

Intermittent Fasting versus Calorie Defect Approach in Losing Weight: A Systematic Review

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ABSTRACT

Background: Calorie restriction (CR) is the gold standard of treatment for treating overweight and obesity. Although this method results in only moderate weight reduction, weight rebound is frequent and CR adherence gradually deteriorates over time. IMF, or intermittent fasting, is a different nutritional approach, reduces calorie consumption. The study's objective is to assess the efficacy of continuous calorie restriction (CCR) with intermittent fasting in treating overweight and obese individuals.

Methods: To find the pertinent literature, PubMed, Web of Science, Science Direct, Cochrane Library, and Google Scholar were exhaustively searched. The Rayyan QRCI was applied throughout this methodical procedure.

Results: our review included eight studies with parameters including body mass index (BMI), age, insulin resistance, eating behavior and sleep quality. The studies investigated the role of intermittent fasting compared to the role of calorie restriction in losing weight.

Conclusion: Our findings imply that CR positively improves metabolic parameters, assisting individuals who are insulin resistant and pre-diabetic. Additionally, IMF can improve health and cellular resilience to illness without calorie restriction and without causing weight loss. In terms of BMI, there was no discernible difference between IMF and CR. These results imply that IMF could be effective like CR for weight reduction.

Keyword: Intermittent Fasting; Calorie Restriction; Energy Control; BMI, Insulin Resistance, Weight Loss.

Introduction

Globally, Obesity has developed as a major public health concern [1]. Creating an energy deficit with calorie restriction (CR), higher energy expenditure or a hybrid of the two advised in guidelines in order to treat obesity and obesity in the broader public. Given that long-term dietary modifications are required for maintained weight loss, the entire benefit of weight loss diets is dependent on factors other than weight loss, but also nutritional content [2].

Diet that are healthy and adhere to dietary recommendations lower the risk of chronic illnesses linked to a sedentary lifestyle while still providing all the necessary nutrients [3]. Systematic reviews and meta-analyses published recently a number of prospective cohort studies have been conducted revealed a link between high-quality diets and decreased risks of type 2 diabetes, cancer, cardiovascular disease, and all-cause death [4].

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Concentrating on nutritional quality while also trying to lose weight might have beneficial implications on one's overall health [5]. The standard therapy for treating obesity is calorie restriction, which often results in moderate (5-10%) weight reduction and short-term (26 weeks) [6]. Daily calorie restriction (DCR) on the other hand adherence declines noticeably with time, and many people recover considerable weight within a year [7]. Caloric restriction (CR) is characterized as a continuous daily calorie decrease. Multiple factors, such as biological (such as hormonal changes), behavioral (such as increased caloric intake), psychological (such as heightened food reward), and environmental (such as the prevalence of high-calorie foods), might contribute to the difficulty of maintaining weight reduction over time. Additional strategies are required to increase adherence for individuals unable or unwilling to follow the CR diet plan [8]. It has become evident that no one dietary strategy can result in weight reduction in all people, and the optimal nutritional strategy for a certain person is one they can maintain over time [9]. Therefore, innovative nutritional treatments are required to provide a variety of evidence-based treatment alternatives for obesity [10]. For lowering calorie consumption, a different approach called Intermittent fasting (IMF) is followed. IMF is becoming more popular as a weight management treatment. IMF is characterized as an energy restriction of more than 60% on two to three days every week or every other day [11]. The IMF might be a tempting technique since people do not have to track and control their caloric intake every day, as well as the cyclical scenery of fasting may help to alleviate DCR-related persistent hunger. The IMF paradigm in mice involves every other day feeding with no calorie restriction [12]. A month-long intermittent fast during Ramadan provides a great IMF model, despite the fact that there is no universally accepted and well-established IMF model in humans. Every year, depending on the season, Muslims fast for about 15 hours during the day and eat whenever they choose without calorie restriction throughout the whole month of Ramadan. Ramadan fasting causes several physiological changes that are probably brought on by the altered eating and sleeping schedules. Many civilizations have acknowledged the benefits of limiting food consumption for a while, whether out of religious observance or in times of scarcity of food, on health and lifespan [13]. Despite the fact that multiple IMF has recently been studied as a weight reduction strategy. Here be various disadvantages that make it difficult to determine to what degree IMF is a long-lasting approach for treating obesity. These restrictions include the absence of DCR management

