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EFFECT OF MODERATE INTENSITY CONTINUOUS TRAINING (MICT) ON OVERWEIGHT AND OBESITY: A COMPREHENSIVE REVIEW OF LITERATURE

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ABSTRACT

Objective: *The aim of this review is to find out the effectiveness of Moderate intensity continuous training (MICT) on overweight and obesity.*

Method: *The articles were selected from various authentic platforms like Google Scholar, PubMed and ScienceDirect. The articles were selected from the year 2017-2023. Total articles selected were around 21 and only 10 articles were selected for the study according to the inclusion and exclusion criteria.*

Results: *The effectiveness of MICT was observed among the articles with the intervention duration of majority of the articles was 12 weeks but few were 4,6,8,10 and 24 weeks respectively. MICT is an effective way to improve body composition, reduce inflammation and increases physical fitness, improving HRQOL, IWQOL, BP, Physical and mental health along with reducing body weight, lipid profile and VO2 max levels. MICT is extremely effective in reduction of liver fat, body fat, BMI, body fat%, blood glucose, DBP, visceral fat, waist circumference*

Conclusion: *In this review it was found that, in overweight or obese populations MICT was effective in weight loss and improving most health markers. For weight loss and ease of implementation MICT might be preferred.*

KEYWORDS: *Aerobic training, adolescents, adults, moderate intensity continuous training (MICT), Obesity, Overweight,*

INTRODUCTION

Obesity and overweight are described as the accumulation of too much fat in the body, which poses a health concern. This is due to an imbalance between calories consumed and calories burnt, with industrialized foods being the main culprit. Other causes of overweight and obesity include growth in physical inactivity and the sedentary lifestyle of the population.[1] According to the World Health Organization (WHO), overweight is defined as having a Body Mass Index (BMI) of 25 to 29.9, while obesity is defined as having a BMI of 30 or more. Obesity affects 36.9% of men and 38.0% of women globally. Obesity or being overweight puts people at risk for cardiovascular disease (CVD), diabetes mellitus (DM), hypertension (HTN), Alzheimer's disease, asthma, metabolic syndrome, liver steatosis, gallbladder disease, osteoarthritis (OA), obstructive sleep apnea, musculoskeletal disorders (joint and muscle pains), and cancer.[2][3] overweight and Obesity is also linked with an increased prevalence of hypertension (according to WHO 2023, increase in blood pressure is when the pressure in your blood vessels is too high (140/90 mmHg or higher), although the underlying processes of obesity-related hypertension is unknown [3].According to a recent World Obesity Federation (WOF) forecast, roughly one billion or 100 crore people worldwide will be obese by 2030, including one in every five women and one in every seven males. South and Southeast Asia are expected to see obesity rates double by 2030. This alarming trend is likely due to the swift dietary and lifestyle shifts that have swept across the region in recent years, contributing to a rise in both obesity and type 2 diabetes.[4]

Exercise is the key component for obesity treatment. Exercise therapies have proven to improve health-related quality of life (HRQOL) in individuals with chronic illness, overweight, and obesity. [5] Moderate-intensity continuous training (MICT) refers to prolonged sessions of moderate intensity exercise without rest. Physical activity has well-documented benefits for weight control, central adiposity reduction, and obesity management. Physical activity is also somewhat beneficial in lowering overall body weight (although they were less effective than a hypocaloric diet), but has a greater impact in reducing visceral obesity. [6]

METHODOLOGY

Source of evidence searched:

- Google Scholar
- PubMed
- Cochrane

Study Selection

Inclusion Criteria

- Articles were included from 2017 to 2022.
- Articles which include Moderate intensity continuous training exercise intervention were included.

