people's health (Crookham, CAQSM, 2013). Therefore, there is a need to provide obese individuals with appropriate exercise prescriptions to motivate them to exercise more actively and for a longer period of time (Rui, 2022). However, currently, there is no scientific systematic review of exercise prescriptions for Chinese obesity university students.

The present study

The aim of this study is to provide exercise prescriptions for weight loss with obesity university students through a systematic review of the literature. It mainly addresses the type of exercise prescriptions are used to intervention in obesity among Chinese university students, to use exercise prescriptions for intervention in obesity among

Chinese university students and the effects of different exercise prescriptions on obese university students

Materials and methods

This study was conducted according to The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Page MJ et al., 2020). This study does not involve individual data or private information, and has been exempted from the ethical review of the Public Health Program at the University of Warwick. A meta-analysis and systematic review were conducted on the intervention methods adopted in the literature and their effects, and then all this information was integrated into a report.

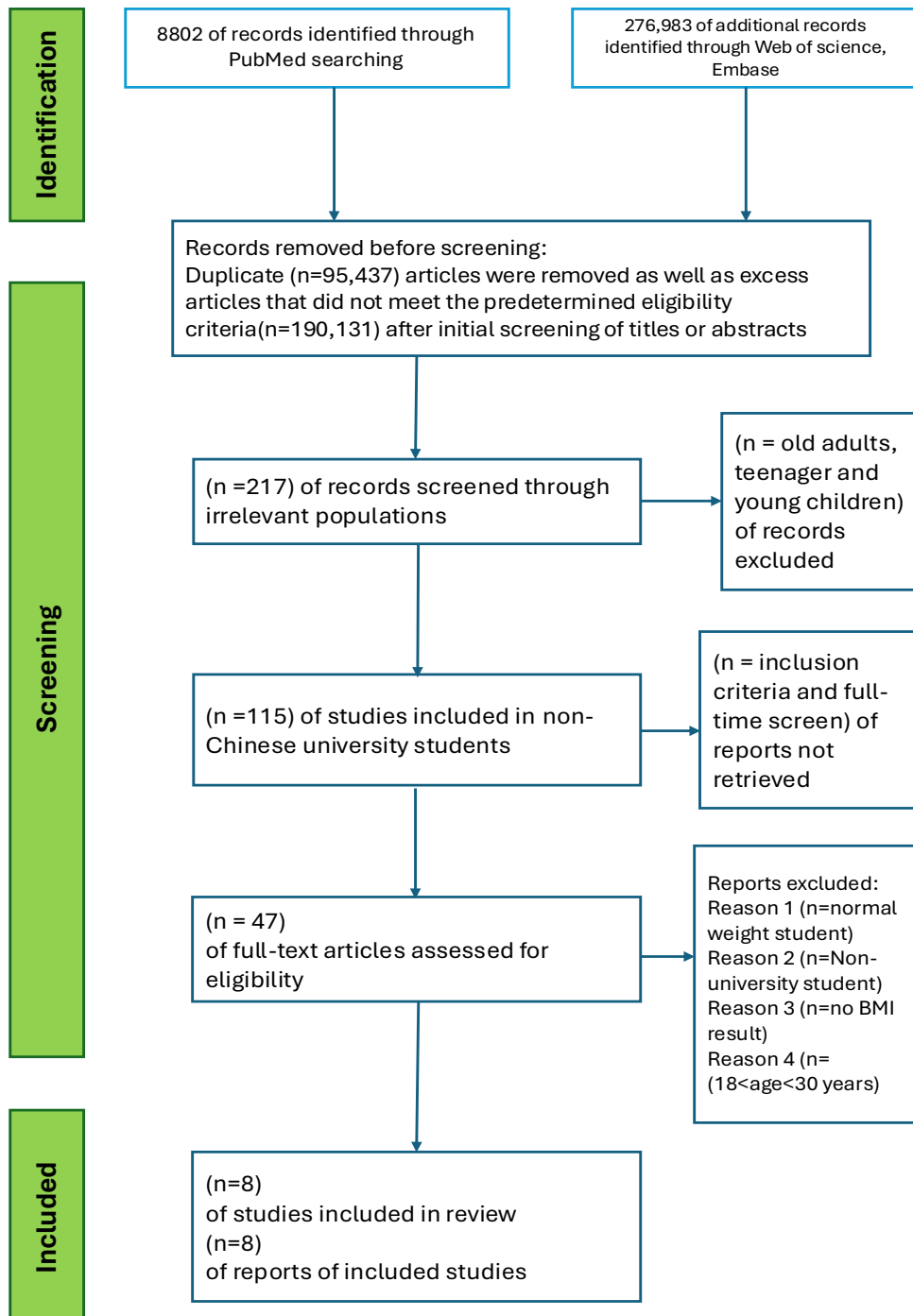
Search Strategy and Process

With the agreement of the University Warwick library, the author searched the following online database :PubMed、 Embase and Web of Science. The keywords used include (Exercise or activity), (prescription * or intervention *), (weight loss or overweight or obesity or obese), (university or college) and (student *), and use the truncation symbol (*) in appropriate places, to make sure that each bias can be captured through search criteria. Used Boolean search terms of AND and OR in the whole searching process (Scott NA, 2009). English language filters were used for each literature. A completed database searched between May 1, 2025 and May 31, 2026, without application time or date limits. Use Endnotes 21 (from the University of Warwick website) to delete repeated articles.

