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Intermittent fasting strategies and their effects on body weight and other cardiometabolic risk factors: systematic review and network meta-analysis of randomised clinical trials

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Additional material is published online only. To view please visit the journal online.

Cite this as: *BMJ* 2025;389:e082007
http://dx.doi.org/10.1136/bmj-2024-082007

Accepted: 07 May 2025

ABSTRACT

OBJECTIVE

To assess the effect of intermittent fasting diets, with continuous energy restriction or unrestricted (ad-libitum) diets on intermediate cardiometabolic outcomes from randomised clinical trials.

DESIGN

Systematic review and network meta-analysis.

DATA SOURCES

Medline, Embase, and central databases from inception to 14 November 2024.

ELIGIBILITY CRITERIA FOR SELECTING STUDIES

Randomised clinical trials comparing the association of intermittent fasting diets (alternate day fasting, time restricted eating, and whole day fasting), continuous energy restriction, and ad-libitum diets were included.

MAIN OUTCOMES

Outcomes included body weight (primary) and measures of anthropometry, glucose metabolism, lipid profiles, blood pressure, C-reactive protein, and markers of liver disease.

DATA SYNTHESIS

A network meta-analysis based on a frequentist framework was performed with data expressed as mean difference with 95% confidence intervals (CIs). The certainty of the evidence was assessed using grading of recommendations assessment, development, and evaluation (GRADE).

RESULTS

99 randomised clinical trials involving 6582 adults of varying health conditions (720 healthy, 5862 existing health conditions) were identified. All intermittent fasting and continuous energy restriction diet strategies reduced body weight when compared with ad-libitum diet. Compared with continuous energy restriction, alternate day fasting was the only form of intermittent fasting diet strategy to show benefit in body weight reduction (mean difference −1.29 kg (95% CI −1.99 to −0.59), moderate certainty of evidence). Additionally, alternate day fasting showed a trivial reduction in body weight compared with both time restricted eating and whole day fasting (mean difference −1.69 kg (−2.49 to −0.88) and −1.05 kg (−1.90 to −0.19), respectively, both with moderate certainty of evidence). Estimates were similar among trials with less than 24 weeks follow-up (n=76); however, moderate-to-long-term trials (≥24 weeks, n=17) only showed benefits in weight reduction in diet strategies compared with ad-libitum. Furthermore, in comparisons between intermittent fasting strategies, alternate day fasting lowered total cholesterol, triglycerides, and non-high density lipoprotein compared with time restricted eating. Compared with whole day fasting, however, time restricted eating resulted in a small increase in total cholesterol, low density lipoprotein cholesterol, and non-high density lipoprotein cholesterol. No differences were noted between intermittent fasting, continuous energy restriction, and ad-libitum diets for HbA_{1c} and high density lipoprotein.

CONCLUSIONS

Minor differences were noted between some intermittent fasting diets and continuous energy restriction, with some benefit of weight loss with alternate day fasting in shorter duration trials. The current evidence provides some indication that intermittent fasting diets have similar benefits to continuous energy restriction for weight loss and cardiometabolic risk factors. Longer duration trials are needed to further substantiate these findings.

TRIAL REGISTRATION

ClinicalTrials.gov NCT05309057.

WHAT IS ALREADY KNOWN ON THIS TOPIC

Weight loss can reduce these risk factors and consequently decrease the burden of serious chronic conditions like type 2 diabetes and cardiovascular disease

Intermittent fasting features periods of fasting or restricted energy intake alternating with periods of normal or ad-libitum energy consumption

While intermittent fasting is a popular weight loss strategy, the health effects of intermittent fasting compared with a usual caloric restriction or ad-libitum diet in humans remain unclear

WHAT THIS STUDY ADDS

99 randomised controlled trials that evaluated intermittent fasting diets, with continuous energy restriction, or ad-libitum diets on intermediate cardiometabolic outcomes were evaluated in this systematic review and network meta-analysis

All intermittent fasting strategies and continuous energy restriction diets showed a reduction in body weight when compared with an ad-libitum diet

Of three intermittent fasting diets (ie, alternate day fasting, time restricted eating, and whole day fasting), alternate day fasting showed benefit in body weight reduction compared with continuous energy restriction

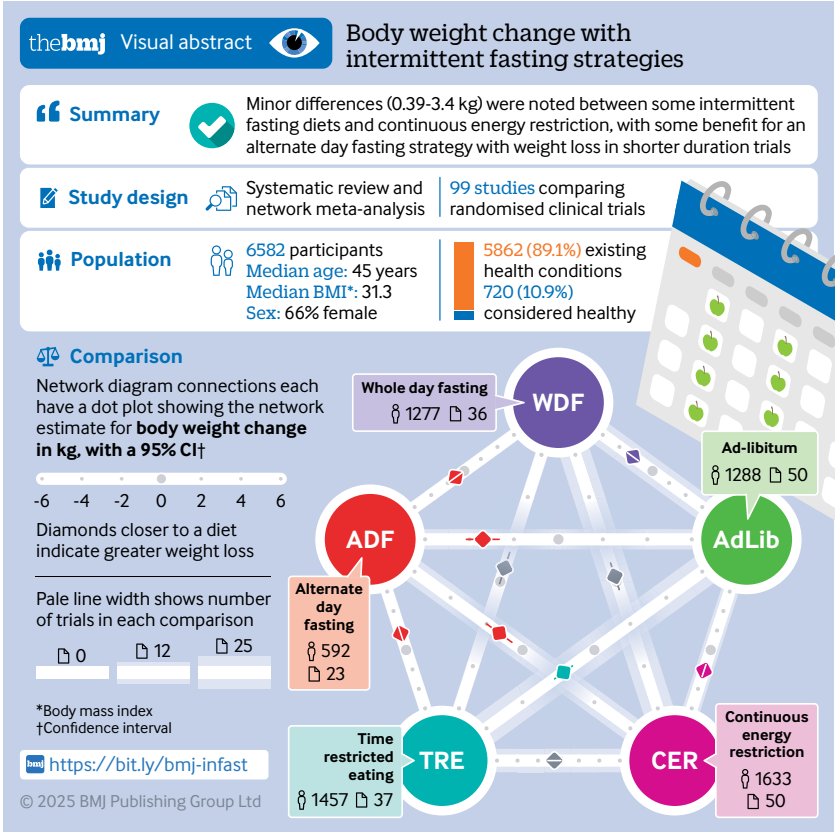
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Introduction

Obesity, hyperglycaemia, and hypertension are among the major cardiometabolic risk factors prevalent in adults.[1] A reduction in these risk factors, all achievable by weight loss, can mitigate the burden of major chronic disease outcomes including type 2 diabetes and cardiovascular disease.[2] As the prevalence of these risk factors increases worldwide, focus has shifted towards behavioural interventions to achieve a more sustainable and wide ranging risk reduction. One common intervention is for weight loss with a continuous energy restriction (CER) diet; although, this strategy is often unsustainable in the long term.[3] An alternative dietary behavioural approach that has gained popularity is intermittent fasting, which encompasses a dietary pattern involving periods of fasting, or restrictive energy intake, interspersed by non-fasting periods of ad-libitum (ie, unrestricted) energy intake.[4 5] The fasting period may vary from several hours during the day to a complete 24 hour period. While no clear definition exists for intermittent fasting, its various methods can fall under three broad categories: time restricted eating (TRE), alternate day fasting (ADF), and whole day fasting (WDF). Briefly, TRE involves a 24 hour pattern consisting of a certain number of hours of non-fasting period, followed by fasting for the remainder of the time. An example is the 16:8 diet involving a 16 hour fasting period followed by an 8 hour eating window. ADF involves a 24 hour fast on alternate days; while WDF involves a cyclical pattern of 24 hour fasting periods followed by ad-libitum periods; for example, a 5:2 diet involving five days of ad-libitum diet and two days of fasting periods.

Despite its popularity as a weight loss strategy in the public, the health effects of intermittent fasting compared with a usual caloric restriction or ad-libitum diet in humans remain unclear. Emerging evidence suggests that intermittent fasting may improve risk markers such as weight,[6] glucose control,[7] and blood pressure[4] more than CER; however, no comprehensive evidence has evaluated the effects of intermittent fasting diets, CER, and ad-libitum diets on cardiometabolic risk factors, or compared the efficacy between the different intermittent fasting methods. Several meta-analyses have been conducted on randomised clinical trials of intermittent fasting in recent years.[8-11] However, these studies have notable limitations, such as focusing solely on the effects of intermittent fasting diets on weight loss. Importantly, these meta-analyses were unable to compare different intermittent fasting strategies because most randomised clinical trials typically compared one intermittent fasting regimen to either CER or ad-libitum diets.

To address these major limitations, and to update the recommendations of the European Association for the Study of Diabetes (EASD), the Diabetes and Nutrition Study Group (DNSG) commissioned this systematic review and meta-analysis. Our aim was to summarise the evidence related to the association of intermittent fasting and CER strategies on body weight and cardiometabolic risk factors in adults from randomised clinical trials that used grading of recommendations assessment, development, and evaluation (GRADE).[12] As few randomised clinical trials comparing intermittent fasting strategies have been published, we conducted network meta-analyses rather than the traditional pairwise meta-analyses to evaluate the association of intermittent fasting strategies on cardiometabolic outcomes.



Methods

This systematic review and network meta-analysis was conducted according to the Cochrane handbook for systematic reviews of interventions[13] and reported according to the preferred reporting items for systematic reviews and meta-analyses (PRISMA)[14] and the PRISMA extension statement for conducting network meta-analyses.[15] This protocol is registered at Clinicaltrials.gov, NCT05309057.

Data sources, searches, and study selection

We searched Medline, Embase, and the Cochrane central register of controlled trials (Clinical Trials; Central) from database inception to 14 November 2024. Manual searches of the reference lists of included studies and reviews supplemented the electronic search strategy. The search included variations of several key terms for fasting, including "intermittent fasting", "time-restricted eating", "alternate fasting", "whole day fasting", etc; and combined with specific terms for outcomes and study design. We applied validated filters from McMaster University's Health

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Information Research Unit to restrict our database search to controlled studies only.[16] See supplemental table 1 for the detailed search strategy.

Supplemental table 2 outlines the PICOTS (population, intervention, comparator, outcome, time, and study) framework used for this network meta-analysis. We included randomised clinical trials in humans, of all health conditions, with a follow-up duration of at least three weeks investigating the association of intermittent fasting, CER, or ad-libitum, or a combination of diets on body measurements, glucose metabolism, lipid profiles, blood pressure, C-reactive protein, and markers of liver disease. Outcomes with fewer than three eligible studies were omitted due to feasibility constraints for the network meta-analysis. We excluded studies of children or pregnant women, had a short follow-up duration (<3 weeks), did not have a suitable control, had a combined intervention where the main association of intermittent fasting strategies could not be separated, or did not report viable endpoint data. Religious fasting were also methods excluded due to wide variability in fasting practices.

Data extraction, risk of bias assessments, and outcomes

Titles and abstracts retrieved were screened to identify studies that met the inclusion criteria by two independent reviewers (ZS-A and TAK). Disagreements were resolved by consensus or a third reviewer (JLS). Study characteristics and relevant data were extracted from each eligible study by independent reviewers (VC, HAB, AC, NC, and JO) and checked by a third reviewer (LC and ZS-A). Mean differences and standard errors (SEs) of the between the treatment group and comparator group were extracted as the main endpoints for each outcome. Between treatment change-from-baseline differences were preferred over end differences. For trials that did not report these values, we used the available data to calculate the appropriate statistics or imputed them using standard formulas and recommended methods.[13 17] We used WebPlotDigitizer to extract data from charts or figures when numerical results were not provided.[18] To prevent unit-of-analysis errors in the network meta-analysis, we adhered to Cochrane guidance by proportionally dividing sample sizes and event counts of shared control groups in multi-arm trials and applied the inverse-variance method for synthesis of multi-arms to avoid over-inflation of their weights.[13] Additionally, data will be available on reasonable request.

When available, information about adverse events and adherence were extracted from each study. Adherence, also referred to as compliance, plays a crucial role in the effectiveness of weight loss strategies.[19] Studies included in this meta-analysis assessed compliance through various methods, such as daily logs of dietary intake and eating time windows, self-assessment, or follow-ups with dietitians. Adherence was calculated as the percentage of days participants adhered to the prescribed diet or eating schedule. The data presented reflect the percentage of adherence to the diet regimen by the end of the intervention period. Furthermore, retention rates were calculated as the ratio of people who completed the study to those initially enrolled. Risk of bias was assessed for each included study using the Cochrane Collaboration Risk of Bias Tool (supplementary methods).[20 21] Additionally, consideration was given to crossover trials, with data analysed using mean differences and an assumed correlation coefficient of 0.5 to estimate standard errors, and risk of bias assessed using the Risk of Bias tool, accounting for period and carryover effects.[13]

The primary outcome of interest was body weight. Secondary outcomes included other important cardiometabolic risk factors including other measures of body measurements (body mass index (BMI), body fat, and waist circumference), glucose metabolism (HbA_{1c}, homeostatic model assessment for insulin resistance (HOMA-IR), fasting glucose, and fasting insulin), blood pressure (systolic and diastolic blood pressure), lipids (total cholesterol, high density lipoprotein cholesterol, low density lipoprotein cholesterol, non-high density lipoprotein cholesterol, and triglycerides), liver function (alanine transaminase (ALT)), and C-reactive protein.

Statistical analysis and grading the evidence

Our network meta-analysis was based on the frequentist framework and was performed using R 4.4.1 statistical computing environment using the R package netmeta.[22] We performed a random-effects network meta-analysis to compare all the interventions simultaneously (direct and indirect), specifically ADF, WDF, TRE, CER, and ad-libitum diet, in a single analysis using mean differences determined from the included studies. We conducted separate network meta-analyses for each cardiometabolic risk factor. For our primary outcome (body weight), we compared diet strategies in an a-priori stratified analysis by trial duration: acute (<24 weeks) and moderate-to-long term (≥24 weeks). For outcomes with at least 10 trials available, we assessed publication bias using comparison adjusted funnel plots to evaluate funnel plot asymmetry.[22] Additional sensitivity analysis was conducted on studies of participants with diabetes. If at least 10 trials per diet comparisons were available, we conducted a-priori subgroup analyses for body weight and all other outcomes age, sex, study duration, type of design, disease status, risk of bias, and funding source.

We determined confidence of the network estimates using the confidence in network meta-analysis (CINeMA)[23] framework, which applies the grade system.[24 25] The CINeMA framework estimates confidence based on six domains: within study bias, reporting bias, indirectness, imprecision, heterogeneity, and incoherence.[23 26] Briefly, within study bias evaluates the potential flaws in the study design or execution that can lead to a systematic difference between the estimated relative treatment

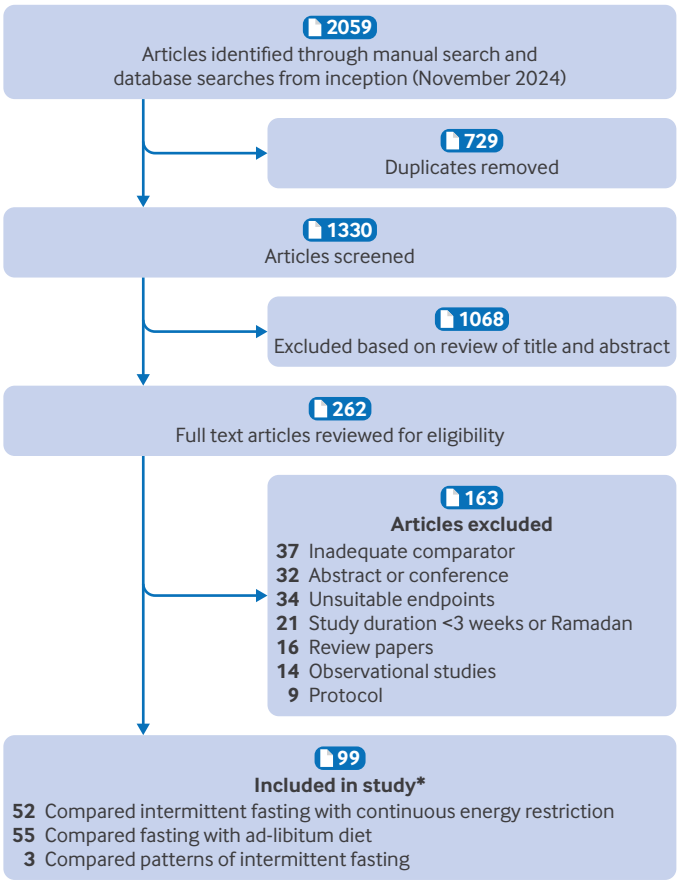


Fig 1 | Flow diagram of study identification and review for randomised clinical trials of intermittent fasting, continuous energy restriction, and ad-libitum diet strategies. *Some studies included comparisons of intermittent fasting with both continuous energy restriction and ad-libitum diets

effect and the true effect, as evaluated using the risk of bias tool. Reporting bias refers to when the results in a systematic review do not accurately represent all the findings from the studies conducted. This bias can occur when non-significant findings or unfavourable results are not reported (publication bias or outcome reporting bias). Indirectness assesses the issue of transitivity, referring to the assumption that trials comparing different interventions are similar in terms of important characteristics that might influence the effect estimate, including age, sex, sample size, and study duration.[27 28] Imprecision, heterogeneity, and incoherence evaluates the reliability and validity of the results. The minimally important difference thresholds used in assessing imprecision, heterogeneity, and incoherence, were predetermined for each outcome based on current clinical evidence. A minimally important difference of 2.0 kg was used to interpret the significance of body weight changes, based on evidence of meaningful weight loss in populations who are obese,[29] while a threshold of 1.0 kg was retained for assessing imprecision in CINeMA GRADE evaluations. Effect sizes were classified as trivial (<1* minimally important difference), small (≥1* minimally important difference), moderate (≥2* minimally important difference), large (≥5* minimally important difference) or very large (≥10* minimally important difference). For body weight, the threshold classifications were trivial (<2.0 kg), small (≥2.0 to <4.0 kg), moderate (≥4.0 to <10.0 kg), large (≥10.0 to <20.0 kg), and very large (≥20.0 kg).

Heterogeneity was assessed based on the confidence and the calculated prediction intervals determined from the network meta-estimates, while incoherence was evaluated using both a global test (random-effects design-by-treatment interaction model approach[30]) and a local test (separating indirect from direct evidence (SIDE)[31]). In the summarised evaluation, the reporting bias domain for each comparison ranged from very low to high risk; while for the other domains, comparisons were assessed as having no concerns, some concerns, or major concerns.

Patient and public involvement

This study evaluated existing data from randomised clinical trials. Due to the limited resources and time and funding constraints, patients and the public were not involved in setting the research question, outcome measures, study design, or data interpretation. To address this gap, we will implement a comprehensive knowledge translation strategy following study dissemination. Our approach includes creating accessible infographics and delivering presentations to diverse community groups to share our findings. We will also develop plain language summaries for distribution across various platforms, including social media feeds. Through these post-study engagement efforts, we aim to gather valuable feedback from individuals with lived experiences of cardiometabolic conditions, which will inform our future research priorities and methodological approaches. This collaboration will ultimately help to ensure subsequent studies better incorporate patient perspectives despite the constraints encountered in our current systematic review and network meta-analysis.

Results

Figure 1 shows the flow of the literature search and selection, of which 99 articles met our inclusion criteria (see supplementary appendix A for the list of excluded studies from the full text review). Table 1 and supplementary table 3 present the key characteristics of the included studies.[6 7 32-128] Overall, included participants had a median age of 45 years (interquartile range 36-50), had overweight or obesity (median BMI of 31.3 (interquartile range 28.4-33.3)), and were mostly female (66% female, 34% male) (total n=6582). The participants had varying health conditions, including having overweight or obesity (54 studies), type 1 diabetes or type 2 diabetes (12 studies), metabolic syndrome (8 studies), or metabolic dysfunction-associated fatty liver disease (also known as non-alcoholic fatty liver disease; 8 studies); overall, 720 individuals were healthy and 5862 had existing health conditions.

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Table 1 | Summary of study characteristics (n=99 studies; 6582 adults)

Characteristics	Study Details**
Median no. of participants (IQR)	46 (32-77)
Median age, years (IQR)	45 (36-50)
Female, no. (%)	4336 (66)
Male, no. (%)	2246 (34)
Median baseline body weight, kg (IQR)†	85 (77-94)
Median baseline body mass index (IQR)†	31 (28-33)
Underlying disease status (no. of studies)	Healthy (n=5), hypertension (n=1), metabolic syndrome (n=8), multiple sclerosis (n=2), NAFLD/MAFLD (n=8), normal weight (n=8), overweight/obese (n=54), PCOS (n=1), prediabetic (n=1), type 1 diabetes (n=1), type 2 diabetes (n=11)
Country (no. of comparisons)	Australia (n=9), Austria (n=1), Brazil (n=4), Canada (n=1), China (n=13), Czech Republic (n=2), Germany (n=3), Indonesia (n=1), Iran (n=8), Italy (n=1), Malaysia (n=2), Mexico (n=1), Netherlands (n=1), Norway (n=3), Poland (n=1), Portugal (n=1), South Korea (n=3), Spain (n=1), Sweden (n=1), Taiwan (n=1), Thailand (n=3), Turkey (n=4), UK (n=10), USA (n=24)
Study design (%)	Parallel (92%) Crossover (8%)
Feeding control (%)‡	Dietary advice (75%) Metabolic (10%) Supplemented (15%)
Diet arms (no. of studies)	Ad-libitum (n=54) Continuous energy restriction (n=53) Alternate day fasting (n=25) Time restricted eating (n=40) Whole day fasting (n=38)
Median follow-up, weeks (range)	12 (3-52)
Trial designed for weight loss (%)	Yes (81%) No (19%)
Energy balance (no. of comparisons)	Neutral (n=26) Negative (n=73)
Funding sources (%)	Agency§ (81%) Agency plus industry (5%) Industry (5%) No funding (1%) Not reported (2%)

Detailed characteristics from each identified study is outlined in supplementary table 3. IQR=interquartile range; PCOS=polycystic ovary syndrome; NAFLD=non-alcoholic fatty liver disease; MAFLD=metabolic dysfunction-associated fatty liver disease.
*Values rounded to the nearest whole number.
†Based on studies that reported data.
‡Metabolic feeding control included provision of all study foods, supplement feeding control included provision of study supplements only, and dietary advice included dietary counselling without the provision of any dietary foods or supplements.
§Agency funding included government, not-for profit health agencies or University sources.

Of the identified randomised clinical trials, almost all (92%) were parallel in study design, with a median follow-up time of 12 weeks (range 3-52 weeks), a median sample size of 46 participants,[32-77] and most trials (81%) were designed for weight loss. A small subset of trials had a duration of three weeks, the minimum threshold, typically reporting modest weight reductions (eg, 0.5-2 kg), consistent with early phase feasibility studies. Conversely, only five trials extended to 52 weeks or more, limiting the feasibility of undertaking a robust analysis for very long term outcomes. Of the intermittent fasting diet groups, we identified 38 studies that evaluated WDF, 40 studies that evaluated TRE, and 25 studies that evaluated ADF. In some studies, the diet composition for different strategies was reported, which showed variability. Many of these diets were designed or recommended to include a higher proportion of carbohydrates compared with protein and fat. Most included studies were conducted in the USA (n=24) and the UK (n=10). Additionally, most of the randomised clinical trials (81%) received funding solely from agencies (ie, government, not-for profit health agencies, or universities).

Supplementary figures 1 and 2 show the individual assessments using the Cochrane risk-of-bias tool for each of the included trials. Taken together with the evidence of the present literature, a serious risk of bias was not indicated because more than 80% of studies were considered to have low risk of bias.

GRADE assessment

The GRADE certainty of evidence for all diet group comparisons are presented in supplementary tables 5-21. For body weight, confidence rating ranged from moderate to high (supplementary table 5). Downgrades from high for comparisons rated as moderate were due to concerns in indirectness, imprecision, or heterogeneity. The remaining comparisons were all rated moderate with downgrades from high for either major concerns in heterogeneity or some concerns for imprecision, heterogeneity or incoherence. Similarly, the certainty of the evidence for other body properties and cardiometabolic outcome measures was on average moderate but ranged from very low to high for each comparison.

Figure 2 and figure 3 display the network analysis of all trials that reported body weight (93 studies;

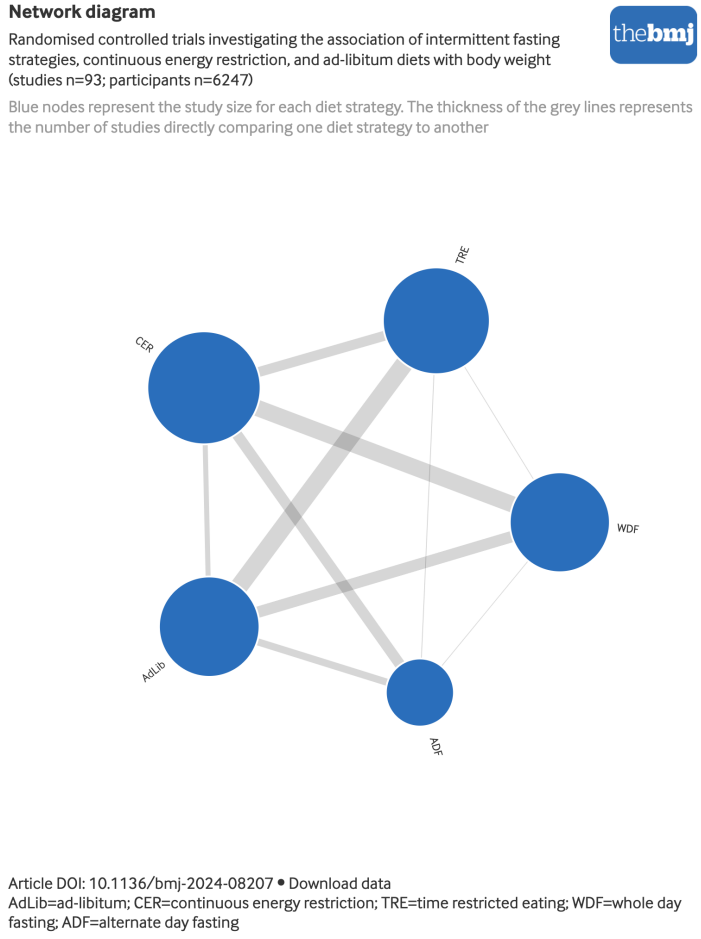


Fig 2 | Network diagram for randomised controlled trials investigating the association of intermittent fasting strategies, continuous energy restriction, and ad-libitum diets with body weight. An interactive version of this graphic is available at https://public.flourish.studio/visualisation/23222926/

6247 participants). The highest number of dietary comparisons were between TRE and ad-libitum (n=25), followed by CER and WDF (n=23), and WDF and ad-libitum comparisons (n=16, fig 2). When compared with the ad-libitum diet, the network analysis showed a small reduction in body weight for ADF (mean difference −3.40 kg (95% CI −4.14 to −2.67), high certainty of evidence), WDF (−2.36 kg (−3. 02 to −1.70), high certainty of evidence), and CER (−2.11 kg (−2.73 to −1.50), moderate certainty of evidence); while TRE showed a trivial reduction (−1.72 kg (−2.21 to −1.22), moderate certainty of evidence) (fig 3). Furthermore, the ADF diet resulted in a trivial additional weight loss when compared with CER (−1.29 kg (−1.99 to −0.59), moderate certainty of evidence). Comparisons between intermittent fasting diet strategies showed a trivial reduction in body weight for ADF versus both TRE (−1.69 kg (−2.49 to −0.88) and WDF −1.05 kg (−1.90 to −0.19), both moderate certainty of evidence); however, no difference was noted between the TRE and WDF diet comparison (fig 3).

The network analysis by trial duration for body weight is shown in fig 4. In trials with less than 24 weeks of follow-up (n=76), ADF showed a small body weight reduction compared with ad-libitum (mean difference −3.37 kg (95% CI −4.16 to −2.59)), and a trivial reduction in weight compared with CER (−1.29 kg (−2.05 to −0.53)), and TRE (−1.72 kg (−2.58 to −0.87)). Compared with ad-libitum, both WDF and CER showed a small reduction in body weight and TRE showed a trivial reduction in weight. Additionally, WDF showed a trivial reduction in body weight when compared with TRE (−0.88 kg (−1.71 to −0.06)). In trials of 24 weeks or more (n=17), the most restrictive strategies (ADF, TRE, and CER) showed small body weight reductions versus ad-libitum (mean difference range −1.88 to −3.63 kg), with no differences between intermittent fasting strategies and CER in these moderate-to-long term studies. WDF, however, showed a trivial reduction in weight loss when compared with ad-libitum.

Figure 5 displays the summary of the network estimates and certainty of the evidence for all diet group comparisons for each outcome of interest. Details on the network analysis and network diagram for the secondary outcomes are presented in supplementary figures 3-34. Similar beneficial results in body weight were observed for intermittent fasting strategies with ad-libitum diets for other body measurements including BMI, body fat, and waist circumference. Among these measurements, ADF showed a large reduction in BMI when compared with ad-libitum (mean difference −1.22 (95% CI −1.55 to −0.89), high certainty of evidence); however, reductions in waist circumference were small (high certainty of evidence) and in body fat were trivial (moderate certainty of evidence). Additionally, moderate reductions in BMI were observed in ADF with WDF (−0.53 (−0.94 to −0.13)) and TRE (−0.60 (−0.97 to −0.24)), with moderate certainty of evidence (fig 5, supplementary figure 4). Furthermore, ADF showed reductions in both BMI (−0.52 (−0.85 to −0.19)) and waist circumference (−1.19 cm (−2.13 to −0.24)), when compared with CER, both with moderate certainty of evidence.

In comparison with intermittent fasting strategies, ADF, compared with TRE, showed small reductions in concentrations of triglycerides and in systolic blood pressure, but showed moderate reductions in non-high density lipoprotein cholesterol and total cholesterol, with certainty of evidence ranging from low to moderate (supplementary figures). ADF compared with WDF, however, only showed small reductions in both non-high density lipoprotein cholesterol and triglycerides (supplementary figures). For comparisons between TRE and WDF, WDF showed small increases in low density lipoprotein cholesterol (mean difference 0.11 mmol/L (95% CI 0.01 to 0.21)), non-high density lipoprotein cholesterol (0.15 mmol/L (0.03 to 0.27)), and total cholesterol (0.17 mmol/L (0.05 to 0.29)), all with low certainty of evidence (supplementary figures 11, 12, and 16).

The assessment of all diet strategy comparisons showed no association with HbA_{1c} or high density lipoprotein cholesterol; certainty of evidence ranged

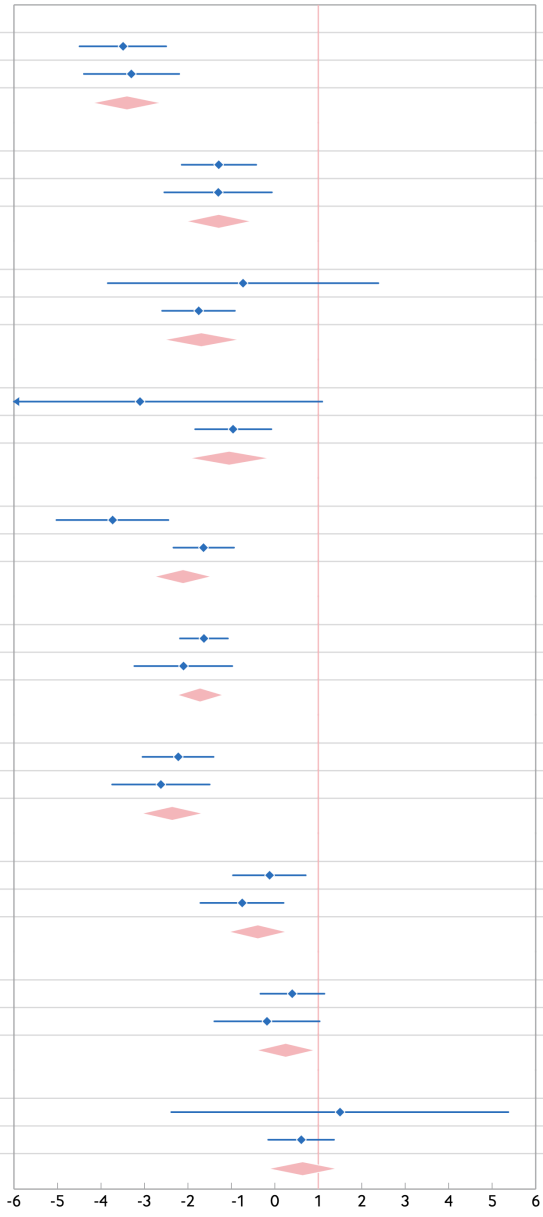
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Network analysis comparing intermittent fasting strategies, continuous energy restriction, and ad-libitum diets on body weight (kg)

Each comparison evaluates the assessment of diet arm one compared with diet arm two. The blue diamond represents the mean difference (MD) and the line represents the 95% confidence interval (CI). This is presented for direct estimates and indirect estimates. The red diamond represents the overall network estimate for that comparison, which integrates both direct and indirect estimates. For example, ADF:AdLib comparison shows the MD of ADF compared to ad-libitum. A negative MD suggests diet 1 had greater reduction compared with diet 2; whereas a positive MD suggests diet 2 had a greater reduction compared with diet 1. Number of studies refers to the total number of direct evidence published for the specific comparison. Direct evidence refers to the proportion of the evidence available from direct assessments through published literature. I^2 refers to the percentage of the total variability in a set of effect sizes due to true heterogeneity

Outcome	No of studies	I^2 (%)	Direct evidence	Mean difference (95% CI)
ADF:AdLib				
Direct estimate	10	21	0.55	-3.49 (-4.49 to -2.50)
Indirect estimate				-3.30 (-4.39 to -2.20)
Network estimate				-3.40 (-4.14 to -2.67)
ADF:CER				
Direct estimate	15	53	0.68	-1.29 (-2.14 to -0.43)
Indirect estimate				-1.30 (-2.54 to -0.07)
Network estimate				-1.29 (-1.99 to -0.59)
ADF:TRE				
Direct estimate	1		0.07	-0.73 (-3.84 to 2.38)
Indirect estimate				-1.75 (-2.59 to -0.92)
Network estimate				-1.69 (-2.49 to -0.88)
ADF:WDF				
Direct estimate	1		0.04	-3.10 (-7.29 to 1.09)
Indirect estimate				-0.96 (-1.83 to -0.08)
Network estimate				-1.05 (-1.90 to -0.19)
CER:AdLib				
Direct estimate	7	46	0.23	-3.73 (-5.02 to -2.45)
Indirect estimate				-1.64 (-2.33 to -0.94)
Network estimate				-2.11 (-2.73 to -1.50)
TRE:AdLib				
Direct estimate	25	90	0.81	-1.63 (-2.18 to -1.08)
Indirect estimate				-2.10 (-3.23 to -0.98)
Network estimate				-1.72 (-2.21 to -1.22)
WDF:AdLib				
Direct estimate	16	78	0.65	-2.22 (-3.04 to -1.41)
Indirect estimate				-2.62 (-3.74 to -1.50)
Network estimate				-2.36 (-3.02 to -1.70)
CER:TRE				
Direct estimate	14	88	0.57	-0.12 (-0.96 to 0.71)
Indirect estimate				-0.75 (-1.71 to 0.20)
Network estimate				-0.39 (-1.02 to 0.23)
CER:WDF				
Direct estimate	23	65	0.73	0.40 (-0.33 to 1.14)
Indirect estimate				-0.18 (-1.39 to 1.03)
Network estimate				0.25 (-0.38 to 0.88)
TRE:WDF				
Direct estimate	1		0.04	1.50 (-2.38 to 5.37)
Indirect estimate				0.61 (-0.15 to 1.36)
Network estimate				0.64 (-0.10 to 1.38)



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ADF=alternate day fasting; AdLib=ad-libitum; CER=continuous energy restriction; TRE=time restricted eating; WDF=whole day fasting

Fig 3 | Network analysis comparing intermittent fasting strategies, continuous energy restriction, and ad-libitum diets on body weight (kg). An interactive version of this graphic is available at https://public.flourish.studio/visualisation/23092314/

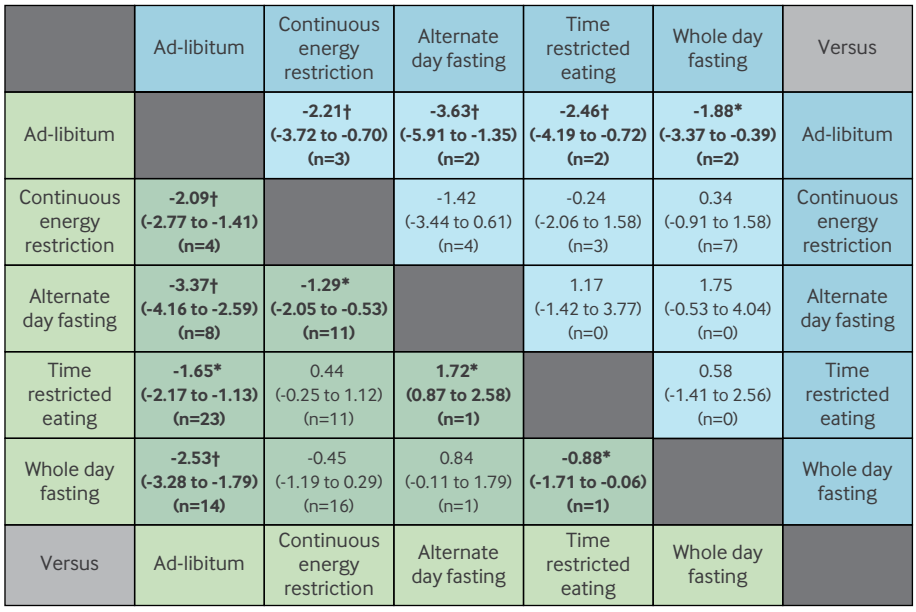


Fig 4 | Network meta-analysis of body weight outcome from 93 randomised clinical trials by follow-up duration: ≥24 weeks (n=17) and <24 weeks (n=76). Results are presented as mean differences and 95% confidence intervals (CIs) based on results from the 93 studies that reported on body weight (kg). Total number of direct comparison studies are noted in the brackets below the confidence intervals. Statistically significant results are in bold. The minimally important difference for body weight was 2.0 kg. Of the minimally important differences that were significant, effect sizes were classified as *trivial (<2.0 kg) and †small (≥2.0 to <4.0 kg); moderate (≥4.0 to <10.0 kg), large (≥10.0 to <20.0 kg), and very large (≥20.0) effect sizes were not noted. Green boxes show studies with <24 weeks duration (n=76). These results compare diets listed on the left column versus bottom row. For example, continuous energy restriction compared with ad-libitum diet shows −2.09 kg (95% CI −2.77 to −1.41), in which continuous energy restriction diets resulted in a 2.09 kg weight loss compared with ad-libitum diets in studies with <24 weeks duration. Blue boxes show studies with ≥24 weeks (n=17). These results compare diets listed on the top row versus right column. For example, continuous energy restriction compared with ad-libitum diet shows −2.21 kg (95% CI −3.72 to −0.70), in which continuous energy restriction diets resulted in a 2.21 kg weight loss compared with an ad-libitum diet in studies with ≥24 weeks duration

from low to high (supplementary figures 10 and 11). Conversely, all diet strategies showed a trivial decline in fasting glucose and HOMA-IR when compared with ad-libitum diet; evidence was of moderate certainty (supplementary figures 8 and 12). Additionally, ADF compared with an ad-libitum diet showed the greatest number of changes across the cardiometabolic risk factors.

