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The Effectiveness of Aerobic Exercise, Strength Training, and HIIT in Obesity Management: Literature Review

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ABSTRACT

Excessive body fat buildup brought on by an imbalance between energy intake and expenditure is the hallmark of obesity, which raises a number of metabolic and cardiovascular risks. The effectiveness of aerobic exercise, resistance training, and High-Intensity Interval Training (HIIT) in the management of obesity is the main emphasis of this study, which employs a literature review strategy by looking at papers from PubMed and Google Scholar published between 2015 and 2025. The analysis's findings demonstrate the effectiveness of aerobic exercise in lowering waist circumference, body fat percentage, and body weight. Resistance training is crucial for lowering visceral fat, maintaining basal metabolism, and gaining lean mass. While HIIT offers a more effective training period, it significantly reduces body fat and improves VO2peak.
All things considered, the three forms of exercise have complimentary advantages and work best when combined in a planned, activity-based obesity control program.

Keywords: Obesity, Aerobic exercise, Resistance exercise, HIIT

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Introduction

Excessive fat accumulation caused by an imbalance between the energy consumed and expended over a long period of time is known as obesity (Pebriani et al. 2018). A decrease in physical activity and the intake of high-energy foods can cause this imbalance. Obesity is a complicated, long-term condition characterized by abnormal or excessive fat accumulation that has a negative effect on health and increases the risk of musculoskeletal, cardiovascular, and metabolic diseases (Ullah and Tamanna 2025). According to the World Health Organization, persons with a BMI of 30 or higher are categorized as obese, with subgroups for Class I (30–34.9), Class II (35–39.9), and Class III (≥40) obesity (Rubino et al. 2025). The decrease in physical activity is also correlated with the rise of technology, as people in modern times tend to prioritize watching TV or playing on electronic devices, which causes them to eat more than they exercise (Mu'thia Hanum 2023). One of the "pillars" in dealing with obesity and overweight is physical activity, which works together with dietary counseling, behavioral support, and medication (Oppert et al. 2021). One type of physical activity that can prevent obesity is by exercising.

Exercise is someone who performs tasks regularly, systematically, and repeatedly so that the workload becomes heavier each day (Gozali, Setiawan, and Farhanto 2024). According (Oroh, Wungouw, and Engka 2021) intense and moderate physical exercise can reduce overall body fat mass and waist size in obese individuals. This proves that physical exercise with high and moderate intensity can prevent obesity. Exercise (aerobic, resistance, or a combination of both) performed can result in an average weight and extra fat loss of 2.5 kg (Oppert et al. 2021).

Aerobic exercise in which the body's big muscles move in a rhythmic manner for a sustained length of time (Bull et al. 2020). Aerobic activity also termed endurance activity enhances cardiorespiratory fitness. Walking, running, swimming, and cycling are

a few examples. Aerobic exercise is a form of physical activity that derives its energy from oxygen and is executed continuously, engaging the major muscle groups (Putu Agus Dharma Hita 2020). Compared to lower levels, aerobic levels that significantly beyond the minimum physical activity recommendations are more likely to lead to clinically meaningful weight loss (Swift et al. 2018). According to (Liu et al. 2024) regular and long-term aerobic exercise reduces fat accumulation, leads to lower blood insulin levels, and improves overall physical function. Aerobic exercise for at least 150 minutes a week has a substantial clinical effect on body fat percentage and waist circumference (Jayedi et al. 2024). According (Chen et al. 2025) moderate-intensity and high intensity aerobic exercise had substantial impacts in reducing total cholesterol, triglyceride, and low-density lipoprotein, however only moderate-intensity exercise significantly raised high-density lipoprotein. Aerobic exercise be a vital behavior for holistic cardiometabolic health-related advantages as a current anti-obesity drug due to its strong favorable influence on patients obesity and type 2 diabetes mellitus (Badri et al. 2023).

Resistance training is a structured workout regimen utilizing weights to enhance muscular strength, aimed at achieving objectives such as improving athletic performance, reducing injuries, or promoting health (Fajar Ramadhan 2023). According (Lopez, Taaffe, et al. 2022) demonstrating that resistance-based training regimens are beneficial and ought to be taken into account as a component of a multi-component therapy program when calorie restriction is applied to individuals who are overweight or obese. According (Lopez, Radaelli, et al. 2022) suggest that resistance-based exercise regimens can significantly change body composition regardless of the resistance exercise dosage or aerobic component advised in persons who are overweight or obese. (Wewege et al. 2022) discovered that in healthy persons, resistance training reduced visceral fat, fat mass, and body fat percentage. The WHO's physical activity guidelines advocate undertaking muscle strengthening activities including all major muscle groups twice a week and we have shown that resistance workouts can help with the preservation of fat- free mass during weight loss (Binmahfoz et al. 2025).

