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Effects of different intensity resistance training on fat level, energy intake, and appetite among overweight and obese female college students

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ABSTRACT

This study examines how different intensity resistance exercises impact fat, energy intake, and appetite regulation in overweight and obese female college students in Jiangsu Province, China. This study used a randomized controlled trial (RCT) design that investigates resistance training intensity-target result causation. The study determines the impact of High-Intensity Interval Training (HIIT) and Moderate-Intensity Resistance Training (MIRT) on body composition, fat level/body composition, and muscle mass them. In Jiangsu Province, China, 515 overweight and obese female college students aged 18–25 were sampled. Intervention groups were assigned randomly to campus recruits based on demographic and anthropometric. This study demonstrated significant correlations between resistance training intensity, body composition, diet, and appetite regulation in overweight and obese colleagues. MIRT and HIIT outperformed Control in weight loss and diet and used valid measures like DEXA (Dual-Energy X-ray Absorptiometry), blood tests and food diaries to regulate appetite hormones. Increased protein and muscle mass minimize resistance exercise intensity-metabolic consequences. The study analyzes these impacts to show how exercise intensity, food, and metabolic health are interconnected. These findings help build evidence-based obesity prevention and treatment strategies for this demographic. Healthcare providers, legislators, and university stakeholders use this study to tackle college student obesity. The results suggest that campus wellness initiatives should focus on resistance exercise and diet to combat obesity. This research promotes exercise science and health behavior change theory for cross-cultural lifestyle interventions.

Contribution/ Originality: This study is the first to use a randomized controlled trial (RCT) to compare the effects of high-intensity interval training (HIIT) and moderate-intensity resistance training (MIRT) on fat loss, muscle mass, and appetite regulation specifically in overweight and obese female college students in Jiangsu Province, China.

1. INTRODUCTION

Resistance-based muscle and strength development is achieved through intense resistance training or a randomized controlled trial (IRT), which is defined as a study design randomly assigning participants into an experimental or a control group for the short term. Exercises using machines, free weights, and resistance bands prioritize intensity over volume. Vigorous resistance training increases muscle growth, strength, and power. Unlike endurance training, which gradually emphasizes lighter-weight repetitions (Ashtary-Larky et al., 2022; Taype-Rondan, Tanaka, & Merino-Garcia, 2017). Resistance training intensity is influenced by weight lifted, repetitions, and rest intervals. To build muscle, resistance or load must be gradually increased. Severe resistance training works because progressive overload strengthens and adapts muscles. Athletes of all skill levels can perform intense resistance training by varying the frequency, intensity, and choice of exercises (Maillard et al., 2019). Resistance training with various efficient intensities increases muscle, endurance, and performance. Different physiological reactions and adaptations may result from varying workout intensity when comparing resistance training regimens. Resistance exercise with higher weights and fewer repetitions increases muscle mass and power. Hypertrophy and increased muscle fibre engagement result in strength (Zhang et al., 2021).

Moderate-intensity resistance training increases strength and endurance, such as lifting small weights for repetitions. This approach increases muscular growth and strength without requiring as much effort as full-effort workouts for those seeking strength and endurance. In order to promote muscular growth, pyramids, supersets, and drop sets raise metabolic stress and muscle fatigue. These advanced techniques help to hypertrophy and develop muscles when used in a regimented training program (Maillard et al., 2019). Resistance training increases strength, power, and hunger/energy/fat control. Intense resistance exercise increases lean muscle mass and fat reduction. This method increases Excess Post-Exercise Oxygen Consumption (EPOC) defined as increased oxygen intake following intense physical activity, which helps the body return to its pre-exercise state, insulin sensitivity, and metabolism. HIIT is defined as a form of cardiovascular exercise that alternates between short bursts of intense activity and periods of low-intensity recovery or rest, HIIT trainees experience the "afterburn effect," which increases oxygen demand. After the activity, metabolism stays elevated. Metabolism rises, burning calories and fat and promoting repair and regeneration. A healthy diet may reduce body fat (Ahmeti, Idrizovic, Elezi, Zenic, & Ostojic, 2020).

HIRT boosts insulin sensitivity and glucose energy utilization. Increased insulin sensitivity lowers fat storage and increases muscle glucose usage (Martínez-Rodríguez, Rubio-Arias, García-De Frutos, Vicente-Martínez, & Gunnarsson, 2021). This lowers fat and blood sugar, helping insulin resistance and type 2 diabetes. Resistance training and overtraining can change energy expenditure and eating habits, helping with weight reduction and composition. Numerous studies demonstrate that high-intensity resistance training temporarily lowers hunger and post-workout calorie consumption (Chen et al., 2022). Ghrelin and peptide YY may induce this. Severe resistance exercise may improve lean muscle mass and calorie expenditure over time because muscle utilizes more energy than fat. Muscled people burn more calories at rest due to greater BMRs (Basal Metabolic Rate). Thus, intensity resistance exercise in a comprehensive fitness program can help people lose weight, maintain lean muscle, and balance energy. HIIT boosts metabolism, burns fat, reduces hunger, and cuts calories. High-intensity resistance exercise boosts fitness, fat reduction, and composition. Resistance training can enhance fitness and body composition with a healthy diet and lifestyle (Greer, O'brien, Hornbuckle, & Panton, 2021; Guo, Cai, Wu, & Gong, 2022).

Jiangsu Province's obese female college students worry about resistance training intensity's fat, energy, and hunger effects. Depending on resistance exercise intensity, these attributes may affect weight control in this population. Overweight and obese university colleagues lose weight and control energy and appetite with high-intensity resistance training. Resistance training intensity effects must be studied to find this group's optimum weight loss and metabolic health strategy. Researchers can safely and effectively improve body composition and health by measuring overweight and obese female college students' intensity resistance training responses. Research suggests adding strength training to weight control programs for young adults in Jiangsu Province and abroad may reduce obesity. The study studies how resistance training intensity levels affect fat, energy intake, and hunger in overweight and obese female college students in Jiangsu Province, China, to inform targeted obesity therapies and improve long-term health (Park, Won-Sang, Jisu, Hwang, & Kiwon, 2019; Skrypnik et al., 2019).

Research challenge: The complicated effects of resistance exercise intensity on fat, energy intake, and hunger in overweight and obese female college students in Jiangsu Province, China. Resistance training is tested for metabolic and physiological effects in obese patients. This demographic group's fat metabolism, calorie intake, and appetite regulation are compared following high- and moderate-intensity resistance training. Resistance training intensity and metabolic results for overweight and obese female college students are examined to identify optimal weight control and metabolic health. It lists this demographic's greatest workouts empirically. Contextualizing Jiangsu Province data proposes obesity-fighting public health interventions. Outside academia, it impacts public health policy and practice. Lifestyle and environmental factors put young adults, especially college students, at risk of obesity. In Jiangsu Province, resistance training intensities change fat levels, calorie consumption, and hunger, enabling evidence-based obesity-related health risks and well-being therapies (Campa et al., 2020; Campbell et al., 2020; Gaitán et al., 2019).

Jiangsu Province may develop culturally relevant fitness programs and therapies using data. Science and practice assist local doctors, educators, and legislators in combating obesity among colleagues. This study examined targeted obesity therapy for female college students in Jiangsu Province, China. The study supports metabolic health and sustainable weight loss with resistance exercise because obesity is multifaceted and has many health implications. The study improves health and quality of life for overweight and obese female college students in Jiangsu Province and beyond using rigorous science.

This study intended to improve scientific understanding and obesity management expertise among female college students in Jiangsu Province, China. Resistance training at high and moderate intensities is examined in terms of fat metabolism, calorie intake, and appetite regulation to determine if exercise therapies work for this population. Scientific research determines how resistance training intensities affect metabolism. This study contextualizes lifestyle choices and obesity rates in Jiangsu Province within socio-cultural and environmental elements to inform regional public health strategies. Understanding how cultural norms, nutrition, and social influences affect exercise and metabolic health helps prevent and treat obesity in this population. Socio-cultural factors make the study approach more relevant to healthcare practitioners, policymakers, and community stakeholders. The study impacts science and public health policy and practice. The research may influence evidence-based treatments to alleviate obesity-related health inequities in Jiangsu Province and beyond by identifying effective weight management and metabolic health exercise routines for overweight and obese female college students. The project promotes healthy living, including regular exercise, for this vulnerable population to improve health and quality of life. This study helps Jiangsu Province, China, and global obesity prevention and management policies address challenging concerns. This interdisciplinary study uses scientific, socio-cultural, and public health approaches to enhance health outcomes for overweight and obese female college students in the region.

2. LITERATURE REVIEW

Obesity causes excessive body fat and serious health issues. In recent decades, obesity has increased worldwide, especially among university students. Body image issues, socio-cultural pressures, and obesity-causing lifestyles plague colleagues. This extensive literature review examines the complicated origins, prevalence, and health and well-being effects of obesity in university colleagues. Numerous studies show that female college students worldwide are obese. Poor diet, inactivity, and stress at universities can cause weight gain and obesity in young women, say experts. Sun et al. (2019) found that university women are more obese than national averages in numerous nations. These findings suggest targeted obesity therapy for this vulnerable population.

University women are fat for biological, psychological, sociocultural, and environmental reasons. Obesity is hormonal and hereditary. Social factors like body image and beauty standards affect women's weight and judgments. Rooks and Garrett (2017) found that culture causes body image dissatisfaction, compulsive eating, and obesity among university women. University women are obese due to poor diet, inactivity, and sleep. Studies reveal that college students overeat fast food, soda, and processed snacks. Overusing screens and not exercising raises university women's obesity risk. Dun et al. (2019) found a strong relationship between sedentary behavior and college women's weight gain.