The searching work was completed by one researcher. Firstly, to find articles through keywords. Then, the irrelevant articles and repeated literatures were excluded after reading title and abstract for the literature, and made sure articles belong to inclusion criteria for the studies after screening title and abstract from those articles and did full-text evaluations for confirmed articles. Two researchers used the following criteria to finish critical assessment of quality:

the source for paper, published time, author's title and article citation. Each difference has to be checked carefully, the final articles following criteria had been included in this study with meta-analysis. The searching process of whole PRISMA protocol was shown in Figure 1.

Figure 1 The PRISMA FRAMEWORK



Inclusion and Exclusion Criteria

The randomized controlled studies published in peer-reviewed journals in English were included in the assessment. Summarized the key parts of the inclusion or exclusion criteria in PICO format (Huang, 2006):

Participants: Chinese Obesity/overweight university students. The average age is between 18 and 30. Participants have to be evaluated as healthy obese university students. Articles related to diseases are excluded.

Intervention Measures: Exercise prescription.

Comparison: Non-exercise/non-targeted exercise prescription intervention

Outcome: All the research results have to include changes of body mass index (BMI) before and after exercise intervention.

Data Extraction

The data extraction form used to record relevant data with inclusion studies, see table 1 and table 2. Data were extracted from 8 inclusion studies and related to the following factors:

- 1) basic information: first author, year of publication, source of literature,
- 2) research characteristics: sample size, type of exercise, observation time, exercise prescription (pattern, frequency, duration, intervention cycle)
- 3) characteristics of the study participants: age, gender, body mass index and body fat basic data,
- 4) Result data: Body Mass Index and Body Fat and Triglyceride measurement results.

Risk of Bias Graph

This systematic review only included randomized controlled trials, so, the ROB2 scale (Higgins JPT, 2016) used to assess the risk bias for each study. The Cochrane table used to show the assessment results (see Figure 2). The ROB2 scale covers each type of bias that is currently known to affect the results of randomized controlled trials.