HIIT (High Intensity Interval Training) training is an efficient and effective exercise approach that requires very little time, with short rest intervals and high intensity (Hernawan et al. 2021). Lack of time is a typical excuse for not exercising, therefore high-intensity interval training (HIIT), which alternates brief bursts of high-intensity exercise and rest intervals, has gained popularity recently due to its time efficiency (Wewege et al. 2017). Short, sporadic bursts of intense activity (often involving <100% [70–90%] of the VO2peak or 85–95% of the peak heart rate) interspersed with active or passive rest intervals are known as high-intensity interval training (HIIT) (Guo 2023). Extensive research has established the major benefits of HIIT in changing body composition (for example, reducing body fat, maintaining or increasing lean muscle mass) and cardiovascular fitness (for example, increasing maximal oxygen intake) (Yin et al. 2025). When compared to MICT, HIIT improved cardiovascular risk factors and caused comparable weight reduction in obese healthy adults, but it increased cardiorespiratory fitness more quickly (Amuri et al. 2021). According (Muchdi Alwidian Anom and Farid 2025) demonstrates that High-Intensity Interval Training (HIIT) is a flexible and successful intervention for raising metabolic health, lowering body fat, and improving cardiorespiratory fitness in those who are overweight or obese.

This study is intended to provide information and understanding about how effective aerobic, resistance, and HIIT activities are for people with obesity. By providing a good and structured training program, it is expected to have a positive effect on individuals with obesity.

Methodology

The method used in this study is a literature review. A literature review is a description of theories, results, and other research materials obtained from reference sources (Mahaputra 2022). The literature analyzed in this study was gathered from

PubMed (a journal search engine platform focusing on natural and biological sciences) and Google Scholar. All the articles in this study are research-based publications published in national and international online journals that have been indexed by Sinta and Scopus. These articles are original research-based journals of high relevance published between 2015 – 2025.

Result

The literature review study tries to explain how effective aerobic exercise, resistance training, and HIIT for patients with obesity.

Aerobic exercise's impact on obese patient

Aerobic exercise has been shown to significantly enhance metabolic health, reduce fat formation, and aid in weight loss in obese people, according to a study of numerous national and international publications. Brisk walking, running, cycling, swimming, and other continuous rhythmic workouts are among the most often researched types of aerobic exercise. A recent meta-analysis by (Jayedi et al. 2024) demonstrates that adding 30 minutes a week to aerobic activity is linked to a reduction in body fat percentage of approximately 0.37%, a reduction in waist circumference of approximately 0.56 cm, and a weight loss of approximately 0.52 kg. The form of fat most detrimental to cardiometabolic health is visceral fat, which can be reduced with at least 150 minutes of aerobic exercise each week. Aerobic exercise influences metabolic parameters in addition to aiding in the reduction of body weight and fat. According to (Chen et al. 2025) low-density lipoprotein (LDL), total cholesterol (TC), and triglycerides (TG) can all be considerably reduced by moderate to high-intensity aerobic exercise. It has been demonstrated that moderate intensity is more successful in raising HDL levels, which are important for cardiovascular protection. In addition to helping people lose weight, aerobics also increase insulin sensitivity, cardiovascular health, and overall quality of life. Long-term aerobic training can lower blood insulin levels, enhance cardiorespiratory fitness, and decrease fat deposition in obese adolescents and young adults, according to (Liu et al. 2024). Aerobic exercise has additional benefits in certain populations, such as obese patients with type 2 diabetes. The combination of diet and aerobic exercise dramatically improves blood glucose control, decreases blood pressure, and improves lipid profiles (Badri et al. 2023). This suggests that aerobic exercise is a crucial intervention for lowering the risk of comorbidities associated with obesity.

