

# Analysis of Intermittent Fasting on the Reduction of Body Fat Compared to Total Weight Loss in the Treatment of Obesity: **Systematic Review**

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# What is Intermittent Fasting?

Intermittent Fasting is an eating pattern not a diet. Where an individual will alternate between periods of eating and fasting.

A common type of intermittent fasting involves not eating for 16 hours and feeding for an 8 hour window on a daily basis. This is referred to the 16:8.

- No consumption of food from the previous day at 8pm until next day at 12pm. (fasting period)
- During fasting period able to drink water, black coffee, and black tea.



**Yellow:** Fast 20:00 to 12:00 (16 hours)

**Green:** Feed 12:00 to 20:00 (8 hours)



# Common Types of Intermittent Fasting

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The 16/8 Method: Fast for 16 hours each day, for example by only eating between noon and 8pm.

Eat-Stop-Eat: Once or twice a week, don't eat anything from dinner one day, until dinner the next day (a 24 hour fast).

The 5:2 Diet: During 2 days of the week, eat only about 500–600 calories.

ADF: Alternate day fasting, don't eat for 24 hours (1 day) followed by a fed day with no intermittent fasting.



# Terminology

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Time restricted feeding: consume food only during a specific time period/window

Intermittent energy restriction: an eating pattern that consists of intermittent fasting and the consumption of energy (calories) at a reduced daily amount based on the individual's body energy requirements

Continuous energy restriction: consumption of a reduced amount of calories based on the individual's body energy requirements



# Objective

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To review and distinguish the type of weight loss individuals sustained while following an intermittent fasting regimen.

Based on results of weight loss, determine if intermittent fasting is an effective treatment for obesity and other co-morbidities related to obesity.

Is there a difference in the type of weight loss participants experienced. For example, adipose tissue loss versus lean muscle loss.