Adverse events and adherence

Supplementary table 4 outlines the adverse events and adherence reported in the identified studies. Assessment of adverse events were reported in 56 trials, of which 27 trials reported no harmful events in the intermittent fasting groups. Of the 29 studies that described some adverse events, all but one was considered severe. Most trials reported mild side effects including constipation, nausea, hunger, diarrhoea, and dizziness. Holmer and colleagues reported a severe event of one participant with hypoglycaemia having a fall[66]; however, the participant remained in the study. A separate study reported one case of high bilirubin and low sodium concentrations in the midstudy follow-up, and one person with low potassium concentrations at the end of the 26 week trial.[35]

Of the 99 identified studies, 74 studies included description of adherence or sufficient information to determine adherence. Most trials reported high adherence (>80%) throughout the duration of the study. Among the trials that had a 52 week follow-up,[50 57 59 64 79] most stated poor adherence in the intervention groups. In one study,[59] adherence to the WDF declined from 74% at six weeks to 22% at 52 weeks. By contrast, however, another 52 week study reported high adherence in the TRE and CRE diet groups (both approximately 84%).[79]

Sensitivity analysis and publication bias

We conducted a sensitivity network meta-analyses for studies with people with type 2 diabetes (n=11) (supplementary figure 35). Briefly, TRF compared with ad-libitum only showed a trivial improvement for body weight (mean difference −1.93 kg (95% CI −2.44 to −1.43)), while WDF (−2.74 kg (−4.30 to −1.18)) and CER (−2.87 kg (−4.63 to −1.11)) diets showed small reductions in body weight compared with ad-libitum. ADF, however, showed a moderate reduction in body weight compared with ad-libitum (−4.42 kg (−5.91 to −2.94)). Additionally, TRE showed a moderate reduction for BMI, small reductions for fasting blood

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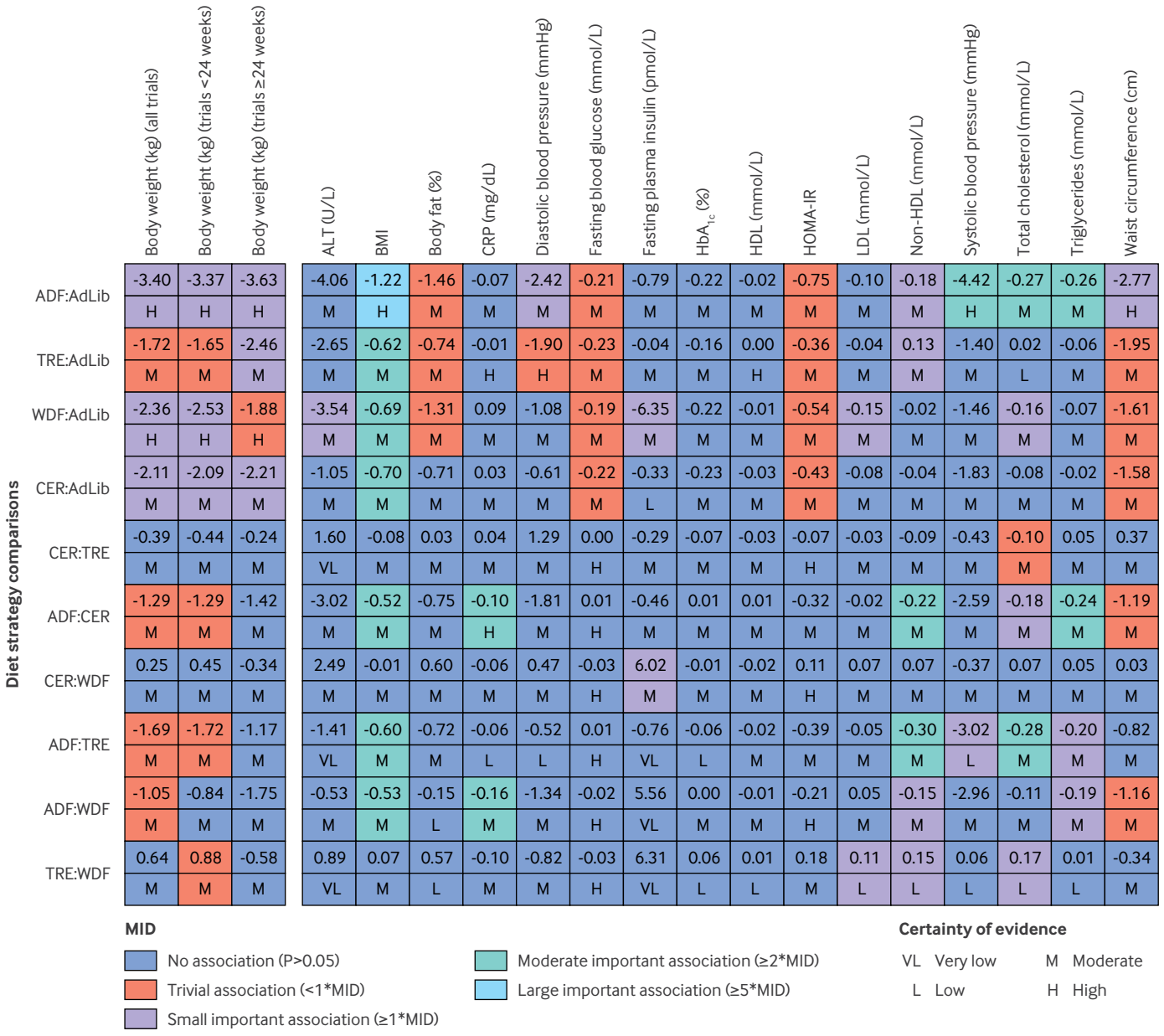


Fig 5 | Summary heatmap of the network effect size estimates (mean differences) and CINeMA certainty of the evidence, which applied the GRADE system, for all comparisons with each outcome of interest (n=17). Results are given as diet strategy 1 compared with diet strategy 2 with reductions favouring diet strategy 1 and increases favouring diet strategy 2 (opposite for high density lipoprotein cholesterol). The colours represent the level of effect based on MID for each outcome (supplementary table 22 for the MIDs). Very large effects (≥10 kg) are not shown as no effect size reached this. The blue boxes represent non-significant network effect estimates (P>0.05) and no important effect; the letters represent certainty of evidence, as per GRADE. ADF=alternate day fasting; AdLib=Ad-libitum; CER=continuous energy restriction; CINeMA=confidence in network meta-analysis; GRADE=grading of recommendations assessment, development, and evaluation; HDL=high density lipoprotein; HOMA-IR=homeostatic model assessment for insulin resistance; LDL=low density lipoprotein; MID=minimally important difference; TRE=time restricted eating; WDF=whole day fasting

glucose and waist circumference, and trivial reductions for both fasting plasma insulin and HOMA-IR. WDF, however, only showed a moderate improvement for fasting plasma insulin when compared with ad-libitum. Among intermittent fasting strategies, ADF moderately improved body weight reduction compared with both TRE, while TRE resulted in a moderate increase in fasting plasma insulin compared with WDF. Since no other study outcome had at least 10 trials in all diet group comparisons, we did not conduct additional subgroup analyses.

Supplementary figures 36-51 show the comparison adjusted funnel plots for all outcomes with 10 or more trials, including body weight, alanine transaminase, body fat percentage, BMI, C-reactive protein, fasting glucose, fasting insulin, HbA_{1c}, high density lipoprotein cholesterol, HOMA-IR, low density lipoprotein cholesterol, non-high density lipoprotein

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cholesterol, systolic blood pressure, total cholesterol, triglycerides, and waist circumference. Funnel plot asymmetry was not observed for any of the outcomes.

Discussion

This meta-analysis concurrently and comprehensively evaluates the association of intermittent fasting, CER, and ad-libitum diets on cardiometabolic risk factors. Our findings showed a trivial to small reduction in body weight for all diet strategies compared with ad-libitum, and trivial reductions for ADF compared with CER, TRE, and WDF. These associations, however, were only significant among comparisons with ad-libitum diet in moderate-to-long term follow-up durations of at least 24 weeks. ADF when compared with TRE or WDF was associated with a reduction in BMI, non-high density lipoprotein cholesterol, and triglycerides. WDF only showed an improvement in total cholesterol over TRE. Additionally, all diet strategies presented similar benefits in cardiometabolic risk over an ad-libitum diet. ADF was the only intermittent fasting strategy to show an improvement in anthropometric and lipid measures when compared to CER. No benefit was observed for HbA_{1c} or high density lipoprotein cholesterol in any diet strategy comparison.

Comparison with other studies

While several systematic reviews and meta-analysis have been performed on intermittent fasting over the years, there are numerous limitations which restrict their overall interpretation or applicability. Previous meta-analyses either focused solely on weight loss, focused on a specific method of fasting, excluded studies with people who have comorbidities, even though this population stands to benefit the most from intermittent fasting, lacked assessment of heterogeneity, or did not assess the certainty of evidence.[8-10 129-131] Our network meta-analysis addresses these important limitations through our comprehensive evaluation of intermittent fasting diet strategies, CER, and ad-libitum diet, on body weight and other cardiometabolic risk factors.

In our analysis, intermittent fasting strategies showed trivial to small improvements in body weight reduction, with similar improvements in other anthropometric measurements including BMI and waist circumference compared to an ad-libitum diet and little additional benefit against CER. These findings are in accordance with previously published meta-analyses.[9 10] Cioffi and colleagues evaluated intermittent fasting, which grouped together WDF and ADF, against CER, in 11 identified trials of adults with overweight or obesity and observed no significant improvement for weight loss.[9] In our network meta-analysis, ADF was the only intermittent fasting strategy to show a reduction in weight when compared with CER, perhaps due to easier adherence to ADF compared with a continuous diet strategy.[11] To date, however, only three studies have directly compared intermittent fasting diets with cardiometabolic outcomes.[39 52 102] Among patients with non-alcoholic fatty liver disease, Cai and colleagues showed that both intermittent fasting strategies were effective in weight loss and other anthropometric measures over an ad-libitum diet; however, no significant differences were observed between intermittent fasting strategies.[39] Similarly, Erdem and colleagues compared anthropometric changes across a 12 week period and observed no significant difference in body weight between intermittent fasting groups (TRF and WDF).[52] Among people with type 2 diabetes and obesity, Umphonsathien and colleagues' study results showed similar improvements for glycaemic control between WDF and ADF.[102] For the first time, using the network meta-analysis approach, we were able to comprehensively examine the associations between intermittent fasting strategies, accounting for both direct and indirect estimates, and observed an improvement in body weight for ADF over TRE. ADF's greater weight loss and cardiometabolic benefits, such as reduced HOMA-IR, may reflect enhanced fat oxidation and insulin sensitivity from prolonged fasting periods; although, short trial durations probably limited larger differences compared with TRE, WDF, or CER.

While our analysis by trial duration for body weight showed similar changes in trials with less than 24 weeks duration to the network analysis of all trials, assessment of longer trial studies showed a reduction in body weight for diet interventions when compared with ad-libitum. The loss of association in the network assessment of moderate to longer term trials (≥24 weeks) may be due to an insufficient number of studies available. Additionally, while our analysis included randomised clinical trials, adherence to dietary interventions may decline over time,[11] and metabolic adaptation could limit sustained weight loss in longer term trials.[132] Notably, the results show that intermittent fasting may offer unique benefits primarily in the short term, whereas both intermittent fasting and CER appear to provide similar moderate-to-long term improvements over ad-libitum diets. This equivalence in sustained outcomes in the moderate-to-long term is a critical take-away for clinicians managing chronic metabolic conditions. The inclusion of three week trials, while showing early weight loss (eg, 0.5-2 kg), reflects short term feasibility rather than sustained effects, which potentially may have inflated short term benefits in the less than 24 week stratum. Additionally, the scarcity of trials of 52 weeks or longer (only five identified) precluded a separate network meta-analysis for very long term effects, limiting relevance to related to sustained long term weight loss. Future randomised clinical trials with extended follow-up are needed to assess the durability of these dietary strategies.

Moreover, as glucose, lipid, and energy metabolism are all regulated by the circadian system, eating at certain times of the day may provide benefits beyond weight loss through differences in insulin sensitive periods, beta cell responsiveness, and thermic effect of food.[133] In a proof-of-concept study among men with prediabetes, a group using TRE with a morning eating window improved (insulin resistance and blood

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pressure) and impaired (triglycerides) cardiometabolic risk factors independent of weight loss when compared with a control group.[134] While our analysis did not examine specific eating time windows, these findings were generally consistent with our results for TRE versus ad-libitum diet showing a benefit in fasting blood glucose, insulin resistance (HOMA-IR), and diastolic blood pressure. Similar benefits were evaluated in the other intermittent fasting diets, ADF and WDF, with additional benefits for total cholesterol. A meta-analysis also showed similar improvements in intermittent fasting compared with a non-intervention diet for insulin and HOMA-IR.[135]

The benefits between intermittent fasting and CER, and among intermittent fasting strategies, for cardiometabolic markers remain unclear. We showed that ADF improved several cardiometabolic risk factors, including non-high density lipoprotein cholesterol, triglycerides, and total cholesterol, while TRE and WDF generally did not result in additional benefits to CER. A few meta-analyses that evaluated intermittent fasting with CER showed no significant benefit for several cardiometabolic risk factors including fasting glucose,[9 10 136 137] HbA_{1c},[9] HOMA-IR,[9] or lipid markers[10 136 137]; however, findings for high density lipoprotein cholesterol are less consistent. In a review of patients with metabolic syndrome, intermittent fasting improved high density lipoprotein cholesterol concentrations,[136] while a separate analysis among individuals with type 2 diabetes and metabolic syndrome found no significant change for high density lipoprotein cholesterol.[137] In our analyses, we found no significant changes in any diet comparison for high density lipoprotein cholesterol. However, comparisons between intermittent fasting showed that ADF was more effective in lowering total cholesterol and triglyceride concentrations. WDF also showed an improvement in reducing total cholesterol levels when compared with TRE. These findings were primarily based on indirect estimates, and thus, direct comparisons are not needed to confirm these associations.

The hypothesised improvement in cardiometabolic health through a fasting diet approach derives primarily from extensive animal model studies.[138-140] Such studies have noted that fasting states can encourage the use of fat stores, with a preferential reduction or browning of adipose tissue mass, improved insulin sensitivity, and reduction in inflammation and oxidative stress.[138] Furthermore, the notion of metabolic switching between the fed and fasted states, particularly through a TRE approach, have also shown benefits in preventing glucose intolerance and dyslipidaemia.[139 140] These metabolic changes, however, have not been substantiated in humans. Moreover, as determined in our network analyses, poor adherence, particularly in longer trials, pose challenges in assessing the true impact of these diet strategies on cardiometabolic health. Additional studies focused on comparing intermittent fasting strategies with focused improvement in participant adherence are needed to elucidate potential differences in dietary approaches and their impact on cardiometabolic risk factors.

The 2.0 kg minimally important difference reflects clinically meaningful weight loss in largely obese populations, aligning with prior evidence.[29] While many observed reductions with intermittent fasting strategies compared to ad-libitum exceeded this threshold, individual strategies of intermittent fasting particularly ADF versus CER (−1.29 kg) fell below this level, suggesting somewhat limited clinical impact in those comparisons. Nevertheless, these intermittent fasting strategies offer a valuable non-pharmacological option for improving cardiometabolic health. By contrast, GLP-1 receptor agonists, such as semaglutide, result in substantial weight reductions of 10-15% body weight (approximately 8-12 kg for an 80 kg individual) alongside significant in improvements HbA_{1c} and cardiovascular risk in adults with overweight or obesity.[141] While GLP-1 treatments provide a powerful tool for transformative outcomes, intermittent fasting strategies remain an effective, accessible approach for those seeking sustainable weight management and cardiometabolic benefits without medication.

Strengths and limitations

This review has several strengths. This systematic review leverages both direct and indirect comparisons of all diet strategies through a network meta-analysis approach. Unlike the traditional pairwise meta-analysis, a network approach allows for more precise estimates, compared with single direct or indirect estimates, and allows for the ability to compare interventions that had not been previously compared. Additionally, we further evaluated the clinical value of these diet strategies on body weight using trial duration stratification. Moreover, we conducted a comprehensive literature search of randomised clinical trials using several databases in conjunction with a manual search. The bias was protection against with a focus on randomised clinical trials, no evidence of serious risk of bias was noted among included trials, and the use of the GRADE approach to assess the certainty of the estimates.

Conversely, important limitations should be considered. Firstly, the GRADE evaluation of the certainty of evidence was downgraded due to considerable heterogeneity and incoherence in the primary outcome of body weight among the various diet strategy comparisons. These downgrades are reflective of unexplained inconsistencies in the treatment effects (heterogeneity) and variations in the direct versus indirect estimates (incoherence). Certainty of evidence was also downgraded for imprecision based on 95% CIs crossing the prespecified minimal important differences for the outcomes of interest. Many randomised clinical trials had small sample sizes, which would have influenced the precision of the effect estimates. Similar downgrades were applied for several secondary cardiometabolic risk factors. Secondly, evidence of serious concern was considered for indirectness in several analyses,

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particularly among intermittent fasting strategy comparisons. Only three randomised clinical trials of direct assessment between intermittent fasting diets were available, thereby limiting generalisability and resulting in downgrades for indirectness.[39 52 102] Thirdly, we acknowledge that adjustments for multiple comparisons were not applied, as they are generally not recommended for prespecified outcomes in meta-analyses.[13] Furthermore, we excluded outcomes with fewer than three eligible studies, which may limit the comprehensiveness of our findings. Future studies with more data could address these gaps. Taken together, the assessments of the strengths and limitations led to the certainty of the evidence to range from low to moderate in most of the investigated outcomes.

Conclusions

Our network meta-analysis showed similar benefits for various intermittent fasting strategies and CER in cardiometabolic risk compared with ad-libitum diets. ADF presented additional trivial to moderate improvements to CER in overall weight, anthropometric measurements, lipid, and systolic blood pressure measures; however, this benefit was not observed in other intermittent fasting strategies. In relation to body weight, ADF showed a reduction when compared with CER, and TRE in shorter trials, although benefits of any diet strategies were lost in longer duration studies. The current evidence provides some indication of the benefits for caloric restriction and intermittent fasting diets, with little additional benefit for intermittent fasting, in cardiometabolic risk. Additional high quality randomised clinical trials with extended durations beyond 52 weeks are needed to elucidate the long term effects of these dietary strategies, with greater emphasis between intermittent fasting diets, and their impact on cardiometabolic health and cardiovascular outcomes across diverse populations.

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Funding: The Diabetes and Nutrition Study Group (DNSG) of the European Association of the Study of Diabetes (EASD) commissioned this systematic review and meta-analysis and provided funding and logistical support for meetings as part of the development of the EASD Clinical Practice Guidelines for Nutrition Therapy. This work was also supported by the Canadian Institutes of Health Research (funding reference number, 129920) through the Canada-wide Human Nutrition Trialists' Network (NTN). The Diet, Digestive tract, and Disease (3-D) Centre, funded through the Canada Foundation for Innovation (CFI) and the Ministry of Research and Innovation's Ontario Research Fund (ORF), provided the infrastructure for the conduct of this project. The Clinical Practice Guidelines Committee of the DNSG of the EASD had input on all aspects of the work. ZSA is supported by the Canadian Institutes of Health Research (CIHR) Fellowship. VC was supported by the CIHR Canada Graduate Scholarship-Masters (CGS-M) Research Award and a University of Toronto Department of Nutritional Sciences Fellowship. SK is primarily funded by the German Center for Diabetes Research (DZD). No other funders had a role in the design or conduct of the study; collection, management, analysis, and interpretation of the data; and preparation, review, approval of the manuscript or decision to publish.

Competing interests: All authors have completed the ICMJE uniform disclosure form at www.icmje.org/disclosure-of-interest/ and declare: TAK has received research support from the CIHR, the International Life Science Institute and National Honey Board. He has been an invited speaker at the Calorie Control Council Annual meeting for which he has received an honorarium. LC held a Mitacs-Elevate post-doctoral fellowship jointly funded by the Government of Canada and the Canadian Sugar Institute (2019-2021). She was employed as a casual clinical coordinator at INQUIS Clinical Research, Ltd. (formerly Glycemic Index Laboratories, Inc), a contract research organization (until 2019). She has received research funding from the Canadian Institutes of Health Research (CIHR), Protein Industries Canada (a Government of Canada Global Innovation Cluster), the United Soybean Board (The United States Department of Agriculture Soybean "Check-off" Program), and the Alberta Pulse Growers. She has received honoraria from the Arkansas Children's Hospital and travel funding from the World Sugars Research Organization for an internal presentation in 2022. SK received grants by the German Center for Diabetes Research (DZD), the German Diabetes Association, the Almond Board of California, the California Walnut Commission, the Wilhelm-Doerenkamp-Foundation. DCWL reports clinical research grant funding from Novo Nordisk. He serves on advisory boards for Amgen, Bayer, Boehringer Ingelheim, HLS Therapeutics, Eli Lilly, Novartis, Novo Nordisk, Pfizer, and Viatris. He serves on speaker bureaus for Amgen, Bayer, Boehringer Ingelheim, CME at Sea, HLS Therapeutics, Eli Lilly, Novartis, Novo Nordisk, and Obesity Canada. He is the founder of Obesity Canada and a member of the board of directors of Canadian Association of Bariatric Physicians and Surgeons

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for no remuneration. JOH reports speaker fees from Eli Lilly. He serves as a member of the scientific advisory board for General Mills. ML reports membership of the Arctic Clum and the Alpine Club, departmental research support from National Institute for Health Research (NIHR), Novo Nordisk Diabetes UK, and All Saints Educational Trust, outside the submitted work, lecturing fees from Novo Nordisk, Eli Lilly, Nestle, and Oviva, and has provided clinical consultancy to the Government of Bermuda, the Ombudsman of Northern Ireland, and Counterweight Ltd, with fees paid to the University of Glasgow. SW has been involved in honoraria, ad boards, or clinical trials for Novo Nordisk Inc, Bausch Health Canada, Eli Lilly, and Boehringer Engelheim. DR is director of Vuk Vrhovac University Clinic for Diabetes, Endocrinology and Metabolic Diseases at Merkur University Hospital, Zagreb, Croatia. 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CWCK has received grants or research support from the Advanced Food Materials Network, Agriculture and Agri-Foods Canada (AAFC), Almond Board of California, Barilla, Canadian Institutes of Health Research (CIHR), Canola Council of Canada, International Nut and Dried Fruit Council, International Tree Nut Council Research and Education Foundation, Loblaw Brands Ltd, the Peanut Institute, Pulse Canada, and Unilever. He has received in-kind research support from the Almond Board of California, Barilla, California Walnut Commission, Kellogg Canada, Loblaw Companies, Nutrartis, Quaker (PepsiCo), the Peanut Institute, Primo, Unico, Unilever, and WhiteWave Foods/Danone. He has received travel support and/or honoraria from the Barilla, California Walnut Commission, Canola Council of Canada, General Mills, International Nut and Dried Fruit Council, International Pasta Organization, Lantmannen, Loblaw Brands Ltd, Nutrition Foundation of Italy, Oldways Preservation Trust, Paramount Farms, the Peanut Institute, Pulse Canada, Sun-Maid, Tate & Lyle, Unilever, and White Wave Foods/Danone. He has served on the scientific advisory board for the International Tree Nut Council, International Pasta Organization, McCormick Science Institute, and Oldways Preservation Trust. He is a founding member of the International Carbohydrate Quality Consortium (ICQC), Executive Board Member of the DNSG of the EASD, is on the Clinical Practice Guidelines Expert Committee for Nutrition Therapy of the EASD and is a Director of the Toronto 3D Knowledge Synthesis and Clinical Trials foundation. 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He has received food donations to support randomised controlled trials from the Almond Board of California, California Walnut Commission, Danone, Nutrartis, Soylent, and Dairy Farmers of Canada. He has received travel support, speaker fees and/or honoraria from FoodMinds LLC, Nestlé, Abbott, General Mills, Nutrition Communications, International Food Information Council (IFIC), Arab Beverage Association, International Sweeteners Association, Calorie Control Council, Phynova, and Collaborative CME and Research Network (CCRN). He has or has had ad hoc consulting arrangements with Almond Board of California, Perkins Coie LLP, Tate & Lyle, Ingredion, and Brightseed. He is on the Clinical Practice Guidelines Expert Committees of Diabetes Canada, EASD, Canadian Cardiovascular Society (CCS), and Obesity Canada/Canadian Association of Bariatric Physicians and Surgeons. He serves as an unpaid member of the Board of Trustees of IAFNS. 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Ethical approval: This study did not require research ethics committee approval.

Data sharing: All data are freely available within the supplementary file. Additional data is available upon request.

Transparency: The primary guarantor and corresponding author (JLS) affirms that the manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned and registered have been explained.

Dissemination to participants and related patient and public communities: The findings of this systematic review and network meta-analysis will be disseminated through conference presentations, education sessions for healthcare professionals, social media feeds, newsletters, and direct outreach to government and stakeholders such as patient organisations and commonly used public sources of patient information. This work was commissioned by EASD and will inform updated guidelines.

Provenance and peer review: not commissioned; externally peer reviewed.

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1 Cannon CP. Cardiovascular disease and modifiable cardiometabolic risk factors. *Clin Cornerstone* 2007;8:11-28. doi:10.1016/S1098-3597(07)80025-1
2 Petrie JR, Guzik TJ, Touyz RM. Diabetes, hypertension, and cardiovascular disease: clinical insights and vascular mechanisms. *Can J Cardiol* 2018;34:575-84. doi:10.1016/j.cjca.2017.12.005
3 Blomain ES, Dirhan DA, Valentino MA, Kim GW, Waldman SA. Mechanisms of Weight Regain following Weight Loss. *ISRN Obes* 2013;2013:210524. doi:10.1155/2013/210524
4 Antoni R, Johnston KL, Collins AL, Robertson MD. Effects of intermittent fasting on glucose and lipid metabolism. *Proc Nutr Soc* 2017;76:361-8. doi:10.1017/S0029665116002986
5 Mattson MP, Longo VD, Harvie M. Impact of intermittent fasting on health and disease processes. *Ageing Res Rev* 2017;39:46-58. doi:10.1016/j.arr.2016.10.005
6 Catenacci VA, Pan Z, Ostendorf D, et al. A randomized pilot study comparing zero-calorie alternate-day fasting to daily caloric restriction in adults with obesity. *Obesity (Silver Spring)* 2016;24:1874-83. doi:10.1002/oby.21581