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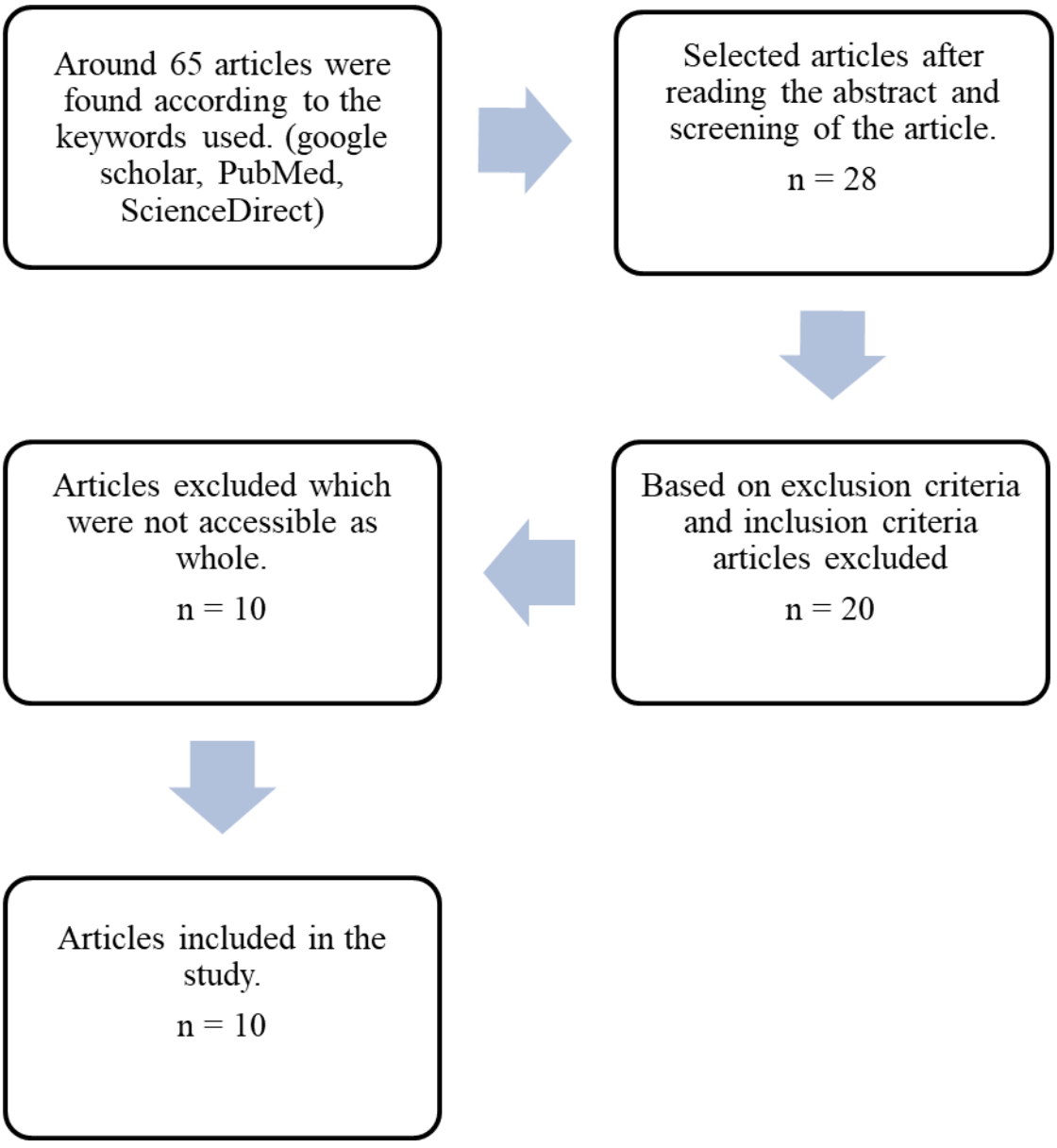
- Articles which include children (10-11 years), adolescents (12-16 years) and adults (18-60 years) of either gender (male and female) were included.
- Articles including overweight and obese population (BMI>25 kg/m^2)

Exclusion Criteria

- Articles before the year 2017.
- Impaired mental status.
- BMI< 25 kg/m^2
- MICT intervention which is less than 2 weeks