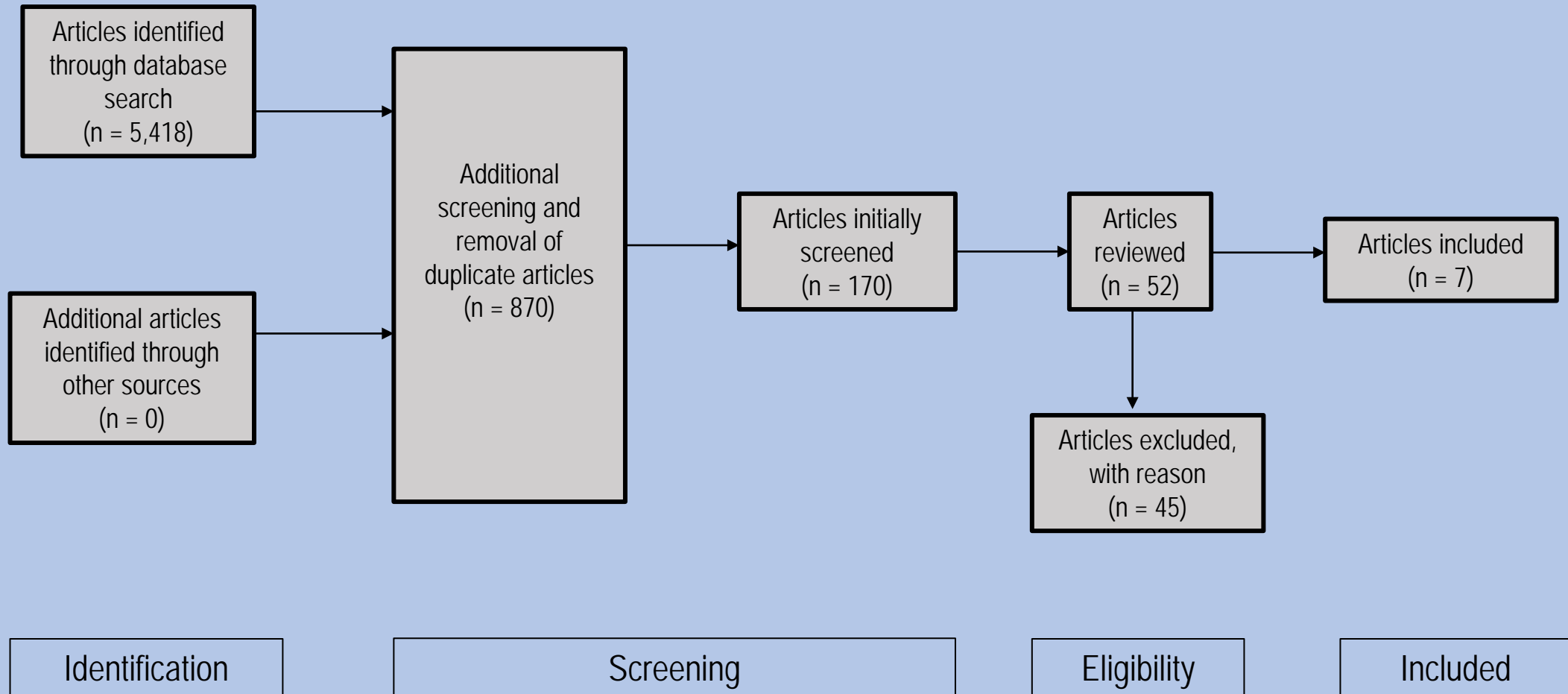
# Methods

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## Inclusion Criteria:

- Men and/or women over the age of 25
- Men and/or women in North America (Canada and the United States of America)
- Individuals with a Body Mass Index minimum of 30
- Individuals must have followed an intermittent fasting regimen for a minimum of 30 days

# Methods



# Characteristics of included studies

Author (Year) [ref]	Study Design	Participants	Trial Duration	N	Study Groups	BMI (kg/m <sup>2</sup> )	Weight Loss	FFM
Coutinho (2018) [9]	RCT	35 adults (age 39 ± 9)  BMI: 36 ± 4 kg/m <sup>2</sup>	12 weeks	18  17	IER: 33% daily calorie reduction  CER: 33% daily calorie reduction	BMI 32 ± 4 kg/m <sup>2</sup>	12.5% loss in both study groups compared to control	N/A
Gabel (2018) [16]	RCT	23 adults  BMI between 30 and 45 kg/m <sup>2</sup>  Age between 25 and 65	12 weeks	23  23	TRF: eat ad libitum from 10:00 to 18:00h daily and fast from 18:00 to 10:00h daily. No restriction on 8-h feeding window in types or quantities of food consumed. Fasting period only able to consume water, black tea, black coffee and diet-sodas  Control: Instructed to maintain weight throughout the trial, not to change eating or exercise habits	BMI 34 ± 1 kg/m <sup>2</sup>	3% weight loss compared to control group	Unchanged lean muscle mass (fat mass decreased ± 2)



Author (Year) [ref]	Study Design	Participants	Trial Duration	N	Study Groups	BMI (kg/m <sup>2</sup> )	Weight Loss	FFM
Hutchinson (2019) [28]	RCT	88 Women  Age: 50 ± 1 year  BMI: 32.3 ± 0.5 kg/m <sup>2</sup>		22  22  22  22	IF70: fasted for 24 hours after breakfast on three consecutive days per week. Fed days consumed 70% of daily caloric needs.  IF100: fasted for 24 hours after breakfast on three consecutive days per week. Fed days consumed 100% of caloric daily needs  DR70: continuous diet restriction, consuming 70% daily caloric needs  Control		-7.9 to -4.8 kg For both IF groups. (3.1%)  -6.9 to -4.4 kg (2.5%)	Unchanged between IF and DR groups
Kalam (2019) [42]	RCT	31 Adults with obesity BMI: 30.0 to 49.9 kg/m <sup>2</sup> Age: 48 ± 2 years	6 months (3 months weight loss followed by 3 months of weight maintenance)	31	ADF with low-carbohydrate diet (30% carbohydrates, 35% protein, and 35% fat)  No control group		-4.0% body weight	unchanged
Smith (2017) [43]	RCT	27 Post-menopausal women with obesity	Over 20 weeks	10  10  7	Weight loss group, consumed hypocaloric diet containing 0.8g/kg body weight per day  Weight loss, high protein diet group, consumed hypocaloric diet containing 1.2g protein/kg body weight per day  Weight maintenance control group		-10% of initial body weight  -10% of initial body weight	Contribution of FFM to total weight loss was less 45% in the weight loss high protein group compared to the weight loss group