at the highest level of care and an inability to follow through on behavioral support or physical activity (PA) recommendations as required by obesity treatment guidelines. A diet with a somewhat low caloric intake, more physical exercise, and behavioral assistance are the main components of the high-intensity, comprehensive behavioral weight loss intervention that is recommended by current guidelines for treating obesity. This intervention should be all persons with a BMI of less than 25 kg/m² are eligible for individual or group counseling sessions with a trained interventionist [11]. Trepanowski as well as co. The researchers looked at the effects of DCR vs. ADF vs. a no-intervention control on weight reduction after 52 weeks in 100 persons with diabetes who were obese or overweight (18-64 years old, BMI 25-40 kg/m², 86% female). The DCR regimen recommended taking 75% of the calories needed to maintain weight in weeks 0–26 and 100% in weeks 27–52. During the weight loss phase (weeks 0-26), On fast days, the ADF technique recommended employing 25% of the baseline energy needs and 125% of the baseline EI on alternate "feast" days. Following that, on fast days, 50% of baseline energy requirements are met, and on non-fast days, 150% of baseline energy requirements are met. Energy needs change on alternate "feast" days throughout the weight maintenance period (weeks 27-52). In comparison to those in the control group, individuals in the DCR and ADF saw similar mean weight reduction at weeks 26 (6.8% in DCR compared to 6.8% in ADF) and 52 (5.3% in DCR compared to 6.0% in ADF). The ADF group had a higher dropout rate (DCR was 29%, ADF was 38%, and control was 26%), which raises questions regarding the long-term tolerability of ADF. Additionally, individuals in DCR and ADF received all meals and no behavioral weight loss support during the first 13 weeks of the research intervention, which limits the study's generalizability. Additionally, participants were told not to alter their PA, which is inconsistent with the most recent recommendations for treating obesity. Members of the ADF group were advised to consume 150% of their daily calorie requirements. This might have resulted in increased attrition throughout the weight maintenance period (weeks 27-52). Furthermore, this study only included a 26-week weight loss phase [14]. We evaluated the consequences of IMF in our systemic review Against the CR strategy to weight loss.

Methods

The PRISMA acronym stands for Preferred Reporting Items for Systematic Reviews and Meta-Analyses. The criteria were followed in this systematic review. Study Design also Duration: This systematic review was carried out in August 2023.

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Strategy for searching: A thorough search was undertaken in five major databases, including Google Scholar, Web of Science, PubMed, Science Direct, and EBSCO, to find the pertinent studies. Our search was restricted to English. We also considered the unique requirements of each database. In order to discover relevant research, the next keywords were changed into terms for PubMed Mesh: "Sickle cell, Malaria, Plasmodium falciparum, Hemoglobin." To match the key phrases, the Boolean operators "OR" and "AND" were applied. Publicly accessible articles, human trials, and publications the search results met everything in English.

Choice criteria

Inclusion criteria: For this review, we took consideration of the following factors:

- Any research compare between intermittent fasting and calorie defect approach in losing weight.
- There were no restrictions on age.
- Accessible, free articles.

Exclusion criteria:

- We excluded papers with faulty research methods or significant statistical mistakes, and restricted access to the entire text.
- Case reports, letters to the editors, and conflict resolutions were not accepted.
- Languages other than English.

Extraction of information: Rayyan (QCRI) was used to detect duplicates in the search strategy's output. The researchers filtered the combined search results using a set of inclusion/exclusion criteria for determining the relevance of the titles and abstracts. Each paper that meets the requirements for inclusion has been examined carefully by the reviewers. The writers presented additional methods for resolving disputes after serious thought. The authors were able to get information on the studies' titles, authors, research year, country, participants, gender, diagnostic tool, main findings, and conclusion.

Method for synthesising data: To give a qualitative summary of the research's results and main elements, Utilizing information from pertinent studies, summary tables were created. Once the data from the systematic review was retrieved, It was established what was the most effective strategy to use the data from the included study papers.

Assessment of the risk of bias: The included studies' quality was evaluated using the ROBINS-I risk of bias assessment technique for non-randomized trials of therapies. Confounding factors, participant selection in study, Intervention categorization, variations from intended interventions the seven themes that were reviewed were missing data, outcome appraisal, and choice of reported result.