FLOW CHART



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Sl. No	Author and Year	Sam ple size	sex	Study design and Methods	Durati on of treate ment	Outcome measure	Study results	Conclusion
1.	Jarle Berge et al. (2022)	73	MF	single-center, open-label, randomized, parallel-group study. Questionnaire was used for assessing efficiency of exercise given	24-weeks	HRQOL questionnaire, SF-36 (IWQOL-Lite), Burden of obesity-specifc weight symptoms (WRSM), (VO2max).	general Health score increased in Both the groups (MICT and HIIT combined MICT (HIIT/MICT) by 11 and 13 points respectively the HRQOL and IWQOL was increased moderately in both groups and the WRMS showed moderate to strong change in both groups.	The study Concluded that There is improvement in HRQOL, IWQOL and WRMS for both the groups but combined HIIT/MICT program did not experience large improvement in general health with those who completed a clean 24-week MICT program.
2.	Jennifer L. Reed et al (2022)	135	MF	A single-centre, parallel-group ,RCT was performed and 135 CAD patients undergoing coronary revascularizа tion were randomly allocated to either HIIT, NW or MICTtwice weekly for 12 weeks.	2 times/wk for 12 weeks.	Functional capacity (6MWT), Beck Depression Inventory-II (BDI-II),(SF-36) and HeartQoL, Anthropometrics and hemodynamics were also measured.	NW had a higher increase in 6MWT distance (m) compared to HIIT and MICT .BDI-II scores improved considerably Significant improvemen ts in SF-36 and HeartQoL scores were seen HIIT, NW, and MICT	The study concluded that all 3 of the exercise programmes (HIIT, NW, MICT) were effective in enhancing physical and mental health for CAD patients. NW significantly improved functional capacity, which is a predictor of future cardiovascular events.
3.	Mousa Khalaf et al. (2021)	333	MF	Systematic Reviews and Meta-analyses of 10 studies with total of 333 participants were analysed from databases of PubMed, Scopus, Web of Science and the Cochrane.	Data taken upto Octob er 2022	Rate of perceived exertion (RPE) or Borg; ≥80–85% VO2max or VO2peck or HRreserve or HRmax	10 studies involving 2 groups HIIT vs. Control or HIIT vs. (MICT) shows HIIT was helpful for reduction in liver fat when directly compared HIIT and CON However, when compared to MICT there was no evidence for an effect of High intensity exercise on liver fat	The authors concluded that MICT is useful in liver fat reduction whereas HIIT had not much effect than MICT on liver fat levels. HIIT can reduce liver fat in overweight and obese persons with metabolic problems despite no weight loss.

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4.	Meng Cao et al. (2021)	325	MF	meta-analysis of randomized controlled trials (RCTs) The population were overweight and/or obese children and adolescents.	Upto Augus t 2021	body composition (BM, BMI, BF%, WC) cardiorespiratory fitness (VO2max, includes yo-yo test distance) blood pressure (SBP and DBP), lipid profile (TG, TC, HDL-C, LDL-C), glucose markers (BG, BI, HOMA-IR)	HIIT had a more positive effect on cardiorespiratory fitness and SBP than MICT However, there was no significant difference in weight, BMI, visceral fat percentage, diastolic blood pressure, or blood sugar levels between two groups.	The authors concluded that both HIIT and MICT had same effect on body weight, BMI, body fat percentage, diastolic blood pressure, or blood glucose levels authors also conclude that HIIT is a safe and effective way to improve cardiorespiratory fitness and systolic blood pressure in obese children and adolescents.
5.	Babak Hoosh mand Mogha dam et al. (2021)	45	F	A three-arm randomizd controlled trial. The study included 45 overweight/ob ese breast cancer survivors who had survived Brest cancer (stage I, II, or III at the time of diagnosis), The HIIT group trained for 30 minutes, 3 times/week for 12 weeks. The control group did not participate in any exercise.	July 2019 to Nove mber 2019	Primary outcome measure was change in body composition. Secondary outcome measures included inflammatory markers, physical fitness markers and QOL.	substantial decreases in serum concentrations of IL6, TNF, and leptin within the intervention group. there was no changes in IL-8 serum from pre to post trial in any of the 3 groups. None of the group showed any significant changes in LM.	Both HIIT and MICT is an effective way to improve body composition, reduce inflammation, and improve physical Fitness in overweight/obese breast cancer survivors, with HIIT having slightely more effictiveness.
6.	Andrea D'Amur i et al. (2021)	32	MF	The study design is a randomised, single-blind, single-center ,parallel group study. subjects were randomised and trained with isoenergetic treadmill exercises for 12 weeks.	12 weeks	The primary outcome measure was to decrease body weight, while secondary outcome include changes in body composition, BP, lipid profile, glycemia, insulin, and VO2 peak.	MICT and HIIT had similar effects on weight loss, fat Mass, fat free mass, DBP and low-density lipoprotein, cholesterol Significant differences were seen between groups in VO2peak and session duration There was no significant change in SBP, HDL cholesterol, triglycerides, glycemia, or	HIIT and MICT both improved cardiovascular risk factors in obese adults, but HIIT led to a faster increase in cardiorespiratory fitness.