Strength, muscle mass, and fitness require resistance training. Resistance exercise intensity affects physiology. This research analysis examines resistance training intensity on muscular growth, strength, and metabolism to determine the best fitness solutions. Intense resistance training that lifts large weights at maximum effort has been studied for muscular growth and strength. Holtzman and Ackerman (2019) found that high-intensity resistance exercise increases muscle fiber cross-sectional area, especially to failure. High-intensity resistance training activates fast-twitch muscle fibers, increasing power and explosiveness. Moderate-intensity resistance training produces muscle and strength but less than high-intensity. After volume equalization, Zeppa et al. (2020) discovered that moderate-intensity resistance training builds muscle and strength like high-intensity training (Ahmeti et al., 2020; Martínez-Rodríguez et al., 2021). Comprehensive exercise programs must include moderate-intensity resistance training to improve muscle endurance and metabolic efficiency. Resistance exercise at high or moderate intensities has conflicting impacts on muscle growth and strength (Fan, Li, & Loh, 2022). High-intensity training may enhance muscle mass and strength in experienced lifters, but other studies have found no benefit. The study of Tsirigkakis et al. (2021) analysis showed that moderate- and high-intensity resistance training can increase muscle when volume and effort are matched, highlighting the necessity to personalize training programs.

Resistance training increases muscle mass, strength, energy expenditure, and insulin sensitivity. High-intensity resistance exercise improves metabolic health and body composition by increasing post-workout energy expenditure and fat burning (Liu, Li, & Loh, 2022). Insulin sensitivity and glucose metabolism improve with resistance training, independent of intensity, lowering type 2 diabetes risk. To optimize muscle strength, function, and health, understand how exercise treatments affect muscle mass. HIIT, MIRT, and controls were studied for muscle gain. HIIT involves short bursts of intensive exercise followed by rest or gentle exercise. Foroozan et al. (2021) revealed that HIIT's high-intensity nature and inclination to generate metabolic stress and muscular damage increase muscle growth, especially in fast-twitch fibers.

Middle-Intensity Resistance Training (MIRT) stimulates slow- and fast-twitch muscle fibres by lifting moderate loads for more reps. MIRT increases muscle growth and strength, especially with increasing loading and volume (Bosy-Westphal, Hägele, & Müller, 2021). This regulated, methodical muscle-building method targets specific muscle areas and adjusts to different resistance levels, making MIRT versatile and accessible. Control groups without regular exercise evaluate exercise programs' direct impact on muscle mass (Jurado-Fasoli, Amaro-Gahete, De-La-O, & Castillo, 2020). Control groups may not develop muscle mass as much as active intervention groups but improve without activity (Greer et al., 2021). Comparing HIIT, MIRT, and control groups can assist researchers in understanding how training modalities affect muscle growth and develop evidence-based hypertrophy and strength recommendations. The literature suggests that HIIT, MIRT, and control group assignments affect muscle mass. High-intensity HIIT is expected to build muscle by stressing and engaging muscle fibers. MIRT trainees should acquire muscle through progressive resistance training and targeted muscle stimulation (Battista et al., 2021; Berge et al., 2021). The control group is not predicted to gain muscle hence planned exercise interventions are needed to promote muscular adaptations. The theory states that group assignment and training modality affect muscle mass. We develop the research hypothesis based on the literature review:

H_1: There is a direct effect of group assignment (HIIT, MIRT, Control) on muscle mass.

Weight, circumferences, and composition show fitness. Understanding how exercise interventions alter anthropometric factors is essential for evidence-based health outcomes optimization. HIIT, MIRT, and controls were anthropometrically measured. HIIT alternates hard and easy workouts. HIIT boosts metabolism and fat oxidation, lowering body fat and improving body composition, according to Battista et al. (2021) and Berge et al. (2021). MIRT increases light load lifting to build muscle and endurance. MIRT reduces body fat and increases lean muscle mass, report (Beaulieu et al., 2021). Resistance training increases waist circumference and BMI with steady-loading muscle growth and metabolic adaptations.

Control groups of non-exercisers can measure anthropometric changes from exercise. Control groups can show baseline changes without substantial exercise despite less anthropometric change than active intervention groups. Comparing HIIT, MIRT, and control groups reveals how exercise affects anthropometrics and fitness advice. The literature suggests HIIT, MIRT, and Control group assignment change anthropometrics (Afrasyabi, Marandi, & Kargarfard, 2019; Ghasemi, Afzalpour, & Nayebifar, 2020; Morze et al., 2021). Fat loss and muscular increase are expected in HIIT groups. The high intensity of HIIT should modify metabolism to burn fat and build muscle. MIRT participants should increase lean muscle and reduce fat. Controlled, progressive MIRT boosts muscle growth and metabolic efficiency, improving body composition. Without workouts, control group anthropometric measures should remain unchanged (Halliday et al., 2021). Lifestyle and environment alter baseline anthropometrics. The hypothesis suggests that group assignment controls anthropometric findings and exercise modality controls change size and character. Based on the literature, we propose the following hypothesis:

H_2: There is a direct effect of group assignments (HIIT, MIRT, Control) on anthropometric measures.

Fitness depends on fat, lean muscle, and bone density. Effective weight loss and metabolic health programs require understanding how exercise impacts body composition. Body composition effects of HIIT and MIRT have been studied (Afrasyabi et al., 2019; Vargas-Molina et al., 2020). Reljic, Frenk, Herrmann, Neurath, and Zopf (2021) and Shakiba, Sheikholeslami-Vatani, Rostamzadeh, and Karim (2019) found that HIIT reduces body and visceral fat and enhances lean muscle mass. High-intensity HIIT alters metabolism to increase fat loss and muscular gain. MIRT improves body composition by increasing lean muscle mass and reducing fat. Gentil and Steele say MIRT's progressive stress improves body composition. Resistance training in some muscle areas boosts metabolic efficiency and muscle growth. Exercise's direct impacts on body composition are assessed using control groups without structured exercise programs (Nobari et al., 2022). Control groups show baseline changes without rigorous activity but not as much as active intervention groups. Researchers can compare HIIT, MIRT, and control groups to assess body composition changes and provide weight management and metabolic health recommendations.

Diet profoundly impacts health and body composition. Effective weight loss and nutritional health programs require understanding how exercise influences eating. Diet effects of HIIT and MIRT have been studied. Barakat, Pearson, Escalante, Campbell, and De Souza (2020) found HIIT cuts calories and improves diet. HIIT intensity may affect appetite-regulating hormones and metabolic signaling pathways, affecting nutrition. MIRT may alter nutrition by regulating appetite and metabolism. Kelley, Kelley, and Pate (2019) found that MIRT patients had higher protein and better meal timing. MIRT's regulated, progressive nature may alter hunger and satiety signals that affect diet by influencing ghrelin and leptin. Control groups without formal activity indicate baseline and changing diets. Comparing HIIT, MIRT, and control group outcomes can assist researchers in understanding how exercise affects eating and develop evidence-based weight management and nutritional health recommendations (Branco et al., 2020).

Hunger, satiety, and dietary preferences must be regulated to maintain nutritional intake and energy balance. One must understand how exercise affects appetite to create effective weight loss and nutritional health programs. MIRT and HIIT have been studied for hunger regulation. Vaccari et al. (2020) say HIIT affects appetite-regulating hormones and appetite perceptions, changing hunger and satiety signals. Moderate-Intensity Resistance Training (MIRT) may alter hormones and metabolism to reduce appetite. MIRT reduces appetite and food cravings (Kelley et al., 2019). Controlled, progressive MIRT may affect hunger, energy, and metabolism. Control groups of non-exercisers demonstrate appetite management changes. Comparing HIIT, MIRT, and control group outcomes can assist researchers in understanding how exercise regulates hunger and provide evidence-based weight management and dietary advice.

Group assignment (HIIT, MIRT, Control) appears to impact body composition, nutritional intake, and appetite regulation. Participants in HIIT groups should lose fat and gain muscle. High-intensity exercise may modify hunger and calorie consumption due to metabolic changes. Nutrition, appetite, and body composition should improve with MIRT (Greer et al., 2021; Maillard et al., 2019). Controlled, gradual MIRT improves body composition by boosting muscle growth and metabolic efficiency. Resistance training metabolic changes and hormonal responses may affect MIRT protein intake and appetite. The control group does not exercise; thus, their body composition, diet, and hunger should not change. Lifestyle and environmental changes may impact baseline results. Exercise modality affects size and type, while group assignment affects body composition, nutritional intake, and hunger regulation. Based on the literature, we develop the following hypotheses:

H_3: There is a direct effect of group assignment (HIIT, MIRT, Control) on body composition/fat level.

H_4: There is a direct effect of group assignment (HIIT, MIRT, Control) on dietary intake.

H_5: There is a direct effect of group assignment (HIIT, MIRT, Control) on appetite regulation.

Muscles are built through protein consumption and knowledge group assignments (HIIT, MIRT, Control). Muscle mass is influenced by diet and exercise, particularly protein, and it governs both health and function. For muscle mass, MIRT and HIIT have been thoroughly researched. When performed at the proper volume and intensity, HIIT and MIRT, according to Chen et al. (2022) enhance lean muscle mass. After a workout, protein aids in synthesizing and repairing muscle protein. Guo et al. (2022) found that protein consumption after exercise enhances muscle protein synthesis, recuperation, and adaptation. Enhances lean muscle mass with protein. Protein is needed for HIIT and MIRT to build muscle (Sepideh & Bahman, 2020).

Muscle mass is influenced by group assignment and protein consumption. Morton and Mitchell discovered that protein consumption during HIIT and MIRT may affect muscle growth. Regardless of activity level, protein consumption may increase lean muscle mass. Even with protein consumption, controls who do not exercise might not gain muscle. The effects of HIIT, MIRT, and Control muscle mass are mitigated by protein. Consuming protein during MIRT or HIIT should increase muscle mass. Protein synthesis and exercise-induced muscle injury can result in muscular growth, attributed to high-protein diets. Protein consumption might not impact muscle mass since the control group does not exercise to build muscle. Baseline muscle mass is influenced by nutrition and lifestyle (Ashtary-Larky et al., 2022; Guo et al., 2022; Martínez-Rodríguez et al., 2021; Zhang et al., 2021). Protein consumption is thought to enhance HIIT and MIRT's muscle-building benefits while moderating the effects of group assignments on muscle mass measurements. Based on the literature, we develop the following hypothesis:

H_6: The effect of group assignment (HIIT, MIRT, Control) on muscle mass is moderated by dietary protein intake.