Author (Year) [ref]	Study Design	Participants	Trial Duration	N	Study Groups	BMI (kg/m <sup>2</sup> )	Weight Loss	FFM
Vardy (2015) [41]	RCT	29 women	10 weeks	15	ADF with low fat diet	34.4 ± 0.8 baseline to 32.7 ± 0.7 end of week 10	-4.3 ± 3.0 kg	
				14	ADF with high fat diet	Same as ADF with low fat diet	Same as ADF with low fat diet	
Zuo (2016) [45]	RCT	40 obese adults Men = 21 Women = 19	12-week weight loss		Phase 1: 12-week high protein, intermittent fasting, low-calorie weight loss diet comparing men and women  Phase 2: 1-year maintenance comparing high protein intermittent fasting with heart healthy diet		Phase 1: -5.2%  Phase 2: regain 1.5%	

RCT, Randomized control trial; BMI, body mass index; IER, intermittent energy restriction; CER, continuous energy restriction; TRF, time restricted feeding; IF70, intermittent fasting 70% daily caloric needs; IF100, intermittent fasting 100% daily caloric needs; DR70, dietary restriction 70% daily caloric needs; ADF, alternate day fasting.

# Results

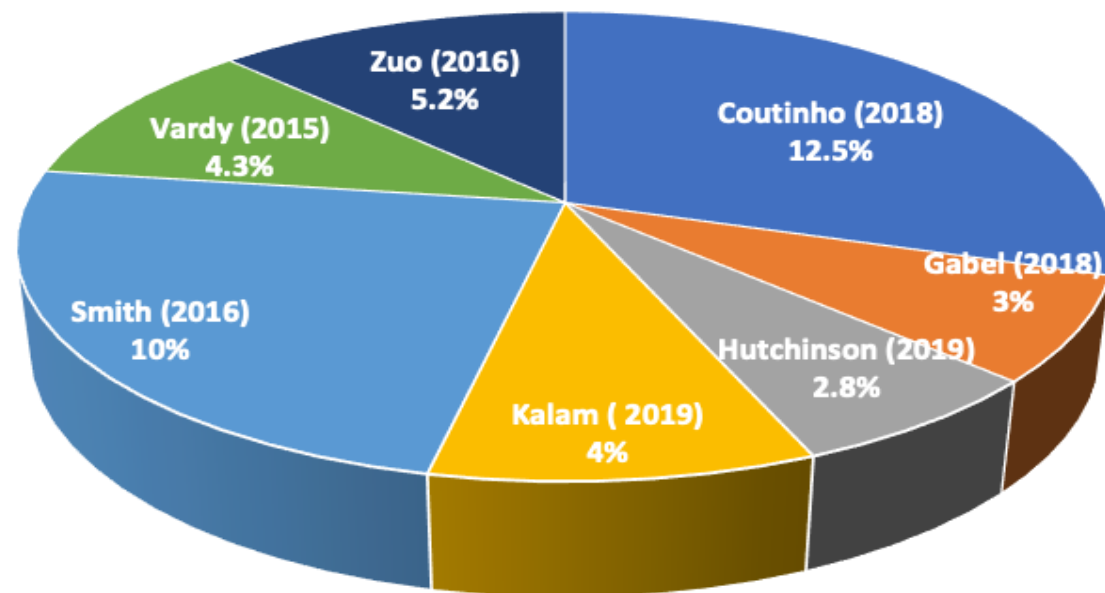
Studies reported weight loss by measuring body mass index (BMI), waist circumference and total body weight by digital scale at the start, midpoint and end of the trials

Two of the seven trials conducted differentiated the type of weight loss participants experienced by reporting their fat free mass (lean muscle mass) and adipose tissue by using the dual energy X-ray absorptiometry (Smith et al., 2017; Kalam et al., 2019)

Zuo et al of 2016, which reported their male participants had a decrease in BMI of 6.1% and female participants had a decrease in BMI of 4.3%

# Results

Body Weight Loss %





# Study Limitations

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Majority of the trials did not differentiate the difference between the type of weight loss.