Including:

Random sequence generation (selection bias)

Allocation concealment (selection bias)

Blinding of participants and personnel (performance bias)

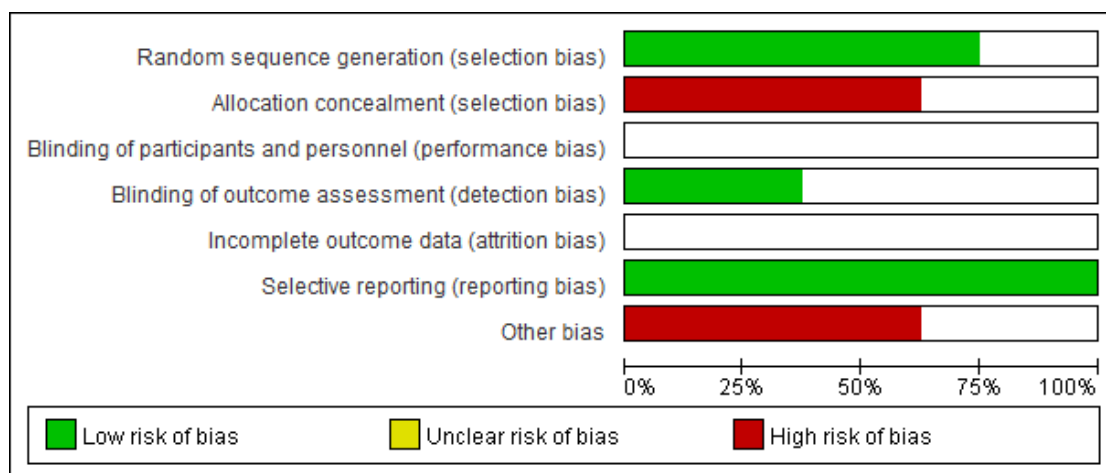
Blinding of outcome assessment (detection bias)

Incomplete outcome data (attrition bias)

Selective reporting (reporting bias)

Other bias

Figure 2 Cochrane randomized trial bias risk assessment results



Data Extraction

Describe the sample size of different studies and participant's demographic characteristics. Describe inclusion study's exercise prescription intervention (pattern, intensity, frequency, duration, result), the changes of observed indicators before and after exercise intervention were statistically calculated separately. A meta-analysis was conducted on studies that could obtain absolute data.

A meta-analysis was conducted using RevMan 5.4 software (Chandler J, et al., 2019). In order to ensure that the analysis of feasibility and reliability, there are only at least three

data groups research report as the same result was incorporated into the meta-analysis (Davey, J. et al., 2011). To find an intervention group through comparing the intervention group and the control group, the effects of eight exercise prescriptions on physical-related result indicators were evaluated. To ensure the feasibility and reliability of the meta-analysis, BMI, BF and TG were analyzed. This analysis used the post-test measured average values and standard deviations (SD) to assess effectiveness. A random effects model was used to explain the expected heterogeneity of each measurement indicator. Heterogeneity was evaluated using the I^2 statistic, with thresholds of $I^2 < 25\%$, $25\% \leq I^2 < 50\%$, and $I^2 > 75\%$ representing low, moderate, and high heterogeneity, respectively [33]. Statistical significance was defined as $P < 0.1$. To consider the difference in included study levels and the worthiness of methods, this research made sure an evaluation and analysis of the effectiveness of exercise prescriptions on weight-loss results. However, due to the limited number of included studies in each meta-analysis (less than 10), it was not conducted by publication bias analysis (Chandler J, et al., 2019).

Results

Searching results

As for database search, a total of 285,785 articles were identified. After removing duplications ($n = 95,437$), 190,131 articles were left for title and abstract screening, followed by a review of the population age ($n = 217$), and then an examination of the inclusion criteria and full-text review ($n = 115$). Eventually, 8 studies met the inclusion criteria for analysis in the final review and adopted a randomized controlled trial (RCT) design (as shown in Figure 1). A total of 681 research participant (Chih-Hui Chiu, 2017, Meng Zhao, 2024, Jing Sun, 2020, Tsung-Lin Chiang, 2019, Zili Zuo, 2025, Xu Song, 2024, Yantao Niu, 2023, Shengyan Sun, 2019), each of the eight studies shown in Figure1, each of them are published articles in peer-reviewed journals. These studies were published from 2017 to 2025. Among them, 2 (25%) were published in 2019 (Tsung-Lin Chiang, 2019); (Shengyan Sun, 2019), and 2 (25%) were published in 2024 (Meng Zhao, 2024); (Xu Song, 2024), 1 paper (12.5%) in 2017 (Chih-Hui Chiu, 2017), 1 paper (12.5%) in 2020 (Jing Sun, 2020), 1 paper (12.5%) in 2023 (Yantao Niu, 2023) 1