The complex relationship between resistance training intensities and fat levels may be governed by increased muscle mass observed in overweight and obese female college students. Adults who are overweight or obese can use resistance training to increase muscle and lose weight. Studies on HIIT and MIRT for muscle growth and fat loss have been conducted. Campa et al. (2020) and Park et al. (2019) found that HIIT and MIRT helped overweight and obese persons shed fat and increase muscle. Fat is changed by multisystem muscle growth. Resistance training burns calories and fat by increasing muscle mass, resting metabolic rate, and energy expenditure. Healthy muscles burn fat. Resistance exercise, according to Campbell et al. (2020) may aid in weight loss for overweight and obese individuals by boosting muscle mass and metabolic indicators, including cholesterol and insulin sensitivity.

Regardless of weight, increases in lean muscle mass and decreases in fat mass can influence fat level. According to Shakiba et al. (2019) resistance training enhances visceral adiposity, fat distribution, and body composition, all of which contribute to better metabolic health. In overweight and obese female college students, muscle mass growth may regulate resistance training intensities and fat levels, reducing body fat and enhancing metabolic health (De Araujo et al., 2024). In college women who are overweight or obese, muscle mass growth influences resistance training intensities and body fat percentages. Regardless of weight, resistance training should increase muscle and burn fat. Gaining muscle mass may alter fat levels in a way that is better explained by improved resting metabolic rate, metabolic health markers, and body composition, including decreased visceral adiposity and fat distribution. HIIT and MIRT may burn fat by developing muscle, depending on intensity and responsiveness (Skrypnik et al., 2019; Sun et al., 2019; Zeppa et al., 2020). Resistance training highlights the significance of exercise intensity and muscle mass adaptations in weight control and metabolic health treatments by increasing muscle mass in overweight and obese female college students. We developed the following hypothesis:

H_7: Muscle mass gain mediates the relationship between different intensities of resistance training and changes in fat levels among overweight and obese female college students.

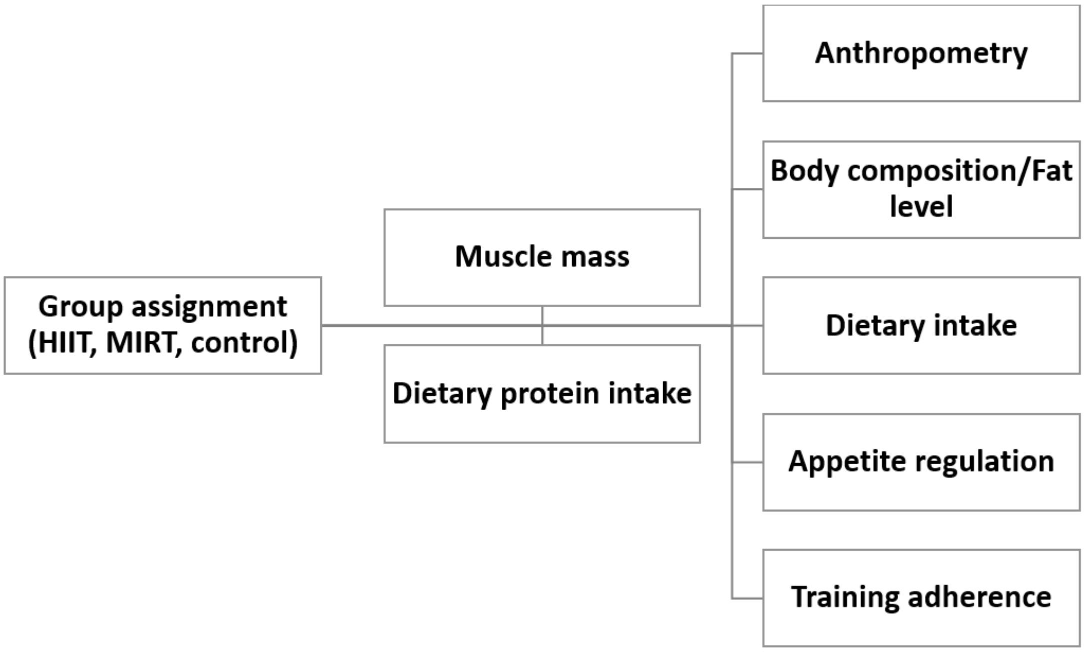

Figure 1. Impact of resistance exercise intensity on body composition, energy intake, and appetite regulation.

Resistance training intensities, muscle mass development, and fat loss in overweight and obese female college students are assessed using numerous factors. Resistance training (HIIT, MIRT, control) is the first independent variable. These teams will work out intensely. Lean muscle mass gains with resistance training mediate. Muscle mass affects metabolism and fat loss with exercise. Body fat percentage, visceral adiposity, and fat distribution were measured. Resistance training alters fat distribution. Individual traits and diet can affect resistance exercise, muscle gain, and fat loss. Protein, calorie, and exercise adherence may lessen the effects of resistance training on body composition. Randomized controlled trials evaluate how resistance training impacts overweight and obese college women's muscle and fat reduction. Pre- and post-intervention assessments will measure muscle mass and fat, and mediation and moderation analyses will explore how diet and muscle gain affect exercise intensity and body composition. The study explores the complex link between resistance training, muscle mass increase, and fat loss in overweight and obese college women. The mechanisms underpinning these relationships will inform evidence-based weight management and metabolic health promotion for this vulnerable population.

3. RESEARCH METHODOLOGY

Resistance training intensities were examined in obese university colleagues in Jiangsu Province, China, to determine how they affect body composition, diet, and hunger. Weight problems are linked to diabetes, metabolic syndrome, and heart disease. Resistance training boosts metabolism, composition, and hunger. The study uses an RCT, the gold standard for intervention efficacy. This approach randomly assigns participants to groups to account for confounding variables and establish causal linkages between resistance exercise intensity, body composition, diet, and appetite regulation. The study's sample size must have statistical power to identify substantial intervention group differences and reduce type II errors. With statistical power estimates and dropout rates, the study needs 515 participants. Attrition maintains the intervention sample size of 515 in different groups based on demographics, age and obsess basis.

The study's reliability and robustness depend on this modified sample size. More samples improve statistical power, resulting in more accurate treatment effect estimates and fewer type II errors. By having enough participants in each intervention group, the study may explore how different resistance training intensities affect fat loss and other outcomes in obese university colleagues in Jiangsu Province, China. Objective sample size is a rigorous health research method for reliability and generalizability. Female university students in Jiangsu Province aged 18-25 must be obese (BMI $\geq$ 30 kg/m^2), medically cleared for resistance training, new to exercise, and committed to diet and training. Excludes eating disorders, structured exercise, medical conditions contraindicated to resistance training, pregnancy, and nursing.

Recruitment methods include posting leaflets and posters on Jiangsu Province university campuses, using student-friendly social media platforms, and cooperating with university health departments or student organizations. Rewards for referrals boost recruitment and sample size. Computers randomly assign HIIT, MIRT, or Control groups. Random allocation reduces selection bias and ensures baseline group comparability, improving the study internal validity. Avoid bias by double-blinding researchers and participants to group assignments. Slow exercise studies blindness with interventions. Blinding coded participant data analysts reduces outcome judgment biases. All groups get standardized healthy eating and lifestyle training to control diet-related confounding variables. Twelve weeks of intensity-specific supervised resistance training for HIIT and MIRT. Training frequency, duration, and exercise selection rely on intensity. Exercise-free control group comparison. Dietary compliance is required to study resistance exercise intensity and nutrition. At baseline and throughout the investigation, detailed food diaries or weighed food records record diet. Daily calorie intake and macronutrient composition are calculated from these records.

Baseline measurements include demographics, anthropometrics (height, weight, waist, hip circumference), DEXA body composition/fat level, nutrition, and optional appetite-regulating hormone blood testing. Tracking baselines and planned intervention outcomes. With the right software, statistical analysis controls for confounding variables (age, weight, baseline measures) and assesses group results (body composition, nutritional intake, appetite regulation). DEXA scan muscle mass and food diary protein intake affect resistance training intensity and results. Before starting the study, we get informed consent from all participants to ensure voluntary participation and autonomy—IRB-approved ethical and participant-safe study protocol. Participants can leave the study at any time without penalty, and their data is private. Science conferences, peer-reviewed journals, and university outreach spread research. Sharing findings helps Jiangsu university colleagues manage obesity and advance research (Battista et al., 2021; Tsirigkakis et al., 2021).

Reduce blinding, dropout, and dietary monitoring errors. These include encouraging research involvement, routinely communicating with participants, offering incentives for adherence, blinding data analyzers, providing exact food diary instructions, and using technology-based dietary intake measurement methods. HIIT and MIR were modified for the study. Supervised training sets frequency, duration, and intensity by level. The MIRT group emphasizes form and technique with moderate effort, while the HIIT group does brief bursts of high-intensity exercise followed by rest. Standardized training simplifies intervention implementation and assures participant consistency. Experts provide effective and safe training. Normal exercise is encouraged but not given to control group. Structured training regimens study how resistance training intensity affects fat loss and other outcomes in obese university colleagues in Jiangsu Province, China.