Results

Search outcomes: After removing 53 duplicates, the systematic search yielded 360 study publications in total. 307 articles were screened for title and abstract; there were 270 research projects left, and 190 were rejected. Only 22 of the 80 reports sought for retrieval were unable to be located. Finally, 30 papers were evaluated for full-text review, 15 were disqualified because the study results were erroneous, and 5 were dismissed because the population type was inappropriate. This systematic review included eight relevant research publications. (Figure 1) depicts a high-level overview of the study selection process.

Characteristics of the research included: (Table 1) outlines the socio-demographic features of the studies evaluated. The systematic review included 8 studies. Six of them are randomized trails [16, 18- 22], and one is Interventional [15]. The average age of the participants was from 18 to 70 years old which observed the relationship with adults [15- 22]. The body mass index included in these studies was between 25 to 45 kg/m² [15, 16, 17, 19, 20, 21, 22]. The period of study was variable, some studies had long duration [15, 16, 19, 21, 22], and others had short time [18, 20]. (Table 2) highlights the clinical aspects of the trials covered. We included 8 studies that investigated the role of intermittent fasting compared to calorie defect in weight loss [15-22]. Two of these studies compared the effect of CR and IMF on human health, sleep quality and nutritional habits [21, 17]. Three studies used the comparison between CR and IMF to prove that CR has good impact on the metabolic parameters and IMF is good with improving cellular resistance [15, 20, 22]. A study added that IMF impact on energy balance [16], on the other hand the two approaches showed the same effect in losing weight and fat mass.

Discussion

Although CR-based weight reduction therapies provide minor weight loss effectiveness there is significant inter-individual variation in the near term. In weight reduction, as well as poor long-term weight loss maintenance. To provide people looking to lose weight a variety of evidence-based alternatives, Long-term success in energy restriction requires evidence-based dietary approaches, and intermittent fasting (IMF) may be a healthy dietary strategy for assisting more individuals in losing weight and improving their metabolic health. [16]. Food quality improvements may be crucial for enhancing long-term health and decreasing the risk of lifestyle diseases illnesses, in addition to the advantages found with weight reduction [23].

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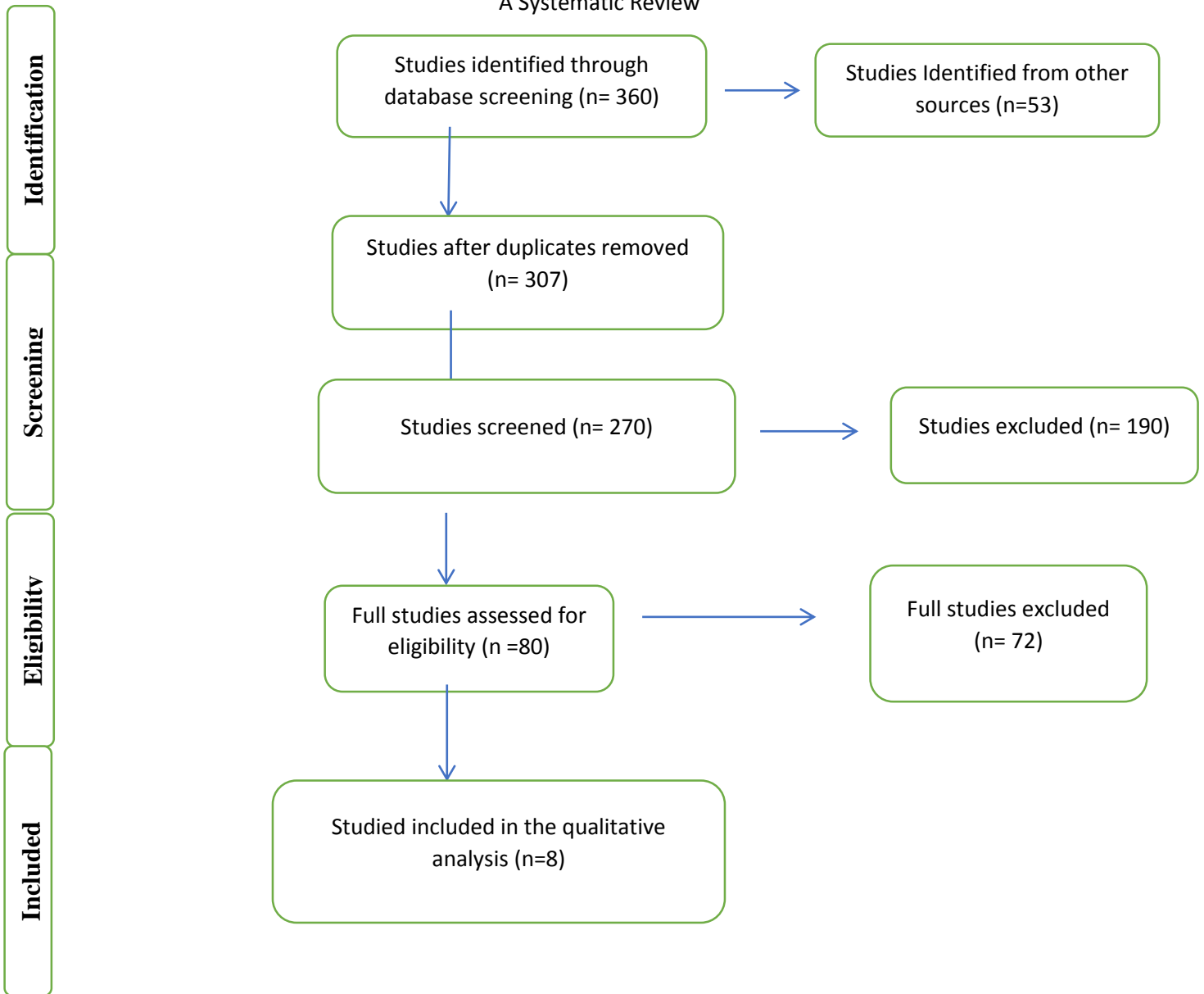


