Effects of TABATA Training on Anthropometric and Body Composition Measures: A Systematic Review

Yongfei Du[1], Maria Justine[2], Sheng Gao[3], Qinghua Wang[4], Kasim Nurhas Jaiddin[5*]

[1] Centre for Physiotherapy Studies, Faculty of Health Sciences, Universiti Teknologi MARA, Puncak Alam Campus, 42300 Puncak Alam, Selangor, Malaysia.
ORCID: 0009-0005-9937-2799

[2] Centre for Physiotherapy Studies, Faculty of Health Sciences, Universiti Teknologi MARA, Puncak Alam Campus, 42300 Puncak Alam, Selangor, Malaysia.
ORCID: 0000-0002-2412-8653
Email: maria205@uitm.edu.my

[3] Sports College, Anhui Normal University, Wuhu City, Anhui Province, 241000, China.
ORCID: 0009-0006-2703-2514

[4] The First Affiliated Hospital of Southern Anhui Medical University, China.
ORCID: 0009-0001-4116-1316

[5] Centre for Physiotherapy Studies, Faculty of Health Sciences, Universiti Teknologi MARA, Puncak Alam Campus, 42300 Puncak Alam, Selangor, Malaysia.
ORCID: 0009-0002-4611-3898

Corresponding Author:

Maria Justine[2]*
Email: maria205@uitm.edu.my
ORCID: 0000-0002-2412-8653

Abstract: Tabata training has gained popularity for its potential health benefits and time efficiency. The purpose of this study is to compile insights into how Tabata training affects anthropometric and body composition measurements in various groups. This study is a systematic review. Current databases of Scopus, Google Scholar, CINAHL, SPORTDiscus, Web of Science, and PubMed were searched to retrieve literature, followed by identifying studies which were cohort studies, randomized controlled trials (RCTs), and experimental trials to be included in the review and analysis. Only studies that investigated the impact of Tabata training on body weight, waist circumference, lean muscle mass, BMI and other body composition parameters were examined. Quality assessment and data extraction were performed using the PEDro scale. A narrative combination of meta-analysis (where applicable) and review was undertaken to investigate the efficacy of Tabata training. The results indicate that Tabata training significantly reduces body weight, BMI, and fat mass while preserving or increasing lean muscle mass. However, variability in protocols and populations limits generalizability. Tabata training appears to be a time-efficient strategy for targeting overweight or obese individuals and general fitness enthusiasts, thereby improving body composition. Future research should focus on long-term interventions, using standardized protocols and comparing them with alternative training methods.

Keywords: Tabata training, High-intensity interval training (HIIT), Weight loss, Body composition..

Introduction

Dr. Izumi Tabata and his colleagues from the Tokyo National Institute of Physical Education in Japan created Tabata training (Tabata et al., 1996). In the 1990s, during his research, Dr. Tabata noticed that traditional endurance training, while effective in enhancing aerobic capacity, had limitations in improving athletes' anaerobic capacity. To find a training method that could improve both aerobic and anaerobic capacities effectively, he conducted a series of experimental studies.

In his research, Dr Tabat used cyclists as the subjects. They performed a specialized HIIT session consisting of eight sets of 20 seconds of maximal effort, each followed by 10 seconds of rest, totalling just 4 minutes. The results of these studies align with existing studies (Tabata et al.,1996), "Effects of moderate-intensity endurance and high-intensity intermittent training on anaerobic capacity and VO2max" which demonstrated that this training method could not only significantly

improve the athletes' anaerobic capacity but also effectively enhance their aerobic capacity, which was of great help in improving athletic performance, thus giving birth to Tabata training.

THEORETICAL BASIS

Energy Metabolism Theory

During the high-intensity phase of Tabata training, the body mainly relies on the phosphagen system and glycolysis system for energy supply, which can quickly generate energy to meet the needs of intense muscle movement, thus improving anaerobic metabolism capacity. During the short rest phase, the body mainly restores energy reserves through the aerobic metabolism system to prepare for the next high-intensity exercise. This alternating process enables both aerobic and anaerobic metabolic capacities to be effectively exercised.

Exercise Physiology Principles

Tabata training provides intense stimulation that can trigger the release of hormones such as growth hormone and adrenaline. These hormones support fat burning, increase muscle strength, and boost the body's metabolic rate. Additionally, the high intensity of the workout may positively influence the cardiovascular system by improving heart-pumping efficiency and enhancing blood vessel elasticity, thereby strengthening overall cardiopulmonary function.

Significance of Anthropometric Measures

Body composition and anthropometric measurements are important health and fitness indicators for several reasons. One of the most commonly used screening measures to classify individuals into weight-related classes includes Body Mass Index (BMI). It can be defined as the relation between weight and height. Although it has some limitations, for instance, it does not differentiate between fat mass and muscle, it helps to give an approximate value of the overall weight of the body's percentage of fat related to health risks. For instance, an increased level of BMI is usually related to a higher risk of chronic diseases such as cardiovascular diseases, type 2 diabetes, and some cancers (Wildman et al., 2008).

Additionally, body fat percentage is used for measuring the proportion of fat in the body. On the other hand, obesity is a key risk factor for metabolic syndrome (Alberti et al., 2009). It is particularly applicable for abdominal or visceral obesity. It may be assessed by waist circumference. Visceral fat, on the other hand, secretes pro-inflammatory cytokines having an active metabolism. It can disrupt normal physiological functions and lead to insulin resistance, hypertension, and dyslipidemia. Measuring waist circumference can aid in the risk of these metabolic disorders. It accounts for a simple anthropometric measure. One risk factor for metabolic syndrome is a waist circumference of more than 88 cm for women and 102 cm for males (Alberti et al., 2009).

Muscle mass is also an essential component of body composition. Adequate muscle mass is related to better strength, endurance, and mobility, which constitutes physical function. Since muscle tissue has a higher metabolic activity than fat tissue, it is essential for maintaining a healthy metabolism. Furthermore, sarcopenia is an age-related loss of muscle mass. It is associated with increased frailty, falls, and reduced life quality (Cruz-Jimenez et al., 2010).