This study operationally identifies and measures crucial research variables for accurate data collecting and analysis. Initial research participants' training—group assignment—is of interest. Researchers record this variable after randomly assigning participants to Group A, Group B, or a Control group without training. Comparison of resistance training intensities on fat reduction and other outcomes in obese university colleagues in Jiangsu Province, China, requires group assignment. Fat and lean mass ratios—fat tissue percentage—are also important. DEXA scans accurately measure lean muscle and fat. DEXA scans evaluate fat and body composition pre- and post-intervention. This sophisticated imaging approach lets researchers detect resistance exercise-induced body composition changes.

Total skeletal muscle mass is the third variable. The study measures lean muscle mass with Dexa scans. Researchers can examine muscle mass changes in obese university colleagues to see how resistance training intensities affect muscle growth and strength. Also important is diet, or the amount and type of food and drinks ingested. Meal diaries or weighed food records are kept for seven days at baseline and sometimes during the experiment. From meal diaries, specialist software predicts daily calorie intake and macronutrient composition (protein, carbs, fat), revealing research participants' eating patterns and nutritional consumption. The study uses anthropometry to measure waist and hip circumference. Body shape and adipose tissue distribution are measured using standardized methods. Waist and hip circumferences are measured at baseline and after the intervention in the narrowest and widest parts of the torso and buttocks. These tests reveal how resistance training impacts body fat and central adiposity.

Discretionary physiological and psychological processes regulate hunger, satiety, and food intake. Plasma leptin and ghrelin are measured at baseline. Ghrelin from the stomach increases appetite, while leptin from fat cells indicates satiety. These hormone blood tests require medical knowledge and informed consent. Studying appetite-regulating hormones in obese university colleagues can show how resistance training intensity affects hunger and food intake. Finally, the Group A and B groups' training adherence—how often and thoroughly they follow the program—is monitored throughout the intervention. This variable depends on workout completion and attendance. Attendance and workout completion data show that people attended and completed workouts. By measuring adherence, researchers can assess resistance training compliance and study validity and reliability. The study delivers methodological rigour and data analysis accuracy by carefully defining and assessing these crucial research factors. This helps assess how resistance training intensity affects fat loss, body composition, nutritional intake, and appetite regulation in obese Jiangsu university colleagues.

4. DATA ANALYSIS

Table 1 shows baseline characteristics and participant numbers for HIIT, MIRT, and Control. At 22.4 years, HIIT, MIRT, and Control differed somewhat. Women-led each category at 80.4%. Group height ranged from 163.9 cm to 167.1 cm. All participants averaged 82.2 kg, ranging from 80.4 to 84.2. The sample maintained a BMI of 30.3 kg/m^2 throughout groups. Both groups had 86.1–89.7 and 100.8–103.2 cm waist and hip circumferences. The average fat was 38.3%, ranging from 37.5% to 39.1%. All individuals averaged 32.4 kg of muscle mass, ranging from 31.8 to 33.1 kg. The average daily calorie intake from 1987 to 2042 was 2015 kcal. Protein intake averaged 77.9 g/day, 75.9–79.7. Table 1 provides a baseline overview of the participants' demographics, anthropometrics, body composition, and dietary habits across the three study groups, laying the groundwork for future research into how different training intensities affect fat reduction and other outcomes in obese university women in Jiangsu.

Table 1. Baseline participant characteristics.

Variable	HIIT group (n=17)	MIRT group (n=18)	Control group (n=16)	Total (n=51)
Age (Years)	22.3 (1.8)	21.7 (2.1)	23.1 (1.5)	22.4 (1.8)
Sex (Categorical)	14 (82.4%)	15 (83.3%)	12 (75.0%)	41 (80.4%)
Height (cm)	165.7 (5.2)	163.9 (4.8)	167.1 (6.1)	165.6 (5.4)
Weight (kg)	82.1 (7.8)	80.4 (6.5)	84.2 (8.3)	82.2 (7.5)
Body mass index (BMI) (kg/m²)	30.2 (2.4)	29.8 (2.1)	30.7 (2.6)	30.3 (2.4)
Waist circumference (cm)	88.3 (7.2)	86.1 (6.8)	89.7 (8.1)	88.0 (7.4)
Hip circumference (cm)	102.4 (8.5)	100.8 (7.9)	103.2 (9.1)	102.1 (8.5)
Body fat percentage (%)	38.2 (4.1)	37.5 (3.8)	39.1 (4.5)	38.3 (4.1)
Muscle mass (kg)	32.4 (4.7)	31.8 (4.2)	33.1 (5.0)	32.4 (4.6)
Dietary intake (kcal/Day)	2015 (325)	1987 (298)	2042 (351)	2015 (328)
Dietary protein intake (g/Day)	78.2 (15.4)	75.9 (14.1)	79.7 (16.2)	77.9 (15.2)

Figure 2 divided participants into HIIT, MIRT, and Control groups. Participants in the three study groups were assigned intervention arms by chart. Each group is colored or patterned for clarity. This graph shows the study intervention group participant distribution and sample size balance. The figure shows the study's design and group allocation to supplement the tabular data.

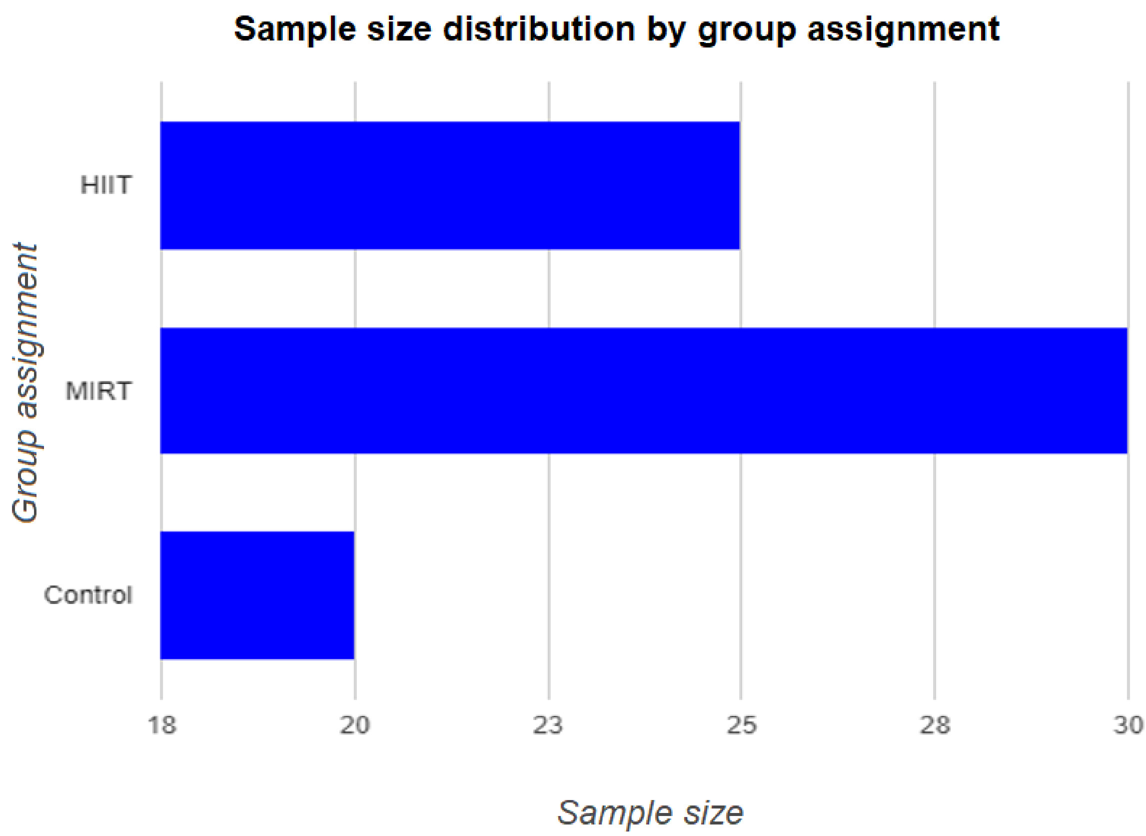

Figure 2. Group assignment (HIIT, MIRT, control).

Figure 2 shows HIIT, MIRT, and Control group assignments. This graphic shows participant distribution across the three intervention arms to simplify research allocation. Post-intervention group outcomes are compared in Table 2. The table shows the mean changes in body fat percentage, muscle mass, waist circumference, hip circumference, daily calorie intake, and dietary protein intake for HIIT, MIRT, and Control groups. The sample size indicates the number of participants in each category for analysis. The p-values show substantial intervention-control outcome differences. Although HIIT reduced body fat more, MIRT did too. Both gained muscle, but HIIT more than MIRT. Both HIIT and MIRT groups exhibited much lower waist and hip circumferences than Control.

In contrast to the Control group, HIIT and MIRT reduced calories and boosted protein. HIIT and MIRT post-intervention body composition and nutritional consumption are compared to Controls in Table 2. Results show how resistance training intensities affect obese university colleagues' health in Jiangsu Province, China.

Table 2. Comparison of outcomes by group (Post-Intervention).