Figure (1): PRISMA flowchart summarizes the study selection process.

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Table (1): Socio-demographic characteristics of the included participants.

Study	Study design	Period of study	Participants	Age range	Gender	Body mass index
Aksungar, F B et al. 2017 [15]	Single-arm Interventional Human Study	2 years	23	28-42years	100% females	29-39
Ostendorf, Danielle M et al. 2022 [16]	two-arm randomized controlled trial	52-week	---	18–60 years	---	27–46 kg/m ²
Hooshiar, Saeedeh Hosseini et al. 2023 [17]	open-label randomized controlled trial	8 weeks	Fifty-six	18 and 50 years	100% Females	40 >BMI ≥25
Davis, Ashley E et al. 2021[18]	---	---	48 rats in 1 st study 16 rats in 2 nd study	---	Rat models	---
Teong, Xiao Tong et al.2023 [19]	randomized controlled trial	between 26 September 2018 and 4 May 2020	209	58 ± 10 years	57% female,	34.8 ± 4.7 kg m ⁻²
Teong, Xiao Tong et al. 2021[20]	randomized controlled trial	8 weeks	46	Mean 50 years	100% females	32.9 [4.4] kg/m ²
Headland, Michelle Louise et al. 2019[21]	randomized parallel trial	12 months	146	18–72 years	124 female, 22 male, mean	33 kg/m
T. M. Sundfør et al. 2019 [22]	A randomized trial	1 year	98	between 21 and 70 years	---	30–45 kg/m ²

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Table (2): Clinical characteristics and outcomes of the included studies.

Study	Method	Outcomes	Conclusion
Aksungar, F B et al. 2017 [15]	<p>- 12 months of CR, a month of IMF (Ramadan), and another 11 months of CR. Before the trial started, daily caloric intake was determined based on the patients' regular daily meals over the course of a month.</p> <p>-During the follow-up, 24-hour urine samples were taken six times, and 24-hour urinary ketones were calculated semi-quantitatively. To identify any dehydration during IMF, 24-hour urine volumes were also tracked.</p> <p>-All blood samples were collected during Ramadan and after a 12-hour fast.</p>	<p>Glucose, insulin, and Homa-IR levels all drastically dropped with CR as BMI dropped. While glucose levels continued to drop over the IMF period, insulin levels stayed the same.</p>	<p>Exercise and CR weight loss have a favorable impact on metabolic markers. IMF may improve cellular health and resilience to illness through a variety of methods.</p>
Ostendorf, Danielle M et al. 2022 [16]	---	<p>Even while weight reduction therapies based on CR have a small short-term success rate, there is significant inter-individual variation in weight loss and poor long-term maintenance of weight loss. IMF is a useful dietary approach to assist more people in losing weight and improving their metabolic health.</p>	<p>Dietary and PA recommendations can be compared between IMF and DCR.</p>
Hooshiar, Saeedeh Hosseini et al. 2023 [17]	<p>Following baseline studies, participants per stratum will be divided into two groups: "daily calorie restriction" (control) and "modified intermittent fasting" (intervention). Every member is expected to adhere to a diet that meets their daily and group energy needs. The Mifflin equation will be used to determine the people's energy needs.</p>	<p>The IMF improves the obesity disorder which leads to improving sleep quality</p>	<p>The quality of sleep can be impacted by weight loss strategies since obesity promotes sleep disturbances.</p>
Davis, Ashley E et al. 2021[18]	<p>In two independent studies utilising male rats, rat models of leanness and obesity that had been intentionally chosen for inherently high(HCR) and low(LCR) aerobic capacity were put on intermittent fasting and 50% calorie-restrictive diets.</p>	<p>There was no statistically significant difference in weight reduction between the two phenotypes.</p>	<p>For those with poor intrinsic aerobic fitness, intermittent fasting is a successful weight-loss method; nevertheless, direct comparison of calorie restriction and intermittent fasting is necessary to identify any differences in energy expenditure in lean and obese individuals.- pronephenotype</p>