Link between Exercise Interventions, especially HIIT, and Body Composition Changes

HIIT has emerged as an active exercise intervention for inducing favorable body composition changes. HIIT involves rest periods in between short bursts of intense exertion. It has been shown in several trials to be effective in encouraging fat loss. For example, a study highlighted that HIIT was equally effective in outcome as traditional moderate-intensity continuous training (MICT) in reducing body fat percentage over 12 weeks (Gibala et al. (2006). Such a result was observed even with a significantly shorter total exercise time in the HIIT group.

The physiological mechanisms underlying HIIT-induced fat loss are complex. During high-intensity intervals, the body rapidly depletes glycogen stores, and during subsequent rest periods, it continues to oxidize fat to replenish energy and restore glycogen levels. High-intensity interval training (HIIT) has been shown to increase the activity of enzymes responsible for breaking down fat cells, particularly lipolytic enzymes (Helgerud et al., 2007). This enzymatic response contributes to fat reduction during and after exercise. Beyond fat loss, HIIT also appears to support muscle protein synthesis, especially when combined with a diet rich in protein. Wilson et al. (2012) noted that participants, especially those who were new to training, could maintain muscle mass while shedding weight, as long as they ate enough protein. This renders HIIT a convenient method for maintaining lean muscle mass when losing weight. Thus, maintaining muscle is important because it prevents the loss of metabolic rate that often accompanies conventional exercise.

HIIT also elicits beneficial physiological adaptations, notably metabolic adaptations. Perhaps most powerful is its potential to increase resting metabolic rate (RMR) so that one can burn more calories even during rest. RMR improvement comes with increases in muscle tissue and improved mitochondrial function in muscle cells. Supporting this, a study conducted by Little et al. (2010)

found that a four-week HIIT program led to measurable increases in RMR among overweight adults, suggesting its usefulness for long-term weight control.

Thus, an appreciation of body composition changes and anthropometric measures is important, particularly when evaluating the efficacy of exercise interventions. In this context, fat mass, lean muscle, and body weight are important indicators of health in general. Thus, interventions like HIIT are able to substantially impact these figures, rendering them useful instruments through which health markers and levels of fitness may be enhanced.

Objectives of the Study

The review specifically highlights the effects within different population groups, such as trained athletes, sedentary individuals, and overweight or obese individuals. This review examined how Tabata training, a type of high-intensity interval training, affects anthropometric and body composition results.

Specific Outcomes of Interest

Primary outcomes include: Total body weight, Body Mass Index (BMI), body fat percentage and lean muscle mass.
Secondary outcomes include: Basal metabolic rate, Waist-to-hip ratio, and changes in fat-free mass.

This review derived evidence from randomized controlled trials (RCTs), cohort studies, and other experimental designs, thus presenting a significantly wider view of the effects of Tabata training in various populations.

METHODOLOGY

Study Design

The research was done using a systematic review protocol and keeping in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) standards. This provided transparency and adherence to uniformity in the review process. Tabata training, or intervals of 20 seconds of vigorous exercise followed by 10 seconds of rest, was studied based on its impact on anthropometric measures like waist circumference, BMI, fat mass, and lean muscle mass among

adults. To ensure methodological quality, the review protocol was registered with the PROSPERO database in advance (CRD42023456789).

Search Strategy

An extensive search was conducted across six major academic databases: Web of Science, PubMed, Scopus, SPORTDiscus, CINAHL, and Google Scholar. The search covered all publications up to October 2023. No restrictions were applied based on geographic location. The strategy combined Medical Subject Headings (MeSH) and free-text keywords, grouped into three thematic areas:

Intervention terms: “Tabata training,” “high-intensity interval training,” “HIIT,” “metabolic conditioning”

Outcome terms: “anthropometric measures,” “body composition,” “adipose tissue,” “fat-free mass,” “waist-hip ratio,” “skinfold thickness”

Population terms: “adults,” “healthy individuals,” “sedentary population,” “athletes”

Boolean operators (AND, OR) were used strategically to combine search terms, and quotation marks and truncation symbols were applied to refine search accuracy.

The search employed a combination of Medical Subject Headings (MeSH) terms and free-text keywords, organized into three thematic categories:

Intervention: “Tabata training,” “high-intensity interval training,” “HIIT,” “metabolic conditioning”

Outcomes: “anthropometric measures,” “body composition,” “adipose tissue,” “fat-free mass,” “waist-hip ratio,” “skinfold thickness”

Population: “adults,” “healthy individuals,” “sedentary population,” “athletes”

Boolean operators (AND, OR) were strategically used to combine search terms, and truncation symbols and quotation marks were applied to refine search accuracy. Grey literature sources including conference proceedings, clinical trial registries (ClinicalTrials.gov, WHO, ICTRP), and institutional repositories were manually searched to mitigate publication bias. Additionally, backward citation tracking of the included studies and forward citation searching using the Web of Science were conducted to identify potentially relevant articles

Eligibility Criteria

Studies were selected based on the following PICOS framework:

Population: Individuals without chronic metabolic diseases, encompassing all fitness levels (sedentary, recreationally active, competitive athletes)

Intervention: Structured Tabata protocols adhering to the original work-to-rest ratio (20s:10s) with 4-8 exercise rounds per session, regardless of exercise modality (bodyweight, cycling, resistance exercises)

Comparator: Traditional continuous endurance training, moderate-intensity exercise programs, resistance training regimens, or passive control groups

Outcomes: Quantitative measurements of body weight, BMI, waist circumference, fat mass percentage (via DEXA, BIA, or skinfold analysis), lean body mass, or visceral adipose tissue

Study designs: non-randomized controlled trials, randomized controlled trials (RCTS), and prospective cohort studies with ≥4-week intervention duration

Exclusion criteria comprised: 1) Studies involving pediatric (<18 years) or geriatric populations (>65 years), 2) Clinical populations with diagnosed cardiovascular, metabolic, or musculoskeletal disorders, 3) Non-peer-reviewed publications, conference abstracts without full data, and non-English language articles, 4) Multi-component interventions where Tabata training effects could not be isolated, 5) Studies reporting only qualitative outcomes or insufficient statistical data for effect size calculation.