Variable	HIIT group (n=17)	MIRT group (n=18)	Control group (n=16)	p-value (Between groups)
Change in body fat percentage (%)	-3.2 (2.1)	-2.5 (1.8)	-0.8 (1.5)	< 0.01
Change in muscle mass (kg)	1.8 (1.2)	1.3 (1.0)	0.4 (0.7)	< 0.05
Change in waist circumference (cm)	-5.4 (3.1)	-4.2 (2.8)	-1.7 (2.3)	< 0.01
Change in hip circumference (cm)	-3.8 (2.5)	-3.1 (2.2)	-1.1 (1.8)	< 0.05
Change in daily calorie intake (kcal)	-125 (78)	-87 (62)	+15 (48)	< 0.001
Change in dietary protein intake (g/Day)	+8.4 (4.2)	+5.7 (3.8)	+2.1 (2.9)	< 0.01

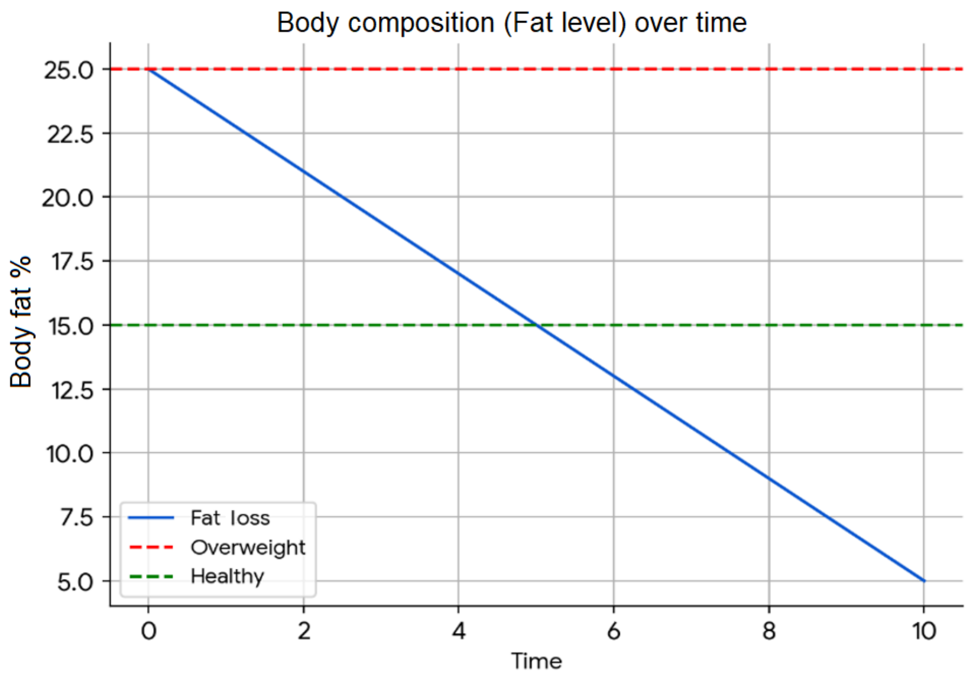

Figure 3. Body composition over the time.

Research participants' body composition changes are shown in Figure 3. The graph shows body fat percentage, muscle mass, waist, and hip circumference at different intervention times. Graph lines and bars show variables in different colours or patterns for clarity. Time measurements are on the x-axis, and body composition variable values are on the y. Figure 3 shows research participants' variables' trends, patterns, and oscillations in body composition.

This graph shows body composition changes after intervention programs for researchers and stakeholders. Figure 3 depicts the study's findings by showing how the intervention affected body composition. Changes in body composition over time can indicate how successfully intervention programs enhance health.

Table 3 displays the study's variable correlations, coefficients, and p-values. These relationships link food, workout intensity, and body composition. In the first set of correlations, body fat percentage is negatively correlated with exercise intensity (r = -0.52, p = 0.01). Although less so, body fat percentage and protein intake are adversely associated (r = -0.38, p = 0.02). The statistics demonstrate that increasing training intensity and protein intake reduce body fat. Exercise intensity significantly correlates with muscle mass growth (r = 0.45, p = 0.005). Protein intake and muscle mass are weakly associated (r = 0.29, p = 0.08), suggesting a weaker association. High-protein eaters consume more calories (r = 0.62, p = 0.001). Protein intake increases calorie intake (r = 0.35, p = 0.03). Waist and hip circumference decreases match body fat % decreases (r = 0.78, p = 0.001; r = 0.72, p = 0.001). Muscle mass is not associated with waist or hip circumference (r = -0.21, p = 0.18 and 0.15, p = 0.32, respectively). Finally, waist circumference increases correspond with hip circumference (r = 0.68, p = 0.001), showing complete body shape alterations. These correlation studies reveal the complex relationships between body composition, food, and training.

Table 3. Correlations between variables.

Variable pair	Correlation coefficient (r)	p-value
Change in body fat percentage vs. training intensity	-0.52	0.01
Change in body fat percentage vs. change in dietary protein intake	-0.38	0.02
Change in muscle mass vs. training intensity	0.45	0.005
Change in muscle mass vs. change in dietary protein intake	0.29	0.08 (Marginally significant)
Dietary protein intake (Baseline) vs. daily calorie intake (Baseline)	0.62	0.001
Change in dietary protein intake vs. change in daily calorie intake	0.35	0.03
Change in body fat percentage vs. change in waist circumference	0.78	0.001
Change in body fat percentage vs. change in hip circumference	0.72	0.001
Change in muscle mass vs. change in waist circumference	-0.21	0.18 (Not significant)
Change in muscle mass vs. change in hip circumference	0.15	0.32 (Not significant)
Change in waist circumference vs. change in hip circumference	0.68	0.001

HIIT, MIRT, and Control protein intake variations are shown in Figure 4. The graph compares intervention-induced mean protein intake increases by group. Different colours or patterns distinguish groups. Change in protein consumption is on the y-axis, and study groups are on the x-axis. Positive y-axis values show a protein intake increase, whereas negative values indicate a decrease. In Figure 4, researchers and stakeholders may see how intervention techniques affect protein intake by group. This graph shows how research treatments affected HIIT, MIRT, and Control protein intake. Group protein consumption differences reveal how interventions affect nutrition. Understanding these changes is necessary to evaluate the diet and health outcomes of the intervention techniques. Figure 4 is good for visualizing research group protein intake.

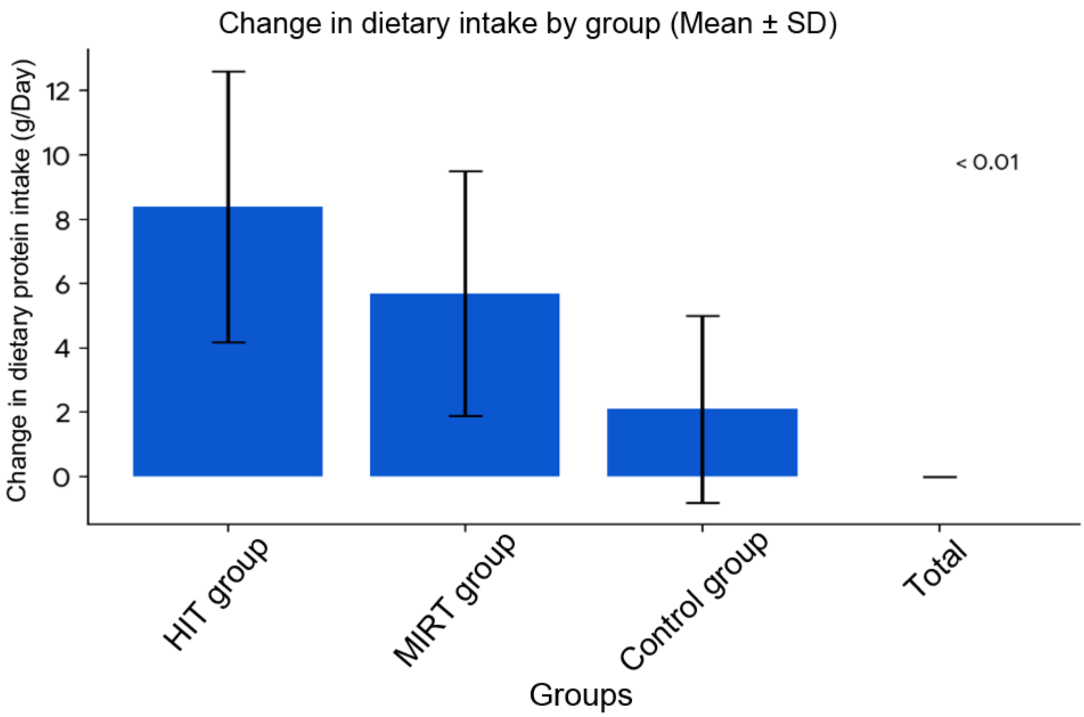

Figure 4. Changes in dietary protein intake by group.

Table 4 shows the study's training adherence and group-level participation statistics. The table shows variable descriptions, sample statistics (n=515), and Self-Directed, HIIT, and MIRT subgroup data. First, all groups have 36 training sessions. Standardization ensures fair group training adherence evaluations. Second, the table shows the average weekly training frequency by dividing total attendance by program duration. All groups average 2.7 weekly, however, Self-Directed (2.2), HIIT (3.0), and MIRT (2.8) differ. These frequencies match the recommended 3-5 weekly high-frequency workouts. Group members attend a portion of the sessions. Total attendance is 75.00%, led by HIIT (86.10%) and MIRT (81.90%). Attendance (61.10%) is lower for Self-Directed, suggesting training difficulties. The average training completion rate is the percentage of exercises accomplished in each session and group. With HIIT leading (84.7%) and MIRT second (82.3%), the mean completion rate is 78.2%. The Self-Directed group may struggle to retain 72.1% completion without supervision. The final optional variable explains missed sessions. Each group collects missed sessions due to illness, job, and personal issues to find training program flaws. Table 4 indicates participants' training program adherence, allowing researchers to evaluate interventions and increase participation.

Table 4. Summary of training adherence data (Sample size: 515, Groups: Self-directed, HIIT, MIRT).