article (12.5%) in 2025 (Zili Zuo, 2025). These articles appeared in eight different journals separately.

Study characteristics

The basic characteristics of the 8 papers included in the study are shown in Table 1. These studies were each conducted on obese university students in China. The research subjects were each Chinese university students who met the WHO criteria for overweight and obesity. Among them, university students (mean age = 20.94 ± 1.11 years, mean BMI = 29.27 ± 1.79 kg/m²) were enrolled in the eight studies. Among the 681 participants (60 females, 381 males, and 240 unknown), they were assigned to either the control group or the exercise intervention group. The duration of the intervention ranged from 8 to 12 weeks. One study reported an intervention frequency of 5 times per week, while the overall study was conducted 3 times per week. The intervention measures included walking on a treadmill exercise, Tai Chi Chuan, High-intensity intermittent training, and pedaling on a cycle ergometer, among others. The main results evaluated by these studies included BMI, BF and TG. The maximum sample size of the randomized controlled trials included in the literature was 300 people, and the minimum was 32 people. Each participant reported the outcome indicators required by the study - the changes in BMI before and after the intervention.

Assessment of risk bias

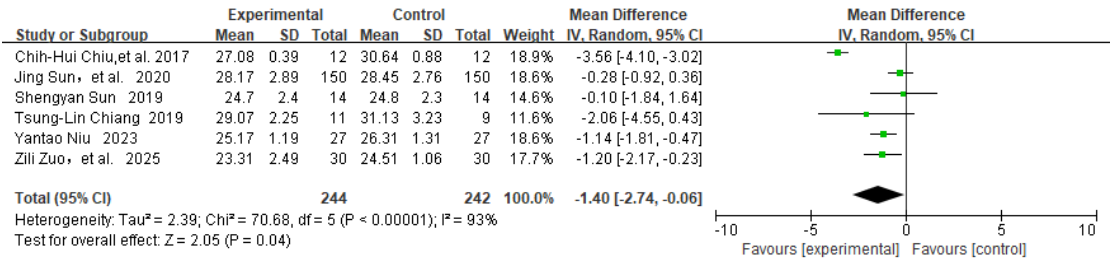
The risk of bias in the eight included studies was shown using the Cochrane table (see Chart 2). Because the research is the exercise prescription intervention measures, so the subjects all know interventions, this inevitably leads to intervention measures of blinded and cause of the high risk of bias. Weight loss was assessed with the use of BMI in each study, and the consistency of outcome assessments resulted in a relatively low risk of bias. However, whether outcome measures were aware of which intervention participants received was not specified, indicating a moderate risk of bias.

Meta-analysis (table 2)

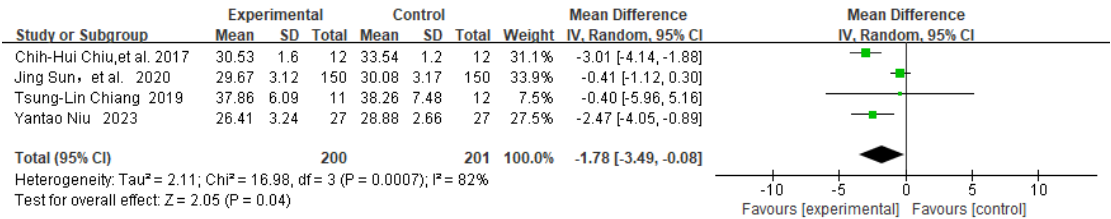
Based on the availability of data with absolutely mean $\pm$ standard deviation, this review

used software RevMan 5.4 (come from the website on University of Warwick) to finish meta-analysis for BMI, BF and TG. Among them, six studies did meta-analysis for BMI, four studies did meta-analysis for BF, and three studies did meta-analysis for TG.