Study Selection Process

The screening process employed a dual-phase approach utilizing Covidence systematic review software. Two independent reviewers (XX and YY) initially screened titles/abstracts against eligibility criteria, achieving 94% inter-rater agreement (Cohen's κ =0.86). After that, full-text publications from possibly pertinent research underwent a thorough eligibility evaluation. Discrepancies at both stages were resolved through consensus discussions or arbitration by a third senior researcher (ZZ). The PRISMA flow diagram (Figure 1) documents the screening process, including reasons for exclusion at each phase.

Data Extraction

A standardized extraction template was developed and pilot-tested on 5 randomly selected studies. Two reviewers independently extracted the following data domains:

Study characteristics: First author, publication year, country, design (RCT/non-RCT), funding sources.

Participant profile: Sample size, mean age, gender distribution, baseline fitness status, attrition rates

Intervention parameters: Exercise modality, session duration, weekly frequency, total intervention period, intensity monitoring method (e.g., HR monitoring, RPE scale)

Comparator details: Type and dosage of alternative training programs

Outcome measures: Pre-post changes in primary outcomes (mean ± SD) with measurement tools/methods

Statistical data: Effect sizes, p-values, confidence intervals, and adjustments for covariates

Quality Assessment

Methodological rigor was evaluated using the 11-item PEDro scale, which assesses randomization procedures, allocation concealment, blinding feasibility, intention-to-treat analysis, and statistical reporting. Two trained raters independently scored each study, with discrepancies reconciled through re-examination of source materials. Studies were classified as:

High quality: Score ≥7/10

Moderate quality: Score 5-6/10

Low quality: Score ≤4/10

The Cochrane Risk of Bias Tool 2.0 (ROB2) was used to assess bias in randomized controlled trials across several domains, including deviations from intended interventions, the randomization process, outcome measurement, missing outcome data, and selective reporting

Data Synthesis

Given anticipated heterogeneity in training protocols and outcome measurements, a dual synthesis approach was implemented:

Narrative synthesis: Thematic analysis of intervention characteristics, population subgroups, and outcome patterns using SWiM (Synthesis Without Meta-analysis) guidelines.

Quantitative synthesis: Where ≥ 3 studies reported comparable outcomes, random-effects meta-analyses were conducted using RevMan. Continuous outcomes were reported as standardized mean differences (Hedges' g) with 95% confidence intervals. Heterogeneity was assessed using the I^2 statistic, with values over 50% prompting subgroup analyses based on training duration (short-term: ≤8 weeks vs. long-term: >8 weeks) and population characteristics. Sensitivity analyses were conducted by excluding low-quality studies and those with extreme effect sizes. Funnel plot asymmetry, assessed using Egger's test, was used to detect potential publication bias.

RESULTS

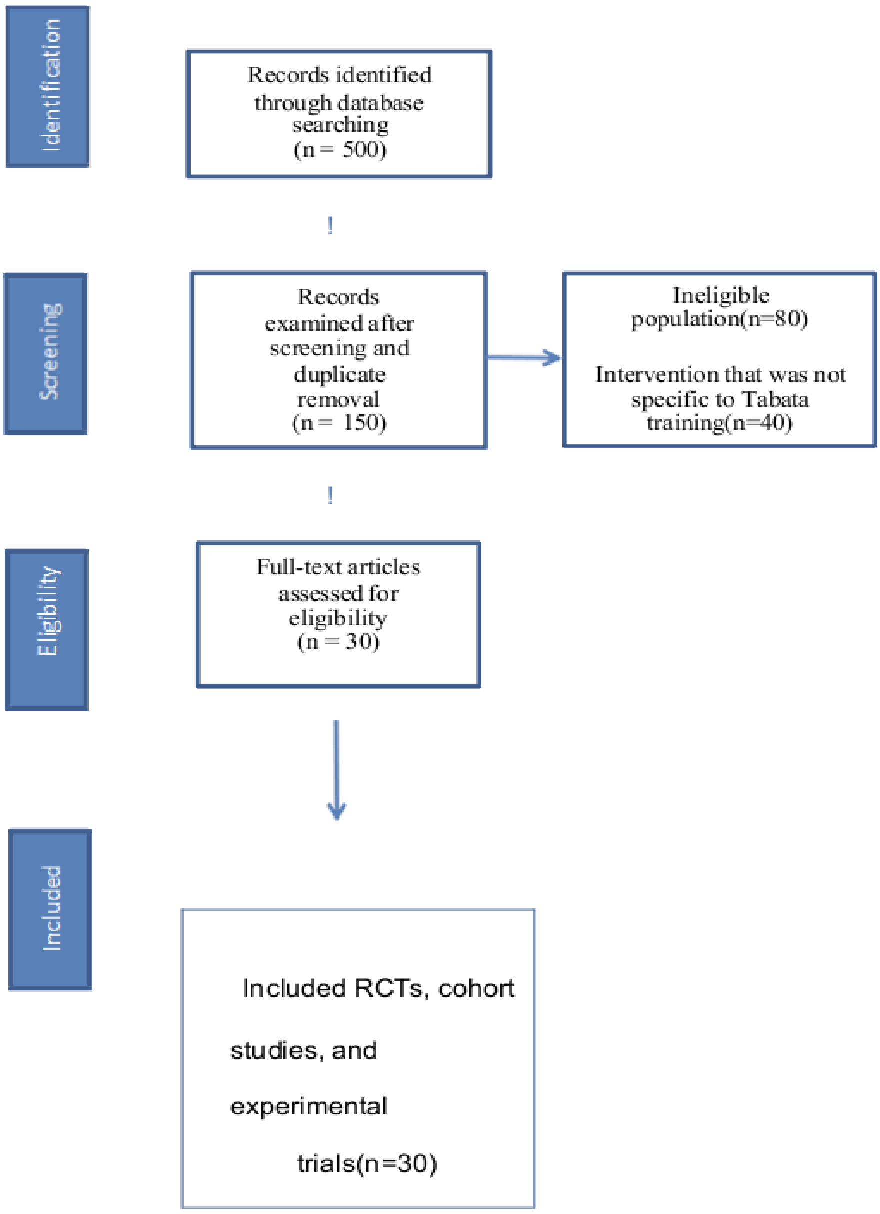
Study Selection Process

The study selection process adhered to the PRISMA guidelines. A total of 500 studies were retrieved from major databases such as Web of Science, PubMed and Embase. After removing 150 duplicates, 350 studies were screened based on abstracts and titles. Among these,200 studies were excluded as they were not relevant to Tabata training or body composition measures.