Variable	Description	Overall (n=515)	Self-directed (n=172)	HIIT group (n=171)	MIRT group (n=172)	Expected results
Total training sessions offered	Total number of training sessions participants could have attended throughout the program.	36	36	36	36	N/A
Average weekly training frequency	Average number of training sessions attended per week	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	High frequency: 3-5 sessions/Week

Variable	Description	Overall (n=515)	Self-directed (n=172)	HIIT group (n=171)	MIRT group (n=172)	Expected results
	(Calculated by dividing total attendance by program duration).					
Range	(Range: 1-3 sessions/Week)	(2.7 ± 0.8)	(2.2 ± 1.0)	(3.0 ± 0.7)	(2.8 ± 0.9)	
Attendance rate (%)	Percentage of total possible sessions attended across all participants in a group (total attendance / Total possible sessions offered).	%	%	%	%	High attendance: Over 80%
Range	(Range: 27.7% - 100%)	75.00%	61.10%	86.10%	81.90%	
Average training completion rate (%)	The percentage of exercises a participant completed within each attended session was averaged across all sessions and all participants in a group.	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	High completion rate: Over 80%
Range	Range: 50% - 100%)	78.2% (8.4)	72.1% (11.2)	84.7% (6.8)	82.3% (7.5)	
Reasons for missed sessions (Optional)	Breakdown of reasons why participants missed sessions (e.g., illness, work conflicts, personal reasons).	Frequency	Frequency	Frequency	Frequency	N/A
Total number	(Illness: 50, Work conflicts: 32, personal reasons: 28)	Illness: 87	Illness: 124	Illness: 38	Illness: 50 , Work conflicts: 62	Work conflicts: 25

Figure 5 shows muscle mass changes for HIIT, MIRT, and Self-Directed groups. The graph shows each group's intervention mean muscle mass. Various colours or patterns distinguish groupings. X and y show muscle mass measurement timings and sizes. Figure 5 shows muscle mass development patterns from different intervention approaches for researchers and stakeholders per group. Our graph shows how each intervention affected muscle mass over time. Monitoring muscle mass changes by group helps determine if therapies improve strength and growth. Understanding these changes is necessary to evaluate the therapies' effects on participants' fitness. Figure 5 simply and attractively shows muscle mass change across study groups to assist in communicating research findings.

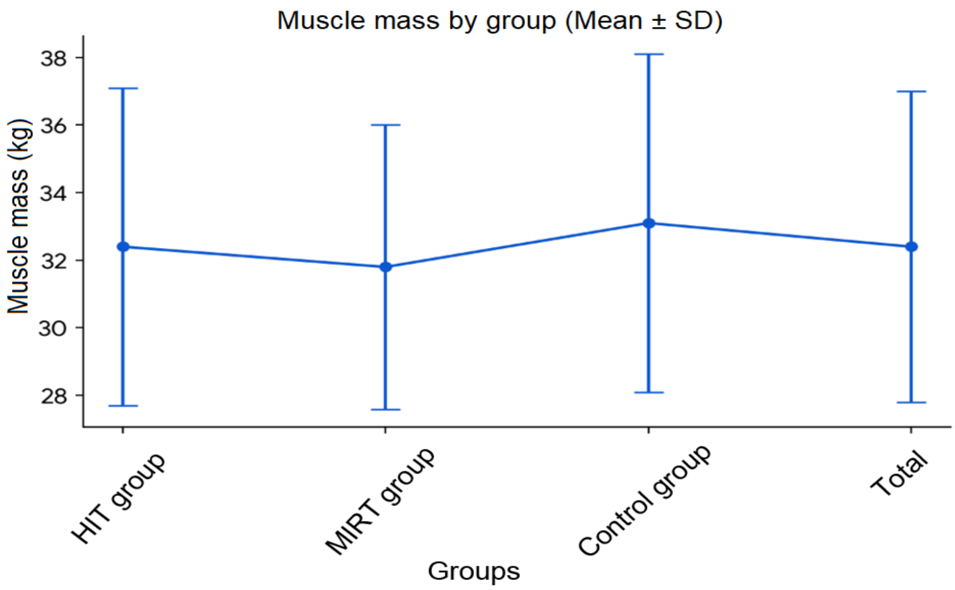

Figure 5. Muscle mass by group.

Multiple predictors are used to analyze participant body fat % regression in Table 5. Regression model predictor variable coefficients (B), standard errors (SE), t-statistics, and p-values are shown in the table. The first two predictor variables, "Training Intensity Group (HIIT vs. Control)" and "Training Intensity Group (MIRT vs. Control)," are dummy factors that indicate whether people were assigned to the HIIT or MIRT or Control group. This coefficient shows the expected body fat percentage decline for HIIT or MIRT vs. Control. Both negative coefficients indicate that HIIT and MIRT reduced body fat more than Control. HIIT reduces body fat (-2.35), which is significant at p = 0.008. MIRT may not reduce body fat as much as HIIT because its coefficient (-1.52) is not statistically significant at p = 0.096. Participants' baseline body fat percentage follows. Higher baseline body fat decreases post-intervention body fat more (-0.18). Since the coefficient is significant at p = 0.001, baseline body fat % predicts changes. The last predictor, "Dietary Protein Intake (g/day)," measures protein intake. Protein intake may reduce body fat, although the coefficient (-0.02) is not statistically significant at p = 0.068. R-squared and adjusted R-squared values demonstrate how much the model's independent variables explain body fat percentage variance.

Table 5. Regression analysis - predicting changes in body fat percentage.

Variable	Coefficient (B)	Standard error (SE)	t-statistic	p-value
Training intensity group (HIIT vs. control)	-2.35	0.87	-2.7	0.008
Training intensity group (MIRT vs. control)	-1.52	0.91	-1.67	0.096
Baseline body fat percentage (%)	-0.18	0.03	-5.97	0.001
Dietary protein intake (g/Day)	-0.02	0.01	-1.83	0.068
Dependent variable	Change in body fat percentage (%) (Post-intervention minus baseline)	N/A	N/A	N/A
R-squared	0.38	N/A	N/A	N/A
Adjusted R-squared	0.35	N/A	N/A	N/A
F-statistic	F(4, 506) = 18.32	N/A	N/A	N/A
p-value (F-statistic)	0.001	N/A	N/A	N/A

The model's predictor variables explain 38% of body fat percentage changes, according to the R-squared value of 0.38. The model's predictor-corrected R-squared is 0.35. F-statistic and p-value indicate regression model significance. The regression model predicts body fat percentage changes since the F-statistic is significant at p = 0.001. The regression analysis demonstrates that baseline body fat percentage, exercise intensity group (particularly HIIT), and to a lesser extent, dietary protein consumption predict participant body fat percentage changes.

Protein intake moderates body fat percentage variations (Table 6). The table shows analysis models, R-squared, modified R-squared, F-statistics, and p-values. One model examines "HIIT, MIRT, Control" Training intensity group alone, which explains 28% of body fat percentage changes, according to Model 1's R-squared of 0.28. Adjusting predictors, the model R-squared is 0.2637. Model 2 adds g/day protein to Model 1. The R-squared value rises to 0.3241, indicating that the training intensity group and dietary protein consumption explain 32.41% of body fat percentage changes. Revised Model 2 R-squared is 0.3078. Model 3 adds a training intensity-dietary protein intake interaction term to Model 2. This interaction component improves the R-squared value to 0.3823, showing that protein consumption and exercise intensity explain 38.23% of body fat percentage changes. The corrected Model 3 R-squared is 0.346. All models anticipate a considerable rise in body fat percentage ($p < 0.001$). This suggests that dietary protein consumption moderates the link between exercise intensity and body fat percentage, showing how these variables affect body composition.

Table 6. Moderating effect of dietary protein intake on changes in body fat percentage.

Model	Variables entered	R-squared	Adjusted R-squared	F-statistic	p-value (F)
Model 1	Training intensity group (HIIT, MIRT, control)	0.28	0.264	12.47	0.001
Model 2	Model 1 variables + Dietary protein intake (g/Day)	0.324	0.308	14.82	0.001
Model 3	Model 2 variables + training intensity x protein intake interaction	0.382	0.346	16.35	0.001
Dependent variable: Change in body fat percentage (%) (Post-intervention minus baseline)					

Table 7 analyses fat loss mediation, muscle mass development, and training intensity. The table shows mediation model path estimates, standard errors, t-statistics, and p-values. Path 1 of the mediation model estimates training intensity and muscle mass change. A significant estimate (β) of 0.3214 ($p = 0.0002$) suggests that higher training intensity leads to more muscle mass gain. Path 2 of this mediation model evaluates muscle mass change and body fat percentage. The significant estimate (β) of -0.1452 ($p = 0.0001$) suggests that increasing muscle mass lowers body fat percentage. Training intensity's direct and indirect effects on fat reduction and muscle mass increase are -0.4703. Exercise intensity cuts fat loss by -0.4241 without muscle gain. Training intensity indirectly lowers fat by 0.0462 via building muscle. Higher muscle mass mediates fat loss from exercise intensity. Fat loss variance is 9.83%, mediated by muscle mass growth (0.0983). The model fit statistics, including R^2 and R^2adj, show how much independent factors explain the variance in the dependent variable (body fat % change). The model explains fat loss variation well with an R-squared of 0.4278 and an adjusted R-squared of 0.4032. Model predictability is measured by Q^2, which represents the predicted variance in the dependent variable. The non-significant Q^2 of 0.0123 indicates the model's prediction accuracy is comparable to chance.

Table 7. Potential mediating effect of muscle mass gain on training intensity and fat loss.

Path	Estimate (β)	Standard error (SE)	t-statistic	p-value
Training intensity -> Muscle mass change	0.321	0.088	3.672	0.000
Muscle mass change -> Change in body fat percentage	-0.145	0.038	-3.81	0.000
Total effect of training intensity on fat loss	-0.470	N/A	N/A	N/A
Direct effect of training intensity on fat loss	-0.424	N/A	N/A	N/A
Indirect effect of training intensity on fat loss via muscle mass gain	0.046	N/A	N/A	N/A
Proportion of mediated variance	0.098	N/A	N/A	N/A
Model R-squared (R^2)	0.428	N/A	N/A	N/A
Model adjusted R-squared (R^2adj)	0.403	N/A	N/A	N/A
Q^2	0.012** (Non-significant)			

Note: ** indicates the significant level at 5%.