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<p>Teong, Xiao Tong et al.2023 [19]</p>	<p>Nutritional assistance to patients in the iTRE and CR arms for 6 months, with an extra 12-month follow-up.</p>	<p>After six months, persons at high risk of type 2 diabetes receiving IMF plus early time-restricted eating (iTRE) had a small improvement in postprandial glycemia in response to a mixed-meal tolerance test compared to those receiving daily CR without timing recommendations.</p>	<p>---</p>
<p>Teong, Xiao Tong et al. 2021[20]</p>	<p>Measurements were taken after 12-hour overnight fasts in both the IMF and CR groups at baseline and week 8, as well as after 24-hour fasts in the IMF group alone at week 8.</p>	<p>IMF resulted with more weight loss and body fat reduction than CR.</p>	<p>In healthy women who are overweight or obese, IMF may be an effective short-term weight reduction alternative to CR that has little negative effects on eating habits, mood, sleep quality.</p>
<p>Headland, Michelle Louise et al. 2019[21]</p>	<p>Primary outcome was for weight loss, and secondary outcomes were for changes in body composition, blood lipids, and glucose.</p>	<p>At 12 months, there were no differences between groups in the rise in HDL cholesterol or the drop in triglycerides. LDL-cholesterol and fasting glucose did not alter.</p>	<p>It produced comparable outcomes in terms of weight reduction, body composition, and changes in cardiometabolic risk variables.</p>
<p>T. M. Sundfør et al. 2019 [22]</p>	<p>---</p>	<p>After three months of intervention, men and women with abdominal obesity showed more favorable changes in nutritional composition and eating habits after a CER than an IER. In both the IER and CER groups, there was comparable weight reduction, energy consumption, and macronutrient composition.</p>	<p>---</p>

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To improve overall health and lower the risk of noncommunicable illnesses, specifically for cardiovascular disease prevention, WHO advises ingesting at least 400 g of fresh fruits and vegetables every day [24]. Following a CER weight reduction diet led to improvements in nutritional content and cognitive restraint, a role in eating behavior in men and women suffering from abdominal obesity, as well as 1 extra component of metabolic syndrome [25]. Additionally, Weight loss methods can have an impact on sleep quality because obesity is one of the main causes of sleep disturbances [17]. In this review, we discovered that eating habits, sleeping patterns, and other factors have been convincingly shown, and meal frequency have a significant impact on human health. Caloric restriction and IMF have both been proved to be promising diets for maintaining a healthy body and losing weight [21]. Decreasing weight with CR and exercise has a good impact on metabolic parameters. This will be especially helpful for patients who are Pre-diabetes and/or insulin resistance will necessitate non-pharmacologic therapy. IMF can promote health and cellular resistance to sickness by employing a number of pathways, even if the fasting phase is followed by an overly calorie-rich period with little reduction in overall calorie consumption [15, 20, 22], Can also have an effect on energy balance [16]. A research found that eight weeks of intermittent fasting resulted in a 6.8% drop in the level of glucose in the blood after fasting and a 22.6% reduction in levels of insulin in obese people [26]. IMF and CR have comparable efficacy for body weight, fat mass, fasting glucose, and insulin [19]. It is well known that eating habits, sleep patterns, and meal frequency have a significant impact on human health. The effect of Intermittent Fasting has also been investigated in weighting loss. The information gathered will help us better understand fasting therapies that can be used to treat overweight and its comorbidities [17]. 27 IMF studies (published between July 1, 2019, and January 1, 2000) were found in a systematic review, Weight reduction ranging from 0.8 to 13.0% of baseline weight was recorded with no ill consequences. Substantial negative impacts [27]. A standard-of-care CR control is one of the major weaknesses of the present evidence base, along with the absence of behavioral support based on guidelines and the failure to adequately assess dietary and PA adherence using objective measurements. IMF has only been studied as a weight loss method in three longer-term (52-week) studies thus far [14, 21, 28]. None of these longer-term trials found any appreciable variations in weight changes between IMF and DCR. However, there are issues with each of these trials that prevent generalizations regarding the IMF's long-term efficacy