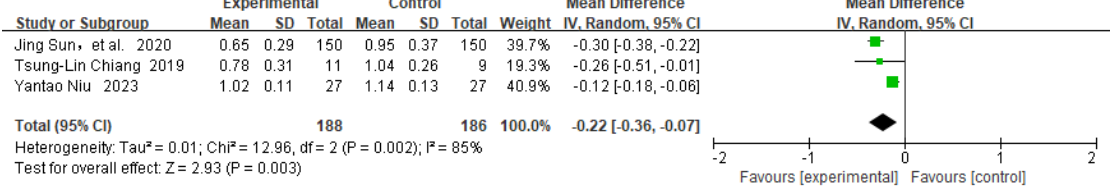
Table 2 The meta-analysis changes for main indicators



BMI



BF



TG

BMI influence

After the exercise intervention was completed, the BMI of six studies decreased significantly, ranging from 2% to 14%, which was statistically significant. There was no significant decrease in BMI in only one study (Tsung-Lin Chiang, 2019).

Among them, the data of six studies were completed. The result of meta-analysis showed that the heterogeneity test $I^2 = 93\%$, indicating severe heterogeneity. $Z = 2.05$, $P < 0.05$ ($P = 0.04$), indicating that there was statistically significant heterogeneity among the studies. Therefore, a subgroup analysis was conducted. The overall effect size was -1.40, with a 95% confidence interval of (-2.74, -0.06), indicating that the overall effect was statistically significant. Three studies showed a decrease in BMI (Chih-Hui Chiu,

2017; Yantao Niu, 2023; Zili Zuo, 2025), and the statistical significance was significant.

Among the 12-week intervention studies, one with high-intensity interval training as the intervention measure had the most significant decrease in BMI after the intervention, with a decrease of 9% (Jing Sun, 2020). The results of the study showed that high intensity training (-8%) compared with light intensity training (-3%) medium intensity training (-5%), the decrease in BMI of the three kinds of intensity after exercise intervention was statistically significant (Chih-Hui Chiu, 2017).

In a study using Cycling wearing VR glasses accompanied by music as an intervention, the BMI of the observation group and the control group decreased significantly after the same intensity of Cycling intervention. Compared with the control group, the BMI of the observation group with VR and music accompaniment decreased more significantly, and the comparison between the two groups was statistically significant at the significance level of 10% (Meng Zhao, 2024).

Among the 8-week intervention studies, one with Tabata-based HIIT as the intervention measure had the most significant decrease in BMI, with a reduction of 14% (Zili Zuo, 2025). A study using Powered treadmill as male and female university students exercise prescription intervention, high strength group of men (8%) and women (7%) compared to moderate intensity interval training men (6%) women (6%) decreased slightly larger, difference was statistically significant (Xu Song, 2024).

BF influence

There are six studies that measure the changes in BF values before and after exercise intervention. Among them, four studies showed a significant decrease in BF values after the intervention (Chih-Hui Chiu, 2017), (Tsung-Lin Chiang, 2019),(Jing Sun, 2020), (Yantao Niu, 2023). Among them, three studies had an intervention period of 12 weeks (Chih-Hui Chiu, 2017, Yantao Niu, 2023, Jing Sun, 2020), and the other three had an intervention period of 8 weeks (Xu Song, 2024, Tsung-Lin Chiang, 2019, Zili Zuo, 2025).

A meta-analysis was performed on BF data from four studies. The results showed that the overall effect size was -1.78, and the 95% confidence interval was (-3.49 0.08), indicating that the overall effect was statistically significant.