Five of the seven studies did not specify if the weight loss achieved by the participants was lean muscle or adipose tissue.

Several studies refer to RCT conducted prior to 2015. Suggesting there is a need for newer up to date studies.

# Future Research



None of the trials included involved an exercise program or regime.

Studies/Trials to investigate the impacts of intermittent fasting along with exercise and caloric restriction and the benefits on obesity

Additional research into intermittent fasting and benefits of this eating pattern in years to come. The long-term impacts on obesity, weight maintenance, hormones, diabetes, and cardiovascular diseases. The ideas and combinations are endless.



# Conclusion

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Weight loss was achieved in all of the studies, in addition some participants displayed a decreased systolic blood pressure, decreased BMI, decreased diastolic blood pressure, decreased HR, decreased waist circumference and re-gain of weight lost.

There is positive health correlation between weight loss and intermittent fasting.

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# Analysis of Intermittent Fasting on the Reduction of Body Fat Compared to Total Weight Loss in the Treatment of Obesity: A Systematic Review

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## Introduction

The cultural and societal stigma of being overweight or obese, has pushed people worldwide towards an interest in figuring out which diet plan works by guaranteeing them a loss of weight. However, because of misconceptions, confusing fads, unnecessary weight loss regimens that don't adhere to the basic sciences of diet and nutrition, the journey to lose weight in fat is often abandoned or ends up with unsatisfactory results [1].

One simple method that has been practiced for many years is intermittent fasting. Diet interventions are aimed to shift the energy balance towards negative by either decreasing caloric intake and/or increasing physical activity have shown to be effective for weight loss. This paper will be investigating the effects of dieting during IF. Diets ranged from a reduced caloric intake, a high protein diet, a low carbohydrate diet, a low protein diet, and a high fat diet within a short time frame. The basic premise involves taking periodic breaks from eating. This can be achieved within a period of 8, 16 or 24 hours on either alternate days or consecutive days. This allows someone to sway between a fed and fasted cycle thus shifting the body is using fats as a reliable source of energy.

Short-term intervention studies have shown that intermittent fasting can reduce body weight and fat mass, fasting glucose and insulin levels, and improve insulin sensitivity and lipid profiles. Glucose is the primary energy source for most tissues during the day. Fatty acids (FA) serve as an alternative fuel source for the most metabolically active organs. This includes the muscles, liver, and brain and rise overnight during fasting. The fed-fast cycle is compromised four stages: the fed state, the post-absorptive and early fasting state, the fasting state, and the starvation or long-term fast state[3]. The metabolic switch from glucose to fatty acid-derived ketones, shifts metabolism from lipid/cholesterol synthesis and fat storage to mobilization of fat through fatty acid oxidation and fatty-acid derived ketones. The mechanism helps preserve muscle mass and function, while reducing fat content. The metabolic switch occurs in the third phase of fasting when glycogen stores in hepatocytes are depleted and adipose tissue lipolysis accelerates. This produces increased fatty acids and glycerol[4]. Protocols that are characterised by severe energy restriction or large energy expenditure such as IF may induce greater physiological changes and/or further stimulate already maximal adaptation rates. The focus in this study is to see the alteration of IF when it comes to weight loss and overall body composition. IF protocol, duration, and baseline characteristics of the sample population will determine how much the average individual will experience change in just the 30 day period. We hope to see that after reviewing multiple studies where placing time restrictions on feeding triggered mechanisms that produce caloric restriction effect and result in a significant different of body composition.