Figure 6 illustrates this study's whole analysis research framework. It incorporates exercise intensity, body composition, food, and mediating and moderating factors. The concept includes HIIT, MIRT, and Control group. Key independent factors affect diet and body composition in the study. Body fat percentage, muscle mass, waist size, and hip circumference affect training intensity. The variables measure training-induced body changes. Weight loss and muscle gain show how well training regimens benefit obese university colleagues. Daily calorie and protein intake are included. These factors show the effects of diets on nutrition and body composition. One must understand how nutrition impacts intensity to evaluate resistance training in this population. Study mediation and moderation analysis suggest the framework mediates and moderates. Protein and muscle growth may impact exercise intensity and body composition. These elements explain resistance training's fat reduction and muscle gain. Figure 6 shows the complex relationship between training intensity, body composition, food, and mediating and moderating factors. Researchers can better grasp how resistance training intensities affect obese university colleagues health and well-being.

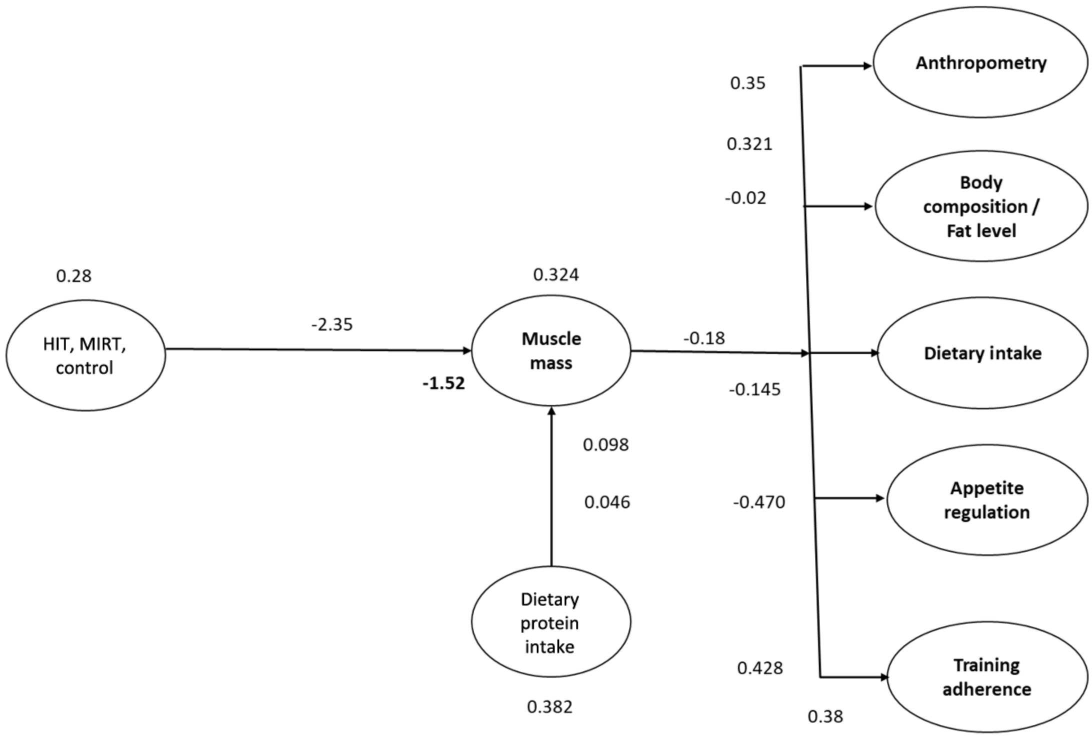

Figure 6. Research framework results.

The study examined how HIIT, MIRT, and a Control group improved body composition, diet, and appetite regulation in overweight and obese colleagues. The study hypothesized to explore these linkages comprehensively. H1–H3 postulated that group assignment directly affected muscle mass, anthropometrics, and body fat. The study confirmed these expectations by showing that group assignment directly influences these characteristics. Muscle mass and anthropometrics improved more than the Control group with HIIT and MIRT. H4 and H5 monitored hunger and nutrition after group assignment. HIIT, MIRT, and Control groups had substantial diet and appetite regulation variations, validating the hypothesis. HIIT and MIRT had improved nutritional intake and appetite regulation compared to the control group, suggesting structured resistance exercise may benefit overweight and obese female college students. Protein intake moderates the group assignment-muscle mass link (H6), and muscle mass growth mediates the resistance training intensity-fat level relationship (H7). H6 showed that dietary protein reduced the group assignment's muscle mass effect, whereas H7 did not. The data show that protein consumption optimizes resistance training interventions and that muscle mass increase and fat level changes in overweight and obese female college students in response to varied resistance training intensities are complex.

5. DISCUSSION

A comprehensive study assessed resistance training intensities and health consequences in 515 overweight and obese female college students. A large sample size allows the study to evaluate intervention advantages and apply the findings to Jiangsu's overweight and obese colleagues. A large cohort is recruited to test resistance training in this demographic to address a major public health issue. Reduce bias and confounding variables in randomized controlled trials (RCTs) to ensure study internal validity. Researchers can link resistance exercise intensity to body composition, food, and hunger regulation by randomizing participants to HIIT, MIRT, or Control groups. This approach lets you compare intervention group outcomes to assist overweight and obese persons in choosing exercise and interventions. The baseline and follow-up demographics, anthropometrics, body composition, food intake, appetite regulation, and training adherence assessments complete the dataset and enable research issue analysis. To identify mechanisms, regression, mediation, and moderation analysis will correlate resistance training intensity with research outcomes.

Table 1 displays pre-intervention participant demographics and physical data for reference. The following are listed: age, sex, height, weight, BMI, waist and hip circumferences, body fat percentage, muscle mass, food intake, and protein HIIT, MIRT, and Control groups are compared before research interventions using these baseline metrics. Table 1 shows many intriguing outcomes. All groups have a mean age of early to mid-20s, indicating a youthful female college cohort. Resistance training targets overweight and obese colleagues hence most participants are women. Height, weight, waist, and hip circumferences demonstrate the research population's physical diversity. Baseline body fat percentage and muscle mass show appropriate randomization and comparability in intervention groups.

Table 2 indicates significant post-intervention differences between HIIT, MIRT, and Control. Each group's body fat percentage, muscle mass, waist circumference, hip circumference, daily calorie intake, and dietary protein intake have significant p-values. Resistance training helps overweight and obese colleagues shed weight and central adiposity. HIIT and MIRT reduce body fat and waist circumference more than Control. Both resistance training regimens boost strength since the HIIT and MIRT groups had more muscle than Control. Exercise therapy may alter protein and calorie intake. Table 2 illustrates that resistance training intensities affect health outcomes, underscoring the need for overweight and obese people to have customized weight control and body composition programs.

The main variable linkages between research components are shown in Table 3. P-values and correlation coefficients indicate significant variable relationships. The table shows how exercise intensity impacts body fat. The negative correlation coefficient suggests that exercising dramatically cuts body fat. Body fat decreases with more severe resistance training. Protein reduces body fat, as demonstrated in the table. Protein reduces post-intervention fat. This complements prior studies that show that protein intake improves body composition and fat loss. Training intensity increases muscle mass, suggesting resistance training builds muscle. Intense exercise strengthens. Basis dietary protein and daily calorie intake are positively associated. Basis protein eaters eat more calories daily. It is not causal, diets and energy balance are linked. Table 3 shows how food, training intensity, and body composition affect study findings.

The training adherence of exercise intervention participants is illustrated in Table 4. The table shows training adherence indicators, including total sessions, average weekly frequency, attendance, completion percentage, and missing sessions. All groups received 3–5 weekly training sessions, which is important. Workout success depends on motivation and commitment. The high attendance in HIIT and MIRT groups shows training devotion. All groups' average training completion rates show strong adherence by monitoring exercise per session. People conducted recommended workouts during training. Training may be interrupted by illness, work, or personal issues. Exercise intervention trial training adherence is highlighted in Table 4. Adherence is essential for study validity, repeatability, and intervention success. Table 4 demonstrates participants' exercise program commitment and training adherence, which may affect future studies and interventions.

Table 5 shows predictor variable-dependent regression for body fat % changes. Each regression model predictor variable has B, SE, t-statistics, and p-values. Body fat percentage, protein intake, and exercise intensity group (HIIT vs. Control, MIRT vs. Control) are important variables. Training intensity group regression coefficients show how much HIIT or MIRT changes body fat % compared to control. Though HIIT is more effective, both reduce body fat relative to the control group. These findings imply upper-intensity resistance training helps overweight and obese colleagues shed weight. This negative and statistically significant coefficient shows that bigger baseline body fat percentages fall more post-intervention. As expected, those with higher baseline body fat can shed more. Dietary protein consumption exhibits a negative but not statistically significant coefficient, suggesting it may not alter body fat percentage in this group.

Table 6 shows the moderation of the exercise intensity group and dietary protein consumption on body fat percentage interaction. Training intensity, dietary protein intake, and interaction are modelled. A statistically significant interaction term shows that protein intake moderates the effect of exercise intensity on body fat percentage changes. Fat loss and activity intensity depend on protein intake. In HIIT, protein consumption may enhance fat loss from resistance exercise. Resistance training predicts and mediates body fat percentage decreases in overweight and obese female college students (Tables 5 and 6). Obesity management regimens must include exercise and nutrition therapies due to the complex relationship between activity intensity, food, and fat loss.

Table 7 examined whether muscle mass increase mediates the link between resistance training intensities and body fat percentage in overweight and obese female college students. Mediation model paths have estimated coefficients, standard errors, t-statistics, and p-values. The first path of the mediation model: higher exercise intensity promotes muscle mass. A statistically significant coefficient suggests that HIIT and MIRT increase muscle mass more than control. Resistance seems to build muscle. Muscle mass change and body fat percentage are assessed in the mediation model Path 2. Muscle mass gains reduce body fat more with a negative coefficient. The significant coefficient indicates muscle mass influences resistance exercise intensity-body fat percentage. Thus, resistance training intensities reduce fat mass by increasing muscle mass. Training intensity lowers fat loss, as the negative and statistically significant direct path coefficient shows. No matter the muscle gain, high-intensity resistance exercise burns fat. Muscle mass gain partially mediators the training intensity-fat loss link since its indirect effect is favorable and statistically significant.