versus DCR for the treatment of obesity. In order to prove long-term efficacy and comprehend the influence of IMF on energy balance, interventional studies must adhere to higher standards of scientific rigour than those found in the present literature.

Conclusion

In conclusion, we observed that IMF worked well as a CR for weight loss. Weight reduction has a significant impact on human health, as do eating habits, sleeping patterns, and meal frequency. This will thus result in non-pharmacologic therapies and be especially beneficial for individuals who are pre-diabetic and/or insulin resistant. We anticipate more extensive research on dietary modifications and cognitive performance, which might lessen the financial costs associated with obesity. In order to establish the efficacy of these weight-loss techniques and to identify whether IMF or CR is more suitable for particular demographics, studies must compare IMF and CR with controlled patient characteristics.

Conflict of Interest

None

Funding

None

References

1. World Health Organization. World Health Statistics 2016 [OP]: Monitoring Health for the Sustainable Development Goals (SDGs). World Health Organization; 2016 Jun 8.
2. Jensen MD, Ryan DH, Apovian CM, Ard JD, Comuzzie AG, Donato KA, et al. 2013 AHA/ACC/TOS guideline for the management of overweight and obesity in adults: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and The Obesity Society. *Journal of the American college of cardiology*. 2014 Jul 1;63(25 Part B):2985-3023.
3. Tapsell LC, Neale EP, Satija A, Hu FB. Foods, nutrients, and dietary patterns: interconnections and implications for dietary guidelines. *Advances in Nutrition*. 2016 May;7(3):445-454.
4. Park SY, Boushey CJ, Shvetsov YB, Wirth MD, Shivappa N, Hébert JR, et al. Diet quality and risk of lung cancer in the multiethnic cohort study. *Nutrients*. 2021 May 12;13(5):1614.
5. Reedy J, Krebs-Smith SM, Miller PE, Liese AD, Kahle LL, Park Y, Subar AF. Higher diet quality is associated with decreased risk of all-cause, cardiovascular disease, and cancer mortality among older adults. *The Journal of nutrition*. 2014 Jun 1;144(6):881-889.
6. Julia C, Péneau S, Andreeva VA, Méjean C, Fezeu L, Galan P, Hercberg S. Weight-loss strategies used by the general population: how are they perceived?. *PLoS one*. 2014 May 22;9(5):e97834.