7 Trepanowski JF, Kroeger CM, Barnosky A, et al. Effects of alternate-day fasting or daily calorie restriction on body composition, fat distribution, and circulating adipokines: Secondary analysis of a randomized controlled trial. *Clin Nutr* 2018;37(6 Pt A):1871-8. doi:10.1016/j.clnu.2017.11.018
8 Cho Y, Hong N, Kim KW, et al. The effectiveness of intermittent fasting to reduce body mass index and glucose metabolism: a systematic review and meta-analysis. *J Clin Med* 2019;8:1645. doi:10.3390/jcm8101645
9 Cioffi I, Evangelista A, Ponzo V, et al. Intermittent versus continuous energy restriction on weight loss and cardiometabolic outcomes: a systematic review and meta-analysis of randomized controlled trials. *J Transl Med* 2018;16:371. doi:10.1186/s12967-018-1748-4
10 Harris L, Hamilton S, Azevedo LB, et al. Intermittent fasting interventions for treatment of overweight and obesity in adults: a systematic review and meta-analysis. *JBI Database System Rev Implement Rep* 2018;16:507-47. doi:10.11124/JBISRIR-2016-003248
11 Alhamdan BA, Garcia-Alvarez A, Alzahrnai AH, et al. Alternate-day versus daily energy restriction diets: which is more effective for weight loss? A systematic review and meta-analysis. *Obes Sci Pract* 2016;2:293-302. doi:10.1002/osp4.52
12 Guyatt GH, Oxman AD, Vist GE, et al, GRADE Working Group. GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. *BMJ* 2008;336:924-6. doi:10.1136/bmj.39489.470347.AD
13 Higgins JPTTJ, Chandler J, Cumpston M, Li T, Page MJ. Welch VA Cochrane Handbook for Systematic Reviews of Interventions version 6.3 (updated February 2022). 2022. Available from: www.training.cochrane.org/handbook
14 Moher D, Liberati A, Tetzlaff J, Altman DG, Group P, PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Med* 2009;6:e1000097. doi:10.1371/journal.pmed.1000097
15 Hutton B, Salanti G, Caldwell DM, et al. The PRISMA extension statement for reporting of systematic reviews incorporating network meta-analyses of health care interventions: checklist and explanations. *Ann Intern Med* 2015;162:777-84. doi:10.7326/M14-2385
16 Wilczynski NL, Morgan D, Haynes RB, Hedges T, Hedges Team. An overview of the design and methods for retrieving high-quality studies for clinical care. *BMC Med Inform Decis Mak* 2005;5:20. doi:10.1186/1472-6947-5-20
17 Stedman MR, Curtin F, Elbourne DR, Kesselheim AS, Brookhart MA. Meta-analyses involving cross-over trials: methodological issues. *Int J Epidemiol* 2011;40:1732-4. doi:10.1093/ije/dyp345
18 WebPlotDigitizer - Extract data from plots, images, and maps. https://automeris.io/WebPlotDigitizer/
19 Lemstra M, Bird Y, Nwankwo C, Rogers M, Moraros J. Weight loss intervention adherence and factors promoting adherence: a meta-analysis. *Patient Prefer Adherence* 2016;10:1547-59. doi:10.2147/PPA.S103649
20 Higgins JP, Altman DG, Gøtzsche PC, et al, Cochrane Bias Methods GroupCochrane Statistical Methods Group. The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. *BMJ* 2011;343:d5928. doi:10.1136/bmj.d5928
21 Moher D, Liberati A, Tetzlaff J, Altman DG, PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Ann Intern Med* 2009;151:264-9, W64. doi:10.7326/0003-4819-151-4-200908180-00135
22 Balduzzi S, Rücker G, Nikolakopoulou A, et al. netmeta: An R package for network meta-analysis using frequentist methods. *J Stat Softw* 2023;106:1-40. doi:10.18637/jss.v106.i02.
23 Papakonstantinou T, Nikolakopoulou A, Higgins JPT, Egger M, Salanti G. CINeMA: Software for semiautomated assessment of the confidence in the results of network meta-analysis. *Campbell Syst Rev* 2020;16:e1080. doi:10.1002/cl2.1080
24 Brignardello-Petersen R, Bonner A, Alexander PE, et al, GRADE Working Group. Advances in the GRADE approach to rate the certainty in estimates from a network meta-analysis. *J Clin Epidemiol* 2018;93:36-44. doi:10.1016/j.jclinepi.2017.10.005
25 Brignardello-Petersen R, Murad MH, Walter SD, et al, GRADE Working Group. GRADE approach to rate the certainty from a network meta-analysis: avoiding spurious judgments of imprecision in sparse networks. *J Clin Epidemiol* 2019;105:60-7. doi:10.1016/j.jclinepi.2018.08.022
26 Nikolakopoulou A, Higgins JPT, Papakonstantinou T, et al. CINeMA: An approach for assessing confidence in the results of a network meta-analysis. *PLoS Med* 2020;17:e1003082. doi:10.1371/journal.pmed.1003082
27 Cipriani A, Higgins JP, Geddes JR, Salanti G. Conceptual and technical challenges in network meta-analysis. *Ann Intern Med* 2013;159:130-7. doi:10.7326/0003-4819-159-2-201307160-00008
28 Jansen JP, Naci H. Is network meta-analysis as valid as standard pairwise meta-analysis? It all depends on the distribution of effect modifiers. *BMC Med* 2013;11:159. doi:10.1186/1741-7015-11-159
29 Ge L, Sadeghirad B, Ball GDC, et al. Comparison of dietary macronutrient patterns of 14 popular named dietary programmes for weight and cardiovascular risk factor reduction in adults: systematic review and network meta-analysis of randomised trials. *BMJ* 2020;369:m696. doi:10.1136/bmj.m696
30 Jackson D, Barrett JK, Rice S, White IR, Higgins JP. A design-by-treatment interaction model for network meta-analysis with random inconsistency effects. *Stat Med* 2014;33:3639-54. doi:10.1002/sim.6188
31 Dias S, Welton NJ, Caldwell DM, Ades AE. Checking consistency in mixed treatment comparison meta-analysis. *Stat Med* 2010;29:932-44. doi:10.1002/sim.3767
32 Andriessen C, Fealy CE, Veelen A, et al. Three weeks of time-restricted eating improves glucose homeostasis in adults with type 2 diabetes but does not improve insulin sensitivity: a randomised crossover trial. *Diabetologia* 2022;65:1710-20. doi:10.1007/s00125-022-05752-z
33 Antoni R, Johnston KL, Collins AL, Robertson MD. Intermittent v. continuous energy restriction: differential effects on postprandial glucose and lipid metabolism following matched weight loss in overweight/obese participants. *Br J Nutr* 2018;119:507-16. doi:10.1017/S0007114517003890
34 Arciero PJ, Poe M, Mohr AE, et alIntermittent fasting and protein pacing are superior to caloric restriction for weight and visceral fat loss. 2023;31:139-149.
35 Bartholomew CL, Muhlestein JB, May HT, et al. Randomized controlled trial of once-per-week intermittent fasting for health improvement: the WONDERFUL trial. *Eur Heart J Open* 2021;1:oeab026. doi:10.1093/ehjopen/oeab026
36 Beaulieu K, Casanova N, Oustric P, et al. Matched weight loss through intermittent or continuous energy restriction does not lead to compensatory increases in appetite and eating behavior in a randomized controlled trial in women with overweight and obesity. *J Nutr* 2020;150:623-33. doi:10.1093/jn/nxz296
37 Betts JA, Richardson JD, Chowdhury EA, Holman GD, Tsintzas K, Thompson D. The causal role of breakfast in energy balance and health: a randomized controlled trial in lean adults. *Am J Clin Nutr* 2014;100:539-47. doi:10.3945/ajcn.114.083402
38 Bhutani S, Klempel MC, Kroeger CM, Trepanowski JF, Varady KA. Alternate day fasting and endurance exercise combine to reduce body weight and favorably alter plasma lipids in obese humans. *Obesity (Silver Spring)* 2013;21:1370-9. doi:10.1002/oby.20353
39 Cai H, Qin YL, Shi ZY, et al. Effects of alternate-day fasting on body weight and dyslipidaemia in patients with non-alcoholic fatty liver disease: a randomised controlled trial. *BMC Gastroenterol* 2019;19:219. doi:10.1186/s12876-019-1132-8
40 Cai J, Shao L, Zhao S, Liu W, Liu P. The effects of three weight management methods on body composition and serum lipids of overweight and obese people. *Front Nutr* 2022;9:1073576. doi:10.3389/fnut.2022.1073576
41 Carter S, Clifton PM, Keogh JB. The effects of intermittent compared to continuous energy restriction on glycaemic control in type 2 diabetes; a pragmatic pilot trial. *Diabetes Res Clin Pract* 2016;122:106-12. doi:10.1016/j.diabres.2016.10.010
42 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 Netw Open* 2018;1:e180756. doi:10.1001/jamanetworkopen.2018.0756
43 Castela I, Rodrigues C, Ismael S, Barreiros-Mota I, Morais J, Araujo JR, et alIntermittent energy restriction ameliorates adipose tissue-associated inflammation in adults with obesity: A randomised controlled trial. *Clin Nutrit* 2022;41:1660-6.
44 Che T, Yan C, Tian D, Zhang X, Liu X, Wu Z. Time-restricted feeding improves blood glucose and insulin sensitivity in overweight patients with type 2 diabetes: a randomised controlled trial. *Nutr Metab (Lond)* 2021;18:88. doi:10.1186/s12986-021-00613-9
45 Cho AR, Moon JY, Kim S, et al. Effects of alternate day fasting and exercise on cholesterol metabolism in overweight or obese adults: A pilot randomized controlled trial. *Metabolism* 2019;93:52-60. doi:10.1016/j.metabol.2019.01.002
46 Chow LS, Manoogian ENC, Alvear A, et al. Time-Restricted Eating Effects on Body Composition and Metabolic Measures in Humans who are Overweight: A Feasibility Study. *Obesity (Silver Spring)* 2020;28:860-9. doi:10.1002/oby.22756
47 Cienfuegos S, Gabel K, Kalam F, et al. Effects of 4- and 6-h Time-Restricted Feeding on Weight and Cardiometabolic Health: A Randomized Controlled Trial in Adults with Obesity. *Cell Metab* 2020;32:366-378.e3. doi:10.1016/j.cmet.2020.06.018
48 Conley M, Le Fevre L, Haywood C, Proietto J. Is two days of intermittent energy restriction per week a feasible weight loss approach in obese males? A randomised pilot study. *Nutr Diet* 2018;75:65-72. doi:10.1111/1747-0080.12372

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49 Coutinho SR, Halset EH, Gåsbakk S, et al. Compensatory mechanisms activated with intermittent energy restriction: A randomized control trial. *Clin Nutr* 2018;37:815-23. doi:10.1016/j.clnu.2017.04.002
50 de Oliveira Maranhão Pureza IR, da Silva Junior AE, Silva Praxedes DR, et al. Effects of time-restricted feeding on body weight, body composition and vital signs in low-income women with obesity: A 12-month randomized clinical trial. *Clin Nutr* 2021;40:759-66. doi:10.1016/j.clnu.2020.06.036
51 Domaszewski P, Konieczny M, Dybek T, et alComparison of the effects of six-week time-restricted eating on weight loss, body composition, and visceral fat in overweight older men and women. *Experiment Gerontol* 2023;174:112116.
52 Erdem NZ, Bayraktaroğlu E, Samancı RA, Geçgil-Demir E, Tarakçı NG, Mert-Biberoğlu F. The effect of intermittent fasting diets on body weight and composition. *Clin Nutr ESPEN* 2022;51:207-14. doi:10.1016/j.clnesp.2022.08.030
53 Ezpeleta M, Gabel K, Cienfuegos S, et al. Effect of alternate day fasting combined with aerobic exercise on non-alcoholic fatty liver disease: a randomized controlled trial. *Cell Metab* 2023;35:56-70. e3. doi:10.1016/j.cmet.2022.12.001
54 Fagundes GBP, Tibaes JRB, Silva ML, et alMetabolic and behavioral effects of time-restricted eating in women with overweight or obesity: preliminary findings from a randomized study. *Nutrition* 2023;107:111909.
55 Fitzgerald KC, Vizthum D, Henry-Barron B, et al. Effect of intermittent vs. daily calorie restriction on changes in weight and patient-reported outcomes in people with multiple sclerosis. *Mult Scler Relat Disord* 2018;23:33-9. doi:10.1016/j.msard.2018.05.002
56 Gabel K, Kroeger CM, Trepanowski JF, et al. Differential effects of alternate-day fasting versus daily calorie restriction on insulin resistance. *Obesity (Silver Spring)* 2019;27:1443-50. doi:10.1002/oby.22564
57 Gray KL, Clifton PM, Keogh JB. The effect of intermittent energy restriction on weight loss and diabetes risk markers in women with a history of gestational diabetes: a 12-month randomized control trial. *Am J Clin Nutr* 2021;114:794-803. doi:10.1093/ajcn/nqab058
58 Guo Y, Luo S, Ye Y, Yin S, Fan J, Xia M. Intermittent fasting improves cardiometabolic risk factors and alters gut microbiota in metabolic syndrome patients. *J Clin Endocrinol Metab* 2021;106:64-79. doi:10.1210/clinem/dgaa644
59 Hajek P, Przulj D, Pesola F, et al. A randomised controlled trial of the 5:2 diet. *PLoS One* 2021;16:e0258853. doi:10.1371/journal.pone.0258853
60 Harvie M, Pegington M, Howell SJ, et al. Randomised controlled trial of intermittent vs continuous energy restriction during chemotherapy for early breast cancer. *Br J Cancer* 2022;126:1157-67. doi:10.1038/s41416-021-01650-0
61 Harvie M, Wright C, Pegington M, et al. The effect of intermittent energy and carbohydrate restriction v. daily energy restriction on weight loss and metabolic disease risk markers in overweight women. *Br J Nutr* 2013;110:1534-47. doi:10.1017/S0007114513000792
62 Harvie MN, Pegington M, Mattson MP, et al. The effects of intermittent or continuous energy restriction on weight loss and metabolic disease risk markers: a randomized trial in young overweight women. *Int J Obes (Lond)* 2011;35:714-27. doi:10.1038/ijo.2010.171
63 He CJ, Fei YP, Zhu CY, et al. Effects of intermittent compared with continuous energy restriction on blood pressure control in overweight and obese patients with hypertension. *Front Cardiovasc Med* 2021;8:750714. doi:10.3389/fcvm.2021.750714
64 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. *Int J Obes (Lond)* 2019;43:2028-36. doi:10.1038/s41366-018-0247-2
65 Hirsh SP, Pons M, Joyal SV, Swick AG. Avoiding holiday seasonal weight gain with nutrient-supported intermittent energy restriction: a pilot study. *J Nutr Sci* 2019;8:e11. doi:10.1017/jns.2019.8
66 Holmer M, Lindqvist C, Petersson S, et al. Treatment of NAFLD with intermittent calorie restriction or low-carb high-fat diet - a randomised controlled trial. *JHEP Rep* 2021;3:100256. doi:10.1016/j.jhepr.2021.100256
67 Hooshiar SH, Yazdani A, Jafarnejad S. Alternate-day modified fasting diet improves weight loss, subjective sleep quality and daytime dysfunction in women with obesity or overweight: a randomized, controlled trial. *Front Nutr* 2023;10:1174293. doi:10.3389/fnut.2023.1174293
68 Hussin NM, Shahar S, Teng NI, Ngah WZ, Das SK. Efficacy of fasting and calorie restriction (FCR) on mood and depression among ageing men. *J Nutr Health Aging* 2013;17:674-80. doi:10.1007/s12603-013-0344-9
69 Hutchison AT, Liu B, Wood RE, et al. Effects of intermittent versus continuous energy intakes on insulin sensitivity and metabolic risk in women with overweight. *Obesity (Silver Spring)* 2019;27:50-8. doi:10.1002/oby.22345
70 Isenmann E, Dissemond J, Geisler S. The effects of a macronutrient-based diet and time-restricted feeding (16:8) on body composition in physically active individuals-a 14-week randomised controlled trial. *Nutrients* 2021;13:3122. doi:10.3390/nu13093122
71 Jimenez AM, Oliva SL, Vilar EG, et al. The Mediterranean diet pattern with intermittent semi-fasting may facilitate weight loss: randomised controlled trial. *Med J Nutrition Metab* 2019;12:153-61doi:10.3233/MNM-180257.
72 Johari MI, Yusoff K, Haron J, et al. Author correction: a randomised controlled trial on the effectiveness and adherence of modified alternate-day calorie restriction in improving activity of non-alcoholic fatty liver disease. *Sci Rep* 2020;10:10599. doi:10.1038/s41598-020-67806-9
73 Kahleova H, Belinova L, Malinska H, et al. Eating two larger meals a day (breakfast and lunch) is more effective than six smaller meals in a reduced-energy regimen for patients with type 2 diabetes: a randomised crossover study. *Diabetologia* 2014;57:1552-60. doi:10.1007/s00125-014-3253-5
74 Kord Varkaneh H, Salehi Sahlabadi A, Găman M-A, et al. Effects of the 5:2 intermittent fasting diet on non-alcoholic fatty liver disease: A randomized controlled trial. *Front Nutr* 2022;9:948655. doi:10.3389/fnut.2022.948655
75 Kotarsky CJ, Johnson NR, Mahoney SJ, et al. Time-restricted eating and concurrent exercise training reduces fat mass and increases lean mass in overweight and obese adults. *Physiol Rep* 2021;9:e14868. doi:10.14814/phy2.14868
76 Kunduraci YE, Ozbek H. Does the energy restriction intermittent fasting diet alleviate metabolic syndrome biomarkers? a randomized controlled trial. *Nutrients* 2020;12:3213. doi:10.3390/nu12103213
77 Lin S, Cienfuegos S, Ezpeleta M, et al. Time-restricted eating without calorie counting for weight loss in a racially diverse population : a randomized controlled trial. *Ann Intern Med* 2023;176:885-95. doi:10.7326/M23-0052
78 Lin YJ, Wang YT, Chan LC, Chu NF. Effect of time-restricted feeding on body composition and cardio-metabolic risk in middle-aged women in Taiwan. *Nutrition* 2022;93:111504. doi:10.1016/j.nut.2021.111504
79 Liu D, Huang Y, Huang C, et al. Calorie restriction with or without time-restricted eating in weight loss. *N Engl J Med* 2022;386:1495-504. doi:10.1056/NEJMoa2114833
80 Liu H, Chen S, Ji H, Dai Z. Effects of time-restricted feeding and walking exercise on the physical health of female college students with hidden obesity: a randomized trial. *Front Public Health* 2023;11:1020887. doi:10.3389/fpubh.2023.1020887
81 Lowe DA, Wu N, Rohdin-Bibby L, et al. Effects of time-restricted eating on weight loss and other metabolic parameters in women and men with overweight and obesity: the treat randomized clinical trial. *JAMA Intern Med* 2020;180:1491-9. doi:10.1001/jamainternmed.2020.4153
82 Manoogian ENC, Zadourian A, Lo HC, et al. Feasibility of time-restricted eating and impacts on cardiometabolic health in 24-h shift workers: The Healthy Heroes randomized control trial. *Cell Metab* 2022;34:1442-1456.e7. doi:10.1016/j.cmet.2022.08.018
83 Maroofi M, Nasrollahzadeh J. Effect of intermittent versus continuous calorie restriction on body weight and cardiometabolic risk markers in subjects with overweight or obesity and mild-to-moderate hypertriglyceridemia: a randomized trial. *Lipids Health Dis* 2020;19:216. doi:10.1186/s12944-020-01399-0
84 Mayra ST, Chondropoulos K, De Leon A, Kravat N, Johnston CS. The feasibility and preliminary efficacy of early time-restricted eating on diet quality in college students: a randomized study. *Obes Res Clin Pract* 2022:16:413-20.
85 Moro T, Tinsley G, Bianco A, et al. Effects of eight weeks of time-restricted feeding (16/8) on basal metabolism, maximal strength, body composition, inflammation, and cardiovascular risk factors in resistance-trained males. *J Transl Med* 2016;14:290. doi:10.1186/s12967-016-1044-0
86 Obermayer A, Tripolt NJ, Pferschy PN, et al. Efficacy and safety of intermittent fasting in people with insulin-treated type 2 diabetes (INTERFAST-2)-A randomized controlled trial. *Diabetes Care* 2023;46:463-8. doi:10.2337/dc22-1622
87 Oh M, Kim S, An KY, et al. Effects of alternate day calorie restriction and exercise on cardio-metabolic risk factors in overweight and obese adults: an exploratory randomized controlled study. *BMC Public Health* 2018;18:1124. doi:10.1186/s12889-018-6009-1
88 Oustric P, Beaulieu K, Casanova N, et al. Food liking but not wanting decreases after controlled intermittent or continuous energy restriction to ≥5% weight loss in women with overweight/obesity. *Nutrients* 2021;13:182. doi:10.3390/nu13010182
89 Overland J, Toth K, Gibson AA, et al. The safety and efficacy of weight loss via intermittent fasting or standard daily energy restriction in adults with type 1 diabetes and overweight or obesity: A pilot study. *Obes Med* 2018;12:13-7doi:10.1016/j.obmed.2018.11.001.

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90 Parvaresh A, Razavi R, Abbasi B, et al. Modified alternate-day fasting vs. calorie restriction in the treatment of patients with metabolic syndrome: a randomized clinical trial. *Complement Ther Med* 2019;47:102187. doi:10.1016/j.ctim.2019.08.021
91 Pinto AM, Bordoli C, Buckner LP, et al. Intermittent energy restriction is comparable to continuous energy restriction for cardiometabolic health in adults with central obesity: a randomized controlled trial; the Met-IER study. *Clin Nutr* 2020;39:1753-63. doi:10.1016/j.clnu.2019.07.014
92 Pureza IROM, Melo ISV, Macena ML, et al. Acute effects of time-restricted feeding in low-income women with obesity placed on hypoenergetic diets: randomized trial. *Nutrition* 2020;77:110796. doi:10.1016/j.nut.2020.110796
93 Queiroz JDN, Macedo RCO, Dos Santos GC, et alCardiometabolic effects of early vs. delayed time-restricted eating plus caloric restriction in adults with overweight and obesity: an exploratory randomized clinical trial. *Br J Nutr* 2022;26:1-13.
94 Razavi R, Parvaresh A, Abbasi B, et al. The alternate-day fasting diet is a more effective approach than a calorie restriction diet on weight loss and hs-CRP levels. *Int J Vitam Nutr Res* 2021;91:242-50. doi:10.1024/0300-9831/a000623
95 Richardson CE, Tovar AP, Davis BA, Van Loan MD, Keim NL, Casazza GA. An intervention of four weeks of time-restricted eating (16/8) in male long-distance runners does not affect cardiometabolic risk factors. *Nutrients* 2023;15:985. doi:10.3390/nu15040985
96 Schübel R, Nattenmüller J, Sookthai D, et al. Effects of intermittent and continuous calorie restriction on body weight and metabolism over 50 wk: a randomized controlled trial. *Am J Clin Nutr* 2018;108:933-45. doi:10.1093/ajcn/nqy196
97 Steger FL, Donnelly JE, Hull HR, Li X, Hu J, Sullivan DK. Intermittent and continuous energy restriction result in similar weight loss, weight loss maintenance, and body composition changes in a 6 month randomized pilot study. *Clin Obes* 2021;11:e12430. doi:10.1111/cob.12430
98 Stote KS, Baer DJ, Spears K, et al. A controlled trial of reduced meal frequency without caloric restriction in healthy, normal-weight, middle-aged adults. *Am J Clin Nutr* 2007;85:981-8. doi:10.1093/ajcn/85.4.981
99 Sundfør TM, Svendsen M, Tonstad S. Effect of intermittent versus continuous energy restriction on weight loss, maintenance and cardiometabolic risk: A randomized 1-year trial. *Nutr Metab Cardiovasc Dis* 2018;28:698-706. doi:10.1016/j.numecd.2018.03.009
100 Templeman I, Smith HA, Chowdhury E, et al. A randomized controlled trial to isolate the effects of fasting and energy restriction on weight loss and metabolic health in lean adults. *Sci Transl Med* 2021;13:eabd8034. doi:10.1126/scitranslmed.abd8034
101 Teong XT, Liu K, Vincent AD, 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. *Nat Med* 2023;29:963-72. doi:10.1038/s41591-023-02287-7
102 Umphonsathien M, Rattanasian P, Lokattachariya S, Suansawang W, Boonyasuppayakorn K, Khovidhunkit W. Effects of intermittent very-low calorie diet on glycemic control and cardiovascular risk factors in obese patients with type 2 diabetes mellitus: A randomized controlled trial. *J Diabetes Investig* 2022;13:156-66. doi:10.1111/jdi.13619
103 Varady KA, Bhutani S, Klempel MC, et al. Alternate day fasting for weight loss in normal weight and overweight subjects: a randomized controlled trial. *Nutr J* 2013;12:146. doi:10.1186/1475-2891-12-146
104 Witjaksono F, Prafiantini E, Rahmawati A. Effect of intermittent fasting 5:2 on body composition and nutritional intake among employees with obesity in Jakarta: a randomized clinical trial. *BMC Res Notes* 2022;15:323. doi:10.1186/s13104-022-06209-7
105 Xie Z, Sun Y, Ye Y, et al. Randomized controlled trial for time-restricted eating in healthy volunteers without obesity. *Nat Commun* 2022;13:1003. doi:10.1038/s41467-022-28662-5
106 Xu M, Li J, Zou Y, Xu Y. The comparison of the effects between continuous and intermittent energy restriction in short-term bodyweight loss for sedentary population: a randomized, double-blind, controlled trial. *Int J Environ Res Public Health* 2021;18:11645. doi:10.3390/ijerph182111645
107 Bilge Sertdemir H, Dursun SB, Namulodi S, Kaya MS, Bayıroğlu F. The effect of intermittent fasting diet and light-intensity physical activity on serum irisin levels in elderly individuals. *Ahi Evran Med J* 2024;8:77-84.
108 Čermáková E, Forejt M, Čermák M. The influence of intermittent fasting on selected human anthropometric parameters. *Int J Med Sci* 2024;21:2630-9. doi:10.7150/ijms.99116
109 Correia JM, Pezarat-Correia P, Minderico C, Infante J, Mendonca GV. Effects of time-restricted eating on aerobic capacity, body composition, and markers of metabolic health in healthy male recreational runners: a randomized crossover trial. *J Acad Nutr Diet* 2024;124:1041-50. doi:10.1016/j.jand.2024.01.005
110 Dunn W, Herrmann SD, Montgomery RN, et al. Optimizing muscle preservation during weight loss in patients with cirrhosis: A pilot study comparing continuous energy restriction to alternate-day modified fasting for weight loss in patients with obesity and non-alcoholic cirrhosis of the liver. *Obes Sci Pract* 2024;10:e70016. doi:10.1002/osp4.70016
111 Dutzmann J, Kefalianakis Z, Kahles F, et al. Intermittent fasting after st-segment-elevation myocardial infarction improves left ventricular function: the randomized controlled INTERFAST-MI trial. *Circ Heart Fail* 2024;17:e010936. doi:10.1161/CIRCHEARTFAILURE.123.010936
112 Ghezzi L, Tosti V, Shi L, et al. Randomised controlled trial of intermittent calorie restriction in people with multiple sclerosis. *J Neurol Neurosurg Psychiatry* 2025;96:158-69. doi:10.1136/jnnp-2024-333465
113 Guevara-Cruz M, Hernández-Gómez KG, Condado-Huerta C, et al. Intermittent fasting, calorie restriction, and a ketogenic diet improve mitochondrial function by reducing lipopolysaccharide signaling in monocytes during obesity: A randomized clinical trial. *Clin Nutr* 2024;43:1914-28. doi:10.1016/j.clnu.2024.06.036
114 Güner E, Aktaç Ş. Time-restricted feeding can increase food-related impulsivity: a randomized controlled trial. *Nutr Neurosci* 2025;28:28-36. doi:10.1080/1028415X.2024.2344139
115 He M, Wang J, Liang Q, et al. Time-restricted eating with or without low-carbohydrate diet reduces visceral fat and improves metabolic syndrome: A randomized trial. *Cell Rep Med* 2022;3:100777. doi:10.1016/j.xcrm.2022.100777
116 Hooshiar SH, Yazdani A, Jafarnejad S. Does an alternate-day modified fasting diet improve premenstrual syndrome symptoms and health-related quality of life in obese or overweight women with premenstrual syndrome? A randomized, controlled trial. *Front Nutr* 2024;10:1298831. doi:10.3389/fnut.2023.1298831
117 Irani H, Abiri B, Khodami B, et al. Effect of time restricted feeding on anthropometric measures, eating behavior, stress, serum levels of BDNF and LBP in overweight/obese women with food addiction: a randomized clinical trial. *Nutr Neurosci* 2024;27:577-89. doi:10.1080/1028415X.2023.2234704
118 Kapogiannis D, Manolopoulos A, Mullins R, et al. Brain responses to intermittent fasting and the healthy living diet in older adults. *Cell Metab* 2024;36:1900-4. doi:10.1016/j.cmet.2024.07.012
119 Keawtep P, Sungkarat S, Boriputakul S, et al. Effects of combined dietary intervention and physical-cognitive exercise on cognitive function and cardiometabolic health of postmenopausal women with obesity: a randomized controlled trial. *Int J Behav Nutr Phys Act* 2024;21:28. doi:10.1186/s12966-024-01580-z
120 Kramer CK, Zinman B, Feig DS, Retnakaran R. The impact of time-restricted eating on beta-cell function in adults with type 2 diabetes: a randomized cross-over trial. *J Clin Endocrinol Metab* 2024;dgae594. doi:10.1210/clinem/dgae594
121 Lee HA, Moon H, Kim Y, Lee JK, Lee HA, Kim HY. Effects of Intermittent Calorie Restriction in Nondiabetic Patients With Metabolic Dysfunction-Associated Steatotic Liver Disease. *Clin Gastroenterol Hepatol* 2025;23:114-123.e13. doi:10.1016/j.cgh.2024.06.051
122 Manoogian ENC, Wilkinson MJ, O'Neal M, et al. Time-restricted eating in adults with metabolic syndrome : a randomized controlled trial. *Ann Intern Med* 2024;177:1462-70. doi:10.7326/M24-0859
123 Parr EB, Radford BE, Hall RC, et al. Comparing the effects of time-restricted eating on glycaemic control in people with type 2 diabetes with standard dietetic practice: A randomised controlled trial. *Diabetes Res Clin Pract* 2024;217:111893. doi:10.1016/j.diabres.2024.111893
124 Sukkriang N, Buranapin S. Effect of intermittent fasting 16:8 and 14:10 compared with control-group on weight reduction and metabolic outcomes in obesity with type 2 diabetes patients: A randomized controlled trial. *J Diabetes Investig* 2024;15:1297-305. doi:10.1111/jdi.14186
125 Sun X, Li F, Yan H, et al. Intermittent compared with continuous calorie restriction for treatment of metabolic dysfunction-associated steatotic liver disease: a randomized clinical trial. *Am J Clin Nutr* 2025;121:158-66. doi:10.1016/j.ajcnut.2024.10.012
126 Talebi S, Shab-Bidar S, Moini A, Mohammadi H, Djafarian K. The effects of time-restricted eating alone or in combination with probiotic supplementation in comparison with a calorie-restricted diet on endocrine and metabolic profiles in women with polycystic ovary syndrome: A randomized clinical trial. *Diabetes Obes Metab* 2024;26:4468-79. doi:10.1111/dom.15801
127 Wang YY, Tian F, Qian XL, Ying HM, Zhou ZF. Effect of 5:2 intermittent fasting diet versus daily calorie restriction eating on metabolic-associated fatty liver disease-a randomized controlled trial. *Front Nutr* 2024;11:1439473. doi:10.3389/fnut.2024.1439473

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128 Zhou Y, Guo X, Liu Z, et al. 6-week time-restricted eating improves body composition, maintains exercise performance, without exacerbating eating disorder in female DanceSport dancers. *J Int Soc Sports Nutr* 2024;21:2369613. doi:10.1080/15502783.2024.2369613
129 Patikorn C, Roubal K, Veettil SK, et al. Intermittent fasting and obesity-related health outcomes: an umbrella review of meta-analyses of randomized clinical trials. *JAMA Netw Open* 2021;4:e2139558. doi:10.1001/jamanetworkopen.2021.39558
130 Elortegui Pascual P, Rolands MR, Eldridge AL, et alA meta-analysis comparing the effectiveness of alternate day fasting, the 5:2 diet, and time-restricted eating for weight loss. Obesity 2023;31:9-21.
131 Roman YM, Dominguez MC, Easow TM, Pasupuleti V, White CM, Hernandez AV. Effects of intermittent versus continuous dieting on weight and body composition in obese and overweight people: a systematic review and meta-analysis of randomized controlled trials. *Int J Obes (Lond)* 2019;43:2017-27. doi:10.1038/s41366-018-0204-0
132 Müller MJ, Bosy-Westphal A. Adaptive thermogenesis with weight loss in humans. *Obesity (Silver Spring)* 2013;21:218-28. doi:10.1002/oby.20027
133 Scheer FA, Hilton MF, Mantzoros CS, Shea SA. Adverse metabolic and cardiovascular consequences of circadian misalignment. *Proc Natl Acad Sci U S A* 2009;106:4453-8. doi:10.1073/pnas.0808180106
134 Sutton EF, Beyl R, Early KS, Cefalu WT, Ravussin E, Peterson CM. Early time-restricted feeding improves insulin sensitivity, blood pressure, and oxidative stress even without weight loss in men with prediabetes. *Cell Metab* 2018;27:1212-1221.e3. doi:10.1016/j.cmet.2018.04.010
135 Gu L, Fu R, Hong J, Ni H, Yu K, Lou H. Effects of intermittent fasting in human compared to a non-intervention diet and caloric restriction: a meta-analysis of randomized controlled trials. *Front Nutr* 2022;9:871682. doi:10.3389/fnut.2022.871682
136 Xu R, Cao Y, Wang PY, Chen XL, Tao D. Intermittent energy restriction vs. continuous energy restriction on cardiometabolic risk factors in patients with metabolic syndrome: a meta-analysis and systematic review. *Front Nutr* 2023;10:1090792. doi:10.3389/fnut.2023.1090792
137 Wang X, Li Q, Liu Y, Jiang H, Chen W. Intermittent fasting versus continuous energy-restricted diet for patients with type 2 diabetes mellitus and metabolic syndrome for glycemic control: A systematic review and meta-analysis of randomized controlled trials. *Diabetes Res Clin Pract* 2021;179:109003. doi:10.1016/j.diabres.2021.109003
138 Longo VD, Mattson MP. Fasting: molecular mechanisms and clinical applications. *Cell Metab* 2014;19:181-92. doi:10.1016/j.cmet.2013.12.008
139 Chaix A, Zarrinpar A, Miu P, Panda S. Time-restricted feeding is a preventative and therapeutic intervention against diverse nutritional challenges. *Cell Metab* 2014;20:991-1005. doi:10.1016/j.cmet.2014.11.001
140 Panda S. Circadian physiology of metabolism. *Science* 2016;354:1008-15. doi:10.1126/science.aah4967
141 Wilding JPH, Batterham RL, Calanna S, et al, STEP 1 Study Group. Once-weekly semaglutide in adults with overweight or obesity. *N Engl J Med* 2021;384:989-1002. doi:10.1056/NEJMoa2032183

Web appendix: Extra material supplied by authors

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SUPPLEMENTARY FILE

Intermittent fasting strategies on body weight and other cardiometabolic risk factors: A systematic review and network meta-analysis of randomized clinical trials

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size for each diet strategy. The thickness of the turquoise lines represents the number of studies directly comparing one diet strategy to another. 91

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Supplementary Figure 39. Comparison adjusted funnel plot for BMI. The horizontal axis represents an adjusted effect size, presenting the difference between each observed effect size and the mean effect size for the specific comparison being made. The dashed lines represent pseudo 95% confidence intervals. 98

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Supplementary Figure 44. Comparison adjusted funnel plot for HDL. The horizontal axis represents an adjusted effect size, presenting the difference between each observed effect size and the mean effect size for the specific comparison being made. The dashed lines represent pseudo 95% confidence intervals. 103

Supplementary Figure 45. Comparison adjusted funnel plot for HOMA-IR. The horizontal axis represents an adjusted effect size, presenting the difference between each observed effect size and the mean effect size for the specific comparison being made. The dashed lines represent pseudo 95% confidence intervals. 104

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Supplementary Figure 48. Comparison adjusted funnel plot for SBP. The horizontal axis represents an adjusted effect size, presenting the difference between each observed effect size and the mean effect size for the specific comparison being made. The dashed lines represent pseudo 95% confidence intervals. 107

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Supplementary Figure 51. Comparison adjusted funnel plot for waist circumference. The horizontal axis represents an adjusted effect size, presenting the difference between each observed effect size and the mean effect size for the specific comparison being made. The dashed lines represent pseudo 95% confidence intervals. 110

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Appendix. List of excluded studies. 112

Supplementary Information

Supplementary Methods

Risk of Bias Assessments

Two independent reviewers assessed each study across six domains of bias (sequence generation, allocation concealment, blinding, incomplete outcome data, selective reporting, and other). For each domain, we used a series of 'signaling questions' to derive the risk of bias. Risk of bias was assessed as either 'low' (proper methods taken to reduce bias), 'high' (improper methods creating bias) or 'unclear' (insufficient information provided to determine the bias level). Reviewer discrepancies were resolved by consensus or arbitration by the senior author (JLS). R package 'robvis'[22] was used to generate the risk of bias summary and proportion figures.

Minimally Important Difference (MID)

The minimally important difference (MID) thresholds used in assessing imprecision, heterogeneity, and incoherence, was predetermined for each outcome based on current clinical evidence – an MID of 2.0 kg was set for the primary outcome of body weight. **Supplementary Table 22** outlines the MID for each outcome evaluated in this network meta-analysis. Using the determined thresholds, we evaluate the level of clinical importance for significant associations based on the network estimates for each diet comparison. The table below indicates how this was assessed using body weight MID of 2.0 kg as an example:

MID association	Formula	Example for Body Weight MID of 2.0 kg
Trivial Association	Trivial = < 1* MID	Trivial: <2.0 kg
Small Important Association	Small = ≥1*MID and <2*MID	Small: ≥2.0 kg and <4.0 kg
Moderate Important Association	Moderate = ≥2*MID and <5*MID	Moderate: ≥4.0 kg and <10.0 kg
Large Important Association	Large = ≥5*MID and <10*MID	Large: ≥10.0 kg and <20.0 kg
Very Large Important Association	Very large = ≥10*MID	Very large: ≥20.0 kg

Supplementary Tables

Supplementary Table 1. Search strategy.