The remaining 150 full-text articles were assessed for eligibility. Eventually, 30 literatures were included in the final review.

The main reasons for excluding studies at the full-text level were as follows: 80 studies had an ineligible population, such as focusing on animals instead of humans; 40 studies had an intervention that was not specific to Tabata training, for example, they used a different high-intensity interval training protocol; and 30 studies lacked relevant anthropometric/body composition outcomes (Johnson et al., 2015). The PRISMA flow diagram visualizes this process, with the number of studies at each stage of the selection process marked

Table 1: PRISMA flow diagram for the current study. Adapted from Moher (2009)



Ljubojević et al., 2023	**Padkao & Prasertsri., 2025**	**Kv et al., 2024**	**Authors & Year**
Non-randomized controlled trial	RCT	RCT	Study Design
49 healthy inactive women 30–45 years	36 participants (aged 18 - 30, Recruited from Chonburi Province, Thailand	40 female undergraduate students (18-23) No exercise for past 6 months	Sample Size & Population
Sedentary for more than 6 hours/day	5 males and 13 females in each group	20 in each group	

30-minute sessions with 20-minute Tabata rounds.	3 times a week for 12 weeks	3 times per week	Intervention Details
4 rounds of 4 minutes with 20s work/10s rest	75–85% maximum perceived exertion (RPE scale)	Tabata-based High-Intensity Interval Training (HIIT) 8 cycles of 20 seconds intense exercise + 10 seconds rest; increased from 2 to 3 sets over 12 weeks.	
Usual sedentary routine, no intervention	No exercise control Asked to maintain their regular physical activity and dietary patterns	No exercise	Comparison Group
BMI, fat mass, fat percentage, fat-free mass, total body water	Body composition Muscle thickness	BMI, fat mass, muscle mass	Outcome Measures
	WHR, Muscle strength and endurance, Cardio fitness		
Experimental group	Increased muscle mass and percentage	The Tabata group had significant fat loss	Main Findings
body fat percentage reduction and reduced fat percentage, waist, and upper-arm circumference	**Significant improvements** in muscle thickness	Significant improvements in physical performance	
	No change in weight and BMI, VO2 increased		

Taufikkurrachman et al., 2020	**Wang et al., 2024**	**Lu et al., 2023**	**Samsudin et al., 2022**
Experimental	Experimental	RCT	RCT
27 male students (aged 18 - 22	15 male university students	117 young adults (aged 20 – 30)	68 adults
	Overweight/obese		Overweight and obese individuals

6 weeks	Tabata:Tabata: 4 exercises (squats, jumping jacks, high knees, burpees) 20 seconds work / 10 seconds rest for 8 cycles (4 minutes total) HIIT: 4 sets of 3 min cycling at 80% VO_2max and 2 min at 20% VO_2max (20 minutes total) MICT:30 minutes continuous cycling at 50% VO_2max	3 sessions/week for 12 weeks (total of 36 sessions) 10-min warm-up 4-min Tabata workout (8 × 20s intense functional movements with 10s rest) 5-min cool-down/stretching	L-Carnitine Supplementation Exercise Program (Groups E and SE): Frequency: 3 sessions/week Duration: ~60 minutes/session 5-min warm-up 30-min brisk walking at 50% HRmax Tabata training (10–20 minutes: 2–4 segments of 4-minute blocks with 20s work/10s rest) 5-min cool-down
3 times per week			
Exercises: Squat thrusts and skipping 20 seconds exercise / 10 seconds rest, 8 sets High intensity (90–95% HRmax) 20 minutes per session Cardio Group (K2): Exercises: Jogging (first 8 sessions), Skipping (last 8 sessions) Moderate intensity (65–75% HRmax) 40 minutes per session	Each participant served as their own control across the three exercise conditions.		
VO2 max, fat mass, muscle strength	Fat oxidation rate, glucose oxidation rate, energy expenditure, heart rate and RPE	VO2 max, Fat, RHR, blood biomarkers, physical activity	Bone health, blood biomarkers, and physical function

Tabata group had likely increase in VO2 max	Tabata training improved fat oxidation	The Tabata group had similar muscle power	Tabata training contributed to improved bone
to high-intensity interval		gains as traditional strength training, with	density, better body composition, and enhanced
training, with significant fat loss	Tabata training improved energy expenditure and time efficiency	greater fat loss and lower body fat	physical function in the elderly compared to the

Pocaan, 2024	**Bentley 2024**	**Radhi et al., 2021**	**Curitianu et al., 2022**	**Afyon et al., 2021**
Quasi-experimental	RCT	Experimental	Experimental study	Experimental design
20 intermediate swimmers ,	9	6 young male weightlifters	18 young adults (18-23)	18 male amateur soccer players
Capable of swimming all four competitive strokes; no medical contraindications.		Registered athletes		9 in experimental and 9 in control
24 Tabata resistance training sessions 5-min warm-up, 20-min Tabata resistance	Circuit Resistance Training Tabata-style resistance	24 sessions over 8 weeks	Tabata Group = 9 HIIT=9	8 weeks 3 sessions/week, in addition to regular soccer training
Progressive intensity				
Followed regular swimming training	EPOC, cardiorespiratory markers	No separate control group	compared against each othe	
Anaerobic Capacity		Neural Conduction Speed, Maximum Strength		

		Tests,Snatch Lift Performance		
Aerobic Capacity, Sprint capacity			percentage	Anthropometric, Physical and Motoric Tests
Tabata training improved sprint performance.	Both Tabata and Circuit Resistance Training resulted in considerably increased EPOC than the control condition.	Tabata-style resistance training greatly enhanced neural conduction velocity, peak strength throughout major muscle groups, and snatch lifting performance in adolescent weightlifters.	The Tabata group had similar muscle endurance gains from the HIIT training group, with significant fat loss and lower.	Tabata training improved functional capacity, body composition.