Resistance exercise's impact on obese patient

Resistance training significantly improves body composition, decreases fat, increases lean mass, and improves metabolic health in those who are overweight or obese, according to a review of numerous international studies. Resistance training regularly lowers total fat mass by 1.4–2.0 kg following an 8–24week intervention, according to a sizable meta-analysis by (Kelley, Kelley, and Stauffer 2023). Furthermore, it has been demonstrated that resistance exercise increases lean body mass (LBM) by roughly 0.8–1.4 kg, which is crucial for preserving basal metabolism and avoiding muscle loss, which frequently happens during weight loss programs. According to a meta-analysis by (Lopez, Taaffe, et al., 2022) Resistance training can reduce visceral adipose tissue (VAT), which is a form of fat closely linked to the risk of type 2 diabetes and cardiovascular disease. It seems that resistance training can improve metabolic health independently of body weight loss because VAT reduction occurs even if total body weight does not change significantly. Resistance training effectively decreased fat mass by approximately 1.6 kg and increased lean mass by approximately 0.8 kg in individuals with obesity, according to a major meta-analysis by (Lopez, Radaelli, et al. 2022). These conclusions were derived from 65 controlled trials involving 2,537 persons who were overweight or obese.

High Intensity Interval Training exercise's impact on obese patient

HIIT is a very successful training technique for increasing cardiorespiratory capacity, decreasing body fat, improving insulin sensitivity, and lowering visceral fat in people who are overweight or obese, according to results from numerous randomized clinical trials (RCTs), systematic

reviews, and meta-analyses. Despite having a shorter training duration, HIIT is frequently as effective as or more so than traditional aerobic exercise. The results of several recent studies indicate that High-Intensity Interval Training (HIIT) has a significant impact on improving body composition, cardiorespiratory problems, and metabolic profiles in those who are overweight or obese. According to a clinical study by (Amuri et al. 2021), HIIT for 12 minutes is able to reduce body fat and muscle mass in the same amount of time as sedang aerobic exercise, but with longer exercise duration, and it also results in a greater increase in VO_2peak. According to a recent meta-analysis by (Khodadadi et al. 2023) that included 36 RCTs, HIIT consistently increases lean mass or fat-free mass while reducing fat mass by roughly 1.86 kg and body fat percentage by roughly 1.5%. This suggests that HIIT helps preserve or improve muscle mass in addition to reducing fat, which is crucial for obese patients' basal metabolism. Furthermore, low-volume HIIT (extremely short duration) can still improve cardiometabolic health, reduce body weight by up to 4%, and improve quality of life, according to research by (Reljic et al. 2020)on patients with severe obesity. This suggests that groups with high obesity rates or restricted mobility can still benefit from HIIT. These results show that HIIT is one of the most effective and efficient training techniques for contemporary obesity treatment programs, particularly for people who need to boost their metabolism quickly or have limited time.

Tabel 1. Performance Improvement

Researchers (Year)	Journal Source	Research Method	Result
(Jayedi et al. 2024)	Jama Network Open	Randomized clinical trials with intervention durations of at least 8 weeks evaluating the effects of supervised aerobic training on adults with overweight or obesity	(Body weight ↓) (Waist Circumference ↓) (Body fat ↓)
(Chen et al. 2025)	MDPI Journal	This study used a random-effects model to aggregate data while accounting for study design, population characteristics, and study heterogeneity.	(Body fat ↓) (LDL↓) (HDL↑)
(Liu et al. 2024)	PubMed	Searches were carried out in the CNKI, WanFangData, VIP, PubMed, Web of Science, Embase, and Cochrane Library databases using a retrieval method that mixes subject terms and free terms.	(Body composition ↓) (Body weight ↓)
(Badri et al. 2023)	PubMed	The findings were displayed as mean differences or standardized mean differences with 95% confidence intervals using a random-effects model for continuous variables.	(Obesity risk ↓)