However, heterogeneity test $I^2 = 82\%$, indicating significant heterogeneity. $Z = 2.05$, $P < 0.05$ ($P = 0.04$), indicating a statistically significant heterogeneity among studies.

The intervention results for sedentary obese university students showed that although high (-12%) intensity training had a more significant reduction in BF compared to light

(-8%) to moderate (-4%) intensity training, low to moderate intensity continuous training also had statistically significant effects on weight loss and the reduction in the extent of BF% (Chih-Hui Chiu, 2017).

As same as the study intervention with 8 weeks, one study of intervention based on Powered treadmill for high-intensity groups with males, the BF declined 24%, female declined 27%. Compared with the control group, male declined 7%, female declined 10%, and it shown the obviously decreased and statistically significant (Sayyed Mohammad Marandi, 2013, Xu Song, 2024).

TG influence

As four studies measured the changes in triglyceride (TG) values before and after the intervention. The data of three studies were carried out by meta-analysis. The result of meta-analysis showed that the heterogeneity test $I^2 = 85\%$, indicating considerable heterogeneity. $Z = 2.93$, $P < 0.05$ ($P = 0.003$), suggesting that there was statistical significance in the heterogeneity among the studies. The overall effect size was -0.22 , with a 95% confidence interval of $(-0.36, -0.07)$, indicating that the overall effect was statistically significant. Since the number of studies was small, a subgroup analysis was not conducted.

After the intervention, the TG values of the observation groups in these four studies decreased significantly (Jing Sun, 2020, Xu Song, 2024, Yantao Niu, 2023, Tsung-Lin). In one of the studies using High-intensity intermittent training as intervention measures, the TG of the study group (-53%) decreased the most significantly compared with that of the control group (-28%) after intervention, and the comparison between the groups within the group was statistically significant (Jing Sun, 2020).

Other indicator influence

Two studies measured muscle mass (Zili Zuo, 2025, Yantao Niu, 2023). Among them, Tabata-based HIIT was used as an intervention measure, Muscle Mass in the observation group increased more significantly than in the control group after intervention, and the difference was statistically significant (Zili Zuo, 2025).

Cardiorespiratory Endurance Index was measured before and after the intervention in treadmill training studies with different intensity, and CEI increased significantly in observation group compared with control group after the intervention (Chih-Hui Chiu, 2017). An exercise intervention study with 12,000 steps per day combined with walking exercises showed that the Systolic blood pressure, Diastolic blood pressure, and Heart

Rate of the observation group were significantly lower than those of the control group after the intervention (Tsung-Lin Chiang, 2019, (Dylan R Barrow, 2019).

Discussion

The result of systematic review shown that exercise prescription has significant effects on reducing BMI, BF and TG, the result of meta-analysis also identified these results. According to the study, the findings support in obese university students in China using exercise prescription for weight loss and improving physical health. The key parameters of an exercise prescription include the intensity, duration, and frequency of university student's exercise, as well as the type of activity that needs to be carried out (Tipton, 2008), in order to achieve the best results of BMI reduction, fat reduction or muscle growth and physical fitness. The researchers identified common exercise prescription parameters in successful weight loss exercise programs for obese Chinese university students. The following provides a basis for the suggestions.

The optimal exercise intensity

It is recommended that obese university students increase exercise intensity for 40% to 95% of maximum heart rate or 50%-90% of $VO_{2\max}$ to optimize weight management and improving physical health (Yantao Niu, 2023).