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7. Dansinger ML, Gleason JA, Griffith JL, Selker HP, Schaefer EJ. Comparison of the Atkins, Ornish, Weight Watchers, and Zone diets for weight loss and heart disease risk reduction: a randomized trial. *Jama*. 2005 Jan 5;293(1):43-53.
8. MacLean PS, Rothman AJ, Nicastro HL, Czajkowski SM, Agurs-Collins T, Rice EL, et al. The accumulating data to optimally predict obesity treatment (ADOPT) core measures project: rationale and approach. *Obesity*. 2018 Apr;26:S6-15.
9. MacLean PS, Wing RR, Davidson T, Epstein L, Goodpaster B, et al. NIH working group report: innovative research to improve maintenance of weight loss. *Obesity*. 2015 Jan;23(1):7-15.
10. Johnston BC, Kanters S, Bandayrel K, Wu P, Naji F, Siemieniuk RA, et al. Comparison of weight loss among named diet programs in overweight and obese adults: a meta-analysis. *Jama*. 2014 Sep 3;312(9):923-933.
11. Rynders CA, Thomas EA, Zaman A, Pan Z, Catenacci VA, Melanson EL. Effectiveness of intermittent fasting and time-restricted feeding compared to continuous energy restriction for weight loss. *Nutrients*. 2019 Oct 14;11(10):2442.
12. Horne BD, Muhlestein JB, Anderson JL. Health effects of intermittent fasting: hormesis or harm? A systematic review. *The American journal of clinical nutrition*. 2015 Aug 1;102(2):464-470.
13. Underwood LE, Thissen JP, Lemozy S, Ketelslegers JM, Clemmons DR. Hormonal and nutritional regulation of IGF-I and its binding proteins. *Hormone Research in Paediatrics*. 1994 Dec 5;42(4-5):145-151.
14. Mitchell NS, Seyoum EA, Bhavsar NA, Webb FJ. Continuous engagement in a weight-loss program promotes sustained significant weight loss. *WMJ: official publication of the State Medical Society of Wisconsin*. 2020 Dec;119(4):253.
15. Trepanowski JF, Kroeger CM, Barnosky A, Klempel MC, Bhutani S, Hoddy KK, et al. Effect of alternate-day fasting on weight loss, weight maintenance, and cardioprotection among metabolically healthy obese adults: a randomized clinical trial. *JAMA internal medicine*. 2017 Jul 1;177(7):930-938.
16. Ostendorf DM, Caldwell AE, Zaman A, Pan Z, Bing K, Wayland LT, et al. Comparison of weight loss induced by daily caloric restriction versus intermittent fasting (DRIFT) in individuals with obesity: study protocol for a 52-week randomized clinical trial. *Trials*. 2022 Aug 29;23(1):718.
17. Hooshyar SH, Yazdani A, Jafarnejad S. Comparison of the effect of modified intermittent fasting and daily calorie restriction on sleep quality, anthropometric data, and body composition in women with obesity or overweight: study protocol of a randomized controlled trial. *Trials*. 2023 Jan 16;24(1):30.
18. Davis AE, Smyers ME, Beltz L, Mehta DM, Britton SL, Koch LG, et al. Differential weight loss with intermittent fasting or daily calorie restriction in low-and high-fitness phenotypes. *Experimental physiology*. 2021 Aug;106(8):1731-1742.
19. Teong XT, Liu K, Vincent AD, Bensalem J, Liu B, Hattersley KJ, et al. Intermittent fasting plus early time-restricted eating versus calorie restriction and standard care in adults at risk of type 2 diabetes: a randomized controlled trial. *Nature Medicine*. 2023 Apr;29(4):963-972.
20. Teong XT, Hutchison AT, Liu B, Wittert GA, Lange K, Banks S, Heilbronn LK. Eight weeks of intermittent fasting versus calorie restriction does not alter eating behaviors, mood, sleep quality, quality of life and cognitive performance in women with overweight. *Nutrition Research*. 2021 Aug 1;92:32-39.
21. Headland ML, Clifton PM, Keogh JB. Effect of intermittent compared to continuous energy restriction on weight loss and weight maintenance after 12 months in healthy overweight or obese adults. *International journal of obesity*. 2019 Oct;43(10):2028-2036.
22. Sundfør, T.M., Tonstad, S. & Svendsen, M. Effects of intermittent versus continuous energy restriction for weight loss on diet quality and eating behavior. A randomized trial. *Eur J Clin Nutr*. 2019;73:1006–1014.
23. Jacobs Jr DR, Steffen LM. Nutrients, foods, and dietary patterns as exposures in research: a framework for food synergy. *The American journal of clinical nutrition*. 2003 Sep 1;78(3):508S-513S.
24. Nishida C, Uauy R, Kumanyika S, Shetty P. The joint WHO/FAO expert consultation on diet, nutrition and the prevention of chronic diseases: process, product and policy implications. *Public health nutrition*. 2004 Feb;7(1a):245-250.
25. World Health Organization. Prevention of cardiovascular disease: guidelines for assessment and management of total cardiovascular risk. World Health Organization; 2007.
26. Varady, K.A.; Bhutani, S.; Church, E.C.; Klempel, M.C. Short-term modified alternate-day fasting: A novel dietary strategy for weight loss and cardioprotection in obese adults. *Am. J. Clin. Nutr*. 2009, 90, 1138–1143.
27. Welton S, Minty R, O'Driscoll T, Willms H, Poirier D, Madden S, et al. Intermittent fasting and weight loss: Systematic review. *Canadian Family Physician*. 2020 Feb 1;66(2):117-125.

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28. Carter S, Clifton PM, Keogh JB. Effect of intermittent compared with continuous energy restricted diet on glycemic control in patients with type 2 diabetes: a randomized noninferiority trial. *JAMA network open*. 2018 Jul 6;1(3):e180756.