	MEDLINE		EMBASE		Cochrane
	Searches		***Searches***		***Searches***
1	alternate day fast*.mp.	**1**	alternate day fast*.mp.	**1**	alternate day fast*.mp.
2	intermittent fast*.mp.	**2**	intermittent fast*.mp.	**2**	intermittent fast*.mp.
3	time restricted feeding.mp.	**3**	time restricted feeding.mp.	**3**	time restricted feeding.mp.
4	meal skipping.mp.	**4**	meal skipping.mp.	**4**	meal skipping.mp.
5	reduced meal frequency.mp.	**5**	reduced meal frequency.mp.	**5**	reduced meal frequency.mp.
6	alternat* calor* diet*.mp.	**6**	alternat* calor* diet*.mp.	**6**	alternat* calor* diet*.mp.
7	intermittent energy restrict*.mp.	**7**	intermittent energy restrict*.mp.	**7**	intermittent energy restrict*.mp.
8	(intermittent adj2 diet*).mp.	**8**	(intermittent adj2 diet*).mp.	**8**	(intermittent adj2 diet*).mp.
9	intermittent calor* restr*.mp.	**9**	intermittent calor* restr*.mp.	**9**	intermittent calor* restr*.mp.
10	(intermittent adj2 restr*).mp.	**10**	(intermittent adj2 restr*).mp.	**10**	(intermittent adj2 restr*).mp.
11	intermittent calori* restr*.mp.	**11**	intermittent calori* restr*.mp.	**11**	intermittent calori* restr*.mp.
12	periodic fasting*.mp.	**12**	periodic fasting*.mp.	**12**	periodic fasting*.mp.
13	periodic diet.mp.	**13**	periodic diet.mp.	**13**	periodic diet.mp.
14	time restricted fasting.mp.	**14**	time restricted fasting.mp.	**14**	time restricted fasting.mp.
15	alternate fasting.mp.	**15**	alternate fasting.mp.	**15**	alternate fasting.mp.
16	whole day fasting.mp.	**16**	whole day fasting.mp.	**16**	whole day fasting.mp.
17	alternate fasting.mp.	**17**	alternate fasting.mp.	**17**	alternate fasting.mp.
18	**or/1-17**	**18**	**or/1-17**	**18**	**or/1-17**
19	"body weight".mp.	**19**	"body weight".mp.	**19**	"body weight".mp.
20	exp Body Weight/	**20**	exp Body Weight/	**20**	exp Body Weight/
21	exp Weight Gain/	**21**	exp Weight Gain/	**21**	exp Weight Gain/
22	bmi.mp.	**22**	bmi.mp.	**22**	bmi.mp.
23	body mass index.mp.	**23**	body mass index.mp.	**23**	body mass index.mp.
24	adiposity.mp.	**24**	adiposity.mp.	**24**	adiposity.mp.
25	hip circum*.mp.	**25**	hip circum*.mp.	**25**	hip circum*.mp.
26	waist circum*.mp.	**26**	waist circum*.mp.	**26**	waist circum*.mp.
27	waist to hip.mp.	**27**	waist to hip.mp.	**27**	waist to hip.mp.
28	fat mass.mp.	**28**	fat mass.mp.	**28**	fat mass.mp.

29	**or/19-28**	**29**	**or/19-28**	**29**	**or/19-28**
30	glyc*m*.mp.	**30**	glyc*m*.mp.	**30**	glyc*m*.mp.
31	Hemoglobin A, Glycosylated/	**31**	Hemoglobin A, Glycosylated/	**31**	Hemoglobin A, Glycosylated/
32	glyc*mia.mp.	**32**	glyc*mia.mp.	**32**	glyc*mia.mp.
33	insulin*.mp.	**33**	insulin*.mp.	**33**	insulin*.mp.
34	gly* albumin.mp.	**34**	gly* albumin.mp.	**34**	gly* albumin.mp.
35	OGTT.mp.	**35**	OGTT.mp.	**35**	OGTT.mp.
36	hba1c.mp.	**36**	hba1c.mp.	**36**	hba1c.mp.
37	HOMA*.mp.	**37**	HOMA*.mp.	**37**	HOMA*.mp.
38	Insulin/	**38**	Insulin/	**38**	Insulin/
39	exp Glucose/	**39**	exp Glucose/	**39**	exp Glucose/
40	Glucose Tolerance Test/	**40**	Glucose Tolerance Test/	**40**	Glucose Tolerance Test/
41	**or/30-40**	**41**	**or/30-40**	**41**	**or/30-40**
42	triglyceride.mp.	**42**	triglyceride.mp.	**42**	triglyceride.mp.
43	triacylglycerol.mp.	**43**	triacylglycerol.mp.	**43**	triacylglycerol.mp.
44	VLDL.mp.	**44**	VLDL.mp.	**44**	VLDL.mp.
45	very low density lipoprotein.mp.	**45**	very low density lipoprotein.mp.	**45**	very low density lipoprotein.mp.
46	lipid*.mp.	**46**	lipid*.mp.	**46**	lipid*.mp.
47	lipids/	**47**	lipids/	**47**	lipids/
48	cholesterol/	**48**	cholesterol/	**48**	cholesterol/
49	cholesterol.mp.	**49**	cholesterol.mp.	**49**	cholesterol.mp.
50	lipoprotein.mp.	**50**	lipoprotein.mp.	**50**	lipoprotein.mp.
51	lipoproteins/	**51**	lipoproteins/	**51**	lipoproteins/
52	(hdl or high density lipoprotein).mp.	**52**	(hdl or high density lipoprotein).mp.	**52**	(hdl or high density lipoprotein).mp.
53	(ldl or low density lipoprotein).mp.	**53**	(ldl or low density lipoprotein).mp.	**53**	(ldl or low density lipoprotein).mp.
54	exp hyperlipidemias/	**54**	exp hyperlipidemias/	**54**	exp hyperlipidemias/
55	apolipoprotein*.mp.	**55**	apolipoprotein*.mp.	**55**	apolipoprotein*.mp.
56	non-hdl.mp.	**56**	non-hdl.mp.	**56**	non-hdl.mp.
57	**or/42-56**	**57**	**or/42-56**	**57**	**or/42-56**
58	CRP.mp.	**58**	CRP.mp.	**58**	CRP.mp.
59	high-sensitivity CRP.mp.	**59**	high-sensitivity CRP.mp.	**59**	high-sensitivity CRP.mp.
60	c-reactive protein.mp.	**60**	c-reactive protein.mp.	**60**	c-reactive protein.mp.

61	hs-CRP.mp.	**61**	hs-CRP.mp.	**61**	hs-CRP.mp.
62	**or/58-61**	**62**	**or/58-61**	**62**	**or/58-61**
63	cpeptide.mp.	**63**	cpeptide.mp.	**63**	cpeptide.mp.
64	c-peptide.mp.	**64**	c-peptide.mp.	**64**	c-peptide.mp.
65	c peptide.mp.	**65**	c peptide.mp.	**65**	c peptide.mp.
66	exp C-peptide/	**66**	exp C-peptide/	**66**	exp C-peptide/
67	**or/63-66**	**67**	**or/63-66**	**67**	**or/63-66**
68	Blood Pressure/	**68**	Blood Pressure/	**68**	Blood Pressure/
69	systolic blood pressure.mp.	**69**	systolic blood pressure.mp.	**69**	systolic blood pressure.mp.
70	SBP.mp.	**70**	SBP.mp.	**70**	SBP.mp.
71	diastolic blood pressure.mp.	**71**	diastolic blood pressure.mp.	**71**	diastolic blood pressure.mp.
72	DBP.mp.	**72**	DBP.mp.	**72**	DBP.mp.
73	or/68-72	**73**	or/68-72	**73**	or/68-72
74	**exp uric acid/**	**74**	**exp uric acid/**	**74**	**exp uric acid/**
75	uric acid.mp.	**75**	uric acid.mp.	**75**	uric acid.mp.
76	urate.mp.	**76**	urate.mp.	**76**	urate.mp.
77	hyperuricemia/	**77**	hyperuricemia/	**77**	hyperuricemia/
78	hyperuricemia.mp.	**78**	hyperuricemia.mp.	**78**	hyperuricemia.mp.
79	hyperuricaemia.mp.	**79**	hyperuricaemia.mp.	**79**	hyperuricaemia.mp.
80	uric.mp.	**80**	uric.mp.	**80**	uric.mp.
81	**or/75-80**	**81**	**or/75-80**	**81**	**or/75-80**
82	fatty liver.mp.	**82**	fatty liver.mp.	**82**	fatty liver.mp.
83	non-alcoholic fatty liver disease/	**83**	non-alcoholic fatty liver disease/	**83**	non-alcoholic fatty liver disease/
84	NAFLD.mp.	**84**	NAFLD.mp.	**84**	NAFLD.mp.
85	transaminases/	**85**	transaminases/	**85**	transaminases/
86	alanine transaminase/	**86**	alanine transaminase/	**86**	alanine transaminase/
87	alt.mp.	**87**	alt.mp.	**87**	alt.mp.
88	aspartate aminotransferase/	**88**	aspartate aminotransferase/	**88**	aspartate aminotransferase/
89	ast.mp.	**89**	ast.mp.	**89**	ast.mp.
90	IHCL.mp.	**90**	IHCL.mp.	**90**	IHCL.mp.
91	intrahepatocellular lipid.mp.	**91**	intrahepatocellular lipid.mp.	**91**	intrahepatocellular lipid.mp.
92	transamin*.mp.	**92**	transamin*.mp.	**92**	transamin*.mp.

93	**or/82-92**	**93**	**or/82-92**	**93**	**or/82-92**
94	**29 or 41 or 57 or 62 or 67 or 74 or 81 or 93**	**94**	**29 or 41 or 57 or 62 or 67 or 74 or 81 or 93**	**94**	**29 or 41 or 57 or 62 or 67 or 74 or 81 or 93**
95	**18 and 94**	**95**	**18 and 94**	**95**	**18 and 94**
96	limit 95 to animals	**96**	limit 95 to animals		
97	**95 not 96**	**97**	**95 not 96**		
98	clinical trial.mp.	**98**	clinical trial.mp.		
99	clinical trial.pt.	**99**	random:.mp.		
100	random:.mp.	**100**	or/98-99		
101	tu.xs	**101**	97 and 100		
102	or/ 98-101				
103	97 and 102				

Supplementary Table 2. PICOTS* framework.

P	Participants	Adult men and women of all health backgrounds
I	Intervention	Alternate day fasting, cyclical whole day fasting, time restricted feeding, continuous energy restriction, or ad libitum diet
C	Comparison	Alternate day fasting, cyclical whole day fasting, time restricted feeding, continuous energy restriction, or ad libitum diet
O	Outcome	Primary outcome: body weight Secondary outcomes: anthropometry, glucose metabolism, lipid profiles, blood pressure, CRP, and markers of liver disease
T	Time	≥ 3 weeks
S	Study Design	Human randomized clinical trials

*Hutton B, Salanti G, Caldwell DM, Chaimani A, Schmid CH, Cameron C, Ioannidis JP, Straus S, Thorlund K, Jansen JP, Mulrow C, Catalá-López F, Gøtzsche PC, Dickersin K, Boutron I, Altman DG, Moher D. The PRISMA extension statement for reporting of systematic reviews incorporating network meta-analyses of health care interventions: checklist and explanations. Ann Intern Med. 2015 Jun 2;162(11):777-84.

Supplementary Table 3: Characteristics of each study (n=99).

Author, Year	Participants*	Setting	Mean Age,	Mean	Mean	Design	Feeding	Diet	Follow-	Type of	Treatment	Type of	Description of	Diet [b]	Primary	Energy	Funding
Andriessen et al. 2022	14 Type 2 Diabetes (7 M, 7 F)	OP, Netherlands	67.5 (5.2)	N/A	30.5 (3.7)	C	DA	Free	3	Not Weight Loss					Hepatic glycogen and insulin sensitivity	Neutral	Agency
											Intervention	TRE	habitual diet within 10h window; last meal no later than 18:00	~56:30:14			
											Control	AdLib	Usual Diet				
Antoni et al. 2018	27 Overweight/Obese (13 M, 14 F)	OP, UK	44.7 (13.5)	89 (14.3)	30.2 (3.6)	P	Supp	Free	9.4	Weight Loss					Postprandial glucose and lipid	Negative	Industry
											Intervention	WDF	5:2 25% of daily energy intake was allowed for the combined 2 days consecutive fasting	~38:26:36			
											Control	CER	Energy reduction by 600 calories of daily requirements				
Arciero et al. 2022	39 Overweight/Obese (13 M, 26F)	OP, USA	50.2 (2.2)	92.9 (5.2)	32.7 (1.7)	P	Met	Free	8	Weight Loss					Body weight and visceral fat loss	Negative	Industry
											Intervention	WDF	400 kcal/day for 1 day/wk or 500 kcal/day for 2 consecutive days/wk + 1350 for women and 1700 kcal/day for men for the remaining days	~35:35:30			
											Control	CER	1200 and 1500 kcal/day for women and men, respectively	~50:35:15			
Bartholomew et al. 2021	103 Type 2 Diabetes (34 M, 69 F)	OP, USA	48.1 (10.9)	101.3 (22.5)	34.5 (7.7)	P	DA	Free	26	Not Weight Loss				NR	LDL-C	Negative	Agency
											Intervention	WDF	6:1 5:2 fasting for 4 weeks and 6:1 fasting for 22 weeks, all on water only diet for fasting days				
											Control	AdLib	Usual Diet				
Beaulieu et al. 2020	46 Overweight/Obese (0 M, 46 F)	OP, UK	34.6 (10.1)	79.96 (11.7)	29.1 (2.4)	P	Met	Supervised	12	Weight Loss					Body weight	Negative	Agency + Industry
											Intervention	ADF	25% daily energy requirement on fasting days. AdLib on alternate days	~36:27:37			
											Control	CER	75% of daily energy intake	~50-55:30-35:15-20			
Betts et al. 2014	33 Normal Weight (12 M, 21 F)	OP, UK	36 (11)	66.7 (7.9)	22.4 (2.2)	P	DA	Free	6	Not Weight Loss				NR	Energy Balance	Negative	Agency
											Intervention	TRE	No breakfast				
											Control	AdLib	Usual Diet				

Author, Year	Participants*	Setting	Mean Age,	Mean	Mean	Design	Feeding	Diet	Follow-	Type of	Treatment	Type of	Description of	Diet [b]	Primary	Energy	Funding
Bhutani et al. 2013	41 Overweight/Obese (2 M, 39 F)	OP, USA	44.7 (2)	93.6 (3.9)	35 (1)	P	Supp	Free	12	Weight Loss					Body weight	Negative	Agency
											Intervention	ADF	very low (25% energy intake) on fast days. AdLib on feed days	~52:24:24			
											Control	AdLib	Usual Diet				
Bilge Sertdemir et al. 2024	20 Healthy	OP, Turkey	69 (9)	81.2 (13.5)	31.2 (3.1)	P	DA	Free	12	Not Weight Loss				NR	Body weight	Negative	NR
											Intervention	WDF	5:2; Two-day food restriction practice (16 hours on Mondays and Thurs- days from 18:00 in the evening to 10:00 the next day)				
											Control	AdLib	Usual Diet				
Cai et al. 2019	264 Non-Alcoholic Fatty Liver Disease (87 M, 177 F)	OP, China	34.5 (5.7)	74.5 (8.2)	26.4 (2.2)	P	Supp	Free	12	Weight Loss					Body weight and dyslipidemia	Negative	No Funding
											Intervention	ADF	very low (25% energy intake) on fast days. AdLib on feed days	~55:30:15			
											Intervention	TRE	Meals consumed in 8h window fasting in other 16 hour window				
											Control	CER	80% of daily energy intake				
Cai et al. 2022	36 Overweight/Obese (5 M, 31 F)	OP, China	44.3 (10)	77.4	29.2	P	DA	Free	12	Weight Loss				NR	Body weight and dyslipidemia	Neutral	Agency
											Intervention	WDF	fast 2 days with 1/4 usual energy intake (~500 and 600 kcal for women and men, respectively); 5 days AdLib				
											Control	CER	reduce energy intake of normal diet by 30-50%; moderatly reduce intake of fat and carbohydrates				
Carter et al. 2016	63 Type 2 Diabetes (30 M, 33 F)	OP, Australia	61.5 (8.4)	99 (15.5)	35.5 (5)	P	DA	Free	12	Weight Loss					Glycemic Control	Negative	Agency
											Intervention	WDF	5:2 399-598 kcal consumed over 2 fasting days combined. AdLib on other 5 days in week	~45:25:30	Glycemic Control		
											Control	CER	Restriction of 1195 kcals to 1553kcals per day	~45:25:30			
Carter et al. 2018	137 Type 2 Diabetes (60 M, 77 F)	OP, Australia	61 (9.1)	101 (18)	36 (5.8)	P	DA	Free	48	Weight Loss					Glycemic Control	Negative	Agency

Author, Year	Participants*	Setting	Mean Age,	Mean	Mean	Design	Feeding	Diet	Follow-	Type of	Treatment	Type of	Description of	Diet [b]	Primary	Energy	Funding
											Intervention	WDF	5:2 500-600 kcal consumption for every fasting day. Ad Lib on 5 feed days/ week		Glycemic Control		
											Control	CER	1200-1500kcal consumed per day	~45:25:30			
Castela et al. 2022	28 Obese (6 M, 22 F)	OP, Norway	39.3 (9)	N/A	35.4 (3.7)	P	DA	Free	12	Weight Loss					Inflammatory Biomarkers	Negative	Agency
											Intervention	WDF	3 non-consecutive fasting days (550 and 660 kcal/day for women and men, respectively); Diet matching estimated daily energy needs for feeding days	~50:30:20			
											Control	CER	33% reduction of estimated energy needs	~50:30:20			
Catenacci et al. 2016	25 Overweight/Obese (6 M, 19 F)	OP, USA	41.1 (8.8)	104(15.8)	37.6 (4.9)	P	Met	Free	8	Weight Loss					Body weight	Negative	Agency
											Intervention	ADF	0kcal consumed on fasting days. Alternating fast and feed days	~55:30:15			
											Control	CER	400kcal daily caloric restriction	~55:30:15			
Čermáková et al. 2024	75 Healthy (52 F, 23 M)	OP, Czech Republic	37 (10)	83 (16)	28.4 (4.4)	P	DA	Free	12	Weight loss					Body Composition	Neutral	Agency
											Intervention	TRF	18:6; 75% of energy needs during 6 hours window	NR			
											Intervention	TRF	18:6; 100% of energy needs during 6 hours window	NR			
											Control	CER	75% of energy needs without time restriction	NR			
Che et al. 2021	120 Type 2 Diabetes (65 M, 55 F)	OP, China	48.5 (9.4)	74.9 (4.4)	26.3 (2.1)	P	DA	Free	12	Weight Loss					Glycemic Control	Neutral	Agency
											Intervention	TRE	10 hour feeding window with no caloric restriction	~52:30:18			
											Control	AdLib	Usual Diet	~51:30:19			
Cho et al. 2019	13 Overweight/Obese (5 M, 8 F)	OP, South Korea	37 (7.5)	74.7 (13)	26.8 (3.4)	P	DA	Free	8	Weight Loss					Cholesterol Metabolism	Neutral	Agency + Industry
											Intervention	ADF	Consumed 25% of daily caloric requirement about 500kcal/day on fast days. 3 fast days a week	~56:30:17			
											Control	AdLib	Usual Diet	~64:24:18			
Chow et al. 2020	20 Overweight/Obese (3 M, 17 F)	OP, USA	45.5 (12.1)	97.8 (25.2)	34.1 (7.5)	P	DA	Free	12	Weight Loss				NR	Body weight	Neutral	Agency

Author, Year	Participants*	Setting	Mean Age,	Mean	Mean	Design	Feeding	Diet	Follow-	Type of	Treatment	Type of	Description of	Diet [b]	Primary	Energy	Funding
											Intervention	TRE	8 hour eating window of AdLib intake				
											Control	AdLib	Usual Diet				
Cienfuegos et al. 2020	58 Overweight/Obese (5 M, 53 F)	OP, USA	46.3 (2.4)	97.7 (3.7)	36.7 (1)	P	DA	Free	8	Weight Loss				NR	Body weight	Negative	Agency
											Intervention	TRE	6 hour daily feeding window. 18hr fast				
											Intervention	TRE	4 hour daily feeding window. 20 hr fast				
											Control	AdLib	Usual Diet				
Conley et al. 2018	23 Overweight/Obese (23 M, 0 F)	OP, Australia	67.5 (3.4)	103.4 (13.5)	34.9 (3.4)	P	DA	Free	26	Weight Loss					Body weight	Negative	Agency
											Intervention	WDF	2 non-consecutive fasting days per week. Participants allowed to consume 600 kcals on fasting days	~37:38:21			
											Control	CER	500 kcal daily caloric restriction	~39:39:22			
Correia et al. 2024	15 healthy; (15M, 0F)	OP, Portugal	23.7 (2.6)	75.15 (11.05)		C	DA	Free	4	Weight Loss					Body Composition	Negative	Agency
											intervention	TRF	16:8; 8h eating window between 13:00 and 21:00 without restriction	NR			
											control	AdLib	No restriction	NR			
Coutinho et al. 2018	28 Overweight/Obese (6 M, 22 F)	OP, Norway	39.3 (10)	102.4 (13.2)	35.4 (3.7)	P	DA	Free	12	Weight Loss					Body weight	Negative	Agency
											Intervention	ADF	3 non-consecuive fasting days per week with 33% of energy restriction over the week	~50:30:20			
											Control	CER	33% of energy restriction over the week	~50:30:20			
deOliveiraMaranhaoPureza et al. 2020	58 Overweight/Obese (0 M, 58 F)	OP, Brazil	31.4 (7.1)	80.8 (11.8)	33.3 (4.1)	P	DA	Free	52	Weight Loss				NR	Body weight	Negative	Agency
											Intervention	TRE	12-hour daily fasting . 500-1000 kcal daily caloric restriction				
											Control	CER	500-1000 daily kcal caloric restriction				
Domaszewski et al. 2023	108 Overweight/Obese (51 M, 57 F)	OP, Poland	68.9 (3.5)	77.1 (12.1)	28.3 (3.17)	P	DA	Free	6	Weight Loss				NR	Body weight	Neutral	Agency
											Intervention	TRE	16:8; fast for 16 hours/day between 8pm to 12am				
											Control	AdLib	educational program based on previous dietary habits				

Author, Year	Participants*	Setting	Mean Age,	Mean	Mean	Design	Feeding	Diet	Follow-	Type of	Treatment	Type of	Description of	Diet [b]	Primary	Energy	Funding
Dunn et al. 2024	13 obese and cirrhosis (5 M, 8 F)	OP, USA	57 (10)	103.7 (21.3)	36.7 (3.18)	C	DA	Free	24	Weight Loss					Body Composition	Negative	Agency
											control	ADF	600-850 kcal/day on fasting days, 12 weeks of weight loss phase involving ADF and 12 weeks of weight maintenance phase involving fasting for 1-2 days per week	NR			
											intervention	CER	1200-1600 kcal/day during 12 weeks of weight loss phase, adjusted caloric intake for weight maintenance during 12 weeks of weight maintenance phase	NR			
Dutzmann et al. 2024	42 patients with acute STEM (8 F, 34 M)	OP, Germany	59.1 (12.7)		29.1 (4.7)	P	DA	Free	12	Not weight loss					Left ventricular ejection fraction	Negative	Agency
											intervention	TRE	16:8; regular diet for not >8 hours per day alternately with fasting for at least 16 hours per day	NR			
											control	CER	regular diet	NR			
Erdem et al. 2022	263 Overweight/Obese (81 M, 182 F)	OP, Turkey	34.0 (11.5)	84.3 (11.6)	32.5 (3.12)	P	DA	Free	12	Weight Loss					Body weight	Neutral	None
											Intervention	TRE	18:6; fed ad libitum 6h/day (13:00-19:00) and fasted for 18h/day (19:00-13:00)	~42:40:18			
											Intervention	WDF	0-500kcal diet for 2 days; ad libitum for 5 days/week	~42:40:18			
											Control	CER	Energy restricted Mediterranean Diet; 70% of energy needs met	~42:40:18			
Ezpeleta et al. 2023	40 Non-Alcoholic Fatty Liver Disease, Obese (8 M, 32 F)	OP, USA	44 (3)	98.0 (5.3)	36.5 (6.6)	P	DA	Free	12	Not Weight Loss					Intrahepatic triglyceride	Neutral	Agency

Author, Year	Participants*	Setting	Mean Age,	Mean	Mean	Design	Feeding	Diet	Follow-	Type of	Treatment	Type of	Description of	Diet [b]	Primary	Energy	Funding
											Intervention	ADF	600 kcal for dinner between 5:00 and 8:00pm on fast days and fasted for 17-20h/day from midnight to 5:00 or 8:00 pm; AdLib on other days; participants provided with fast day meals during first month then DA thereafter	~55:30:15			
											Control	AdLib	Habitual diet and physical activity				
Fagundes et al. 2023	36 Overweight/Obese (0 M, 36 F)	OP, Brazil	34.3 (9.1)	82.7 (9.4)	30.4 (3.2)	P	DA	Free	4	Weight Loss					Body weight	Negative	Agency
											Intervention	TRE	16:8; Eating window either between 8:00 and 16:00 or 12:00 and 20:00; caloric restriction of 513-770 kcal/day				
											Control	CER	caloric restriction of 513-770 kcal/day	~40-45:30-35:20-25			
Fitzgerald et al. 2018	36 Multiple Sclerosis (7 M, 29 F)	OP, USA	37.4 (7.4)	N/A	32.6 (7.8)	P	Met	Free	8	Weight Loss					Body weight	Negative	Agency
											Intervention	WDF	2 consecutive days/week of fasting with 25% of caloric requirement. 100% of calorie needs 5 days/week	~55:30:15			
											Intervention	CER	78%of calorie needs 7 days/week	~55:30:15			
											Control	AdLib	Usual Diet	~55:30:15			
Gabel et al. 2019	43 Overweight/Obese (10 M, 33 F)	OP, USA	41.9 (3)	97 (4)	35.1 (1)	P	Met	Free	24	Not Weight Loss					Body weight	Negative	Agency
											Intervention	ADF	25% of energy requirement on fst days and 125% on alternating feeding daus	~47:36:17			
											Intervention	CER	75% of energy needs consumed daily	~48:35:17			
											Control	AdLib	Usual Diet	~47:36:17			
Ghezzi et al. 2024	34 Multiple Sclerosis (6 M, 28 F)	OP, USA	48.2 (9.8)	80.7 (15.2)	28.7 (4.3)	C	DA	Free	12	Weight Loss					Leptin	Negative	Agency
											intervention	ADF	No more than 500kcal/day on two non-consecutive fasting days	NR			
											control	AdLib	Usual Diet	NR			
Gray et al. 2021	121 Overweight/Obese (0 M, 121 F)	OP, Australia	39.6 (9.0)	89.9 (27.1)	32.6 (9.4)	P	DA	Free	52	Weight Loss					Body weight	Negative	Agency

Author, Year	Participants*	Setting	Mean Age,	Mean	Mean	Design	Feeding	Diet	Follow-	Type of	Treatment	Type of	Description of	Diet[b]	Primary	Energy	Funding
											Intervention	ADF	2 fasting days a week. 500kcal on fasting days	~35:25:40			
											Control	CER	1500kcal/day	~45:25:30			
Guevara-Cruz et al. 2024	33 Obese (28 F, 5 M)	OP, Mexico	36.9 (11.0)	90.1 (11.9)	35.3 (4.0)	P	DA	Free	4	Not weight loss					Mitchondrial function	Negative	Agency + Industry
											Intervention	TRF	16:8; 500 kcal restriction from usual energy intake; 16 hrs fasting and 8 hrs to comply with food intake	50:30:25			
											Intervention	CER	500 kcal restriction from usual energy intake	50:30:25			
											Control	AdLib	Habitual diet				
Guner et al. 2024	30 Healthy (8 M, 22 F)	OP, Turkey	28.03 (3.46)	62.8 (21.53)	23.445 (3.39)	P	DA	Free	4	Weight loss					Body weight	Negative	Agency
											Intervention	TRE	16:8; 8h eating window	NR			
											Control	AdLib	0	NR			
Guo et al. 2021	39 Metabolic Syndrome (21 M, 18 F)	OP, China	41.4 (2)	76.1 (11.6)	28.2 (4.2)	P	DA	Free	8	Not Weight Loss				NR	Body weight	Negative	Agency
											Intervention	WDF	2 non-consecutive fasting days per week with 75% energy restriction on fasting days				
											Control	AdLib	Usual Diet				
Hajek et al. 2021	300 Overweight/Obese (101 M, 199 F)	OP, UK	48 (13)	95 (14.83)	34.37 (4.82)	P	DA	Free	52	Weight Loss				NR	Body Weight and Body fat	Negative	Agency
											Intervention	WDF	500-600kcal energy intake on fasting days, 2 non-consecutive days per week (group support)				
											Intervention	WDF	500-600kcal energy intake on fasting days, 2 non-consecutive days per week (self-help)				
											Control	AdLib	Usual Diet				
Harvie et al. 2011	107 Overweight/Obese (0 M, 107 F)	OP, UK	40.1 (4)	83 (15.9)	30.6 (5.1)	P	DA	Free	24	Weight Loss					Body weight	Neutral	Agency
											Intervention	WDF	2 consectuvie days with 75% energy reduction and mediterranean type diet on remaining 5 days	~45:30:25			
											Control	CER	25% daily energy reduction	~45:30:25			
Harvie et al. 2013	77 Overweight/Obese (0 M, 77 F)	OP, UK	46.8 (8.0)	82.8 (15.6)	31 (4.9)	P	DA	Free	12	Weight Loss					Body weight	Negative	NR

Author, Year	Participants*	Setting	Mean Age,	Mean	Mean	Design	Feeding	Diet	Follow-	Type of	Treatment	Type of	Description of	Diet[b]	Primary	Energy	Funding
											Intervention	WDF	2 consecutive fasting days/week with 70% energy restriction and 40g carbohydrates	~45:30:25			
											Control	CER	25% calorie reduction	~45:30:25			
Harvie et al. 2021	169 Breast Cancer (0 M, 169 F)	OP, UK	51.9 (24-77)	74.4 (16.2)	28.1 (6.1)	P	DA	Free	3	Weight Loss					Body weight	Negative	Agency
											Intervention	WDF	2 consecutive energy restriction days with 650-1000 kcals consumed	~45:30:25			
											Control	CER	Average daily caloric intake was 1208 kcals	~45:30:25			
He et al. 2021	205 Hypertension (87 M, 118 F)	OP, China	50.5 (8.8)	86.3 (14.1)	28.7 (2.7)	P	DA	Free	26	Weight Loss					Blood pressure	Negative	Agency
											Intervention	WDF	2 fasting days with 500-600kcal/day and then adlib on 5 other days.				
											Control	CER	1000-1200 kcals of energy intake	~45-50:30:20-25			
He at al. 2022	162 Metaboic Syndrome (102 M, 60 F)	OP, China	41.1 (1.34)	84.6 (2.01)	29.3 (0.5)	P	DA	Free	12	Weight loss					Body weight and abdominal fat area	Negative	Agency
											Intervention	TRE	16:8; 8h eating window	NR			
											Intervention	TRE+	16:8; 8h eating window and low carb-diet	NR			
											Control	AdLib	Low-carb diet	NR			
Headland et al. 2019	222 Overweight/Obese (40 M, 182 F)	OP, Australia	49.5 (13.8)	91 (16.5)	33.1 (4.9)	P	DA	Free	52	Weight Loss				NR	Body weight	Negative	Agency
											Intervention	WDF	2 fasting days/ week 500kcal energy intake on fasting days				
											Control	CER	1000-1200 kcal energy intake				
Hirsh et al. 2019	22 Overweight/Obese (9 M, 13 F)	OP, USA	41.0 (11.7)	78.0 (9.3)	27.3 (2.6)	P	Supp	Free	7	Weight Loss				NR	Body weight	Negative	Industry
											Intervention	WDF	2 consecutive days, 730kcal/day. Adlib on remaining days				
											Control	AdLib	Usual Diet				
Holmer et al. 2021	49 Non-Alcoholic Fatty Liver Disease (20 M, 29 F)	OP, Sweden	56.5 (9.5)	95.5 (16.3)	32.6 (4.1)	P	DA	Free	12	Weight Loss					Body weight	Negative	Agency
											Intervention	WDF	2 non-consecutive days of fasting/week with 500-600 kcal on these days	~45-60:25:10-20			
											Control	AdLib	Usual Diet				
Hooshiar et al. 2023	47 Overweight/Obese (0 M, 47 F)	OP, Iran	35.6 (8.4)	81.3 (12.9)	31.6 (3.4)	P	DA	Free	8	Weight Loss					Body weight	Negative	Agency

Author, Year	Participants*	Setting	Mean Age,	Mean	Mean	Design	Feeding	Diet	Follow-	Type of	Treatment	Type of	Description of	Diet [b]	Primary	Energy	Funding
											Intervention	ADF	25% daily energy requirements on fasting days (meals eaten between 12 and 2 pm) and 100% daily energy requirements on feeding days (breakfast at 8am, lunch at 1pm and dinner at 8pm; snacks at 10am, 4pm and 10pm)	~55:30:15			
											Control	CER	63% of daily energy requirements (3 main meals at 8am, 1pm and 8pm; 3 snacks at 10am, 4pm and 10pm)	~55:30:15			
Hussin et al. 2013	31 Overweight/Obese (31 M, 0 F)	OP, Malaysia	59.7 (6.3)	72 (7.7)	26.7 (2.2)	P	DA	Free	12	Not Weight Loss				NR	Mood	Negative	Agency
											Intervention	WDF	2 fasting days weekly with 300-600kcal on fasting days				
											Control	AdLib	Usual Diet				
Hutchison et al. 2019	63 Overweight/Obese (O M, 63 F)	OP, Australia	50.5 (2.2)	87.9 (3.3)	32.2 (1.0)	P	Met	Free	8	Weight Loss					Insulin sensitivity	Negative	Agency
											Intervention	WDF	3 days fasting - 32% of daily energy intake on fasting days and 100% on non fasting days	~45:31:17			
											Intervention	CER	70% of calculated baseline energy requirements daily	~48:34:21			
											Control	AdLib		~44:40:15			
Hooshiar et al. 2024	49 Overweight/Obese (0M,49F)	OP, Iran	31.94 (8.12)	81.6 (13.04)	31.63 (3.42)	P	DA	Free	8	Weight loss					Premenstral Syndrome	Negative	Agency
											intervention	ADF	On fasting days, 75% calorie restriction consumed between 12pm and 2pm	55:15:30			
											control	CER	63% of their daily calorie requirements (27% restriction)	55:15:30			
Isenmann et al. 2021	35 Overweight/Obese (14 M, 21 F)	OP, Germany	27.7 (5.5)	77.5 (14.8)	26 (3.1)	P	DA	Free	10	Weight Loss					Body weight	Negative	Agency
											Intervention	TRE	16 hours daily fasting with adlibtum eating	~45-65:20-35:20-35			
											Control	AdLib	Usual Diet	~45-65:20-35:20-35			
Jimenez et al. 2019	42 Overweight/Obese (10 M, 32 F)	OP, Spain	47 (7.9)	94.5 (15.6)	34.1 (4.4)	P	Met	Free	6	Weight Loss				NR	Body weight	Negative	Agency