The results of showed that compared with low-intensity exercise, high-intensity exercise can significantly reduce body weight and body fat when the energy expenditure is equal, which is the same as the results of previous studies (Chih - Hui Chiu, 2017, Lee MG, 2012). Therefore, both 8-week high-intensity aerobic training and 12-week high-intensity interval training can be preferentially recommended for obese university students in China who need to lose both weight and fat (Sun,2020; Xu, 2024; Zuo, 2025). Since intensity is key to the regulation of abdominal fat, it is recommended that a high-intensity training program should be developed for obese individuals when their exercise capacity is high enough (Chih-Hui Chiu, 2017). For obese individuals who do not exercise or are not accustomed to intense physical activity, achieving 50% to 90% of $VO_{2\max}$ in SIT or HIIT is an optional exercise strategy for weight loss and improvement of cardiometabolic health. (Shengyan Sun, 2019; Racil et al., 2016 (Shengyan Sun, 2019;

Racil et al., 2016).

Tai chi through the combined aerobic and resistance exercise training to improve BMI, blood lipids, and increase muscle mass. Due to Tai Chi requires the exercise intensity to be 50-70% of the maximum heart rate (Wang, 2024), it is recommended for obese university students who cannot accept intensive training (Niu,2023).

Previous research has shown that HR and blood pressure are direct indicators for assessing the benefits of exercise (Kokkinos P., 2014; Shephard RJ and Balady GJ, 1999). The goals for daily walking steps should combine with median-intensity exercise, which can make sure the health benefits for walking exercise with obesity university students, for example, SBP, DBP and HR has significant decreases, but they have to sustain for a long time (> 20 weeks) to get the declination for BMI and blood lipids (Tsung-Lin Chiang, 2019).

40-80% of the largest HR treadmill training on a regular basis may be achieved in BMI and blood lipid of falling at the same time, significantly improve the CEI (Chih - Hui Chiu, 2017). Among them, light intensity training of 60 minutes three times a day is suitable for sedentary obese people, which is consistent with the research results of Marandi SM et al. (2013).

The optimal exercise frequency and duration

It is recommended that obese university students exercise 3 to 5 times a week, for 28 to 60 minutes each time, and increase the frequency over time to maintain weight loss. There are similar frequencies across studies, with 3 times per week being the common prescribed frequency (Marandi,2013), as well as frequency fluctuations of 5 times per week.

As for obese university students, exercise three times a week can almost effectively reap the benefits of exercise. However, HIIT can save nearly 40% of the time per week, so it is considered as an effective exercise strategy for the management of overweight and obesity (Jingyun Hu, 2022). The SIT intervention produced similar health benefits one third of the time. Therefore, it also provided a highly effective exercise strategy for inactive overweight population who have no more time (Shengyan Sun, 2019).

Tsung-Lin Chiang et al. (2019) reported that there is no observed improvement in body composition after 6-12 weeks of intervention. However, when the intervention period was increased to 20-36 weeks, significant reductions in body weight, BMI, and body fat percentage were observed. It was considered that in cases of insufficient exercise

intensity, an extended intervention period may be needed to ensure improvement.

The American College of Sports Medicine association (American College of Sports Medicine, ACSM) exercise testing and prescription guide pointed out that the obese or overweight adults have to be moderate to severe intensity of movement, movement of 50-60 minutes each time, to maintain long-term weight loss effects (Riebe D, et al., 2017).