(Kelley et al. 2023)	PubMed	Data from a large, recent systematic review with meta-analysis of randomized controlled intervention studies looking at the effects of resistance training on body weight and body composition were restricted to studies in men and women with a mean age of 60 years or older for the current IIRD meta-analysis.	(Body fat ↓) (Body weight ↓)
(Lopez, Taaffe, et al. 2022)	PubMed	Included were studies with overweight or obese children and adolescents (<18 years), young adults (≥18 to 35 years), middle-aged adults (>35 to 59 years), and older individuals (≥60 years).	(Body fat ↓) (Body weight ↓) (BMI↓) (VAT↓)
(Lopez, Radaelli, et al. 2022)	Medicine & Science in Sport & Exercise (ACSM)	A random-effects model was used for the meta-analysis. Meta-regression models were used to examine relationships between mean differences and possible moderators.	(Lean mass↑)(Body fat ↓)
(Amuri et al. 2021)	PubMed	For 12 weeks, 44 obese participants were randomly assigned to either MICT (60% of maximum oxygen consumption, VO2 peak) or HIIT (3–7 repetitions of 3 minutes at 100% VO2 peak alternated with 1.5 minutes at 50% VO2 peak).	(Diastolic Blood Pressure ↓) (Body fat↓) (Muscle mass↓)
(Khodadadi et al. 2023)	PubMed	(1) RCTs, (2) adult population cohorts (18 years), (3) trials reporting mean (SD) alterations to body composition (e.g., subcutaneous skinfold caliper, air displacement plethysmography [ADP], Bioelectrical Impedance Analysis [BIA], and dual-energy X-ray absorptiometry [DEXA])	(Lean mass↑)(Body fat ↓) (Metabolism↑)
(Reljic et al. 2020)	Journal Of Translational Medicine	65 obese people with sedentary jobs (48.7 ± 9.9 years, BMI: 39.6 ± 7.1 kg/m2) were randomly assigned to either an inactive control group	(Cardiometabolic↑) (Waist Circumference ↓) (Body weight ↓) (Blood Pressure ↓)

		(CON) or an incredibly time-efficient HIIT (5 × 1 min at 80–95% maximum heart rate on cycle ergometers, 2×/week for 12 weeks).

Dicussion

The results of this literature show that weight training, aerobic exercise, and high-intensity interval training (HIIT) have distinct but complimentary effects on the management of obesity. All forms of exercise generally improve physical fitness, cardiometabolic health, and body composition, while the exact processes and extent of these benefits differ.

Aerobic Exercise in Obesity Management

It has been demonstrated that regular aerobic exercise improves metabolic health and lowers body fat percentage and waist circumference. According to a meta-analysis by (Jayedi et al. 2024), increasing aerobic activity by 30 minutes per week is linked to a 0.37% reduction in body fat and a 0.56 cm reduction in waist circumference. These results are consistent with those (Badri et al. 2023), who demonstrated that in obese individuals with type 2 diabetes, a combination of diet and aerobic exercise can improve glycemic profiles and lower the risk of metabolic complications. According to (Liu et al. 2024), aerobic exercise also increases insulin sensitivity and cardiorespiratory capacity in children and adults with obesity. In addition, (Chen et al. 2025) found that moderate to high aerobic exercise can improve lipid profiles, including lowering LDL and triglizerida and raising HDL. Overall, this study indicates that aerobic exercise is highly effective in reducing the risk of cardiometabolic disease and promoting the reduction of body fat, making it an essential component in managing obesity.

Resistance Training and Its Effects on Body Composition

Resistance training is excellent at boosting muscle mass and basal metabolism, in contrast to aerobic exercise, which concentrates more on fat removal. After 8–24 weeks of intervention, resistance training has been demonstrated to increase lean mass by around 0.8–1.4 kg and decrease fat mass by approximately 1.4–2.0 kg (Kelley et al. 2023). The study by (Lopez, Taaffe, et al. 2022) which demonstrated that resistance training is successful in lowering visceral adipose tissue (VAT) even when overall weight loss is not large, supports these conclusions. This shift in body composition is significant because lean mass contributes to a higher resting metabolic rate, which aids in long-term weight control. According to (Lopez, Radaelli, et al. 2022) resistance training is still beneficial for increasing lean mass and decreasing fat mass in a variety of age groups, including older individuals and adolescents. Furthermore, the (Wewege et al. 2022) study confirms that resistance training significantly lowers visceral fat, a type of fat that is strongly linked to the risk of cardiometabolic disorders. In general, resistance training is crucial for retaining a healthy body composition, particularly when losing weight.

The Effectiveness of HIIT as an Efficient Alternative

HIIT is a highly effective training technique for increasing cardiorespiratory fitness and decreasing body fat. One benefit of HIIT is that it requires less training time than conventional aerobic techniques while still producing outcomes that are on par with or even better. According to(Amuri et al. 2021), HIIT can result in body fat reductions that are comparable to those of moderate-intensity aerobic training, but with a significantly shorter duration and a higher increase in VO_2peak. According to a meta-analysis by (Khodadadi et al. 2023), HIIT considerably increases fat-free mass while reducing body fat percentage by about 1.5% and fat mass by 1.86 kg. The benefit of this increase in fat-free mass is that it can raise metabolism even with comparatively little overall workout time. Furthermore, low-volume HIIT can still enhance cardiometabolic health and reduce body weight by up to 4% in just 12 weeks, according to a study by (Reljic et al. 2020) on people with severe obesity. HIIT is also considered flexible and can be applied to various age groups and health conditions.