Author, Year	Participants*	Setting	Mean Age,	Mean	Mean	Design	Feeding	Diet	Follow-	Type of	Treatment	Type of	Description of	Diet [b]	Primary	Energy	Funding
											Intervention	WDF	5 days of fasting with 600-700 caloric intake on fasting days, non fasting days involved mediterranean diet				
											Control	AdLib	No fasting but Mediteranean diet				
Johari et al. 2019	43 Non-Alcoholic Fatty Liver Disease (33 M, 10 F)	OP, Malaysia	47 (14.8)	80.3	30.8 (6.5)	P	DA	Free	8	Weight Loss				NR	BMI	Negative	Agency
											Intervention	ADF	70% restriction on fasting days. AdLib on non fasting days				
											Control	AdLib	Usual Diet				
Kahleova et al. 2014	54 Type 2 Diabetes Overweight/Obese (29 M, 25 F)	OP, Czech Republic	59.4 (7)	94.1 (15.5)	32.6 (4.9)	C	DA	Free	12	Weight Loss					Body weight	Negative	Agency
											Intervention	TRE	Reduction of 500kcal/day. 2 meals a day breakfast btw 6:00-10:00 hours, lunch btw 12:00 - 16:00	~50-55:30:20-25			
											Control	AdLib	3 meals a day and 3 snacks				
Irani et al. 2023	56 Overweight/Obese (0 M, 56 F)	OP, Iran	42.31 (8.82)	81.89 (9.59)	31.27 (3.49)	P	DA	Free	8	Weight loss					Body weight	Negative	Agency
											intervention	TRE	14:10; 10h eating window from 10am-8pm of a low calorie diet (300-500kcal deficit)	52:18:30			
											control	CER	300-500kcal deficit	52:18:30			
Kapogiannis et al. 2024	40 Overweight/Obese (24 F, 16 M)	OP, USA	63.3 (5.2)	97.2 (13.6)	34.4 (3.6)	P	I = Supp; C = DA	Free	8	Not weight loss					Body weight	Negative	Agency
											Intervention	WDF	5:2; healthy living (HL) diet with education on portion control and calorie intake according to U.S. Department of Agriculture (USDA) recommendations for 5 days/week; 2 consecutive days drinking only two meal replacement shakes (480kcal/day)	NR			
											Control	AdLib	HL diet with education on portion control and calorie intake according to U.S. Department of Agriculture (USDA) recommendations	NR			

Author, Year	Participants*	Setting	Mean Age,	Mean	Mean	Design	Feeding	Diet	Follow-	Type of	Treatment	Type of	Description of	Diet [b]	Primary	Energy	Funding
Kord Varkaneh et al. 2022	44 Non-Alcoholic Fatty Liver Disease (27 M, 17 F)	OP, Iran	45.3 (9.8)	88.1 (15.8)	30.5 (2.7)	P	DA	Free	12	Weight Loss					Body weight	Negative	Agency
											Intervention	WDF	5:2; 2 consecutive fasting days with 25% of recommended calories intake over 2h (12-2pm)	~55:30:15			
											Control	AdLib	Usual Diet				
Kotarsky et al. 2021	21 Overweight/Obese with Insulin Resistance (2 M, 19 F)	OP, USA	44.5 (2.6)	82.5 (3)	29.6 (0.8)	P	DA	Free	8	Weight Loss					Fat mass	Negative	Agency
											Intervention	TRE	16 h daily fasting. Average caloric restriction observed was 300 kcals per day	~48:35:16			
											Control	AdLib	average caloric restriction observed was 250 kcals per day	~49:33:14			
Keawtep et al. 2024	46 Obese and Postmenopausal (46 F)	OP, Thailand	53.2 (3.4)	70.4 (9.6)	28.7 (2.8)	P	DA	Free	12	Not weight loss					Executive functions, memory, and plasma BDNF levels	Negative	Agency
											Intervention	WDF	5:2; Gradually reduced calorie consumption on fasting days (75% of energy requirements for weeks 1–4, 50% of energy requirements for weeks 5–8, and 25% of energy requirements for weeks 9–12); AdLib for non-fasting days	NR			
											Control	AdLib	Usual diet	NR			
Kunduraci et al. 2020	65 Metabolic Syndrome (31 M, 34 F)	OP, Turkey	48.1 (2.15)	92.9 (2.4)	34.7 (0.83)	P	DA	Free	12	Weight Loss					Body weight	Negative	Agency
											Intervention	TRE	16-h daily fast. 25% energy intake reduction on daily basis.	~39:43:17			
											Control	CER	25% energy intake reduction on daily basis	~42:19:37			
Kramer, 2024	39 Overweight with T2DM (14 M, 25 F)	OP, Canada	56.3 (9.4)	89 (18.3)	32.4 (5.7)	C	DA	Free	6	Weight loss					Beta-cell function	Negative	Agency
											intervention	TRE	20:4; 4h eating window	NR			
											control	AdLib					
Lee et al. 2024	63 Metabolic dysfunction-associated liver disease (34 F, 29 M)	OP, Korea	49.2 (12.7)	73.9 (22.1)	27.4 (4.3)	P	DA	Free	12	Not weight loss						Neutral	Agency

Author, Year	Participants*	Setting	Mean Age,	Mean	Mean	Design	Feeding	Diet	Follow-	Type of	Treatment	Type of	Description of	Diet [b]	Primary	Energy	Funding
											intervention	WDF	5:2; Women and men were instructed to consume 500 kcal/d and 600 kcal/d, respectively, on 2 nonconsecutive days per week without time restrictions; non-fasting days followed Korean Dietary Reference Intakes with limit of 2000 kcal/day for women and 2500 kcal/day for men	60:22.5:13.5			
											control	CER	80% of the standard calories (1200–1500 kcal/d for women and 1500–1800 kcal/d for men or a reduction of 500–1000 kcal/d from the standard calories)	60:22.5:13.5			
Lin et al. 2022	63 Overweight/Obese (0 M, 63 F)	OP, Taiwan	52.2 (7.6)	65.8 (9.2)	25.8 (3.7)	P	DA	Free	8	Weight Loss					Body weight	Negative	Agency
											Intervention	TRE	16 h daily fasting. Daily caloric intake restricted to 1400 kcals	~47:34:15			
											Control	CER	Daily caloric intake restricted to 1400 kcals	~47:34:15			
Lin et al. 2023	77 Obese (11 M, 66 F)	OP, USA	44 (11)	101 (17)	37.3 (5.3)	P	DA	Free	24	Weight Loss					Body weight	Neutral	Agency
											Intervention	TRE	16:8 (ad lib eating between 12-8pm)				
											Control	CER	reduce energy intake by 25%	~50:30:20			
											Control	AdLib	Usual Diet				
Liu et al. 2022	139 Overweight/Obese (71 M, 68 F)	OP, China	31.9 (9.1)	88.1 (11.6)	31.5 (2.8)	P	Supp	Free	52	Weight Loss					Body weight	Negative	Agency
											Intervention	TRE	TRE with of 1500 - 1800 kcals/day withing 8-hr feeding window daily	~40-55:20-30:15-20			
											Control	CER	1500 - 1800 kcals/day	~40-55:20-30:15-20			
Liu et al. 2023	38 Normal/Overweight/ Obese (0 M, 38 F)	OP, China	20.2 (1.8)	55.2 (5.3)	21.0 (1.3)	P	DA	Free	8	Weight Loss				NR	Body weight	Neutral	Agency
											Intervention	TRE	16:8; 8h eating window between 10:00 and 18:00 without restriction				
											Control	AdLib	Usual Diet				
Lowe et al. 2020	116 Overweight/Obese (70 M, 46 F)	OP, USA	46.5 (10.5)	99.2 (16)	32.7 (4.2)	P	DA	Free	12	Weight Loss				NR	Body weight	Neutral	Agency
											Intervention	TRE	16 h daily fasting, AdLib				

Author, Year	Participants*	Setting	Mean Age,	Mean	Mean	Design	Feeding	Diet	Follow-	Type of	Treatment	Type of	Description of	Diet [b]	Primary	Energy	Funding
											Control	AdLib	Usual Diet				
Manoogian et al. 2022	137 Normal Weight (125 M, 12 F)	OP, USA	40.36 (9)	88.2	36	P	DA	Free	12	Not Weight Loss					Body weight	Neutral	Agency
											Intervention	TRE	14:10; Mediterranean diet	~60:25:15			
											Control	AdLib	Mediterranean Diet				
Manoogian et al. 2024	108 Metabolic Syndrome (53 M, 55 F)	OP, USA	58.6 (10.9)	89.595 (16.7)	31.225. (4.05)	P	DA	Free	12	Weight loss					HbA1c, fasting glucose, fasting insulin, homeostasis model assessment of insulin resistance, and glycemic assessments from continuous glucose monitors.	Negative	Agency
											Intervention	TRE	16:8; 8-10h eating window	NR			
											Control	AdLib	Usual Diet				
Maroofi et al. 2020	88 Overweight/Obese (25 M, 63 F)	OP, Iran	44.6 (10.3)	87 (16.7)	32 (4.3)	P	DA	Free	8	Weight Loss					Body weight	Negative	Agency
											Intervention	WDF	3 fasting days. 30% caloric intake during fasting days	~52:30:18			
											Control	CER	30% caloric intake daily				
Mayra et al. 2022	18 Normal Weight (1 M, 17 F)	OP, USA	23.3 (4.2)	64 (2.1)	23.5 (2.5)	P	DA	Free	4	Weight Loss					Body weight	Neutral	None
											Intervention	TRE	18:6; consume within one hour of waking and for up to a total of 6 hours; one day off per week				
											Control	AdLib	consume within one hour of waking and for up to a toal of 16 hours; one day off per week				
Moro et al. 2016	34 Normal Weight (0 M, 34 F)	OP, Italy	29.2 (3.8)	84.6 (12.9)	26.9 (2.9)	P	DA	Free	8	Not Weight Loss					Body weight	Neutral	Agency
											Intervention	TRE	16h fasting. No caloric restriction	~53:25:22			
											Control	AdLib	Usual Diet	~55:24:21			
Obermayer et al. 2023	46 Type 2 Diabetes (24 M, 22 F)	OP, Austria	63 (7)	100 (15)	34.3 (4.5)	P	DA	Free	12	Weight Loss				NR	HbA1c	Neutral	Agency

Author, Year	Participants*	Setting	Mean Age,	Mean	Mean	Design	Feeding	Diet	Follow-	Type of	Treatment	Type of	Description of	Diet [b]	Primary	Energy	Funding
											Intervention	ADF	3 nonconsecutive fasting days of 75% calorie restriction (intake allowed as breakfast and/or lunch to have 18h fasting period); AdLib for other days				
											Control	AdLib	Usual Diet				
Oh et al. 2018	23 Overweight/Obese (7M, 16 F)	OP, South Korea	36.2 (9.2)	72.7 (12.3)	27.0 (2.9)	P	DA	Free	8	Weight Loss				NR	Body weight	Neutral	Agency
											Intervention	ADF	3 nonconsecutive days of fasting with 25% of daily energy intake (400-500kcal, between 12-2pm); AdLib on remaining 4 days				
											Control	AdLib	Usual Diet				
Oustric et al. 2021	30 Overweight/Obese (0 M, 30 F)	OP, UK	34.6 (9.4)	80 (11.1)	29.1 (2.4)	P	Supp	Free	12	Weight Loss				NR	Body weight	Negative	Agency + Industry
											Intervention	ADF	Alternating adlib and 75% energy restriction days				
											Control	CER	25% daily energy restriction				
Overland et al. 2018	10 Type 1 Diabetes (2 M, 8 F)	OP, Australia	46.9 (4.9)	86.26 (18.5)	31.7 (4)	P	Supp	Free	12	Weight Loss				NR	Body weight	Negative	Industry
											Intervention	WDF	2 days of fasting per week with 600kcal on fast fays				
											Control	CER	30% reduction daily				
Parr et al. 2024	43 Overweight/Obese with T2DM (17 F, 26 M)	OP, Australia	55.6 (8.4)	93.9 (16.4)	32.5 (4.5)	P	DA	Free	24	Not weight loss					HbA1c	Neutral	Agency
											intervention	TRE	15:9; limit eating to between 10:00 and 19:00 for as many days as possible	40:18:38			
											control	AdLib	provided with publicly available nutrition guidance for T2DM (Baker Heart and Diabetes Institute resources)	38:20:39			
Parvaresh et al. 2019	69 Metabolic Syndrome (41 M, 28 F)	OP, Iran	45.5 (8.54)	85.5 (11.44)	31.3 (3.59)	P	DA	Free	8	Weight Loss					Body weight	Negative	NR
											Intervention	ADF	3 fast days 75% energy restriction. 100% on feed day	~62:23:14			
											Control	CER	Consumed 75% of daily caloric requirements	~61:24:14			

Author, Year	Participants*	Setting	Mean Age,	Mean	Mean	Design	Feeding	Diet	Follow-	Type of	Treatment	Type of	Description of	Diet [b]	Primary	Energy	Funding
Pinto et al. 2020	43 Overweight/Obese (12 M, 31 F)	OP, UK	53.1 (10.2)	88.5 (18.8)	31.4 (5.1)	P	Supp	Free	4	Weight Loss					Body weight	Negative	Industry
											Intervention	WDF	2 fasting days with 600 kcals on fasting days	~42:38:18			
											Control	CER	500 kcal energy restriction daily	~40:37:16			
Pureza et al. 2020	58 Overweight/Obese (0 M, 58 F)	OP, Brazil	31 (19 - 44)	80.8 (12.3)	33.3 (4.3)	P	DA	Free	3	Weight Loss					Body weight	Negative	Agency
											Intervention	TRE	Eat only during a 12h period. 500-100kcal caloric restriction daily	~52:27:21			
											Control	CER	500-100kcal caloric restriction daily	~53:27:20			
Queiroz et al. 2022	48 Obese (6 M, 42 F)	OP, Brazil	29 (6)	83.9 (11.9)	31.0 (2.8)	P	DA	Free	8	Weight Loss					Body weight	Negative	Agency
											Intervention	TRE	75% daily energy requirements eaten as 3 meals between 8:00-16:00 (first meal could be one hour early or later than this start time; but window is always the same)	~50:20:30			
											Intervention	TRE	75% daily energy requirements eaten as 3 meals between 12:00-20:00 (first meal could be one hour early or later than this start time; but window is always the same)	~50:20:30			
											Control	CER	25% calorie reduction	~50:20:30			
Razavi et al. 2021	69 Metabolic Syndrome (41 M, 28 F)	OP, Iran	42.2 (8.96)	88.3 (7.95)	31.3 (3.56)	P	Supp	Free	16	Weight Loss					Body weight	Negative	NR
											Intervention	ADF	3 fast days with 75% energy restriction on fasting days. AdLib on feed days	~61:26:14			
											Control	CER	Consumed 75% of daily caloric requirements	~59:26:15			
Richardson et al. 2023	15 Normal Weight (15 M, 0 F)	OP, USA	28.7 (5.2)	73.5 (8.6)	23.3 (2.3)	C	DA	Free	4	Not Weight Loss					Body composition	Neutral	Agency
											Intervention	TRE	16:8; consume all meals in same 8h period each day	~60:20:20			
											Control	AdLib	12:12; consume all meals in same 12h period each day	~60:20:20			
Schubel et al. 2018	150 Overweight/Obese (75 M, 75 F)	OP, Germany	50.5 (8.1)	94.1 (14.9)	31.4 (3.8)	P	DA	Free	12	Weight Loss					Body weight	Negative	Agency

Author, Year	Participants*	Setting	Mean Age,	Mean	Mean	Design	Feeding	Diet	Follow-	Type of	Treatment	Type of	Description of	Diet [b]	Primary	Energy	Funding
											Intervention	WDF	2 days with 25% of individual energy requirement	~43:37:15			
											Intervention	CER	80% of individual energy requirement daily	~45:35:15			
											Control	AdLib		~43:36:16			
Steger et al. 2020	35 Overweight/Obese (8 M, 27 F)	OP, USA	45.6 (10.5)	89.1 (10.7)	31.2 (2.4)	P	Supp	Free	12	Weight Loss					Body weight	Negative	Agency
											Intervention	WDF	3 fast days with 550-800kcals consumed on fasting days	~44:38:17			
											Control	CER	1200-1600kcals consumed daily	~46:38:16			
Stote et al. 2007	15 Normal Weight (5 M, 10 F)	OP, USA	45 (0.7)	66.5 (3.1)	23.4 (0.5)	C	Met	Supervised	8	Not Weight Loss					Body weight	Neutral	NR
											Intervention	TRE	1 meal a day	~50:36:15			
											Control	AdLib	3 meals a day	~49:36:15			
Sukkriang et al. 2024	99 Obese with T2DM (58 F, 41 M)	OP, Thailand	45.3 (6.1)	82.3 (15.6)	31.9 (5.2)	P	DA	Free	12	Weight loss					Body weight	Negative	Agency
											Intervention	TRE	16:8; fast for 16 hours 3 days/week (2 weekdays and 1 weekend); follow general diabetic diet	NR			
			ß								Intervention	TRE	14:10; fast for 14 hours 3 days/week (2 weekdays and 1 weekend); follow general diabetic diet	NR			
											Control	AdLib	3 meals on diabetic diet (avoid desserts, sticky rice and high-sugar diets)	NR			
Sun et al. 2024	60 Metabolic dysfunction-associated steatotic liver disease and abnormal glucose metabolism; (24F, 36M)	OP, China	47.9 (10.9)	84.0 (16.5)	30.0 (4.5)	P	I = Supp; C = DA	Free	12	Weight loss					Liver fat content	Neutral	Agency
											Intervention	WDF	5:2; 497.6 kcal/d from plant-based meal replacements on fasting days; balanced diet without calorie restriction on non-fasting days	60:12.5:25			
											Control	CER	Prescribed amount of calories (25kcal/kg x [height (cm) - 100]kg) without time restriction	60:12.5:25			
Sundfor et al. 2018	112 Overweight/Obese (56 M, 56 F)	OP, Norway	48.7 (10.9)	108 (16.2)	35.2 (3.7)	P	DA	Free	26	Weight Loss					Body weight	Negative	NR

Author, Year	Participants*	Setting	Mean Age,	Mean	Mean	Design	Feeding	Diet	Follow-	Type of	Treatment	Type of	Description of	Diet [b]	Primary	Energy	Funding
											Intervention	WDF	400kcal for females & 600kcal for males consumed on 2 fasting days. AdLib on 5 remaining days	~45-50:30-35:20			
											Control	CER	26-28% reduced dietary intake	~45-50:30-35:20			
Talebi et al. 2024	60 Obese with PCOS (60F)	OP, Iran	30.5 (5)	82.5 (12.9)	30.2 (3.6)	P	I = Supp; C = DA	Free	8	Weight loss					Body weight	Neutral	Agency
											Intervention	TRE	14:10; 10-hour adlib eating window between 08:00 AM and 06:00 PM plus daily placebo supplementation	NR			
											Control	CER	consumed prescribed calories without regard to time; the daily prescribed total calories for the DCR group ranged from 1500 to 1800 kcal per day	55:15:30			
Templeman et al. 2021	24 Normal Weight (12 M, 12 F)	OP, UK	43.5 (8.7)	72.2 (9.3)	24 (2.2)	P	DA	Free	3	Weight Loss					Body weight	Negative	Agency
											Intervention	ADF	alternating 0 kcal on fasting days and 150% of energy requirement on feeding days	~38:39:16			
											Control	CER	75% of required energy intake	~40:39:16			
Teong et al. 2023	207 Prediabetic (87 M, 120 F)	OP, Australia	57.8 (10.2)	98.9 (16.5)	34.6 (4.7)	P	Supp	Free	24	Weight Loss					Glycemic Control	Negative	Agency
											Intervention	ADF	20:4; 30% of energy requirements on fasting days followed by 20h fast starting at 12:00 for 3 nonconsecutive days/wk (two meal replacements for breakfast and lunch); usual diet on non-fasting days	~59.4:26.4:14.2			
											Control	CER	30% restriction of energy requirements daily; one meal replacement per day	~59.4:26.4:14.2			
											Control	AdLib	Usual Diet				
Trepanowski et al. 2018	79 Overweight/Obese (13 M, 66 F)	OP, USA	44.6 (2)	95.3 (3)	34.4 (1)	P	Met	Free	24	Weight Loss					Body composition	Negative	Agency
											Intervention	ADF	Alternating 25% of energy needs on fast day and 125% on feed days	~55:30:15			

Author, Year	Participants*	Setting	Mean Age,	Mean	Mean	Design	Feeding	Diet	Follow-	Type of	Treatment	Type of	Description of	Diet [b]	Primary	Energy	Funding
											Intervention	CER	75% of energy needs everyday	~55:30:15			
											Control	AdLib	Normal diet				
Umphonsathien et al. 2022	40 Type 2 Diabetes (11 M, 29 F)	OP, Thailand	49.6 (7.2)	78.1 (6.7)	30. (1.8)	P	Supp	Free	18	Weight Loss					Glycemic Control	Neutral	Agency + Industry
											Intervention	WDF	2 non-consecutive days of fasting (600kcal/day in 3 meals); AdLib for the rest of the days	~55:30:15			
											Intervention	ADF	4 non-consecutive days of fasting (600kcal/day in 3 meals); AdLib for the rest of the days	~55:30:15			
											Control	AdLib	Usual Diet				
Varady et al. 2013	30 Normal Weight/Overweight (8 M, 22 F)	OP, USA	47.5 (2.5)	77 (3)	26 (1)	P	Met	Free	12	Weight Loss					Bodyweight	Negative	Agency
											Intervention	ADF	75% energy restriction on fasting days (alternating)	~55:30:15			
											Control	AdLib	Usual Diet				
Wang, 2024	54 NAFLD (31 M, 23 F)	OP, China	30.5 (8.63)	92.5 (15.5)	32.5 (5)	P	DA	Free	12	Weight loss					Hepatic Steatosis	Negative	Agency
											Intervention	ADF	2 fasting days per week of 600kcal/day for females and 800kcal/day for males	NR			
											Control	CER	1500-1800kcal/day for males 1200-1500kcal/day for females				
Witjaksono et al. 2022	50 Obese (50 M, 0 F)	OP, Indonesia	31 (19 - 54)	90.2 (12.9)	30.6	P	DA	Free	8	Weight Loss					Bodyweight	Neutral	Agency
											Intervention	WDF	5:2; Fasting for 14h on Mondays and Thursdays (from sunrise to sunset or from 4am-6pm); AdLib for non-fasting periods	~50.4:35:13.6			
											Control	AdLib	Usual Diet	~45.5:37:14.5			
Xie et al. 2022	82 Normal Weight (18 M, 64 F)	OP, China	31.1 (10)	61.1 (10.2)	21.9 (2.8)	P	DA	Free	5	Weight Loss				NR	Insulin sensitivity	Negative	Agency
											Intervention	TRE	early TRE between 6:00 AM and 3:00 PM				
											Intervention	TRE	mid-day TRE between 11:00 AM and 8:00 PM				
											Control	AdLib	Usual Diet				
Xu et al. 2021	18 Normal Weight/Overweight (4 M, 14 F)	OP, China	31.3 (6.3)	65.2 (11.2)	23.8 (3.2)	P	DA	Free	4	Weight Loss				NR	Bodyweight	Negative	Agency
											Intervention	WDF	800 kcal/day for 3 days in a row, then AdLib on Day 4				
											Control	CER	500kcal restriction daily				

Author, Year	Participants*	Setting	Mean Age,	Mean	Mean	Design	Feeding	Diet	Follow-	Type of	Treatment	Type of	Description of	Diet [b]	Primary	Energy	Funding
Zhou et al. 2024	20 Healthy (20 F)	OP, China	19.3 (1.2)	52.6 (5.3)	19.2 (1.8)	P	DA	Free	6	Not weight loss					Body composition	Neutral	Agency
											Intervention	TRF	16:8; Instructed to consume all their dietary intake within an 8-hour window (11 a.m. to 7 p.m.); no energy intake beyond the 8-hour eating window was allowed	52:15:33			
											Control	AdLib	habitual eating patterns	49:17:34			

Abbreviations
ADF, alternate day fasting; Adlib, ad libitum; BMI, body mass index; CER, caloric energy restriction; C, Crossover; DA, dietary advice; F, female; IF, intermittent fasting; M, male;NR, not reported; P, parallel; Supp, supplemented; TRE, time restricted eating; WDF, whole day fasting

Footnotes
* Total participant count included in the present network meta-analysis.
[a] Metabolic feeding control included provision of all study foods, supplement feeding control included provision of study supplements only, and dietary advice included
[b] Total energy intake in the form of carbohydrate:fat:protein
[c] Positive energy balance included interventions designed to consume excess calories on top of a baseline diet. Negative energy balance included interventions designed
[d] Agency funding included government, not-for profit health agencies or University

Carbs= 4kcal/g
Fat= 9kcal/g
Protein= 4kcal/g

Supplementary Table 4. Outlined adverse events reported in the intermittent fasting diet strategies, and adherence to diet strategies (n=99).

			Adherence to Diet Strategy					
	Study	Adverse Effects in the Intermittent Fasting Diet Strategy	ADF	WDF	TRE	CER	Ad-Libitum* (not always reported)	Other
1	Andriessen et al. 2022	None	81%				86%	
2	Antoni et al. 2018	NR						34% dropout rate for the whole study
3	Arciero et al. 2022	Mild: Reduced desire to eat		>90%		>90%		
4	Bartholomew et al. 2021	Mild: Constipation, dizziness, diarrhea, Edema, headache, insomnia, light-headed, muscle tension, nausea, and low energy		95 ± 12%				
5	Beaulieu et al. 2020	Mild: Cravings for sweets and savory foods	Not Reported					
6	Betts et al. 2014	NR			Not Reported			
7	Bhutani et al. 2013	NR	80% ± 9%					
8	Bilge Sertdemir et al. 2024	NR		Not Reported			Not Reported	
9	Cai et al. 2019	Mild: Hyperphagic	97.50%		97.50%	97.50%		
10	Cai et al. 2022	NR		Not Reported		Not Reported		
11	Carter et al. 2016	NR		84%		78%		
12	Carter et al. 2018	NR		44%		49%		
13	Castela et al. 2022	NR						80% of participants completed study.
14	Catenacci et al. 2016	None						93% of participants completed study.
15	Čermaková et al. 2024	Mild: Fatigue, headache, concentration disorder, and hunger			84%*	87%*		
16	Che et al. 2021	None			90%		83%	
17	Cho et al. 2019	NR	73%				73%**	
18	Chow et al. 2020	NR			60%***			
19	Cienfuegos et al. 2020	Mild: Nausea, constipa- tion, diarrhea, headaches, fatigue, and irritability did not change			88.60%			
20	Conley et al. 2018	Mild: Increased hunger		73%		75%		
21	Correia et al. 2024	NR		Not Reported	100%		100%	
22	Coutinho et al. 2018	None	78%			83%		
23	DeOliveiraMaranhaoPureza et	NR						53.44% participants completed study.
24	Domaszewski et al. 2023	None			99%			
25	Dunn et al. 2024	NR	72%			89%		
26	Dutzmann et al. 2024	None			83.70%	Not Reported		
27	Erdem et al. 2022	NR		57%	Not Reported.	98%		
28	Ezpeleta et al. 2023	NR	95%				100%	
29	Fagundes et al. 2023	NR			46%	75%		
30	Fitzgerald et al. 2018	Mild: Increased hunger, fatigue, headache.			92%	92%	75%	
31	Gabel et al. 2019	NR	32%			49%	48%	
32	Ghezzi et al. 2024	Mild: Headache, tiredness, loose stool.	98%				Not Reported	
33	Gray et al. 2021	NR	53%			50%		
34	Guevara-Cruz et al. 2024	None			>80%	>80%	Not Reported	
35	Guner et al. 2024	NR			92.4 ± 4.2%		Not Reported	
36	Guo et al. 2021	None		91.30%			78.30%	
37	Hajek et al. 2021	None		22%			Not Reported	
38	Harvie et al. 2021	NR		63%		77%		
39	Harvie et al. 2011	Mild: Lack of energy, headache, feeling cold and constipatio, hunger, lack of concentration, bad temper and preoccupation with food.		44%		32%		

Study	Adverse Effects in the Intermittent Fasting Diet Strategy	Adherence to Diet Strategy					
		ADF	WDF	TRE	CER	Ad-Libitum* (not always reported)	Other
40 Harvie et al. 2013	Mild: Feeling cold, decreased energy levels, constipation, headaches, and bad breath on energy-restricted days		76%		Not Reported		
41 He et al. 2021	Mild: Fatigue, headache, and nausea.		95%*		95%*		
42 He et al. 2022	None			72%*	62%*		
43 Headland et al. 2019	NR		Not Reported		Not Reported		
44 Hirsh et al. 2019	None		98.0 ± 7.3%		Not Reported		
45 Holmer et al. 2021	Severe: Hypoglycemia (resulting in a fall). Remaining sympotoms were mild.		96%		80%		
46 Hooshiar et al. 2023	NR	82%			86%		
47 Hooshiar et al. 2023	Mild: Mood (anger)	81%*			83%*		
48 Hussin et al. 2013	None		Not Reported			Not Reported	
49 Hutchison et al. 2019	NR						Detail on adherence was not provided, however, it was noted that diffculty to adhering to different diets improved over time.
50 Irani et al. 2024	NR			Not Reported	Not Reported		
51 Isenmann et al. 2021	NR			98.40%		88.90%	
52 Jimenez et al. 2019	NR		Not Reported				
53 Johari et al. 2019	None	75-83%					
54 Kahleova et al. 2014	None			93%		93%%	
55 Kapogiannis et al. 2024	NR		Not Reported			Not Reported	
56 Keawtep et al. 2024	None			88.80%		Not Reported	
57 Kord Varkaneh 2022	NR		88%			81%	
58 Kotarsky et al. 2021	None			81%		Not Reported	
59 Kramer et al. 2024	Mild: Fatigue and feeling cold			High (not specified)		Not Reported	
60 Kunduraci et al. 2020	None			97%	94%		
61 Lee et al. 2024	Mild: Fatigue, and nausea.		91.70%		83.90%		
62 Lin et al. 2023	None			87%	61%		
63 Lin et al. 2022	NR			84%		Not Reported	
64 Liu et al. 2022	Mild: Fatigue, dizziness, headache, decreased ap-petite, upper abdominal pain, dyspepsia, and constipation			84.0±16.1%	83.8±12.6%		
65 Liu et al. 2023	Mild			90%%		90%	
66 Lowe et al. 2020	NR			83.50%		92.10%	
67 Manoogian et al. 2022	None			68-77%		Not Reported	
68 Manoogian et al. 2024	Mild: Fatigue, and lack of concentration.			>85%		Not Reported	
69 Maroofi et al. 2020	NR		96%		96%		
70 Mayra et al. 2022	NR			57%%		100%	
71 Moro et al. 2016	NR			Not Reported			
72 Obermayer et al. 2023	None	91%					
73 Oh et al. 2018	NR	90%					
74 Oustric et al. 2021	NR	81.4 ± 14.6%			89.0 ± 9.7%		
75 Overland et al. 2018	None		Not Reported				
76 Parr et al. 2024	NR			>90%		Not Reported	
77 Parvaresh et al. 2019	None	Not Reported			Not Reported		

	Study	Adverse Effects in the Intermittent Fasting Diet Strategy	Adherence to Diet Strategy					
			ADF	WDF	TRE	CER	Ad-Libitum* (not always reported)	Other
78	Pinto et al. 2020	NR		Not Reported		Not Reported		
79	Pureza et al. 2020	NR						Study reports no statistically significant difference between adherence difficulty between TRE and CRE. The participants reported being adherent to both protocols as moderately challenging.
80	Queiroz et al. 2022	Mild: Hunger and headaches			79%****		85%	
81	Razavi et al. 2021	None	Not Reported			Not Reported		
82	Richardson et al. 2023	None			Not Reported		Not Reported	
83	Schubel et al. 2018	Mild: Dizziness and cramps		73.50%		Not Reported		
84	Steger et al. 2021	NR	80%			80%		
85	Stote et al. 2007	NR		Not Reported			Not Reported	
86	Sukkriang et al.	Mild: Palpitations, dizziness, mood change, and abdominal pain			Not Reported		Not Reported	
87	Sun et al.	Mild: fatigue, headache, lack of concentration, insomnia		82.80%		96.30%		
88	Sundfor et al. 2018	None		100%		100%		
89	Talebi et al.	Mild: Headache			82.20%		Not Reported	
90	Templeman et al. 2021	NR						
91	Teong et al. 2023	Mild: Fatigue, and hunger	Not Reported			Not Reported	Not Reported	
92	Trepanowski et al. 2018	NR	Not Reported			Not Reported		
93	Umphonsathien et al. 2022	None	>95%	>95%				
94	Varady et al. 2013	Mild: Headache and constipation	98 ± 5%			Not Reported		
95	Wang et al. 2024	Mild: Hunger and headaches	90%*			90%*		
96	Witjaksono et al. 2022	NR		Not Reported				
97	Xie et al. 2022	none			97.5%****			
98	Xu et al. 2021	Mild: Constipation, fatigue, and mild anxiety.		Not Reported		Not Reported		
99	Zhou et al.	None			Not Reported		Not Reported	

*Calculated based on data reported in the manuscript.

**Determined based on the number of completers. A subset of completers was selected for the biomarkers measured in the study.

***The TRE group was adherent on 55.5% ± 22.4% of days to eating within ±15 minutes of the 8-hour eating time window, on 60% ± 23% of days to within ±30 minutes, and on 66.3% ± 20.7% of days to within ±60 minutes of the 8-hour time window. The average adherence to the intervention was therefore 60%.

**** Averaged adherence data from two arms of the same dietary intervention group. For example, two TRE groups (morning versus afternoon fasting time) were averaged.