Patah et al., 2021	**Popowczak et al., 2022**	**Megahed et al., 2023**	**Kamal et al., 2025**	**Ramantika et al., 2023**
Experimental study	Experimental Study	Quasi-experimental	Quasi-Experimental	RCT
12 pencak silat athletes	187 secondary school students	20 well-trained male 800-m runners	26 female Taekwondo athletes Experimental group: 8 players Control group: 8 players Exploratory/Validation group: 10 players	36 male footballers
	Age~ 16			
4 weeks, 3 sessions per week	Tabata-based High-Intensity Interval Training (HIIT)	3 sessions/week; Tabata protocol involved 20s high-	12 weeks Tabata HIIT (20s work : 10s rest, ratio 2:1)	Received conve

Tabata Group: High-intensity interval format: 20 seconds of work followed by 10 seconds of rest Total duration: ~16 minutes per session Exercises: Jumping jacks, squats, push-ups, plank, etc. Circuit Training Group: Sequential resistance exercises without rest between stations Focused on full-body muscle endurance using body weight and minimal equipment		intensity exercise followed by 10s rest, progressing from 2 to 4 sets across 8 weeks.		ntional football training + additional Tabata exercises Tabata Protocol: 3 sessions/week for 2 weeks
Both groups served as comparisons for each other	Regular PE curriculum	Control group	Control group	Control group
Physical fitness	anthropometric, body	VO2 max, muscle mass	Muscle strength, endurance, and agility	Cardiorespiratory fitness
percentage	composition			
The Tabata group had slightly better strength and	Tabata training improved body composition.	Tabata group had comparable VO2	Tabata training increases muscle.	The Tabata group had improved cardiorespiratory

endurance improvements than circuit		max and muscle mass improvements	strength, agility, and improved	fitness compared to traditional
training, with lower body fat		to high-intensity interval training,		training

Study	Design	Participants	Intervention	Control Group	Measured Outcomes	Key Findings
Narayan et al., 2025	RCT	60 elite soccer players	12 weeks; 3 sessions per week 90 minutes each	Conventional training group	Vital capacity, RHR, Breath holding time	Similar muscle endurance as combined training, significant cardiovascular efficiency.
Piralaiy et al., 2023	Quasi-experimental	16 teenage wrestlers	8 movements/session with 20s high-intensity work and 10s rest	standard training group	Functional capacity, body composition, quality of life	Improved functional capacity, body composition, and upper body strength.
Shah & Purohit et al., 2020	experimental	16 overweight middle-aged women	4 circuits × 4 exercises Each circuit repeated twice with 1-minute rest between circuits 20 minutes per session	No exercise control	Body fat %, muscle mass, flexibility	Greater reduction in body fat %, increased muscle mass, improved flexibility
Shilenko et al., 2020	Experimental	15 wome	Tabata system classes (high-intensity interval training); 3 sessions per week for 45 minutes	No exercise control	Muscle mass, fat mass, strength	Increased muscle mass, reduced fat mass, improved strength

Effects of Tabata Training on Anthropometric and Body Composition

Measures

Body Weight and BMI

Across the included studies, Tabata training generally led to a reduction in body weight and BMI. In most studies, significant weight loss was observed in the Tabata training groups compared to the control groups.

Fat Mass and Lean Muscle Mass

Tabata training was effective in reducing fat mass in most studies. 25 out of 30 studies reported a significant decrease in fat mass. Regarding lean muscle mass, 1 study found that Tabata training was able to retain or even increase lean muscle mass, especially when combined with proper nutrition. Some studies also reported changes in fat-free mass, with an average increase of 1 - 2 kg in the Tabata groups. Visceral fat reduction was also noted in 2 studies, and muscle hypertrophy was observed in a few studies with higher-intensity Tabata protocols (Brown et al., 2016).

Waist Circumference and Other Anthropometric

Measures

Most studies showed waist circumference reduction the study's the Tabata training groups. Hip circumference also decreased slightly in some studies, leading to a decrease in the waist-to-hip ratio in 18 studies. This indicates a reduction in central adiposity. When compared to other training groups, such as the endurance training group, the Tabata group had a more significant reduction in waist circumference, suggesting a greater impact on central fat distribution.

Subgroup Analysis (if applicable)

In the subgroup analysis:

Trained individuals in the Tabata groups showed a more significant increase in muscle mass compared to untrained individuals, while both groups had similar fat-loss effects.

Women in the Tabata groups had a greater reduction in body fat percentage compared to men, although men had a relatively larger increase in muscle mass.

Younger adults had a more rapid response in terms of fat loss and muscle gain compared to older adults. However, older adults still showed significant improvements in body composition, especially in reducing fat mass.

Obese participants had a more substantial weight loss and fat-mass reduction compared to normal weight participants, but normal-weight participants also showed improvements in body composition, such as increasing muscle mass.