(Muchdi Alwidian Anom and Farid 2025) stated that HIIT is capable of improving metabolic parameters, reducing body fat, and enhancing cardiorespiratory fitness in overweight and obese individuals.

Comparison of the Effectiveness of Aerobic, Resistance Training, and HIIT

The comparison of resistance training, HIIT, and aerobic exercise reveals that while each type of exercise is more beneficial than the others in managing obesity, they all work well together.

Aerobic exercise is often better in reducing body fat overall, weight, and waist circumference. An increase of 30 minutes of aerobic activity per week was linked to a 0.37% decrease in body fat percentage, a 0.56 cm decrease in waist circumference, and a 0.52 kg reduction in body weight, according to a meta-analysis by (Jayedi et al. 2024). This is in line with the results of (Chen et al. 2025), who found that in overweight and obese people, moderate to high-intensity aerobic exercise dramatically lowers LDL, triglycerides, and total cholesterol while raising HDL. Aerobic exercise is crucial for controlling cardiometabolic risk since it also improves insulin sensitivity and cardiorespiratory capacity (Badri et al. 2023).

Resistance training is better than aerobic exercise for maintaining fat-free mass, increasing lean mass, and raising basal metabolic rate. After an 8–24 week intervention, resistance training has been shown to improve lean mass by 0.8–1.4 kg and reduce total fat mass by about 1.4–2.0 kg (Kelley et al. 2023). In addition, visceral adipose tissue (VAT), the deepest fat strongly associated with the risk of type 2 diabetes and cardiovascular disease, can be reduced through resistance training (Lopez, Taaffe, et al. 2022). Resistance training consistently improves body composition in overweight and obese populations, regardless of exercise dosage or combination with aerobic training, according to Lopez, Radaelli, et al. (2022). Resistance training's ability to preserve muscle mass is crucial, particularly since weight loss frequently results in muscle loss if strength training isn't combined with it.

HIIT, on the other hand, provides the most time-efficient method with outcomes that are on par with or even better than those of conventional aerobic exercise. Despite shorter exercise periods, HIIT has been demonstrated to dramatically reduce body fat and enhance VO_2peak more quickly (Amuri et al. 2021). According to a meta-analysis by (Khodadadi et al. 2023), HIIT can increase lean mass while decreasing fat mass by roughly 1.86 kg and body fat percentage by roughly 1.5%. Low-volume HIIT can enhance cardiometabolic health, reduce body weight by up to 4%, and improve waist circumference within 12 weeks, even in populations with extreme obesity (BMI > 35) (Reljic et al. 2020). This HIIT's efficacy makes it a great option for people with little time or enthusiasm, but because of its high intensity, it necessitates taking basic fitness levels into account before beginning.

Resistance training is excellent at increasing lean mass and basal metabolism, aerobic exercise is generally more successful at lowering fat and improving cardiometabolic health, and high-intensity interval training (HIIT) is the most effective way to improve fitness and reduce body fat quickly. The best outcomes for managing obesity and improving total body composition are thought to come from a mix of the three, especially aerobic and resistance exercise.

Implications for Obesity Management Programs

The results of this study suggest that a multifaceted exercise approach, rather than relying solely on one kind of exercise, is necessary for an effective obesity control program.

Aerobic exercise regularly lowers body weight and fat while improving lipid profiles and insulin sensitivity, it is a crucial part of obesity management regimens (Jayedi et al. 2024). Aerobic exercise is the primary strategy for lowering cardiometabolic risk in people who are overweight or obese.

Resistance training, on the other hand, has significant ramifications for obesity management initiatives that emphasize raising basal metabolism and halting muscle mass loss. It has been demonstrated that muscle resistance reduces visceral adipose tissue and increases lean body mass (Lopez, Taaffe, et al. 2022). Exercise regimens can assist maintain long-term metabolic rates,

lessen the impacts of weight gain, and improve body composition more successfully by preserving muscle mass throughout weight loss. Resistance training should therefore be a required part of any obesity strategy, particularly for those who are experiencing a calorie deficit.

HIIT has significant ramifications for programs targeted at people with little time or poor motivation in addition to these two elements. When compared to traditional training, short but vigorous HIIT has been demonstrated to more effectively reduce body fat, increase VO_2peak, and improve metabolism (Amuri et al. 2021). Low-volume HIIT still promotes weight loss and cardiometabolic health even in people with extreme obesity (Reljic et al. 2020). As a result, HIIT can be employed as a substitute or variation of exercise to increase program efficacy.