Supplementary Table 5. Confidence in effect estimates in network meta-analysis of diet interventions for body weight outcome.

comparison	within study bias	reporting bias	indirectness	imprecision	heterogeneity	incoherence	confidence rating
ADF:AdLib	No concerns	Low risk	No concerns	No concerns	No concerns	No concerns	High
ADF:CER	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
ADF:TRE	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
ADF:WDF	No concerns	Low risk	No concerns	No concerns	Major concerns	No concerns	Moderate
AdLib:CER	No concerns	Low risk	No concerns	No concerns	Some concerns	Some concerns	Moderate
AdLib:TRE	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
AdLib:WDF	No concerns	Low risk	No concerns	No concerns	No concerns	No concerns	High
CER:TRE	No concerns	Low risk	No concerns	Some concerns	Some concerns	No concerns	Moderate
CER:WDF	No concerns	Low risk	No concerns	No concerns	Major concerns	No concerns	Moderate
TRE:WDF	No concerns	Low risk	No concerns	Some concerns	Some concerns	No concerns	Moderate

Supplementary Table 6. Confidence in effect estimates in network meta-analysis of diet interventions for ALT outcome.

comparison	within study bias	reporting bias	indirectness	imprecision	heterogeneity	incoherence	confidence rating
ADF:AdLib	No concerns	Low risk	No concerns	Some concerns	No concerns	No concerns	Moderate
ADF:CER	No concerns	Low risk	No concerns	Some concerns	Some concerns	No concerns	Moderate
ADF:WDF	No concerns	Low risk	No concerns	Major concerns	No concerns	No concerns	Moderate
AdLib:CER	No concerns	Low risk	No concerns	Some concerns	Some concerns	No concerns	Moderate
AdLib:TRE	No concerns	Low risk	No concerns	Some concerns	Some concerns	No concerns	Moderate
AdLib:WDF	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
CER:WDF	No concerns	Low risk	No concerns	Some concerns	Some concerns	No concerns	Moderate
ADF:TRE	No concerns	Low risk	Major concerns	Major concerns	No concerns	No concerns	Very low
CER:TRE	No concerns	Low risk	Major concerns	Major concerns	No concerns	No concerns	Very low
TRE:WDF	No concerns	Low risk	Major concerns	Major concerns	No concerns	No concerns	Very low

Supplementary Table 7. Confidence in effect estimates in network meta-analysis of diet interventions for BMI outcome.

comparison	within study bias	reporting bias	indirectness	imprecision	heterogeneity	incoherence	confidence rating
ADF:AdLib	No concerns	Low risk	No concerns	No concerns	No concerns	No concerns	High
ADF:CER	No concerns	Low risk	No concerns	No concerns	Major concerns	No concerns	Moderate
ADF:TRE	No concerns	Low risk	No concerns	No concerns	Major concerns	No concerns	Moderate
ADF:WDF	No concerns	Low risk	No concerns	No concerns	Major concerns	No concerns	Moderate
AdLib:CER	No concerns	Low risk	No concerns	No concerns	Major concerns	No concerns	Moderate
AdLib:TRE	No concerns	Low risk	No concerns	No concerns	Major concerns	No concerns	Moderate
AdLib:WDF	No concerns	Low risk	No concerns	No concerns	Major concerns	No concerns	Moderate
CER:TRE	No concerns	Low risk	No concerns	Major concerns	No concerns	No concerns	Moderate
CER:WDF	No concerns	Low risk	No concerns	Major concerns	No concerns	No concerns	Moderate
TRE:WDF	No concerns	Low risk	No concerns	Major concerns	No concerns	No concerns	Moderate

Supplementary Table 8. Confidence in effect estimates in network meta-analysis of diet interventions for body fat outcome.

comparison	within study bias	reporting bias	indirectness	imprecision	heterogeneity	incoherence	confidence rating
ADF:AdLib	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
ADF:CER	No concerns	Low risk	No concerns	No concerns	Major concerns	No concerns	Moderate
ADF:TRE	No concerns	Low risk	No concerns	No concerns	Major concerns	No concerns	Moderate
AdLib:CER	No concerns	Low risk	No concerns	No concerns	Major concerns	No concerns	Moderate
AdLib:TRE	No concerns	Low risk	No concerns	No concerns	Major concerns	No concerns	Moderate
AdLib:WDF	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
CER:TRE	No concerns	Low risk	No concerns	No concerns	Major concerns	No concerns	Moderate
CER:WDF	No concerns	Low risk	No concerns	No concerns	Major concerns	No concerns	Moderate
ADF:WDF	No concerns	Low risk	No concerns	Major concerns	Major concerns	No concerns	Low
TRE:WDF	No concerns	Low risk	No concerns	Major concerns	Major concerns	No concerns	Low

Supplementary Table 9. Confidence in effect estimates in network meta-analysis of diet interventions for CRP outcome.

comparison	within study bias	reporting bias	indirectness	imprecision	heterogeneity	incoherence	confidence rating
ADF:AdLib	No concerns	Low risk	No concerns	Some concerns	Some concerns	No concerns	Moderate
ADF:CER	No concerns	Low risk	No concerns	No concerns	No concerns	No concerns	High
AdLib:CER	No concerns	Low risk	No concerns	Major concerns	No concerns	No concerns	Moderate
AdLib:TRE	No concerns	Low risk	No concerns	No concerns	No concerns	No concerns	High
AdLib:WDF	No concerns	Low risk	No concerns	Some concerns	No concerns	No concerns	Moderate
CER:TRE	No concerns	Low risk	No concerns	Major concerns	No concerns	No concerns	Moderate
CER:WDF	No concerns	Low risk	No concerns	Some concerns	Some concerns	No concerns	Moderate
ADF:TRE	No concerns	Low risk	Major concerns	Major concerns	No concerns	No concerns	Low
ADF:WDF	No concerns	Low risk	Major concerns	No concerns	No concerns	No concerns	Moderate
TRE:WDF	No concerns	Low risk	Major concerns	Some concerns	No concerns	No concerns	Moderate

Supplementary Table 10. Confidence in effect estimates in network meta-analysis of diet interventions for DBP outcome.

comparison	within study bias	reporting bias	indirectness	imprecision	heterogeneity	incoherence	confidence rating
ADF:AdLib	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
ADF:CER	No concerns	Low risk	No concerns	Some concerns	No concerns	No concerns	Moderate
ADF:WDF	No concerns	Low risk	No concerns	Some concerns	No concerns	No concerns	Moderate
AdLib:CER	No concerns	Low risk	No concerns	Some concerns	No concerns	No concerns	Moderate
AdLib:TRE	No concerns	Low risk	No concerns	No concerns	No concerns	No concerns	High
AdLib:WDF	No concerns	Low risk	No concerns	Some concerns	No concerns	No concerns	Moderate
CER:TRE	No concerns	Low risk	No concerns	Some concerns	No concerns	No concerns	Moderate
CER:WDF	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
ADF:TRE	No concerns	Low risk	Major concerns	Some concerns	Some concerns	No concerns	Low
TRE:WDF	No concerns	Low risk	Major concerns	Some concerns	No concerns	No concerns	Moderate

Supplementary Table 11. Confidence in effect estimates in network meta-analysis of diet interventions for fasting glucose outcome.

comparison	within study bias	reporting bias	indirectness	imprecision	heterogeneity	incoherence	confidence rating
ADF:AdLib	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
ADF:CER	No concerns	Low risk	No concerns	No concerns	No concerns	No concerns	High
ADF:TRE	No concerns	Low risk	No concerns	No concerns	No concerns	No concerns	High
ADF:WDF	No concerns	Low risk	No concerns	No concerns	No concerns	No concerns	High
AdLib:CER	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
AdLib:TRE	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
AdLib:WDF	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
CER:TRE	No concerns	Low risk	No concerns	No concerns	No concerns	No concerns	High
CER:WDF	No concerns	Low risk	No concerns	No concerns	No concerns	No concerns	High
TRE:WDF	No concerns	Low risk	No concerns	No concerns	No concerns	No concerns	High

Supplementary Table 12. Confidence in effect estimates in network meta-analysis of diet interventions for fasting insulin outcome.

comparison	within study bias	reporting bias	indirectness	imprecision	heterogeneity	incoherence	confidence rating
ADF:AdLib	No concerns	Low risk	No concerns	Major concerns	No concerns	No concerns	Moderate
ADF:CER	No concerns	Low risk	No concerns	Major concerns	No concerns	No concerns	Moderate
AdLib:CER	No concerns	Low risk	No concerns	Major concerns	No concerns	Major concerns	Low
AdLib:TRE	No concerns	Low risk	No concerns	No concerns	Major concerns	No concerns	Moderate
AdLib:WDF	No concerns	Low risk	No concerns	No concerns	Major concerns	No concerns	Moderate
CER:TRE	No concerns	Low risk	No concerns	Major concerns	No concerns	No concerns	Moderate
CER:WDF	No concerns	Low risk	No concerns	No concerns	Major concerns	No concerns	Moderate
ADF:TRE	Major concerns	Low risk	Major concerns	Major concerns	No concerns	Major concerns	Very low
ADF:WDF	Major concerns	Low risk	Major concerns	Some concerns	Some concerns	Major concerns	Very low
TRE:WDF	Major concerns	Low risk	Major concerns	Some concerns	Some concerns	Major concerns	Very low

Supplementary Table 13. Confidence in effect estimates in network meta-analysis of diet interventions for HbA1c outcome.

comparison	within study bias	reporting bias	indirectness	imprecision	heterogeneity	incoherence	confidence rating
ADF:AdLib	No concerns	Low risk	No concerns	Some concerns	Some concerns	No concerns	Moderate
ADF:CER	No concerns	Low risk	No concerns	Major concerns	No concerns	No concerns	Moderate
ADF:WDF	No concerns	Low risk	No concerns	Major concerns	No concerns	No concerns	Moderate
AdLib:CER	No concerns	Low risk	No concerns	Some concerns	Some concerns	No concerns	Moderate
AdLib:TRE	No concerns	Low risk	No concerns	Some concerns	Some concerns	No concerns	Moderate
AdLib:WDF	No concerns	Low risk	No concerns	Some concerns	Some concerns	No concerns	Moderate
CER:TRE	No concerns	Low risk	No concerns	Some concerns	Some concerns	No concerns	Moderate
CER:WDF	No concerns	Low risk	No concerns	No concerns	Major concerns	No concerns	Moderate
ADF:TRE	No concerns	Low risk	Major concerns	Major concerns	No concerns	No concerns	Low
TRE:WDF	No concerns	Low risk	Major concerns	Major concerns	No concerns	No concerns	Low

Supplementary Table 14. Confidence in effect estimates in network meta-analysis of diet interventions for HDL outcome.

comparison	within study bias	reporting bias	indirectness	imprecision	heterogeneity	incoherence	confidence rating
ADF:AdLib	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
ADF:CER	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
ADF:TRE	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
ADF:WDF	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
AdLib:CER	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
AdLib:TRE	No concerns	Low risk	No concerns	No concerns	No concerns	No concerns	High
AdLib:WDF	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
CER:TRE	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
CER:WDF	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
TRE:WDF	No concerns	Low risk	Major concerns	No concerns	Some concerns	Some concerns	Low

Supplementary Table 15. Confidence in effect estimates in network meta-analysis of diet interventions for HOMA-IR outcome.

comparison	within study bias	reporting bias	indirectness	imprecision	heterogeneity	incoherence	confidence rating
ADF:AdLib	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
ADF:CER	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
ADF:WDF	No concerns	Low risk	No concerns	No concerns	No concerns	No concerns	High
AdLib:CER	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
AdLib:TRE	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
AdLib:WDF	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
CER:TRE	No concerns	Low risk	No concerns	No concerns	No concerns	No concerns	High
CER:WDF	No concerns	Low risk	No concerns	No concerns	No concerns	No concerns	High
ADF:TRE	No concerns	Low risk	Major concerns	No concerns	Some concerns	No concerns	Moderate
TRE:WDF	No concerns	Low risk	Major concerns	No concerns	No concerns	No concerns	Moderate

Supplementary Table 16. Confidence in effect estimates in network meta-analysis of diet interventions for LDL outcome.

comparison	within study bias	reporting bias	indirectness	imprecision	heterogeneity	incoherence	confidence rating
ADF:AdLib	No concerns	Low risk	No concerns	Some concerns	Some concerns	No concerns	Moderate
ADF:CER	No concerns	Low risk	No concerns	Some concerns	Some concerns	No concerns	Moderate
ADF:TRE	No concerns	Low risk	No concerns	Some concerns	Some concerns	No concerns	Moderate
ADF:WDF	No concerns	Low risk	No concerns	Some concerns	Some concerns	No concerns	Moderate
AdLib:CER	No concerns	Low risk	No concerns	Some concerns	Some concerns	No concerns	Moderate
AdLib:TRE	No concerns	Low risk	No concerns	Some concerns	Some concerns	No concerns	Moderate
AdLib:WDF	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
CER:TRE	No concerns	Low risk	No concerns	Some concerns	Some concerns	No concerns	Moderate
CER:WDF	No concerns	Low risk	No concerns	Some concerns	Some concerns	No concerns	Moderate
TRE:WDF	No concerns	Low risk	Major concerns	No concerns	Major concerns	No concerns	Low

Supplementary Table 17. Confidence in effect estimates in network meta-analysis of diet interventions for non-HDL outcome.

comparison	within study bias	reporting bias	indirectness	imprecision	heterogeneity	incoherence	confidence rating
ADF:AdLib	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
ADF:CER	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
ADF:TRE	No concerns	Low risk	No concerns	No concerns	No concerns	Some concerns	Moderate
ADF:WDF	No concerns	Low risk	No concerns	No concerns	Major concerns	No concerns	Moderate
AdLib:CER	No concerns	Low risk	No concerns	Some concerns	Some concerns	No concerns	Moderate
AdLib:TRE	No concerns	Low risk	No concerns	No concerns	Major concerns	No concerns	Moderate
AdLib:WDF	No concerns	Low risk	No concerns	Some concerns	Some concerns	No concerns	Moderate
CER:TRE	No concerns	Low risk	No concerns	Some concerns	Some concerns	No concerns	Moderate
CER:WDF	No concerns	Low risk	No concerns	Some concerns	Some concerns	No concerns	Moderate
TRE:WDF	No concerns	Low risk	Some concerns	No concerns	Major concerns	Some concerns	Low

Supplementary Table 18. Confidence in effect estimates in network meta-analysis of diet interventions for SBP outcome.

comparison	within study bias	reporting bias	indirectness	imprecision	heterogeneity	incoherence	confidence rating
ADF:AdLib	No concerns	Low risk	No concerns	No concerns	No concerns	No concerns	High
ADF:CER	No concerns	Low risk	No concerns	Some concerns	No concerns	No concerns	Moderate
ADF:WDF	No concerns	Low risk	No concerns	Some concerns	No concerns	No concerns	Moderate
AdLib:CER	No concerns	Low risk	No concerns	Some concerns	No concerns	No concerns	Moderate
AdLib:TRE	No concerns	Low risk	No concerns	Some concerns	No concerns	No concerns	Moderate
AdLib:WDF	No concerns	Low risk	No concerns	Some concerns	No concerns	No concerns	Moderate
CER:TRE	No concerns	Low risk	No concerns	Some concerns	Some concerns	No concerns	Moderate
CER:WDF	No concerns	Low risk	No concerns	Some concerns	Some concerns	No concerns	Moderate
ADF:TRE	No concerns	Low risk	Major concerns	No concerns	Some concerns	No concerns	Low
TRE:WDF	No concerns	Low risk	Major concerns	Major concerns	No concerns	No concerns	Low

Supplementary Table 19. Confidence in effect estimates in network meta-analysis of diet interventions for total cholesterol outcome.

comparison	within study bias	reporting bias	indirectness	imprecision	heterogeneity	incoherence	confidence rating
ADF:AdLib	No concerns	Low risk	No concerns	No concerns	No concerns	Some concerns	Moderate
ADF:CER	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
ADF:TRE	No concerns	Low risk	No concerns	No concerns	No concerns	Some concerns	Moderate
ADF:WDF	No concerns	Low risk	No concerns	Some concerns	Some concerns	No concerns	Moderate
AdLib:CER	No concerns	Low risk	No concerns	Some concerns	Some concerns	No concerns	Moderate
AdLib:TRE	No concerns	Low risk	No concerns	No concerns	Major concerns	Major concerns	Low
AdLib:WDF	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
CER:TRE	No concerns	Low risk	No concerns	No concerns	Major concerns	No concerns	Moderate
CER:WDF	No concerns	Low risk	No concerns	Some concerns	Some concerns	No concerns	Moderate
TRE:WDF	No concerns	Low risk	Major concerns	No concerns	Some concerns	Major concerns	Low

Supplementary Table 20. Confidence in effect estimates in network meta-analysis of diet interventions for triglyceride outcome.

comparison	within study bias	reporting bias	indirectness	imprecision	heterogeneity	incoherence	confidence rating
ADF:AdLib	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
ADF:CER	No concerns	Low risk	No concerns	No concerns	Some concerns	Some concerns	Moderate
ADF:TRE	No concerns	Low risk	No concerns	No concerns	Major concerns	No concerns	Moderate
ADF:WDF	No concerns	Low risk	No concerns	No concerns	Major concerns	No concerns	Moderate
AdLib:CER	No concerns	Low risk	No concerns	Some concerns	Some concerns	No concerns	Moderate
AdLib:TRE	No concerns	Low risk	No concerns	Some concerns	Some concerns	No concerns	Moderate
AdLib:WDF	No concerns	Low risk	No concerns	Some concerns	Some concerns	No concerns	Moderate
CER:TRE	No concerns	Low risk	No concerns	Some concerns	Some concerns	No concerns	Moderate
CER:WDF	No concerns	Low risk	No concerns	Some concerns	Some concerns	No concerns	Moderate
TRE:WDF	No concerns	Low risk	Major concerns	Major concerns	No concerns	Major concerns	Low

Supplementary Table 21. Confidence in effect estimates in network meta-analysis of diet interventions for waist circumference outcome.

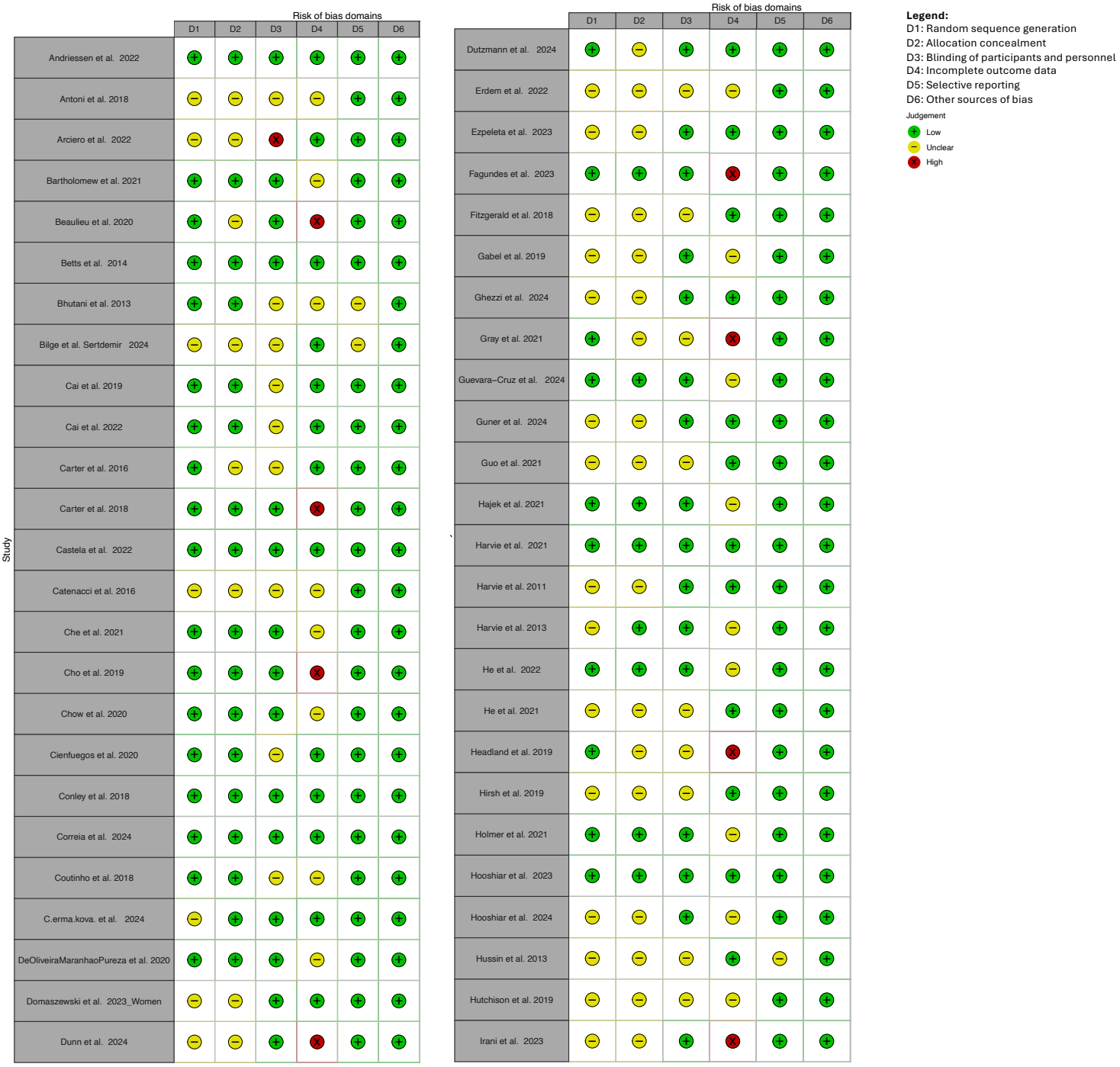
comparison	within study bias	reporting bias	indirectness	imprecision	heterogeneity	incoherence	confidence rating
ADF:AdLib	No concerns	Low risk	No concerns	No concerns	No concerns	No concerns	High
ADF:CER	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
ADF:TRE	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
AdLib:CER	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
AdLib:TRE	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
AdLib:WDF	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
CER:TRE	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
CER:WDF	No concerns	Low risk	No concerns	No concerns	Major concerns	No concerns	Moderate
TRE:WDF	No concerns	Low risk	No concerns	No concerns	Some concerns	No concerns	Moderate
ADF:WDF	No concerns	Low risk	Major concerns	No concerns	Some concerns	No concerns	Moderate

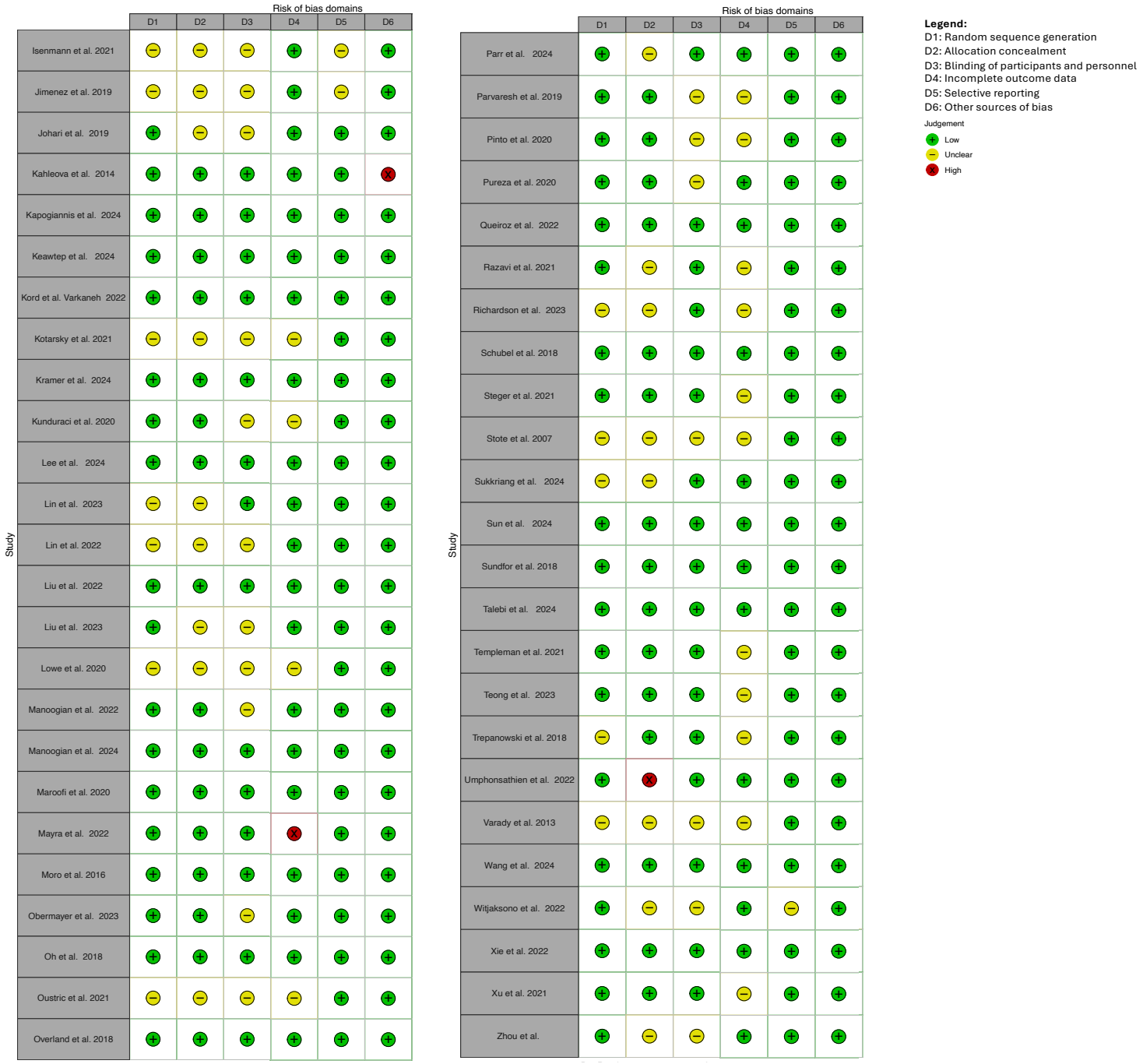
Supplementary Table 22. Minimally important difference (MID) threshold for each outcome.

Outcome	MID Threshold	Rationale and Reference
Body Weight	1.0 kg	1 kg is an MID established by Johnston et al. and Ge et al. [1, 2]
ALT	2.85 U/L	10% of the median reference value (28.5 U/L) for males and females [3]
BMI	0.2 kg/m²	Approximately equivalent to the MID for body weight of 1 kg; adjusted to 0.2 kg/m² for consistency
Body Fat	2%	Absolute reduction based on 5-7% weight loss being clinically meaningful
CRP	0.05 mg/dl	0.5 mg/L (equivalent to 0.05 mg/dl) represents 10% of the cut-off threshold for clinical inflammation [4]
Diastolic Blood Pressure	2 mmHg	1 mmHg reduction in DBP represents reductions seen for average dose-doubling of a BP agent [5]
Fasting Glucose	0.5 mmol/l	Approximately equivalent to the MID for A1C of 0.3% [6]
Fasting Insulin	5 pmol/l	Approximately equivalent to the MID for fasting glucose of 0.5 mmol/L
HbA1c	0.3%	Threshold identified as clinically relevant by EMA [7] and FDA [8, 9]
HDL	0.1 mmol/l	0.1 mmol/L represents the minimum reduction used to support health claims [10, 11] and CCS guidelines [12]
HOMA-IR	1	Proportional reduction to fasting glucose
LDL	0.1 mmol/l	0.1 mmol/L represents the minimum reduction used to support health claims [10, 11] and CCS guidelines [12]
Non-HDL	0.1 mmol/l	0.1 mmol/L represents the minimum reduction used to support health claims [10, 11] and CCS guidelines [12]
Systolic Blood Pressure	2 mmHg	2 mmHg reduction in SBP identified by JNC7 [13] and seen for average dose-doubling of a BP agent [5]
Total Cholesterol	0.1 mmol/l	0.1 mmol/L represents the minimum reduction used to support health claims [10, 11]
Triglyceride	0.1 mmol/l	0.1 mmol/L represents the minimum reduction used to support health claims [10, 11] and CCS guidelines [12]
Waist Circumference	2 cm	Approximately equivalent to the MID for body weight of 1 kg [14]; adjusted to 2 cm for consistency

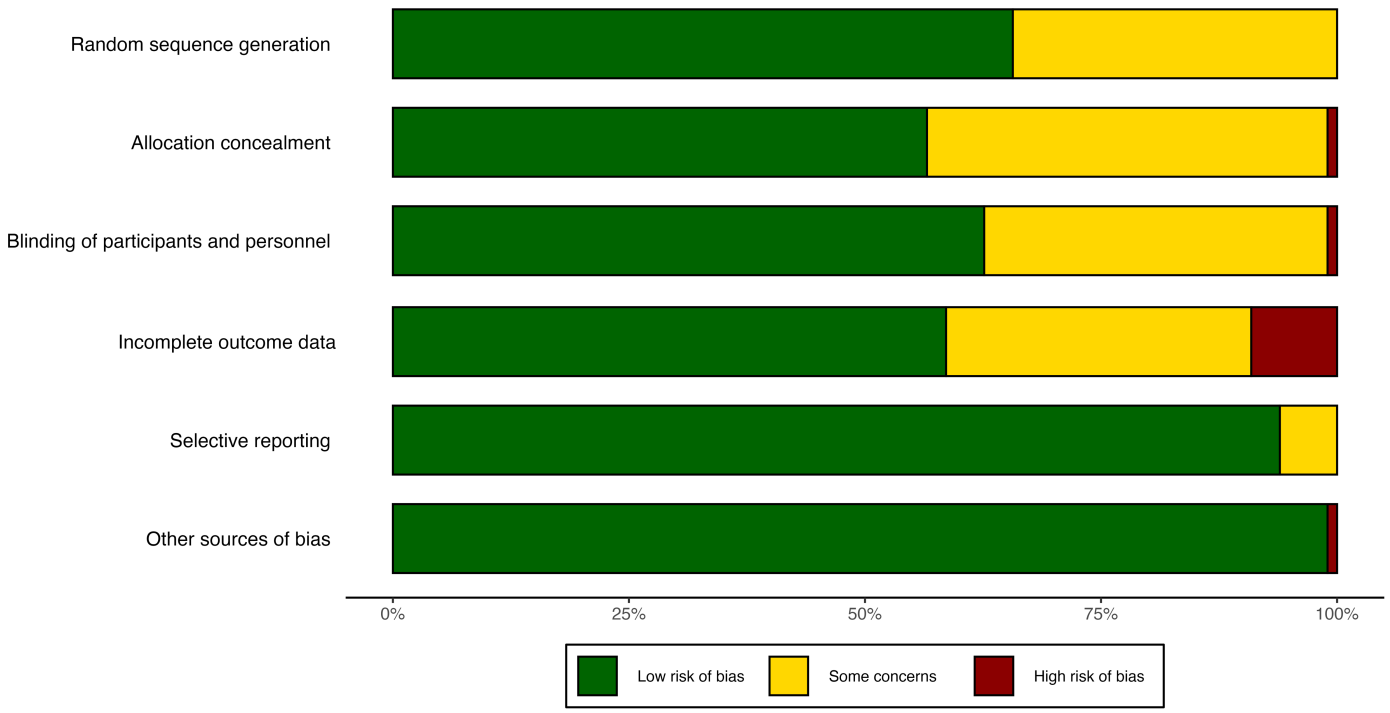
Footnotes:
[1] Johnston BC, Kanters S, Bandayrel K, et al. Comparison of weight loss among named diet programs in overweight and obese adults: a meta-analysis. JAMA. 2014;312(9):923-33.
[2] Ge L, Sadeghirad B, Ball GDC, et al. Comparison of dietary macronutrient patterns of 14 popular named dietary programmes for weight and cardiovascular risk factor reduction in adults: systematic review and network meta-analysis of randomised trials. BMJ. 2020;369:m696.
[3] Tietz Textbook of Clinical Chemistry. Edited by CA Burtis, ER Ashwood. Philadelphia, WB Saunders Company, 1994.
[4] Rifai N, Horvath AR, Wittwer CT, eds. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics. 6th ed. Elsevier, 2018.
[5] Law MR, Wald NJ, Morris JK, et al. Value of low dose combination treatment with blood pressure lowering drugs: analysis of 354 randomised trials. BMJ. 2003;326(7404):1427. https://www.bmj.com/content/326/7404/1427
[6] Nathan DM, Kuenen J, Borg R, et al. Translating the A1C assay into estimated average glucose values. Diabetes Care. 2008;31(8):1473-8.
[7] European Medicines Agency. Guideline on clinical investigation of medicinal products in the treatment or prevention of diabetes mellitus. CPMP/EWP/1080/00 Rev. 1. 2018. https://www.ema.europa.eu/en/documents/scientific-guideline/draft-guideline-clinical-investigation-medicinal-products-treatment-prevention-diabetes-mellitus_en.pdf
[8] Food and Drug Administration. Guidance for Industry on Diabetes Mellitus-Evaluating Cardiovascular Risk in New Antidiabetic Therapies to Treat Type 2 Diabetes; Availability. 2008. https://www.federalregister.gov/documents/2008/12/19/E8-30086/guidance-for-industry-on-diabetes-mellitus-evaluating-cardiovascular-risk-in-new-antidiabetic
[9] U.S. Food & Drug Administration. Diabetes Mellitus: Efficacy Endpoints for Clinical Trials Investigating Antidiabetic Drugs and Biological Products Guidance for Industry. Draft Guidance. 2023. https://www.fda.gov/media/168475/download
[10] Food Directorate, Health Products and Food Branch, Health Canada. Summary of Health Canada's assessment of a health claim about soy protein and cholesterol lowering. Ottawa: Bureau of Nutritional Sciences. March 2015. https://www.canada.ca/en/health-canada/services/food-nutrition/food-labelling/health-claims/assessments/summary-assessment-health-claim-about-protein-cholesterol-lowering.html
[11] Food Directorate, Health Products and Food Branch, Health Canada. Oat products and blood cholesterol lowering. Ottawa: Bureau of Nutritional Sciences. 2010.
[12] Anderson TJ, Grégoire J, Pearson GJ, et al. 2016 Canadian Cardiovascular Society Guidelines for the Management of Dyslipidemia for the Prevention of Cardiovascular Disease in the Adult. Can J Cardiol. 2016;32(11):1263-82.
[13] Chobanian AV, Bakris GL, Black HR, et al. Seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. Hypertension. 2003;42(6):1206-52.
[14] Sacks FM, Bray GA, Carey VJ, et al. Comparison of weight-loss diets with different compositions of fat, protein, and carbohydrates. N Engl J Med. 2009;360(9):859-73.