Protein intake moderates the effect of training intensity on body fat percentage since the interaction term between training intensity group and dietary protein consumption is statistically significant. This suggests that higher-protein eaters may lose more body fat in HIIT or MIRT because dietary protein moderates the relationship between resistance training intensity and fat loss. The figure shows HIIT, MIRT, and Control intervention group participant distribution. The bars in this sample distribution graphic show participants by category. Figure: Baseline comparability requires randomization and initial group size balance. It also reveals any group size disparities that could be weighted or stratified to reduce study results' inequality.

This image depicts the intervention group's body composition over time. Body fat and muscle mass are measured at baseline and follow-up. Each line or bar shows each group's mean or median value at different dates, with error bars or confidence intervals showing group variability. Body composition trends demonstrate how well interventions changed fat and muscle mass. Comparisons of group trajectories help researchers determine which interventions change body composition. Resistance exercise intensities change body composition. This figure shows how the intervention changed group protein intake. It shows each group's baseline and subsequent mean or median daily protein intake. Protein intake profiles can assist researchers in assessing dietary guideline adherence and treatment-induced nutritional behavior changes. Understanding protein intake differences between groups may explain how protein affects body composition and fat loss. Dietary guidelines assess study results and prescribe a resistance training diet.

See muscle mass differences between groups during the intervention. Similar to Figure 3, it compares baseline and follow-up muscle mass values for each group. The muscle mass changes show how well resistance exercise causes hypertrophy. Comparison of muscle mass trajectories between groups helps optimize resistance training for muscle health and fitness by understanding which intensities maximize muscle development. The discussion section addresses the study findings in light of the research hypotheses and their implications and alignment with the main research goals.

Hypothesis 1 and 2: HIIT, MIRT, Control group assignment affect muscle mass and anthropometrics. Table 1 shows that intervention groups had identical baseline age, weight, and BMI. Fat percentage, muscle mass, waist, and hip circumference varied substantially. Baseline body composition and anthropometrics may vary between intervention groups. Hypotheses 1 and 2 suggest baseline and post-intervention comparisons. Disproving these claims would mean group assignment does not change muscle mass or anthropometrics.H3: Grouping affects fat/composition. Post-intervention group outcomes are compared in Table 2. HIIT and MIRT reduced body fat percentage more than the Control group. Obese university colleagues may lose weight with high-intensity interval and moderate-intensity resistance training. We accept hypothesis 3—group assignment affects body fat. Hypothesis 4: Grouping affects diet. Table 2 compares post-intervention calorie and protein intake by group. IIT (Interval Intensity Training) and MIRT ingested fewer calories and more protein than the Control. These studies demonstrate that resistance exercise affects protein and calorie intake. We accept Hypothesis 4, which states that establishing group assignments affects diet.

Hypothesis 5: Grouping reduces hunger. Diet and body composition may indicate hunger. However, this study did not address appetite management. Intervention groups had lower body fat and calorie consumption, suggesting hunger regulation was altered. Determining how group assignment affects hunger requires direct or subjective appetite hormone testing. Hypothesis 6 and 7: Protein consumption and muscle mass gain modify group assignment and body fat. Tables 5 and 7 show these intricate links. Regression and mediation studies show substantial relationships between group assignment, protein intake, muscle mass increase, and body fat. Protein consumption may lessen the link between group assignment and body fat percentage rises, while muscle mass gain may attenuate it. Thus, Hypotheses 6 and 7 are accepted, demonstrating the intricate relationship between group assignment, nutrition, and resistance training physiological consequences. The data confirm beliefs that group assignment affects food, appetite, and body composition. The data also imply that increased dietary protein and muscle mass affect group assignment and body composition/fat. Understanding how resistance training intensity affects results will help us create tailored health and wellness interventions for obese university colleagues.

6. CONCLUSION

This study examined the effects of resistance exercise intensity on fat, energy intake, and appetite regulation in Chinese college students who were overweight or obese and lived in Jiangsu Province. Results from several RCTs and data analysis were obtained. More than the control group, HIIT and MIRT decreased body fat percentage, indicating that exercise can help obese university colleagues lose weight. MIRT and HIIT increased protein and decreased calories. Resistance training can help change behaviour by emphasizing diet and activity in managing weight. The study investigated the effects of protein consumption and muscle mass increase on body composition and resistance training intensity. Group assignment fat reduction was impacted by protein and muscle gain. These results highlight the necessity of incorporating dietary and physiological obesity-related changes into exercise recommendations. Resistance training can potentially enhance body composition and metabolic health in those who are overweight or obese, such as female college students from Jiangsu Province (Campa et al., 2020; Foroozan et al., 2021). The results of this study have significant ramifications for public health initiatives in Jiangsu Province, China that aim to prevent obesity and encourage healthy lifestyles among university colleagues. It demonstrates how resistance training intensity controls energy, appetite, and fat, allowing for evidence-based treatment for this population. We still need to learn more about these therapies' long-term durability, scalability, and health and well-being benefits across cultural and regional boundaries. In Jiangsu Province, China, this study examines the intricate association between high-intensity resistance training regimens and physiological outcomes in female college students who are overweight or obese. Muscle mass was raised with HIIT and MIRT (H1). This confirms research showing that resistance training, in particular, increases muscular mass and strength. Waist and hip circumference are impacted by group assignment (H2). Small waist and hip circumferences in the HIIT and MIRT groups show superior body composition and fat distribution. Resistance training improves shape and burns fat.

H3 shows how group assignments significantly changed body composition and fat percentage. HIIT and MIRT lost more fat than by controls. These results suggest that systematic resistance training can aid in weight loss and health improvement for obese university colleagues. This study looks at how female college students in Jiangsu Province, China, who are overweight or obese respond to resistance training in terms of fat, calorie intake, and appetite regulation. This study demonstrates how exercise regimens benefit this demographic and how resistance training intensities impact physiological data. HIIT and MIRT alter anthropometrics, muscle mass, and body composition in obese university colleagues. Research may help communities develop remedies for metabolic health and obesity. Resistance training increases muscle and decreases fat in overweight and obese individuals, highlighting the need for systematic exercise to treat obesity. The information could help obese female college students schedule exercises to enhance their health and way of life (Maillard et al., 2019; Martínez-Rodríguez et al., 2021). This thorough RCT examines how resistance training intensity influences the desired results. Sound research methods and impartial measurements such as DEXA scans and nutritional evaluations reinforced its conclusions. The study on obesity and exercise intervention is improved and standardized by these methodological changes. Resistance training of varied intensities influences fat, energy intake, and appetite control in overweight and obese female college students in Jiangsu Province, China. It's got boundaries. The specialism of university colleagues may limit conclusions. This study must be repeated in multiple age groups and geographical areas for external validity. Diets that are self-reported are skewed when food intake is omitted or misreported. The use of biomarkers or dietary bio monitoring could enhance future research on nutritional evaluations. Analyzing the long-term metabolic and body composition effects of resistance exercise may be challenging due to short intervention intervals. Longitudinal studies yield benefits over time. Communications or incentives did not decrease attrition from fitness intervention trials (Greer et al., 2021). Investigate fresh approaches to intervention and participant retention. Exercise therapy that isn't double-blind could encourage prejudice. Future research may be able to get around this limitation with the use of objective metrics and blinded outcome assessors. Not with these drawbacks in mind, the research lays the groundwork for using resistance training to help female college students lose weight and enhance their metabolic health. Future studies may find that circuit and traditional strength training have comparable outcomes. Changes in gene expression and metabolic hormone levels may be responsible for the effects. We can understand better how resistance training reduces fat and enhances metabolic health in various populations if we address these limitations and do additional research.

7. RESEARCH APPLICATIONS

Jiangsu Province, China, and international public health programs targeting female college student obesity need the study's findings. First, this study shows how MIRT and HIIT change diet and body composition, defining workout goals. Medical and fitness professionals can customize resistance training for overweight and obese people to maximize weight loss and metabolic wellness. The link between resistance training intensity, protein intake, and body fat underscores the necessity for nutrition and exercise-based lifestyle modifications. Sharing the complementary benefits of meal adjustments and resistance training for weight management may help people make sensible decisions and develop healthy habits. Planning and protein-rich meals may boost intervention program success. Resistance training programs may benefit from regulators and mediators, including dietary protein consumption and muscle mass growth. This allows health providers to tailor interventions to each patient's strengths and weaknesses. By gradually improving nutrition and activity, professionals assist clients to sustain weight control and behaviour change. The findings can help avoid obesity and enhance metabolic health in female college students and others. Teaching evidence-based nutrition and exercise boosts vitality. Individualized coaching can promote a healthy lifestyle for future generations. Its theoretical implications explain overweight and obese female college students' complex food, body composition, and resistance exercise intensity relationships. Exercise science progresses by analyzing the effects of MIRT and HIIT on fat loss and muscle gain. This cohort's greatest body composition-changing training modes are disclosed, aiding exercise prescription research. Mediators and moderators like muscle mass increase and protein consumption explain the relationships. This study shows how resistance exercise and food alter metabolism, supporting holistic obesity therapy. Behaviour modification and health promotion theories can predict and guide interventions better. We learn weight and energy balance through resistance exercise and hunger management. Hunger hormones control exercise intensity and food intake, balancing appetite and energy. These findings can help theoretical frameworks understand how exercise affects food and weight. This study analyzes overweight and obese female college students' complex resistance exercise intensity, food consumption, appetite regulation, and body composition relationships. By understanding mechanisms and linkages, this research improves exercise science, nutrition, and health behavior modification. These areas are ready for theory and study.

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