All things considered, the primary conclusion for obesity treatment programs is the necessity of integrating resistance training, aerobic exercise, and high-intensity interval training. Programs can effectively decrease body fat, build and maintain muscle mass, improve cardiovascular and metabolic health, and increase the effectiveness of workouts thanks to this combination. The guidelines of worldwide health organizations, which stress the significance of complete physical activity in tackling overweight and obesity, are in line with this integrated strategy (Oppert et al. 2021). In order to ensure long-term sustainability, an optimal obesity management program should be balanced, progressive, and consider individual features.

Conclusions

The results of this literature review indicate that aerobic exercise, resistance training, and high-intensity interval training (HIIT) all provide important but different contributions to the management of obesity. Aerobic exercise is an essential part of obesity prevention regimens because it regularly shows substantial efficacy in lowering waist circumference, total body fat, and cardiometabolic risk factors. By boosting lean mass, enhancing basal metabolic rate, and decreasing visceral adipose tissue, resistance training makes a special contribution to long-term weight regulation and halting muscle loss during calorie restriction. Even in people with severe obesity, HIIT provides a very time-efficient substitute that results in comparable or even better improvements in fat reduction, VO_2peak, and metabolic parameters.

Overall, the data indicates that there isn't a particular type of exercise that is better in every way. Rather, the most successful regimens for managing obesity combine resistance training, aerobic exercise, and high-intensity interval training (HIIT) in a methodical and systematic way. This combination strategy allows for improved cardiometabolic health, increased adherence because of various training options, simultaneous reduction of body fat, and retention or enhancement of lean mass. Therefore, while creating all-encompassing, long-lasting obesity control programs for a variety of demographics, a multimodal exercise strategy should be seen as crucial.

References:

Amuri, Andrea D., Juana Maria Sanz, Eleonora Capatti, Francesca Di Vece, Filippo Vaccari, Stefano Lazzer, Giovanni Zuliani, Edoardo Dalla Nora, and Angelina Passaro. 2021. “Effectiveness of High- - Intensity Interval Training for Weight Loss in Adults with Obesity : A Randomised Controlled Non- - Inferiority Trial.” 1–10. doi: 10.1136/bmjsem-2020-001021.

Badri, Sameer, Al Mhanna, Sílvia Rocha Rodriguesc, Mahaneem Mohamed, and Alexios Batrakoulis. 2023. “Effects of Combined Aerobic Exercise and Diet on Cardiometabolic Health in Patients with Obesity and Type 2 Diabetes : A Systematic Review and Meta - Analysis.” *BMC Sports Science, Medicine and Rehabilitation* 5:1–15. doi: 10.1186/s13102-023-00766-5.

Binmahfoz, Ahmad, Anas Dighriri, Cindy Gray, and Stuart R. Gray. 2025. “Effect of Resistance Exercise on Body Composition , Muscle Strength and Cardiometabolic Health during Dietary Weight Loss in People Living with Overweight or Obesity : A Systematic Review and Meta- - Analysis.” 1–14. doi: 10.1136/bmjsem-2024-002363.

Bull, Fiona C., Salih S. Al-, Stuart Biddle, Katja Borodulin, Matthew P. Buman, Greet Cardon, Catherine Carty, Jean-Philippe Chaput, Sebastien Chastin, Roger Chou, Paddy C. Dempsey, Loretta Dipietro, Ulf Ekelund, Joseph Firth, Christine M. Friedenreich, Leandro Garcia, Muthoni Gichu, Russell Jago, Peter T. Katzmarzyk, Estelle Lambert, Michael Leitzmann, Karen Milton, Francisco B. Ortega, Chathuranga Ranasinghe, Emmanuel Stamatakis, Anne Tiedemann, Richard P. Troiano, Hidde P. Van Der Ploeg, Vicky Wari, and Juana F. Willumsen. 2020. "World Health Organization 2020 Guidelines on Physical Activity and Sedentary Behaviour." 1451–62. doi: 10.1136/bjsports-2020-102955.

Chen, Zhuying, Runyu Zhou, Xiaojie Liu, Jingqi Wang, Leiyuyang Wang, Yuanyuan Lv, and Laikang Yu. 2025. "Effects of Aerobic Exercise on Blood Lipids in People with Overweight or Obesity : A Systematic Review and Meta-Analysis of Randomized Controlled Trials." (Ldl).