Supplementary Figures

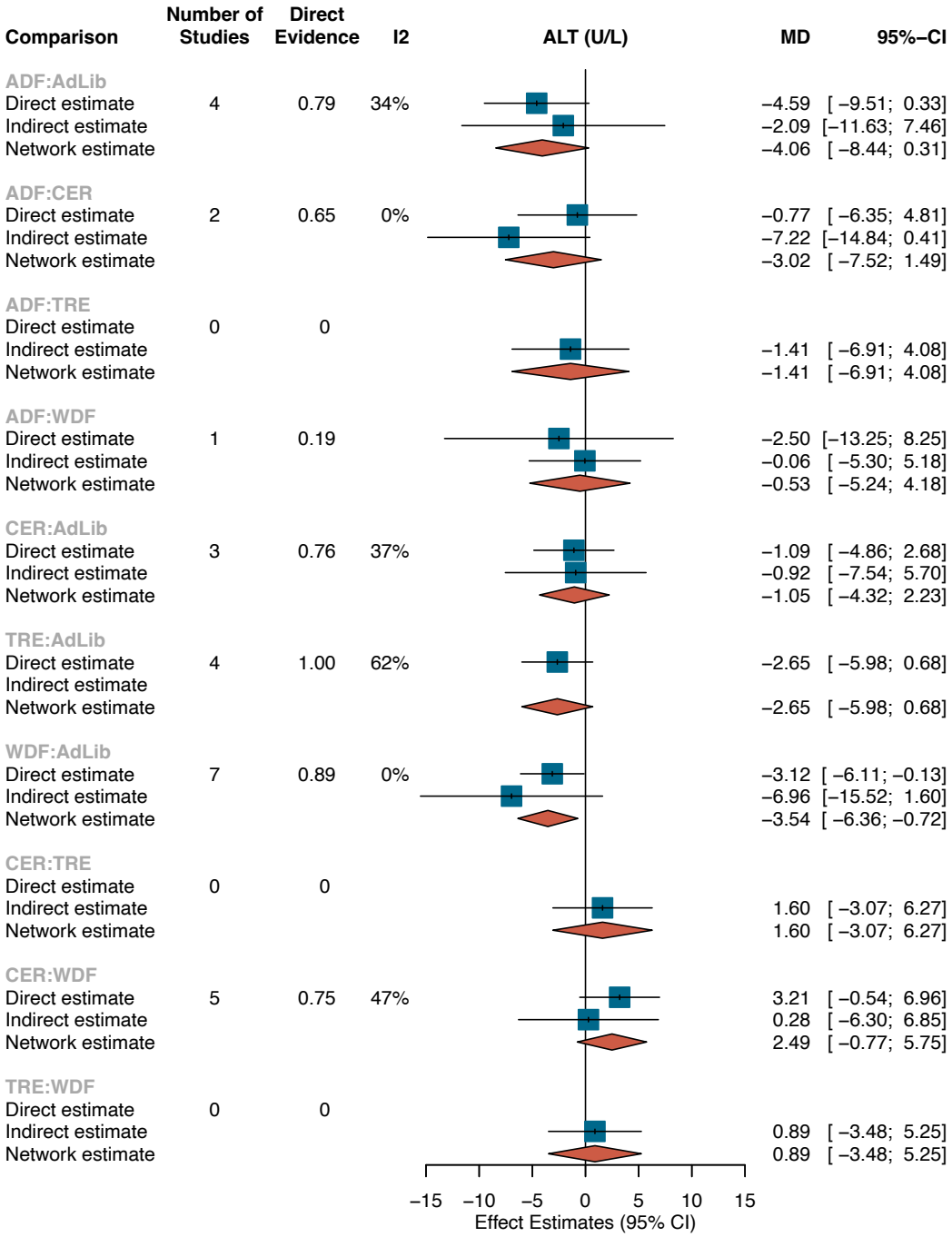

Risk of bias domains
D1
D2
D3
D4
D5
D6
Study
Andriessen et al. 2022
Antoni et al. 2018
Arciero et al. 2022
Bartholomew et al. 2021
Beaulieu et al. 2020
Betts et al. 2014
Bhutani et al. 2013
Bilge et al. Sertdemir 2024
Cai et al. 2019
Cai et al. 2022
Carter et al. 2016
Carter et al. 2018
Castela et al. 2022
Catenacci et al. 2016
Che et al. 2021
Cho et al. 2019
Chow et al. 2020
Cienfuegos et al. 2020
Conley et al. 2018
Correia et al. 2024
Coutinho et al. 2018
C.erma.kova. et al. 2024
DeOliveiraMaranhaoPureza et al. 2020
Domaszewski et al. 2023_Women
Dunn et al. 2024
Dutzmann et al. 2024
Erdem et al. 2022
Ezpeleta et al. 2023
Fagundes et al. 2023
Fitzgerald et al. 2018
Gabel et al. 2019
Ghezzi et al. 2024
Gray et al. 2021
Guevara–Cruz et al. 2024
Guner et al. 2024
Guo et al. 2021
Hajek et al. 2021
Harvie et al. 2021
Harvie et al. 2011
Harvie et al. 2013
He et al. 2022
He et al. 2021
Headland et al. 2019
Hirsh et al. 2019
Holmer et al. 2021
Hooshiar et al. 2023
Hooshiar et al. 2024
Hussin et al. 2013
Hutchison et al. 2019
Irani et al. 2023
Legend:
D1: Random sequence generation
D2: Allocation concealment
D3: Blinding of participants and personnel
D4: Incomplete outcome data
D5: Selective reporting
D6: Other sources of bias
Judgement
Low
Unclear
High



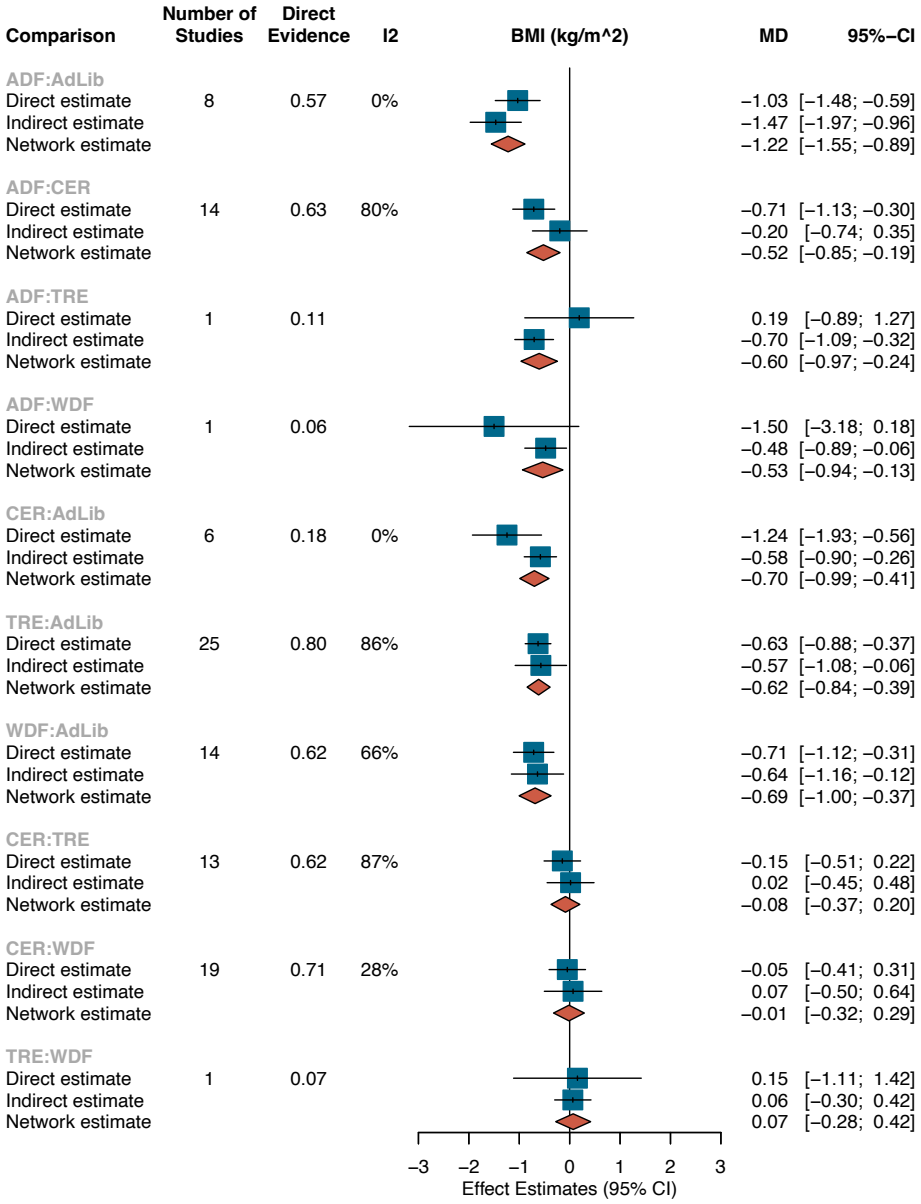
Supplementary Figure 1. Cochrane risk of bias summary of all included studies (n=99). Columns D1-D6 refer to: D1: Random sequence generation (D1) which considers selection bias (biased allocation to interventions) due to inadequate generation of a randomized sequence; D2: Allocation concealment (D2), which considers selection bias (biased allocation to interventions) due to inadequate concealment of allocations prior to assignment; Blinding of participants and personnel (D3) which considers performance bias due to knowledge of the allocated interventions by participants and personnel during the study; Incomplete outcome data (D4), which considers attrition bias due to amount, nature or handling of incomplete outcome data; Selective reporting (D5), which considers reporting bias due to selective outcome reporting; and Other sources of bias (D6), which considers other biases due to other problems not identified by D1-D5. Each individual study was evaluated for these ROB criteria by two independent reviewers.



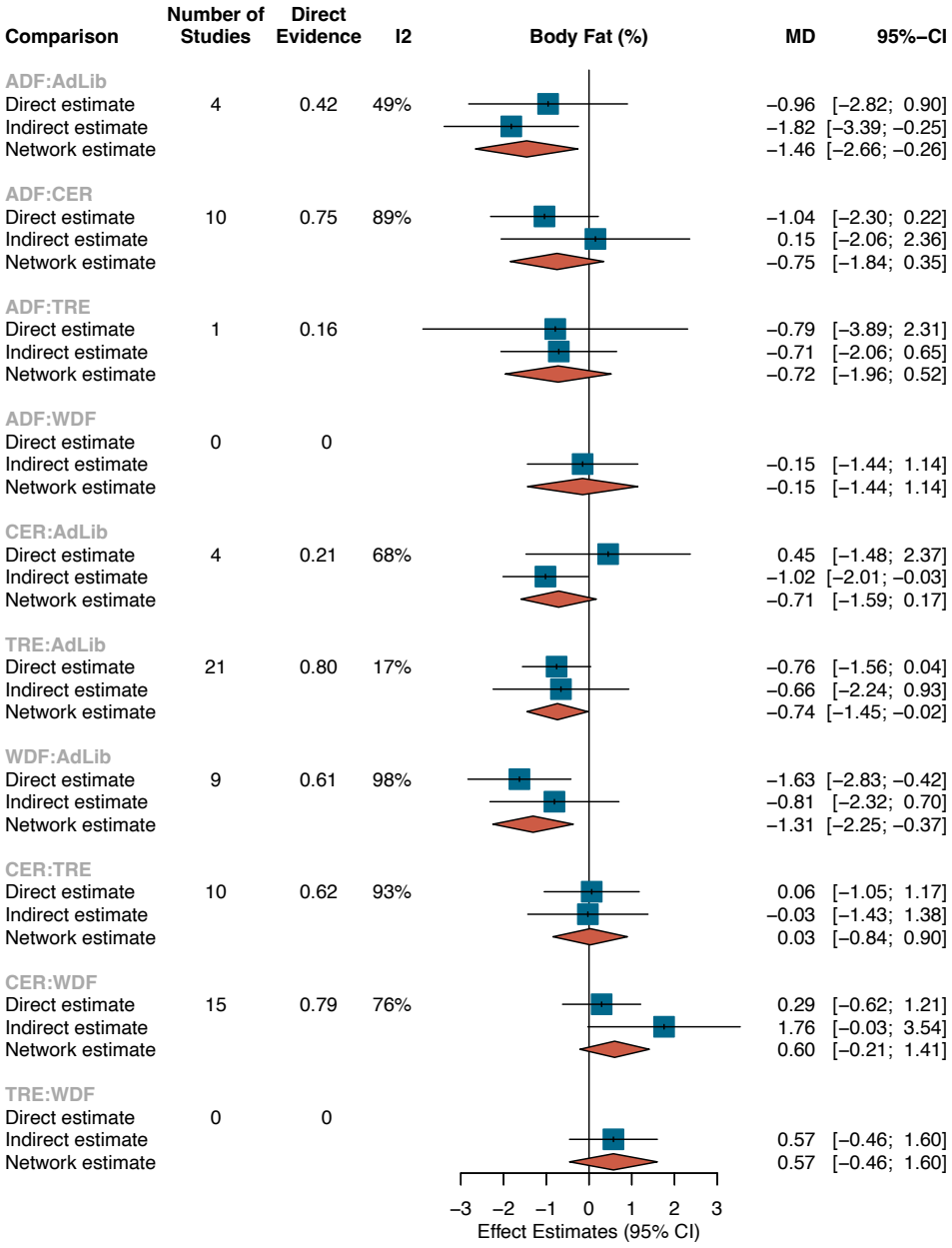
Supplementary Figure 2. Risk of bias proportion for all included trials based on the outlined criteria.



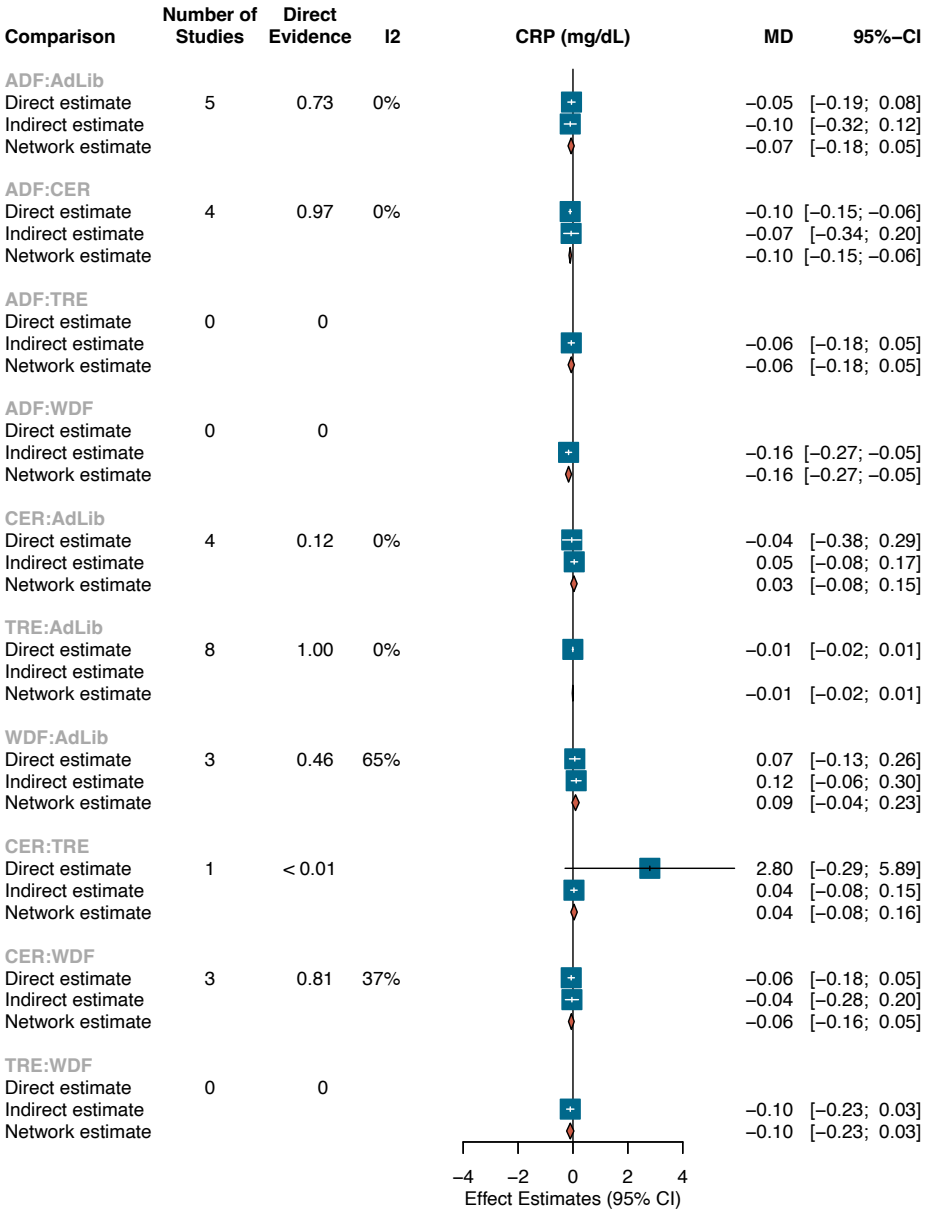
Supplementary Figure 3. Network analysis comparing intermittent fasting strategies, continuous energy restriction, and ad-libitum diets on ALT (U/L). Each comparison evaluates the assessment of diet arm 1 compared to diet arm 2. The blue box represents the mean difference (MD) and the line represents the 95% confidence intervals (CI). This is presented for direct estimates and indirect estimates. The red diamond represents the overall network estimate for that comparison, which integrates both direct and indirect estimates. For example, ADF:AdLib comparison shows the MD of ADF compared to ad-libitum. A negative MD suggests diet 1 had greater reduction compared to diet 2; whereas a positive MD suggests diet 2 had a greater reduction compared to diet 1. 'Number of studies' refers to the total number of direct evidence published for the specific comparison. `Direct evidence` refers to the proportion of the evidence available from direct assessments through published literature. 'I2' refers to the percentage of the total variability in a set of effect sizes due to true heterogeneity.



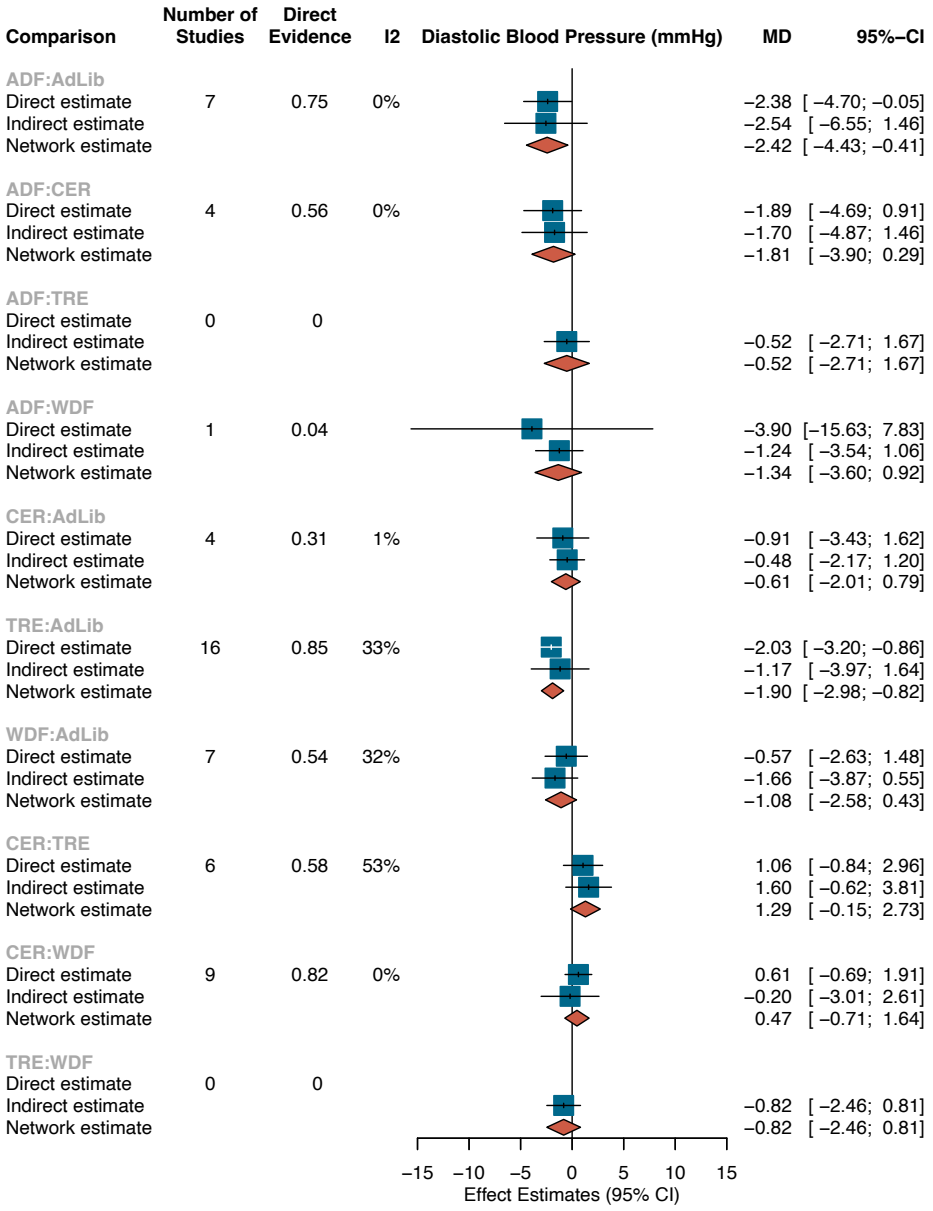
Supplementary Figure 4. Network analysis comparing intermittent fasting strategies, continuous energy restriction, and ad-libitum diets on BMI (kg/m^2). Each comparison evaluates the assessment of diet arm 1 compared to diet arm 2. The blue box represents the mean difference (MD) and the line represents the 95% confidence intervals (CI). This is presented for direct estimates and indirect estimates. The red diamond represents the overall network estimate for that comparison, which integrates both direct and indirect estimates. For example, ADF:AdLib comparison shows the MD of ADF compared to ad-libitum. A negative MD suggests diet 1 had greater reduction compared to diet 2; whereas a positive MD suggests diet 2 had a greater reduction compared to diet 1. 'Number of studies' refers to the total number of direct evidence published for the specific comparison. `Direct evidence` refers to the proportion of the evidence available from direct assessments through published literature. 'I^2' refers to the percentage of the total variability in a set of effect sizes due to true heterogeneity.



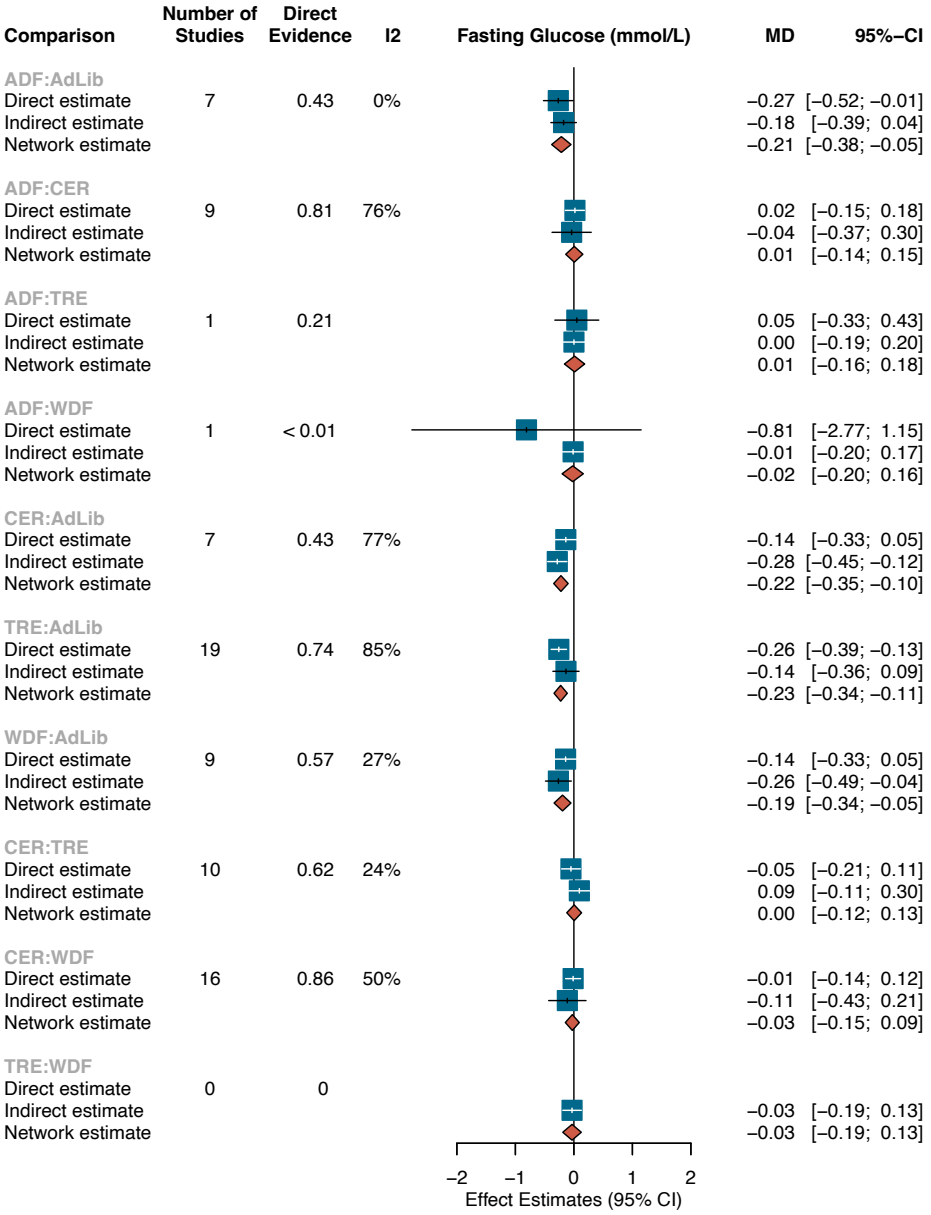
Supplementary Figure 5. Network analysis comparing intermittent fasting strategies, continuous energy restriction, and ad-libitum diets on body fat (%). Each comparison evaluates the assessment of diet arm 1 compared to diet arm 2. The blue box represents the mean difference (MD) and the line represents the 95% confidence intervals (CI). This is presented for direct estimates and indirect estimates. The red diamond represents the overall network estimate for that comparison, which integrates both direct and indirect estimates. For example, ADF:AdLib comparison shows the MD of ADF compared to ad-libitum. A negative MD suggests diet 1 had greater reduction compared to diet 2; whereas a positive MD suggests diet 2 had a greater reduction compared to diet 1. 'Number of studies' refers to the total number of direct evidence published for the specific comparison. `Direct evidence` refers to the proportion of the evidence available from direct assessments through published literature. 'I^2' refers to the percentage of the total variability in a set of effect sizes due to true heterogeneity.



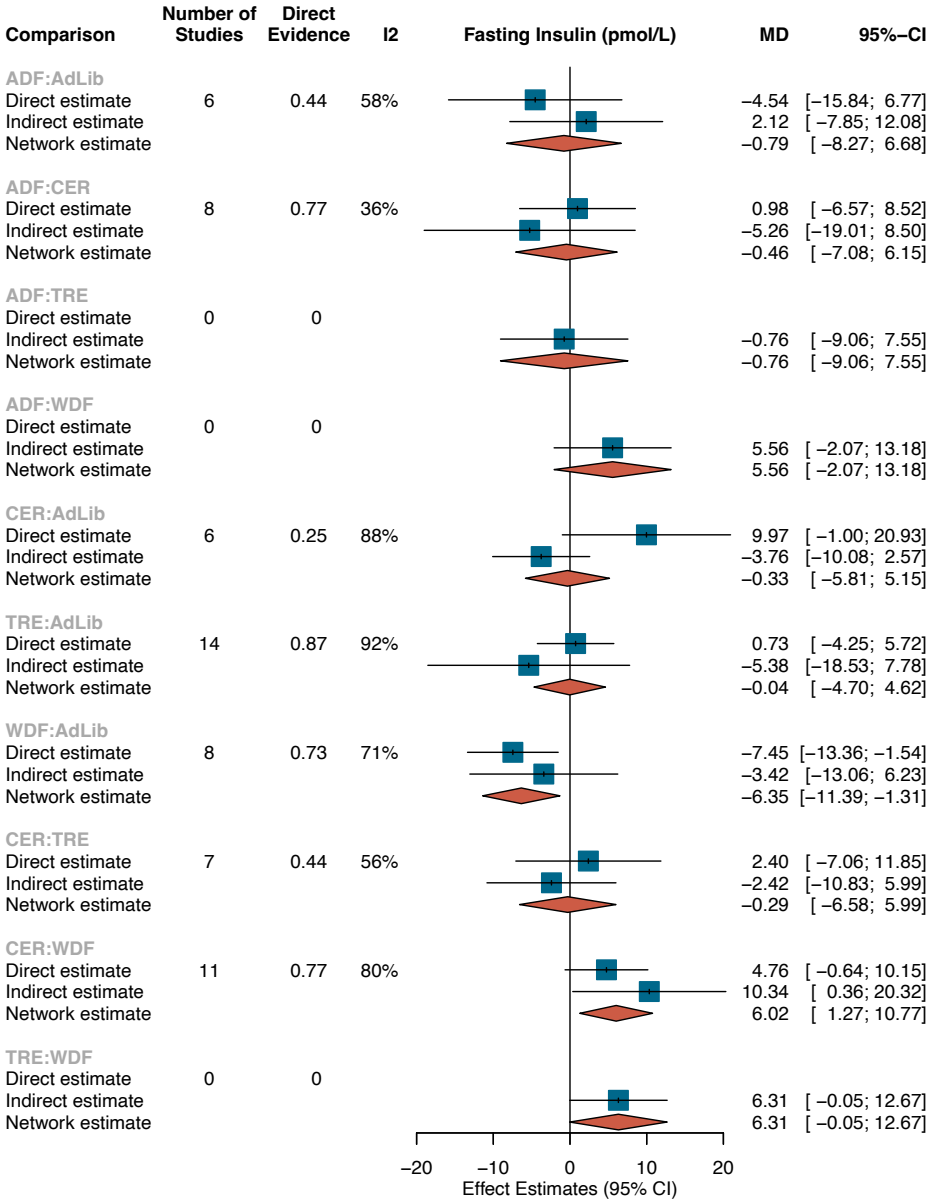
Supplementary Figure 6. Network analysis comparing intermittent fasting strategies, continuous energy restriction, and ad-libitum diets on CRP (mg/dL). Each comparison evaluates the assessment of diet arm 1 compared to diet arm 2. The blue box represents the mean difference (MD) and the line represents the 95% confidence intervals (CI). This is presented for direct estimates and indirect estimates. The red diamond represents the overall network estimate for that comparison, which integrates both direct and indirect estimates. For example, ADF:AdLib comparison shows the MD of ADF compared to ad-libitum. A negative MD suggests diet 1 had greater reduction compared to diet 2; whereas a positive MD suggests diet 2 had a greater reduction compared to diet 1. 'Number of studies' refers to the total number of direct evidence published for the specific comparison. `Direct evidence` refers to the proportion of the evidence available from direct assessments through published literature. 'I2' refers to the percentage of the total variability in a set of effect sizes due to true heterogeneity.



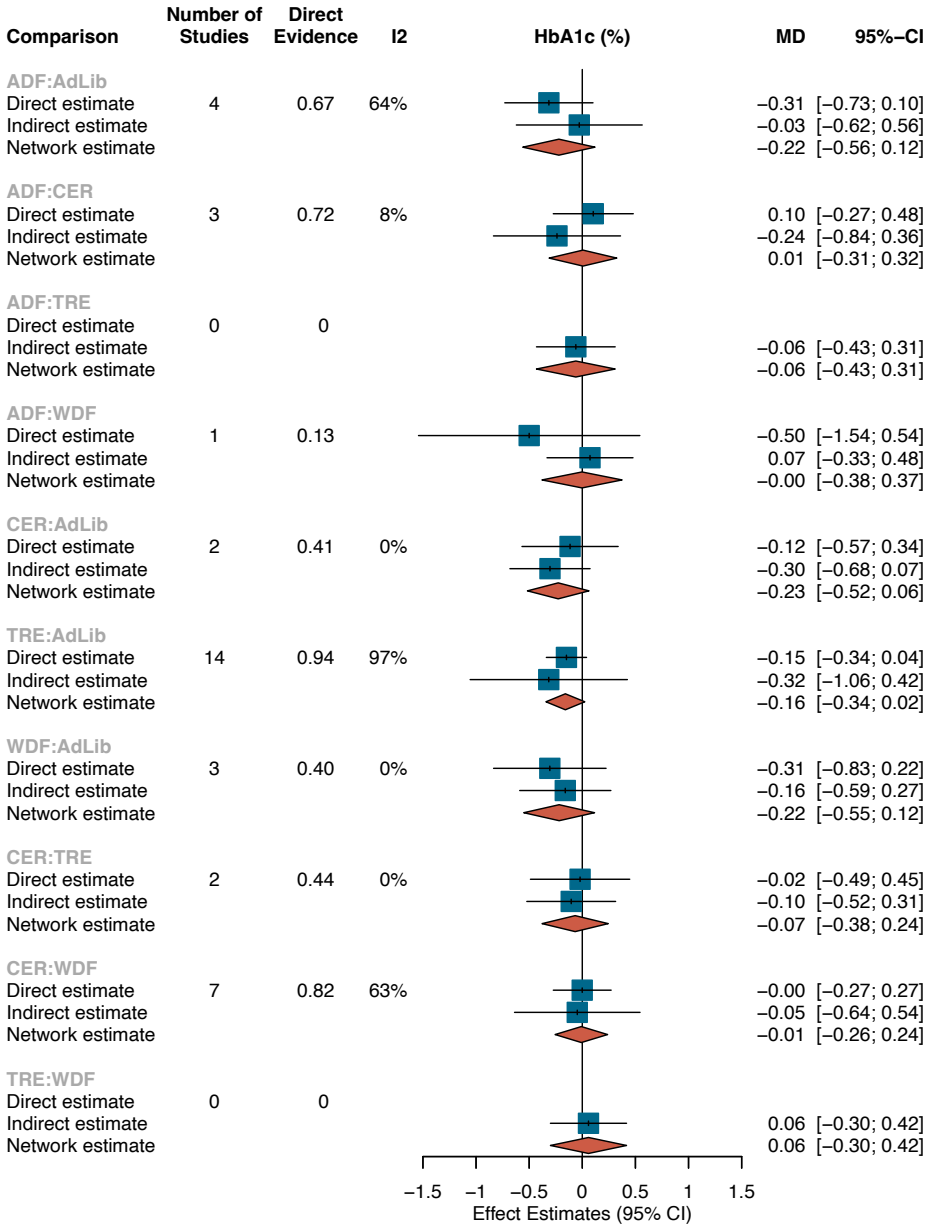
Supplementary Figure 7. Network analysis comparing intermittent fasting strategies, continuous energy restriction, and ad-libitum diets on diastolic blood pressure (mmHg). Each comparison evaluates the assessment of diet arm 1 compared to diet arm 2. The blue box represents the mean difference (MD) and the line represents the 95% confidence intervals (CI). This is presented for direct estimates and indirect estimates. The red diamond represents the overall network estimate for that comparison, which integrates both direct and indirect estimates. For example, ADF:AdLib comparison shows the MD of ADF compared to ad-libitum. A negative MD suggests diet 1 had greater reduction compared to diet 2; whereas a positive MD suggests diet 2 had a greater reduction compared to diet 1. 'Number of studies' refers to the total number of direct evidence published for the specific comparison. `Direct evidence` refers to the proportion of the evidence available from direct assessments through published literature. 'I^2' refers to the percentage of the total variability in a set of effect sizes due to true heterogeneity.