The optimal exercise pattern

This study recommends multiple exercise patterns that can be used to achieve weight loss effects. In specifically, it includes high-intensity interval exercise and aerobic exercise, among which aerobic exercise includes bicycle, tai chi, and pedaling with dynamometer(Akbulut et al., 2022). The research results show that Tabata-based HIIT is the exercise pattern that can cause the greatest reduction in BMI, and the exercisers also achieve a significant decrease in body fat (Zili Zuo, 2025). Dyslipidemia refers to abnormal lipids in the blood, and hyperlipidemia is the main form of lipid abnormality. This condition is considered to be a pathogenic risk factor for cardiovascular disease and is characterized by elevated levels of TG et al. (Akbulut, et al.,2022). (Sun et al. 2020) found that aerobic exercise and high-intensity interval training can significantly improve the body weight of obese male university students. However, the effect of high-intensity interval training in improving glucose and lipid metabolism among obese male university students is greater than that of aerobic exercise. This study recommended for obesity in Chinese university students by high intensity intermittent movement or high strength training in order to obtain significant weight loss, at the same time, it can get CEI indicators increased, or TG declined, but need to keep on longer-term (Jing Sun, 2020; Chih-Hui Chiu, 2017). Studies have shown that Tabata can be used as an effective short-term weight-loss exercise program for overweight and obese male university students (Wang, 2024), which is consistent with the results of this study. (Ramos et al., 2016) have demonstrated that 12-week HIIT can effectively control the weight of overweight individuals, reduce body fat percentage, improve BMI, and effectively increase basal metabolic rate. The combination of music and VR with exercise can make physical activity more attractive and solve the common barriers of obese university students in China who lack interest and participation in exercise (Meng Zhao, 2024).

Strengths and Limitations

The advantage of this study is that it is the first to conduct a systematic review within meta-analysis of exercise prescription intervention for weight among obese university students in China. Moreover, it has summarized personalized exercise prescription strategies based on the different needs of obese university students to achieve the goal of promoting health. However, in systematic reviews, exercise intervention has inherent limitations. In specifically, failure to blind participants to the intervention will consistently result in a higher risk of bias when assessing risk bias. Due to the limited number of studies included, the difference of obesity status around included populations, the duration periods and difference of frequency and control groups cause considerable heterogeneity with meta-analysis. In this review, the final number included in the study of the data extraction is below expectations. Some of the included studies had small sample sizes and only focused on university students in specific regions of China, which may limit the generalizations of the results (Dylan, 2019). Some studies did not record whether daily food intake during the intervention period was lower than that recorded daily (Schoeller, 1995). In some studies, there was no non-exercise control group (Schoeller, 1995). Some studies only included overweight male students, so it is unclear that whether the findings can be extrapolated to normal or obese populations or to women (Yantao, 2023). Huang Weixiong (2026) emphasized that the intensity of intervention should be adjusted according to the individual initial physical condition, rather than using a uniform standard to optimize safety and effectiveness. This provides valuable suggestions for future research, and the above limitation requires consistency for choosing samples in the future research.

By identifying the commonalities of exercise prescriptions among Chinese university students with healthy obesity phenotypes, this review provides an effective starting point for weight loss and improving physical health through exercise prescriptions. Multiple studies have confirmed that high-intensity exercise is the most effective to weight loss, including high-intensity interval training and high-intensity aerobic exercise. There is evidence suggesting that high-intensity exercise programs can improve the body composition (reducing weight, body fat while retaining muscle) and physical health (enhancing CEI, blood pressure, and heart rate) of obese individuals. This study suggests that for obese Chinese university students, when their exercise capacity is high enough, it is recommended to formulate a high-intensity exercise prescription for them. For inactively overweight university students with insufficient time, the SIT exercise method is recommended. For obese university students who lack

interest and participation in sports, it is recommended to combine music and VR with sports to make sports activities more attractive. For obese university students who sit for long periods without moving, it is recommended that they do three 60-minute light-intensity exercises each day, which can also effectively reduce weight and body fat. Different forms of Tai chi exercise can be recommended for obese university students who cannot accept high-intensity training. As for obesity population for choosing walking, it is recommended that the daily walking goals should be combined with moderate-intensity exercise. The frequency and duration of exercise for each mode should be performed at least 3 times a week for a minimum of 28-60 minutes to maximize improvement in body composition and promote physical health.

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Author contributions

Zilong Guan was responsible for drafting the manuscript. Zilong Guan and Surangi Jayakody Mudiyansele conducted the search and screening of articles and evaluated the selected articles. Shamila Manori Devagiri Mudiyansele supervised the overall work and provided revision suggestions. All authors have read and approved the final manuscript for publication.

Declaration of interest statement;

This author declares that there are no conflicts of interest.

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