Fajar Ramadhan, Ziko. 2023. "PENGARUH LATIHAN RESISTANCE BAND DAN LATIHAN BEBAN (BARBEL 1KG) TERHADAP POWER OTOT LENGAN PADA ATLET TAEKWONDO PESAWARAN PROVINSI LAMPUNG." *Jurnal Penjaskesrek* 10(1):38–48. doi: 10.46244/penjaskesrek.v10i1.2135.

Gozali, Yayan, Donny Setiawan, and Galih Farhanto. 2024. "Jurnal Olahraga Dan Kesehatan Indonesia (JOKI) Available Online at Https://Jurnal.Stokbinaguna.Ac.Id/Index.Php/JOK EFEKTIVITAS LATIHAN PLYOMETRIC." 4:185–93.

Guo, Linxuan. 2023. "The Effect of HIIT on Body Composition , Cardiovascular Fitness , Psychological Well-Being , and Executive Function of Overweight / Obese Female Young Adults." (January):1–10. doi: 10.3389/fpsyg.2022.1095328.

Hernawan, Nipaldi, Andang Rohendi, Gani Kardani, Program Studi, Pendidikan Jasmani, and Universitas Galuh. 2021. "Perbandingan Pengaruh Metode Latihan Tabata Dengan Metode High Intensity Interval Training Terhadap Hasil Daya Tahan Kardiovaskular Pemain Sepakbola." 7(2):30–42.

Jayedi, Ahmad, Sepideh Soltani, Alireza Emadi, Mahdieh-sadat Zargar, and Ali Najafi. 2024. "Aerobic Exercise and Weight Loss in Adults A Systematic Review and Dose-Response Meta-Analysis." 7(12):1–20. doi: 10.1001/jamanetworkopen.2024.52185.

Kelley, George A., Kristi S. Kelley, and Brian L. Stauffer. 2023. "Effects of Resistance Training on Body Weight and Body Composition in Older Adults : An Inter-Individual Response Difference Meta-Analysis of Randomized Controlled Trials." 106(2):1–19. doi: 10.1177/00368504231179062.

Khodadadi, Fatemeh, Reza Bagheri, Raoof Negaresh, Sajjad Moradi, Michael Nordvall, Donny M. Camera, Alexei Wong, and Katsuhiko Suzuki. 2023. "The Effect of High-Intensity Interval Training Type on Body Fat Percentage , Fat and Fat-Free Mass : A Systematic Review and Meta-Analysis of Randomized Clinical Trials." 1–27.

Liu, Xuan, Qiang Li, Fuxiang Lu, and Dongsheng Zhu. 2024. "Effects of Aerobic Exercise Combined with Resistance Training on Body Composition and Metabolic Health in Children and Adolescents with Overweight or Obesity : Systematic Review And." 2016(August). doi: 10.3389/fpubh.2024.1409660.

Lopez, Pedro, Régis Radaelli, Dennis R. Taaffe, Daniel A. Galvão, Robert U. Newton, Elisa R. Nonemacher, Victória M. Wendt, Renata N. Bassanesi, Douglas J. P. Turella, and Anderson Rech. 2022. "Moderators of Resistance Training Effects In." (16):1804–16. doi: 10.1249/MSS.0000000000002984.

Lopez, Pedro, Dennis R. Taaffe, Daniel A. Galv, Robert U. Newton, Elisa R. Nonemacher, Renata N. Bassanesi, Douglas J. P. Turella, and Anderson Rech. 2022. "Resistance Training Effectiveness on Body Composition and Body Weight Outcomes in Individuals with Overweight and Obesity across the Lifespan : A Systematic Review and

Meta-Analysis." (October 2021):1–25. doi: 10.1111/obr.13428.

Mahaputra, M. Ridho. 2022. "Literature Review Faktor Faktor Yang Mempengaruhi Berpikir Positif." 1(1):33–40.

Mu'thia Hanum, Azmy. 2023. "FAKTOR-FAKTOR PENYEBAB TERJADINYA OBESITAS PADA REMAJA Azmy Mu' Thia Hanum Program Studi Gizi, Fakultas Kesehatan Masyarakat, Universitas Airlangga." 9(2):137–47.

Muchdi Alwidian Anom, Firdo, and Rahman Farid. 2025. "THE EFFECTIVENESS OF HIGH-INTENSITY INTERVAL TRAINING (HIIT) ON WEIGHT LOSS AND METABOLIC PARAMETERS : A SCOPING REVIEW." 17(2):499–510.