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							plasma insulin levels.	
7.	Marlee n A. van Baak et al. (2021)	66	MF	A Systematic review and meta-analyses were done from 4 electronic databases (PubMed, Web of Science, Cochrane Library, and EMBASE)	2-70 week (media n 12 week)	VO2max, 12MWT, GPAQ, walking speed.	Articles were included if (>18 years, (BMI ≥ 25 to ≥ 30 kg/m2) The 66 studies included 3954 participants, with sample sizes ranging from 12 to 464. Training durations ranged from 2 to 70 week And aged from 20 to 75 years ,with baseline BMIs ranging from 26.4 to 37.2 kg/m2 and VO2max ranging from 14.9 to 39.7 ml/min/kg	The study concluded that all form of training (aerobic (MICT), resistance, combined aerobic and resistance, and high-intensity interval training) increases the VO2 max levels and physical fitness level. for the most beneficial exercise programmes combined aerobic training and high-intensity interval training. To improve muscle strength, include resistance exercise in your training programme for better outcome.
8.	Oppert, J. *et al.* (2021)	7	MF	Systematic reviews and meta-analyses was performed, priori defined research questions (Q1 to Q7) were addressed.	January 2010 to Decem ber 2019.	Vo2max	A moderate-int ensity aerobic exercise programme is recommende d for weight loss, visceral fat reduction, and BP Exercise programmes improve calorie intake, quality of life, and psychological well-being.	The research mainly concluded that the moderate-intensity aerobic exercise regimen is indicated for weight loss, visceral fat reduction, and blood pressure control. The expected weight loss ranges from 2 to 3 kg. To retain lean mass while losing weight, a resistance exercise regimen of moderate to high intensity is recommended.
9.	Bellich a A, van Baak MA, et al. (2021)	149	MF	3 electronic databases were searched for SRMA.	betwee n 2010 to Decem ber 2019	weight loss, fat loss, visceral fat loss.	Exercise resulted in considerable weight loss, fat loss, and visceral fat reduction. Both aerobic and high-intensit y interval training resulted in similar weight, fat, and visceral loss when energy expenditure was equivalent.	The authors concluded that MICT, HIIT, aerobic and resistance all of these improves body weight and composition in overweight or obese adults. Although the impact on weight and fat loss is minimal (just a few kilogrammes), reducing visceral fat is expected to improve cardiometabolic health in these patients. Visceral fat loss can occur even if participants lose little or no weight.

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10.	Poon ET-C, Wongpi pit W et al (2021)	492	MF	A Randomized controlled trials (RCTs) was performed. healthy men and women aged 40 years or above, training programs had to last at least 2 weeks	Minim um 2 weeks	VO2 max	Interval training and MICT resulted in significant improvemen ts in VO2max (mL/kg/min) Interval training resulted in a considerably higher increase in VO2max compared to other modalities of training	The author concluded that Interval training and moderate-intensity continuous training (MICT) significantly improved cardiorespiratory fitness in middle-aged and older adults. High-intensity interval training (HIIT) and sprint interval training (SIT) increased maximum oxygen consumption (VO2max) more than MICT.

DISCUSSION

Physical activity has well-documented benefits for weight control/reduction, reduction in central adiposity, and obesity management and is also helpful in lowering overall body weight, liver fat, cardiovascular disease (CVD), and the onset of non-alcoholic fatty liver disease[6] Moderate-intensity continuous training (MICT) is a type of exercise training which has prolonged sessions of moderate intensity exercise without rest and is a typical approach for treating obesity that requires at least 150 minutes of moderate-intensity (40-60% VO2 max) exercise. [6]

several studies show that MICT is effective in improving body composition , weight loss, loss of adipose tissue, loss of body fat, decrease in blood pressure, decrease in BMI, improvement in VO2 max, improves physical and mental health, reduction in blood glucose level and reduction in inflammation [10][11]
several studies show that HIIT improves the cardiorespiratory fitness effectively and largely compared to MICT mainly when talking about VO2 max[10] and HIIT can be a time-efficient component for weight management programmes. [11] along with it it takes 9.7 minutes less time per session. [10] HIIT also effectively reduced blood pressure (BP) by approximately 3-5 mmHg[8] HIIT may be more beneficial than MICT in enhancing endothelial function in hypertensive MS patients. [7]

The findings of the literature review have significant ramifications for methods used to treat and prevent obesity and overweight by performing MICT exercise regime. If aiming to reduce the body weight and body composition variables MICT should be considered as it is easy to perform and has no complications as when HIIT is performed, but if also aiming to improve the cardiorespiratory fitness effectively and to be time efficient in weight loss management program then HIIT should be considered.

CONCLUSION

The review of literature emphasises the remarkable prevalence and consequences of overweight and obesity, with a range of investigations. Research conducted globally has repeatedly demonstrated that MICT is efficient and useful in weight loss, and other body composition components among people who are overweight or obese thus, targeted interventions are required to address this problem. Several studies have identified the importance of MICT in weight loss and prevention of obesity along with other intervention's which increases the effectiveness of the intervention.

There is a need for a comprehensive approach to Obesity and overweight due to its prevalence. By addressing this epidemic and taking steps towards the prevention the general well-being of an individual may be enhanced.

Conflict of Interest

The authors state no conflict of interest.

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