**Yellow:** Fast 20:00 to 12:00 (16 hours)  
**Green:** Feed 12:00 to 20:00 (8 hours)

## Results



A total of 7 articles were selected based on the inclusion criteria noted in the Methods section. All 7 peer-reviewed scholarly articles were randomized control trials (RCT). The review was conducted to determine if there was a significant difference between adipose tissue loss and the loss of lean muscle mass when participants partook in some degree of intermittent fasting.

Majority of the trials did not differentiate the difference between the type of weight loss. Five of the seven studies did not specify if the weight loss achieved by the participants was lean muscle or adipose tissue.

Similarly, the studies reported weight loss by measuring body mass index (BMI), waist circumference and total body weight by digital scale at the start, midpoint and end of the trials (Coutinho et al., 2018; Gabel et al., 2018; Hutchinson et al., 2019; Vardy et al., 2015; and Zuo et al., 2016). Refer to Table 1, for overview of characteristics of the included studies.

The preservation of lean muscle mass supports weight loss. The more lean muscle mass an individual has contributes to the increased number of calories an individual is able to burn while at rest, allowing individuals to maintain a healthier weight and reduce the negative impacts associated with the accumulation of excess adipose tissue. The results obtained in all of the studies are warranted to a full discussion as to what interventions worked in helping participants achieve success to the interventions that simply did not produce the results desired.

## Conclusion

To achieve successful weight loss and sustain it over time, it is always recommended that you also include changes in lifestyle behavior; and implement a diet that is calorie restricted and enhances dietary quality; and an increase in energy expenditure. Furthermore, the successful treatment of overweight and obesity does require adjuvant therapeutics such as exercise, unless more extreme measures such as bariatric surgery is indicated. Although none of the studies in cooperated exercise, it is a proven formula that works when combined with restricted calories in a certain number of hours per day.

Regarding dietary interventions for weight loss, an individualized diet that achieves a state of negative energy balance should be recommended. Diets are usually based on the inclusion or exclusion of different foods or food groups (religion, tolerance and personal preference should be considered); diets that manipulate macronutrient content (this was used in some of the studies reviewed where participants utilized a high protein, low carb option) and diets that manipulate time (this was the purpose of the research to prove that fasting was effective).

In the short term, diets and intermittent fasting promote different degrees of success, but in the long term, the small differences do not instill confidence for recommending one diet over another. The number of unanswered questions remains large. Why do some individuals experience successful weight loss, whereas others are more resistant to losing weight? How do different diets change hormonal secretion, gut microbiome composition, and gene expression? How do these changes regulate appetite and energy expenditure? In the future, further investigation into these factors might allow us to indicate the most successful diet for each individual.

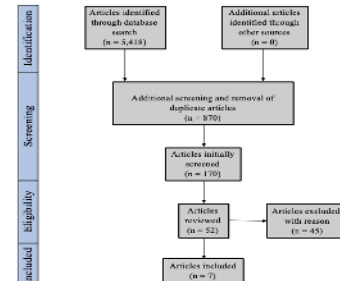
Our limited knowledge allows us to conclude that there is no one optimally effective manipulation of diet or intermittent fasting for all individuals to lose weight. In the short term, diets based on high protein low carbohydrate or fasting might be considered as a jump start. In the long term, diets that prescribe high quality foods should be encouraged and a sustainable form of intermittent fasting. Finally, the fundamental point is to adopt a diet that creates a balance and is based on adequate food quality and moderation to promote health. Adherence and consistency will predict long term success.

## Materials and methods

### Method

The information gathered in this research article was contributed by several members of the research group. Whom of which separately gathered other published articles that met specific parameters of the aforementioned hypothesis. The sources used to gather the articles were mainly Pubmed and Google scholars. The main search terms were intermittent fasting, weight loss and diet. Approximately fifty two articles were reviewed and chosen to prove the effects of intermittent fasting on the body. From the fifty two articles there were inclusion and exclusion factors. Only seven had all of the required information to be associated with the presented hypothesis.

The inclusion parameters that had to be met were the volunteers BMI being thirty and above starting out and at least twenty five years of age. Automatically any article that included animal trials were eliminated from review. The research had to be conducted in the last five years and the study had to be conducted in the United States. No experiments were performed in part for this research, none any surveys conducted.



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