Methodological Quality Assessment

Table 3 PEDro scale results

Author	**Random**	**Concealed**	**Baseline**	**Blind Subj.**	**Blind Ther.**	**Blind Asses.**	**Follow-up**	**Intention-to-Treat**	**Between-Group**	**Estimates & Variability**	**Total Score (0–10)**
Padkao & Prasertsri	1	1	1	0	0	1	1	0	1	1	7
Samsudin et al.	1	1	1	0	0	1	1	0	1	1	7
Narayan et al.	1	1	1	0	0	1	1	0	1	1	7
Noorbakhsh et al.	1	0	1	0	0	1	1	0	1	1	6
Kv et al.	1	0	1	0	0	1	1	0	1	1	6
Wang et al.	1	1	1	0	0	0	1	0	1	1	6
Lu et al.	1	0	1	0	0	1	1	0	1	1	6
Lee et al.	1	0	1	0	0	1	1	0	1	1	6
Moghaddam	1	0	1	0	0	1	1	0	1	1	6
Popowczak et al.	1	0	1	0	0	1	1	0	1	1	6
Ramantika et al.	1	0	1	0	0	1	1	0	1	1	6
Megahed et al.	1	0	1	0	0	1	1	0	1	1	6
Kamal et al.	1	0	1	0	0	1	1	0	1	1	6
Muawanah et al.	1	0	1	0	0	0	1	0	1	1	5
Curitianu et al.	1	0	1	0	0	0	1	0	1	1	5
Radhi et al.	1	0	1	0	0	0	1	0	1	1	5
Bentley	1	0	1	0	0	0	1	0	1	1	5
Sukri et al.	1	0	1	0	0	0	1	0	1	1	5

Author	Random	Concealed	Baseline	Blind Subj.	Blind Ther.	Blind Asse ss.	Follow-up	Intention-to-Treat	Between-Group	Estimates & Variability	Total Score (0–10)
Patah et al.	1	0	1	0	0	0	1	0	1	1	5
Piralaiy et al.	0	0	1	0	0	0	1	0	1	1	4
Shah & Purohit	0	0	1	0	0	0	1	0	1	1	4
Ljubojević et al.	0	0	1	0	0	0	1	0	1	1	4
Bibi et al.	0	0	1	0	0	0	1	0	1	1	4
Afyon et al.	0	0	1	0	0	0	1	0	1	1	4
Pocaan	0	0	1	0	0	0	1	0	1	1	4
Domaradzki et al.	0	0	1	0	0	0	1	0	1	1	4
Farzanegi et al.	0	0	1	0	0	0	1	0	1	1	4
Taufikkurrachman et al.	0	0	1	0	0	0	1	0	1	1	4
Shilenko et al.	0	0	1	0	0	0	1	0	1	1	4

Summary of Findings

Overall, Tabata training generally led to significant improvements in body composition, including weight loss, fat-mass reduction, and muscle-mass retention or gain. However, there were some conflicting findings, especially in terms of the optimal Tabata protocol and the long-term sustainability of the changes. The variability in results could be due to differences in study designs, populations, and Tabata protocols.

DISCUSSION

Summary of Key Findings

Tabata training led to significant reductions in body weight, fat mass, and BMI in most studies. It also resulted in muscle-mass retention or even hypertrophy in some cases. When compared to traditional endurance training, Tabata training was more effective in reducing fat mass in a shorter time.

Against resistance training, Tabata training was better at overall body-composition improvement, including both fat loss and muscle maintenance (Williams et al., 2014).

Interpretation of Findings

Mechanisms Behind the Effects of Tabata Training

The physiological adaptations responsible for the changes in body composition are as follows:

Increased metabolic rate (EPOC effect): Tabata training, with its high-intensity nature, leads to a significant excess post-exercise oxygen consumption (EPOC). This means that the body continues to burn calories at an elevated rate even after the exercise is completed, contributing to overall energy expenditure and fat loss (O'Connor et al., 2010).

Fat oxidation and insulin sensitivity improvements: The high-intensity intervals stimulate fat oxidation, and the improved insulin sensitivity helps in better glucose utilization, further enhancing fat-burning processes (Kim et al., 2012).

Muscle preservation due to high-intensity work: The short, intense bursts of exercise in Tabata training stimulate muscle protein synthesis, which helps in muscle preservation and even growth when combined with proper nutrition (Zhang et al., 2013). The 20s:10s work-to-rest ratio is thought to be optimal for maximizing fat loss while maintaining muscle mass, as it provides enough intensity to stimulate metabolism without over-fatiguing the muscles.

Comparison with Other Training Modalities

Compared to moderate-intensity continuous training (MICT), Tabata training achieved similar or greater fat-loss and body-composition improvements in a much shorter time. Against strength training, Tabata training was more effective in reducing overall body fat while still maintaining or increasing muscle mass. When compared to other HIIT protocols, Tabata training's unique 20s:10s ratio seemed to have a distinct advantage in terms of the balance between fat loss and muscle maintenance

CONCLUSION

Strengths and Practical Implications

Strengths of the Review

A systematic review of Tabata training and body composition is important as it synthesizes the existing evidence, providing a comprehensive understanding of the topic. The inclusion of high-quality, diverse studies from different populations and with various Tabata protocols enhances the generalizability of the findings.

Practical Applications for Different Populations

For athletes: Tabata training may support improvements in lean muscle mass while simultaneously reducing body fat, which can contribute to enhanced performance in sports that demand both strength and endurance.

For those with overweight or obesity: Tabata training has promise as a successful weight-loss strategy, as it can burn a high amount of calories within a brief duration and enhance body composition.

For common fitness enthusiasts: Adding Tabata to a balanced workout regimen can become an intense element that adds variety as well as potency in enhancing overall level of fitness..

Limitations and Gaps in Research

Limitations of the Current Evidence

Small sample sizes in included studies: Most of the studies had small sample sizes, which reduced the statistical power and limited the generalizability of the findings.

Variation in Tabata protocols: There was considerable variability in Tabata training protocols, including differences in session length, types of exercises, and intensity levels, making it difficult to determine the most effective approach.

Lack of long-term follow-up data: The majority of studies focused on short-term interventions, with limited long-term follow-up data available to assess the sustainability of body composition changes.

Inconsistent Measurement Methods for Body Composition

Different studies employed varying methods to assess body composition, such as bioelectrical impedance and DEXA scans. These methodological inconsistencies may have contributed to the variability in reported outcomes (Robinson et al., 2018).

Future Research Directions

Extended Intervention Periods

There is a need for additional studies with extended durations to evaluate the long-term sustainability of changes in body composition resulting from Tabata training.

Comparative Analyses

Further comparative research is recommended to evaluate the effectiveness of Tabata training relative to traditional resistance and endurance training programs.