Oppert, Jean-michel, Alice Bellicha, Marleen A. Van Baak, Francesca Battista, Kristine Beaulieu, John E. Blundell, Jorge Encantado, Andrea Ermolao, and Adriyan Pramono. 2021. "Exercise Training in the Management of Overweight and Obesity in Adults : Synthesis of the Evidence and Recommendations from the European Association for the Study of Obesity Physical Activity Working Group." 22(April):1–12. doi: 10.1111/obr.13273.

Oroh, Pricillia J., Herlina I. S. Wungouw, and Joice N. A. Engka. 2021. "Latihan Fisik Pada Pasien Obesitas." 13(28):34–43.

Pebriani, Leila, Agnes Frethernety, Elsa Trinovita, Mahasiswa Program Studi, Pendidikan Dokter, Palangka Raya, Palangka Raya, Palangka Raya, Kalimantan Tengah, Dosen Pengajar Program, Studi Pendidikan Dokter, Fakultas Palangka Raya, Universitas Palangka Raya, Palangka Raya, and Junk Food. 2018. "STUDI LITERATUR : PENGARUH KONSUMSI JUNK FOOD TERHADAP OBESITAS Literature Review : Effect Of Junk Food Consumption On Obesity Abstrak."

Putu Agus Dharma Hita, I. 2020. "Efektivitas Metode Latihan Aerobik Dan Anaerobik Untuk Menurunkan Tingkat Overweight Dan Obesitas 1." 7(2):135–42.

Reljic, Dejan, Fabienne Frenk, Hans J. Herrmann, Markus F. Neurath, and Yurdagül Zopf. 2020. "Low - Volume High - Intensity Interval Training Improves Cardiometabolic Health , Work Ability and Well - Being in Severely Obese Individuals : A Randomized - Controlled Trial Sub - Study." *Journal of Translational Medicine* 1–15. doi: 10.1186/s12967-020-02592-6.

Rubino, Francesco, David E. Cummings, Robert H. Eckel, Ricardo V Cohen, John P. H. Wilding, Wendy A. Brown, Fatima Cody Stanford, Barbara E. Corkey, Hermann Toplak, Alexander Kokkinos, Robert F. Kushner, Francesco Branca, Jonathan Valabhji, Matthias Blüher, Stefan R. Bornstein, Harvey J. Grill, Eric Ravussin, Edward Gregg, Noor B. Al Busaidi, Nasreen F. Alfaris, Ebaa Al Ozairi, Lena M. S. Carlsson, Jesús R. Luna Fuentes, Vicki M. Mooney, Joseph Nadglowski Jr, Agbo Urudinachi, Magdalena Olszanecka-glinianowicz, and An Pan. 2025. "The Lancet Diabetes & Endocrinology Commission Definition and Diagnostic Criteria of Clinical Obesity." 8587(24). doi: 10.1016/S2213-8587(24)00316-4.

Swift, Damon L., Joshua E. Mcgee, Conrad P. Earnest, Madison Nygard, and Neil M. Johannsen. 2018. "The Effects of Exercise and Physical Activity on Weight Loss and Maintenance." *Progress in Cardiovascular Diseases* #pagerange#. doi: 10.1016/j.pcad.2018.07.014.

Ullah, Mohammad Iftekhar, and Sadeka Tamanna. 2025. "Obesity : Clinical Impact , Pathophysiology , Complications , and Modern Innovations in Therapeutic Strategies." 1–22.

Wewege, M., R. Van Den Berg, R. E. Ward, and A. Keech. 2017. "The Effects of High-Intensity Interval Training vs . Moderate-Intensity Continuous Training on Body Composition in Overweight and Obese Adults : A Systematic Review and Meta-Analysis." (June):635–46. doi: 10.1111/obr.12532.

Wewege, Michael A., Imtiaz Desai, Cameron Honey, Brandon Coorie, Matthew D. Jones, Briana K. Clifford, Hayley B.

Leake, and Amanda D. Hagstrom. 2022. "The Effect of Resistance Training in Healthy Adults on Body Fat Percentage , Fat Mass and Visceral Fat : A Systematic Review and Meta - Analysis." *Sports Medicine* 52(2):287–300. doi: 10.1007/s40279-021-01562-2.

Yin, Hang, Jia Zhang, Menglong Lian, and Yajing Zhang. 2025. "A Systematic Review and Meta-Analysis of the Effectiveness of High-Intensity Interval Training for Physical Fitness in University Students."