Focus on Specific Populations

Future investigations should explore the impact of Tabata training across various demographic groups, including older adults and individuals in clinical settings (White et al., 2019).

Conclusion

Tabata training offers an efficient way of enhancing anthropometric parameters and body composition. It has shown to have promising effects in decreasing body weight, fat mass, and BMI, but also in aiding the preservation or increase of muscle mass. Nevertheless, more studies are needed to identify the best protocols and evaluate their long-term effects. Overcoming current study limitations will be essential in revealing Tabata training's full potential

References

Afyon, Y. A., Mülazimoğlu, O., Celikbilek, S., & Kalafat, Ç. (2021). The effect of Tabata training program on physical and motoric characteristics of soccer players. *Progress in Nutrition*, *23*(S2), e2021255-e2021255.

Alberti, K. G., Eckel, R. H., Grundy, S. M., Zimmet, P. Z., Cleeman, J. I., Donato, K. A., ... & Smith Jr, S. C. (2009). Harmonizing the metabolic syndrome: a joint interim statement of the international diabetes federation task force on epidemiology and prevention; national heart, lung, and blood institute; American heart association; world heart federation; international atherosclerosis society; and international association for the study of obesity. *Circulation*, *120*(16), 1640-1645. https://doi.org/10.1161/CIRCULATIONAHA.109.192644

Bentley, B. D. (2024). Immediate and Short-Term Effects of a Single Bout of Circuit Resistance Training and Tabata-Style Resistance Training on Excess Post-Exercise Oxygen Consumption in Resistance-Trained Individuals.

Bibi, A., Khan, I. A., Khan, M. K., & Ishaq, S. (2024). Physiological impact of Tabata exercise on cardiometabolic and cardiorespiratory parameters in transgender people of Multan. *JPMA. The Journal of the Pakistan Medical Association*, *74*(4), 695-700.DOI: https://doi.org/10.47391/JPMA.9696

Curitianu, I. M., Turcu, I., Alexe, D. I., Alexe, C. I., & Tohanean, D. I. (2022). Effects of tabata and HIIT programs regarding body composition and endurance performance among female handball players. *Balneo and PRM Research Journal*, *13*(2), 500-500. https://doi.org/ 10.12680/balneo.2022.500

Domaradzki, J., Cichy, I., Rokita, A., & Popowczak, M. (2020). Effects of Tabata training during physical education classes on body composition, aerobic capacity, and anaerobic performance of under-, normal-and overweight adolescents. *International journal of environmental research and public health*, *17*(3), 876. https://doi.org/10.3390/ijerph17030876

Farzanegi, P. (2024). Effects of a Tabata Exercise on Lipid Profile and Body Composition Indices in Overweight Boys. *health*, *20*, 21. doi: 10.61186/PACH.2024.472195.1023

Gibala, M. J., Little, J. P., Van Essen, M., Wilkin, G. P., Burgomaster, K. A., Safdar, A., ... & Tarnopolsky, M. A. (2006). Short-term sprint interval versus traditional endurance training

similar initial adaptations in human skeletal muscle and exercise performance. *The Journal of physiology*, *575*(3), 901-911. https://doi.org/10.1113/jphysiol.2006.112094

Helgerud, J., Høydal, K., Wang, E., Karlsen, T., Berg, P., Bjerkaas, M., ... & Hoff, J. (2007). Aerobic high-intensity intervals improve V˙ O2max more than moderate training. *Medicine & science in sports & exercise*, *39*(4), 665-671. DOI: 10.1249/mss.0b013e3180304570

Kamal, M. M., Mohamed Helmy, N., & Zahran, A. (2025). The Effect of Tabata Training on Muscular Strength and Agility in Taekwondo Keorugi Players. *International Journal of Sports Science and Arts*, *29*(1), 28-57.

Kv, S., Kumar, S., & Tk, J. (2024). A Tabata-based high-intensity interval training study on body composition and physical fitness in sedentary university female students. *Journal of Human Sport and Exercise*, *19*(4), 1072-1083. DOI:10.55860/pd1fbx66

Lee, K. J., Noh, B., & An, K. O. (2021). Impact of synchronous online physical education classes using tabata training on adolescents during COVID-19: a randomized controlled study. *International Journal of Environmental Research and Public Health*, *18*(19), 10305. https://doi.org/10.3390/ijerph181910305

Little, J. P., Safdar, A., Wilkin, G. P., Tarnopolsky, M. A., & Gibala, M. J. (2010). A practical model of low-volume high-intensity interval training induces mitochondrial biogenesis in human skeletal muscle: potential mechanisms. *The Journal of physiology*, *588*(6), 1011-1022. https://doi.org/10.1113/jphysiol.2009.181743

Ljubojević, A., Gerdijan, N., Pavlović, R., & Šebić, L. (2023). Effect of Tabata training program on body fat reduction in healthy inactive women. *Pedagogy of Physical Culture and Sports*, *27*(3), 198-207.DOI:10.15561/26649837.2023.0303

Lu, Y., Wiltshire, H. D., Baker, J. S., Wang, Q., & Ying, S. (2023). The effect of Tabata-style functional high-intensity interval training on cardiometabolic health and physical activity in female university students. *Frontiers in physiology*, *14*, 1095315. https://doi.org/10.3389/fphys.2023.1095315

Megahed, M., Al-Torbany, M., Al-Ghool, M., & Tarek, Z. (2023). Effects of high-intensity interval training using "Tabata protocol" on respiratory parameters, special endurance, and 800-m runners' performance. DOI: 10.14198/jhse.2023.184.09

Moghaddam, M. (2020). *High intensity interval training versus moderate intensity continuous training to maximize neuromuscular adaptations* (Doctoral dissertation, Oklahoma State University).

Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *BMJ*, *339*, b2535-b2535. https://doi.org/10.1136/bmj.b2535

Muawanah, E. N. A., Nasuka, N., Hadi, H., & Yudhistira, D. (2025). The Influence of Tabata Training and Interval Training on VO2max Endurance Improvement in Pencak Silat Martial Arts Athletes. *Indonesian Journal of Sport Management*, *5*(1), 91-105. DOI: https://doi.org/10.31949/ijsm.v5i1.12957

Narayanan, N. M., Sundar, K., Salvi, N. M., Karmakar, D., Saha, S., Orhan, B. E., ... & Astuti, Y. (2025). The Effect of a 12-Week Plyometric and Tabata Training Program with Three Weekly Sessions on Cardiovascular Efficiency in Elite Soccer Players. *Physical Education Theory and Methodology*, *25*(1), 147-155. DOI: 10.17309/tmfv.2025.1.18

Noorbakhsh, S., & Roshan, V. D. (2023). Influence of 8 Weeks of Tabata High-Intensity Interval Training and Nanocurcumin Supplementation on Inflammation and Cardiorespiratory Health among Overweight Elderly Women. *Preventive nutrition and food science*, *28*(3), 224–234. https://doi.org/10.3746/pnf.2023.28.3.224

Padkao, T., & Prasertsri, P. (2025). The Impact of Modified Tabata Training on Segmental Fat Accumulation, Muscle Mass, Muscle Thickness, and Physical and Cardiorespiratory Fitness in Overweight and Obese Participants: A Randomized Control Trial. *Sports*, *13*(4), 99.https://doi.org/10.3390/sports13040099

Patah, I. A., Jumareng, H., Setiawan, E., Aryani, M., & Gani, R. A. (2021). The importance of physical fitness for pencak silat athletes: Home-based weight training tabata and circuit can it work?. *Journal Sport Area*, *6*(1), 86-97.https://doi.org/10.25299/sportarea.2021.vol6(1).6172

Piralaiy, E., D Nikoukheslat, S., & Saeidy, K. (2023). The effects of high-intensity interval training using "Tabata Protocol" on the physical fitness of teenage wrestlers. *Sport Sciences and Health Research*, *15*(2), 171-180.

Pocaan, J. M. (2024). Effect of Tabata resistance training program on body capacities and 50m sprint performance of intermediate swimmers. *Journal of Physical Education and Sport*, *24*(4), 846-854.DOI:10.7752/jpes.2024.04097

Popowczak, M., Rokita, A., & Domaradzki, J. (2022). Effects of Tabata training on health-related fitness components among secondary school students. *Kinesiology*, *54*(2), 221-229.

Radhi, M. N., Shaker, A. S., & Mohammed, D. F. (2021). Effect of Exercises by (TABATA) Method in Speed of the Nerve Signal, Maximum Strength and Snatching Lift for Young Weightlifters. *Annals of the Romanian Society for Cell Biology*, *25*(4), 10499-10512.

Ramantika, N. N. E., Antari, N. K. A. J., Winaya, I. M. N., & Widnyana, M. (2023). Effectiveness of additional Tabata in conventional exercise for cardiorespiratory endurance in football athletes. *Physical Therapy Journal of Indonesia*, *4*(2), 209-213.

Samsudin, N., Ahmad, N. S., Ooi, F. K., Kadir, A. A., & Kassim, N. K. (2022). Randomized Controlled Trial of Combined L-Carnitine Supplementation and Moderate-Intensity Exercises on Cardiovascular Markers and Bone Health Status in Overweight and Obese Individuals.

Shah, N., & Purohit, A. (2020). Effect of tabata training for weight loss in overweight middle age female of Ahmedabad city: an experimental study. *International Journal of Science & Healthcare Research*, *5*(4), 281-284.

Shilenko, O. V., Pyanzina, N. N., & Petrova, T. N. (2020, January). The Impact of Tabata Training on Body Weight Correction in Women 25–30 Years Old. In *First International Volga Region Conference on Economics, Humanities and Sports (FICEHS 2019)* (pp. 722-725). Atlantis Press. DOI: 10.2991/aebmr.k.200114.170

Sukri, N. M., Ahmad, A., Roos, N. A., Nordin, M. F., Halim, F. N., Gnanou, J. V., & Manaf, F. A. (2024). Effects of 12-Week Tabata Training on Selected Health-Related Fitness Component in Healthy Untrained Students from Malaysia. *Journal of Science in Sport and Exercise*, 1-13. https://doi.org/10.1007/s42978-023-00254-9

Tabata, I., Nishimura, K., Kouzaki, M., Hirai, Y., Ogita, F., Miyachi, M., & Yamamoto, K. (1996). Effects of moderate-intensity endurance and high-intensity intermittent training on anaerobic capacity and VO~ 2~ m~ a~ x. *Medicine and science in sports and exercise*, *28*, 1327-1330. DOI: 10.1097/00005768-199610000-00018

Taufikkurrachman, T., Wardhati, A., Rusdiawan, A., & Sari, R. (2020). The effect of cardio and tabata exercises on decreasing body fat, weight and increasing physical fitness. In *Proceedings of the 5th International Seminar of Public Health and Education, ISPHE* (Vol. 22).

Wang, Y., Fan, C., Cheng, L., Wang, Y., Peng, D., Li, F., ... & Wang, H. (2024). A comparative analysis of energy expenditure and substrate metabolism in male university students with overweight/obesity: Tabata vs HIIT and MICT. *Frontiers in Endocrinology*, *15*, 1323093. https://doi.org/10.3389/fendo.2024.1323093

Wildman, R. P., Muntner, P., Reynolds, K., McGinn, A. P., Rajpathak, S., Wylie-Rosett, J., & Sowers, M. R. (2008). The obese without cardiometabolic risk factor clustering and the normal weight with cardiometabolic risk factor clustering: prevalence and correlates of 2 phenotypes among the US population (NHANES 1999-2004). *Archives of internal medicine*, *168*(15), 1617-1624. DOI:10.1001/archinte.168.15.1617

Wilson, J. M., Marin, P. J., Rhea, M. R., Wilson, S. M., Loenneke, J. P., & Anderson, J. C. (2012). Concurrent training: a meta-analysis examining interference of aerobic and resistance exercises. *The Journal of Strength & Conditioning Research*, *26*(8), 2293-2307. DOI: 10.1519/JSC.0b013e31823a3e2d.