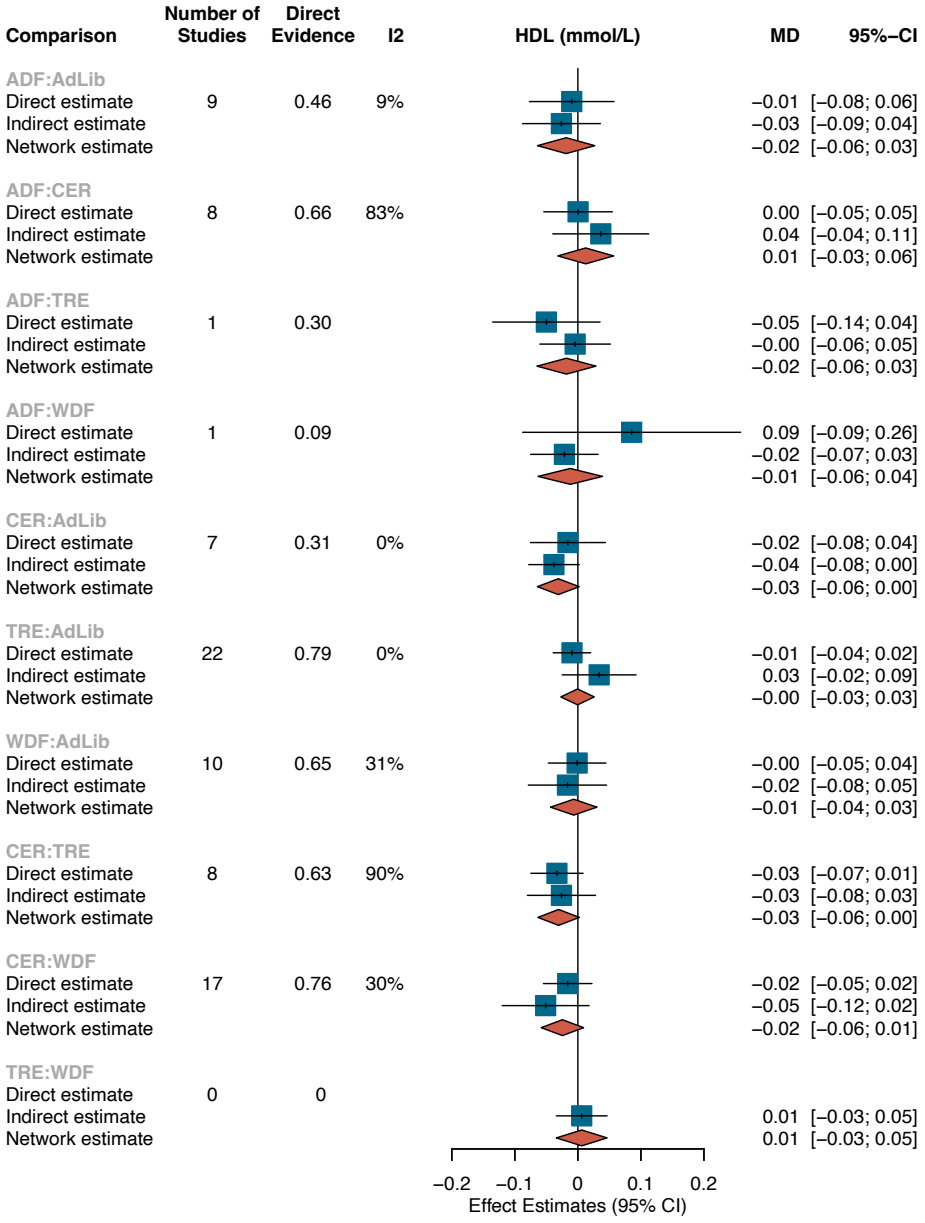
Supplementary Figure 8. Network analysis comparing intermittent fasting strategies, continuous energy restriction, and ad-libitum diets on fasting glucose (mmol/L). Each comparison evaluates the assessment of diet arm 1 compared to diet arm 2. The blue box represents the mean difference (MD) and the line represents the 95% confidence intervals (CI). This is presented for direct estimates and indirect estimates. The red diamond represents the overall network estimate for that comparison, which integrates both direct and indirect estimates. For example, ADF:AdLib comparison shows the MD of ADF compared to ad-libitum. A negative MD suggests diet 1 had greater reduction compared to diet 2; whereas a positive MD suggests diet 2 had a greater reduction compared to diet 1. 'Number of studies' refers to the total number of direct evidence published for the specific comparison. `Direct evidence` refers to the proportion of the evidence available from direct assessments through published literature. 'I^2' refers to the percentage of the total variability in a set of effect sizes due to true heterogeneity.



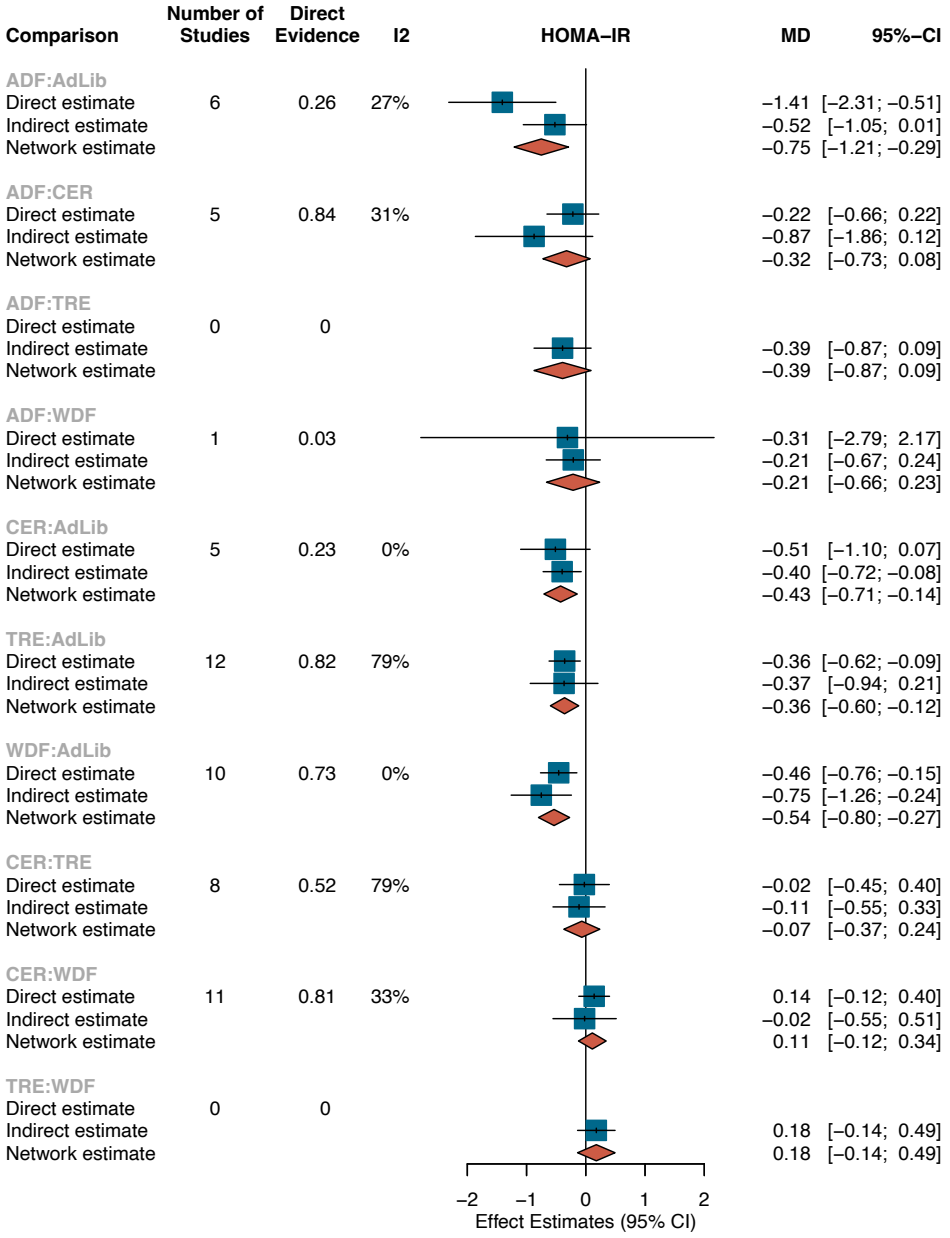
Supplementary Figure 9. Network analysis comparing intermittent fasting strategies, continuous energy restriction, and ad-libitum diets on fasting insulin (pmol/L). Each comparison evaluates the assessment of diet arm 1 compared to diet arm 2. The blue box represents the mean difference (MD) and the line represents the 95% confidence intervals (CI). This is presented for direct estimates and indirect estimates. The red diamond represents the overall network estimate for that comparison, which integrates both direct and indirect estimates. For example, ADF:AdLib comparison shows the MD of ADF compared to ad-libitum. A negative MD suggests diet 1 had greater reduction compared to diet 2; whereas a positive MD suggests diet 2 had a greater reduction compared to diet 1. 'Number of studies' refers to the total number of direct evidence published for the specific comparison. `Direct evidence` refers to the proportion of the evidence available from direct assessments through published literature. 'I2' refers to the percentage of the total variability in a set of effect sizes due to true heterogeneity.



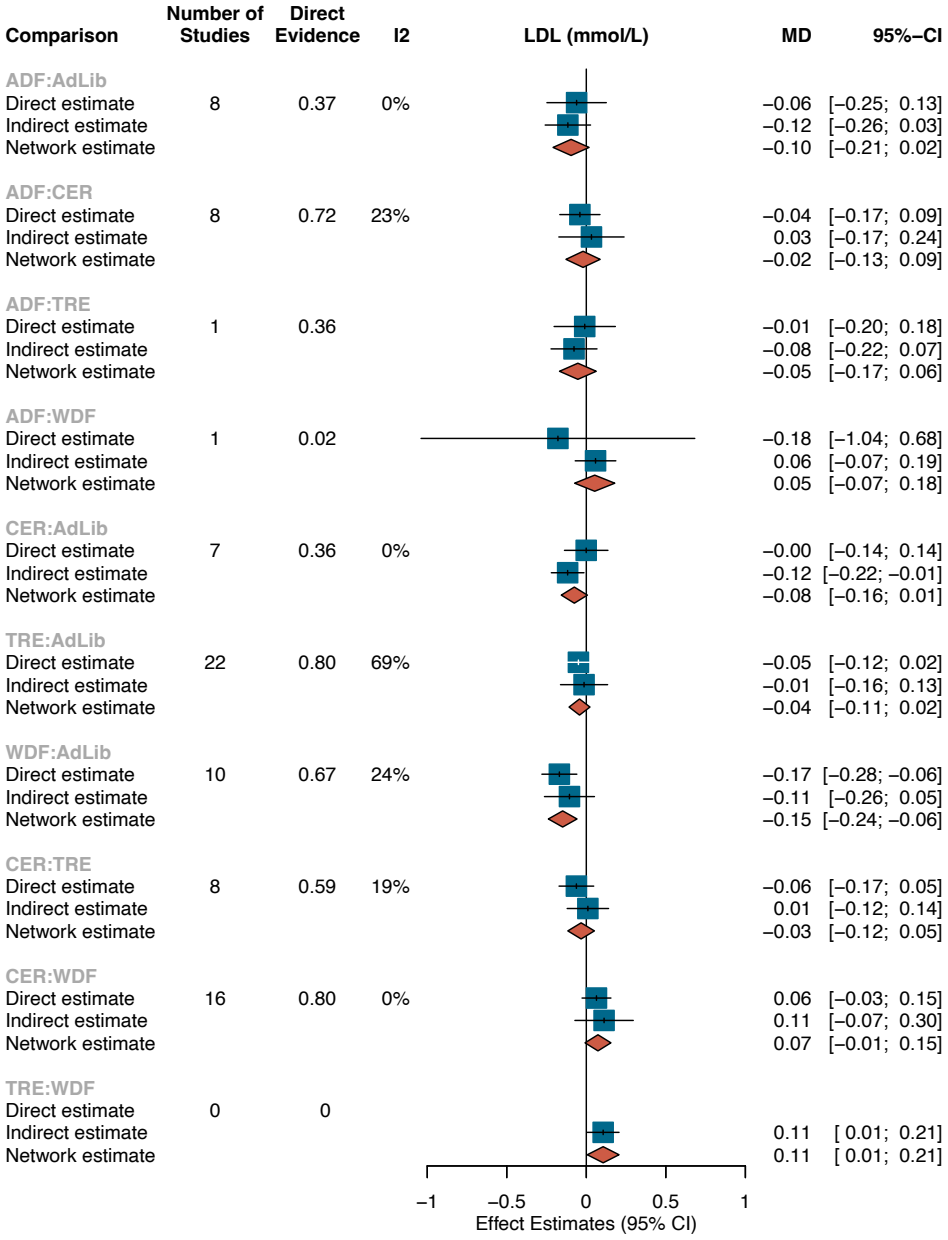
Supplementary Figure 10. Network analysis comparing intermittent fasting strategies, continuous energy restriction, and ad-libitum diets on HbA1c (%). Each comparison evaluates the assessment of diet arm 1 compared to diet arm 2. The blue box represents the mean difference (MD) and the line represents the 95% confidence intervals (CI). This is presented for direct estimates and indirect estimates. The red diamond represents the overall network estimate for that comparison, which integrates both direct and indirect estimates. For example, ADF:AdLib comparison shows the MD of ADF compared to ad-libitum. A negative MD suggests diet 1 had greater reduction compared to diet 2; whereas a positive MD suggests diet 2 had a greater reduction compared to diet 1. 'Number of studies' refers to the total number of direct evidence published for the specific comparison. `Direct evidence` refers to the proportion of the evidence available from direct assessments through published literature. 'I^2' refers to the percentage of the total variability in a set of effect sizes due to true heterogeneity.



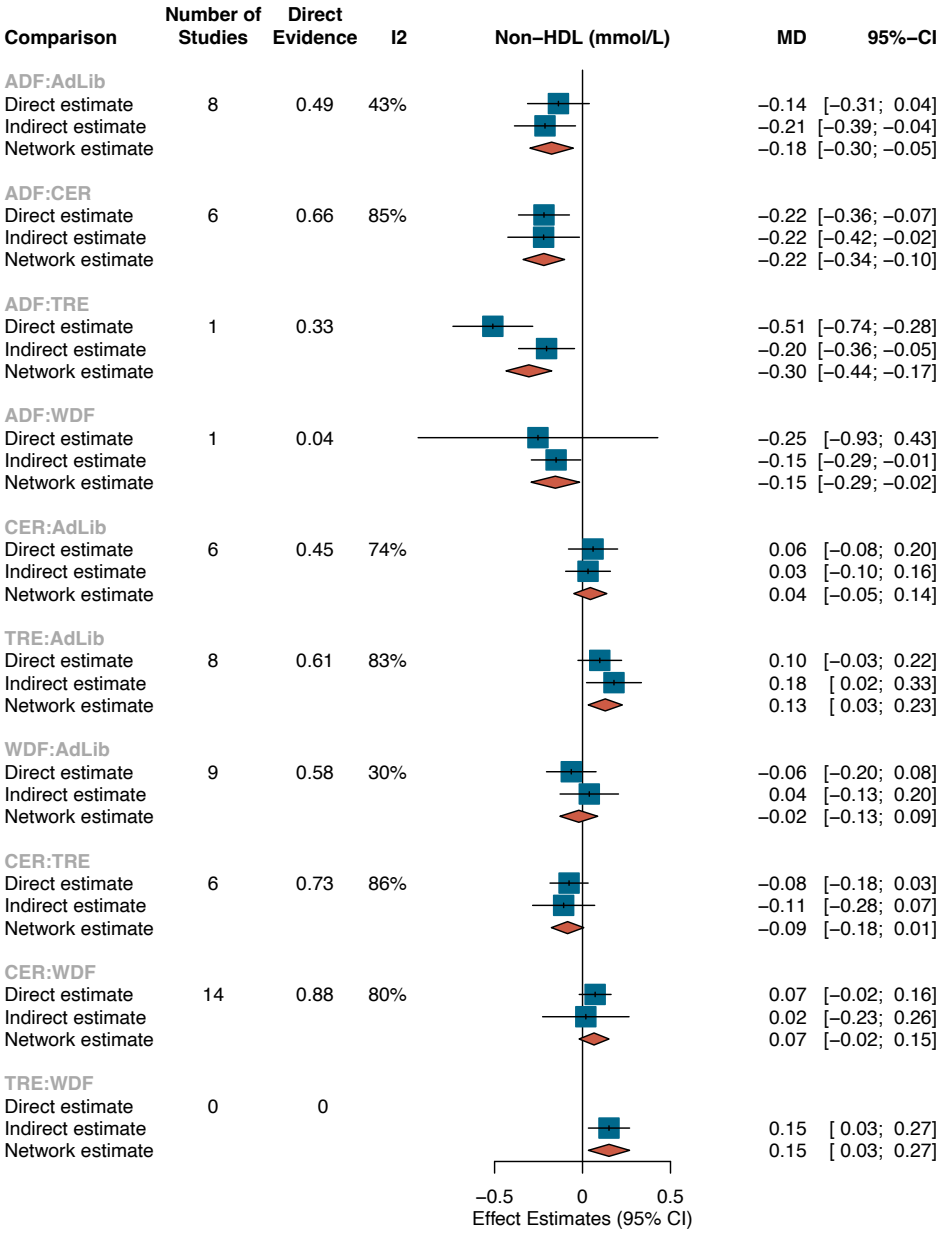
Supplementary Figure 11. Network analysis comparing intermittent fasting strategies, continuous energy restriction, and ad-libitum diets on HDL (mmol/L). Each comparison evaluates the assessment of diet arm 1 compared to diet arm 2. The blue box represents the mean difference (MD) and the line represents the 95% confidence intervals (CI). This is presented for direct estimates and indirect estimates. The red diamond represents the overall network estimate for that comparison, which integrates both direct and indirect estimates. For example, ADF:AdLib comparison shows the MD of ADF compared to ad-libitum. A negative MD suggests diet 1 had greater reduction compared to diet 2; whereas a positive MD suggests diet 2 had a greater reduction compared to diet 1. 'Number of studies' refers to the total number of direct evidence published for the specific comparison. `Direct evidence` refers to the proportion of the evidence available from direct assessments through published literature. 'I^2' refers to the percentage of the total variability in a set of effect sizes due to true heterogeneity.



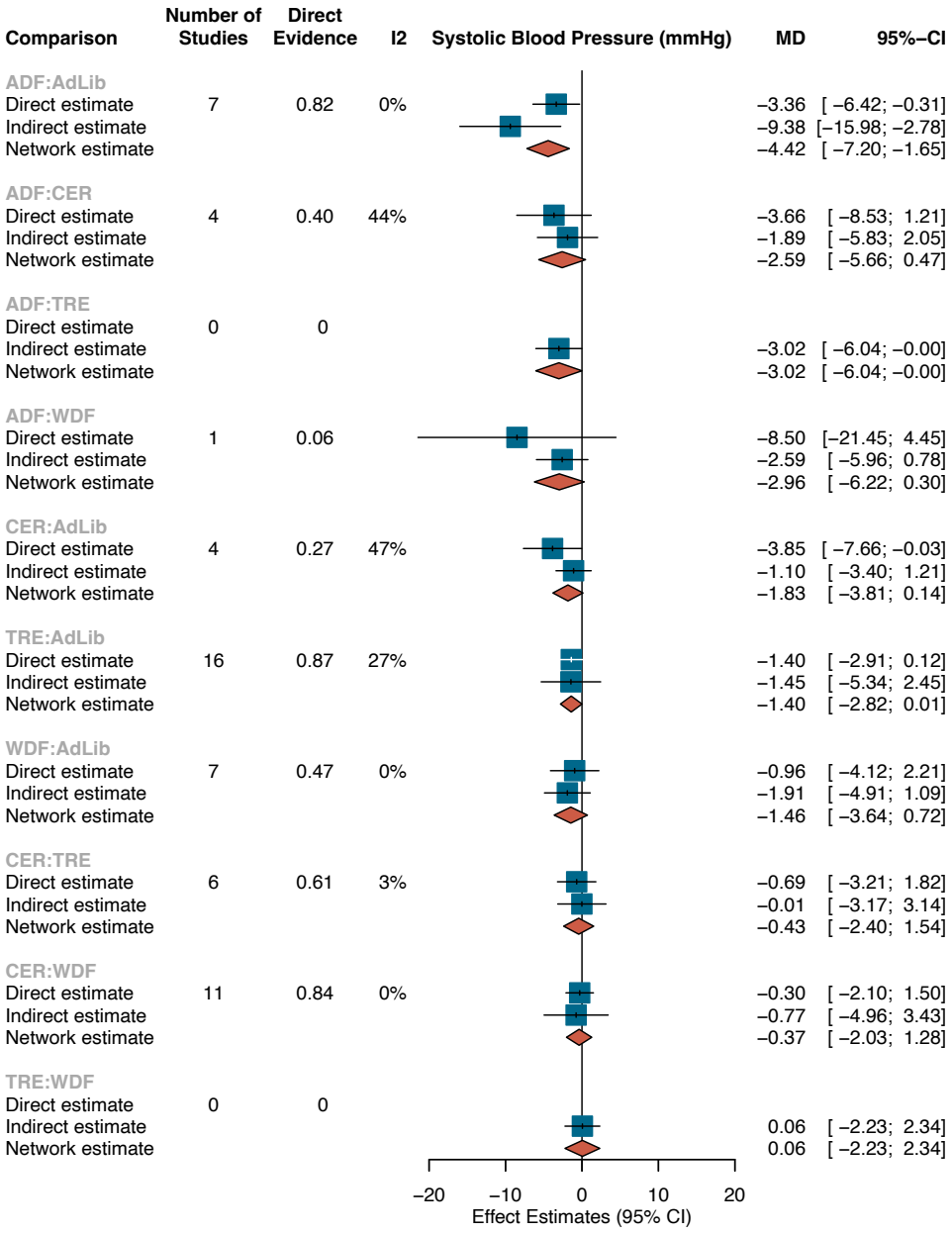
Supplementary Figure 12. Network analysis comparing intermittent fasting strategies, continuous energy restriction, and ad-libitum diets on HOMA-IR. Each comparison evaluates the assessment of diet arm 1 compared to diet arm 2. The blue box represents the mean difference (MD) and the line represents the 95% confidence intervals (CI). This is presented for direct estimates and indirect estimates. The red diamond represents the overall network estimate for that comparison, which integrates both direct and indirect estimates. For example, ADF:AdLib comparison shows the MD of ADF compared to ad-libitum. A negative MD suggests diet 1 had greater reduction compared to diet 2; whereas a positive MD suggests diet 2 had a greater reduction compared to diet 1. 'Number of studies' refers to the total number of direct evidence published for the specific comparison. `Direct evidence` refers to the proportion of the evidence available from direct assessments through published literature. 'I^2' refers to the percentage of the total variability in a set of effect sizes due to true heterogeneity.



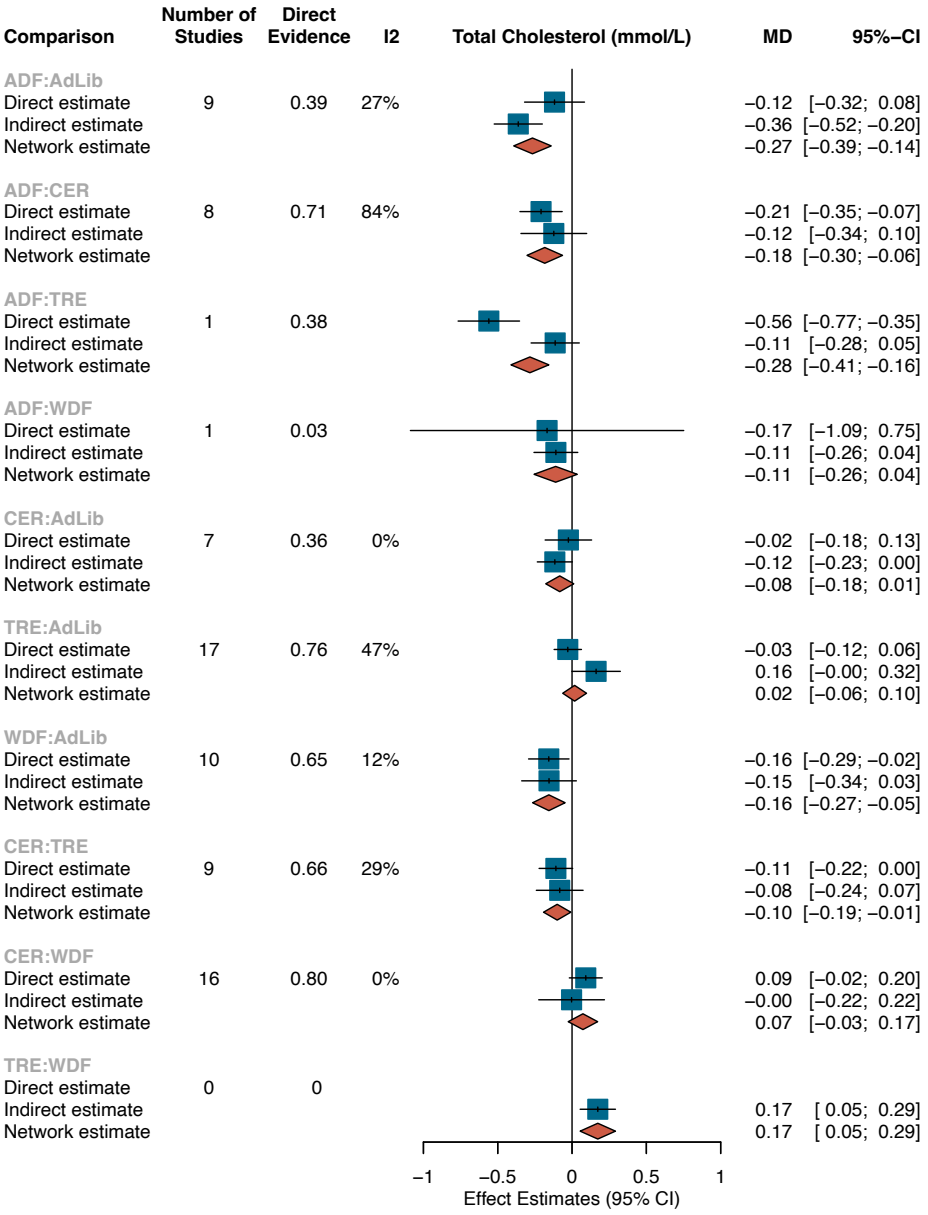
Supplementary Figure 13. Network analysis comparing intermittent fasting strategies, continuous energy restriction, and ad-libitum diets on LDL (mmol/L). Each comparison evaluates the assessment of diet arm 1 compared to diet arm 2. The blue box represents the mean difference (MD) and the line represents the 95% confidence intervals (CI). This is presented for direct estimates and indirect estimates. The red diamond represents the overall network estimate for that comparison, which integrates both direct and indirect estimates. For example, ADF:AdLib comparison shows the MD of ADF compared to ad-libitum. A negative MD suggests diet 1 had greater reduction compared to diet 2; whereas a positive MD suggests diet 2 had a greater reduction compared to diet 1. 'Number of studies' refers to the total number of direct evidence published for the specific comparison. `Direct evidence` refers to the proportion of the evidence available from direct assessments through published literature. 'I^2' refers to the percentage of the total variability in a set of effect sizes due to true heterogeneity.



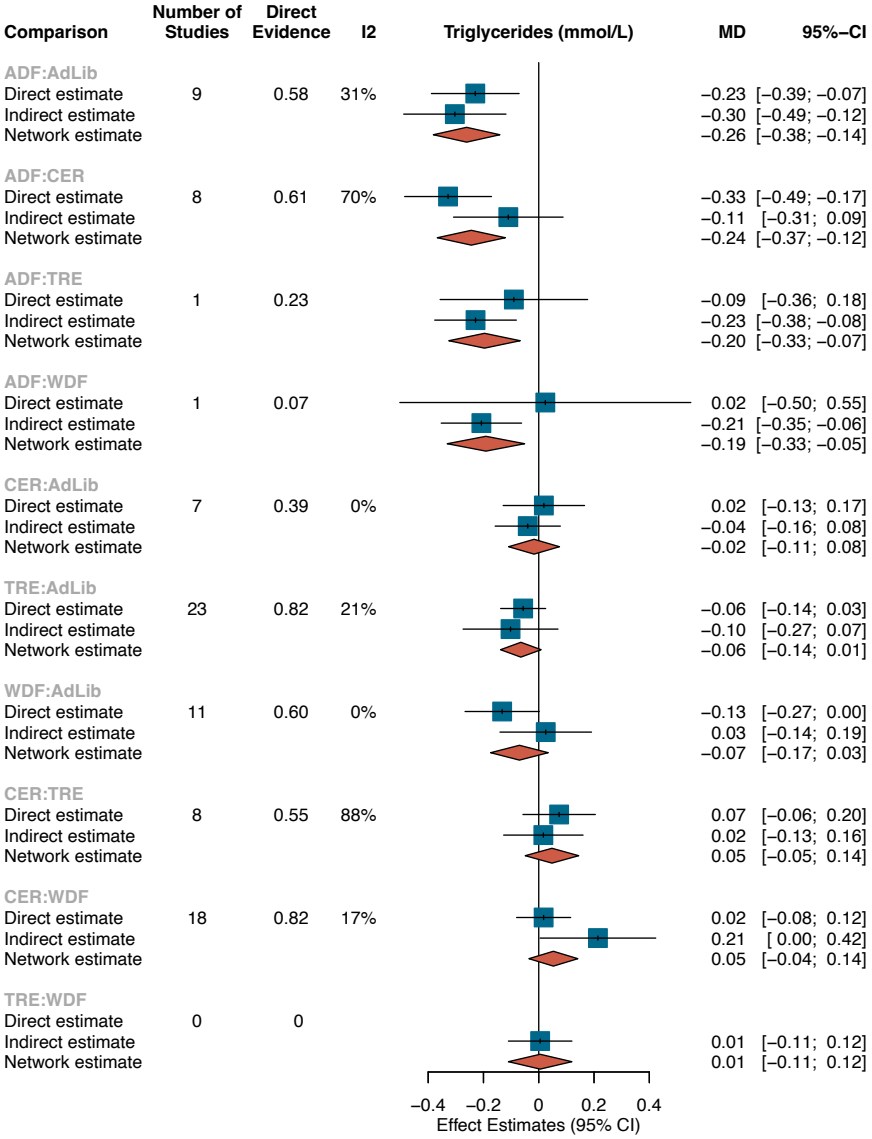
Supplementary Figure 14. Network analysis comparing intermittent fasting strategies, continuous energy restriction, and ad-libitum diets on non-HDL (mmol/L). Each comparison evaluates the assessment of diet arm 1 compared to diet arm 2. The blue box represents the mean difference (MD) and the line represents the 95% confidence intervals (CI). This is presented for direct estimates and indirect estimates. The red diamond represents the overall network estimate for that comparison, which integrates both direct and indirect estimates. For example, ADF:AdLib comparison shows the MD of ADF compared to ad-libitum. A negative MD suggests diet 1 had greater reduction compared to diet 2; whereas a positive MD suggests diet 2 had a greater reduction compared to diet 1. 'Number of studies' refers to the total number of direct evidence published for the specific comparison. `Direct evidence` refers to the proportion of the evidence available from direct assessments through published literature. 'I2' refers to the percentage of the total variability in a set of effect sizes due to true heterogeneity.



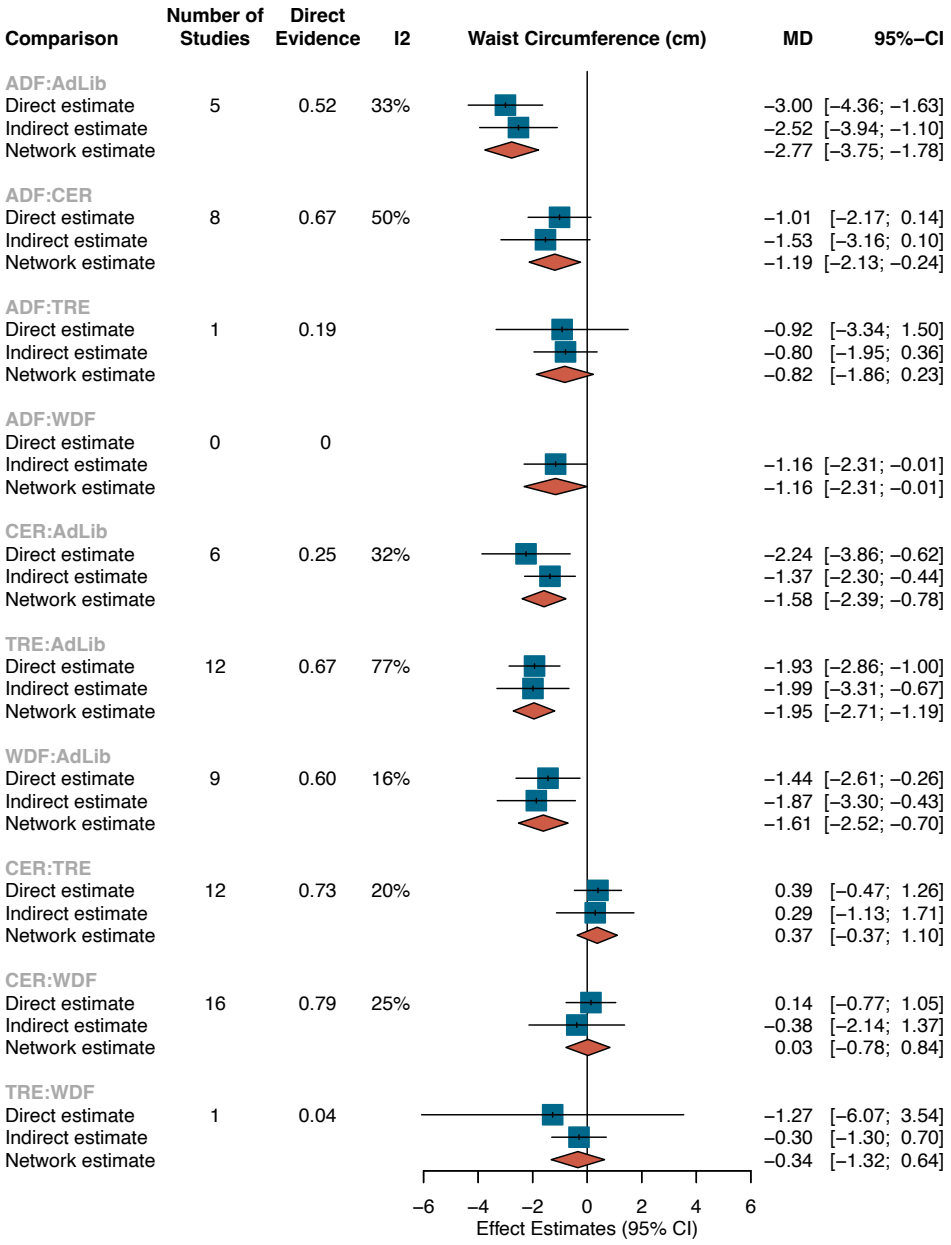
Supplementary Figure 15. Network analysis comparing intermittent fasting strategies, continuous energy restriction, and ad-libitum diets on systolic blood pressure (mmHg). Each comparison evaluates the assessment of diet arm 1 compared to diet arm 2. The blue box represents the mean difference (MD) and the line represents the 95% confidence intervals (CI). This is presented for direct estimates and indirect estimates. The red diamond represents the overall network estimate for that comparison, which integrates both direct and indirect estimates. For example, ADF:AdLib comparison shows the MD of ADF compared to ad-libitum. A negative MD suggests diet 1 had greater reduction compared to diet 2; whereas a positive MD suggests diet 2 had a greater reduction compared to diet 1. 'Number of studies' refers to the total number of direct evidence published for the specific comparison. `Direct evidence` refers to the proportion of the evidence available from direct assessments through published literature. 'I^2' refers to the percentage of the total variability in a set of effect sizes due to true heterogeneity.



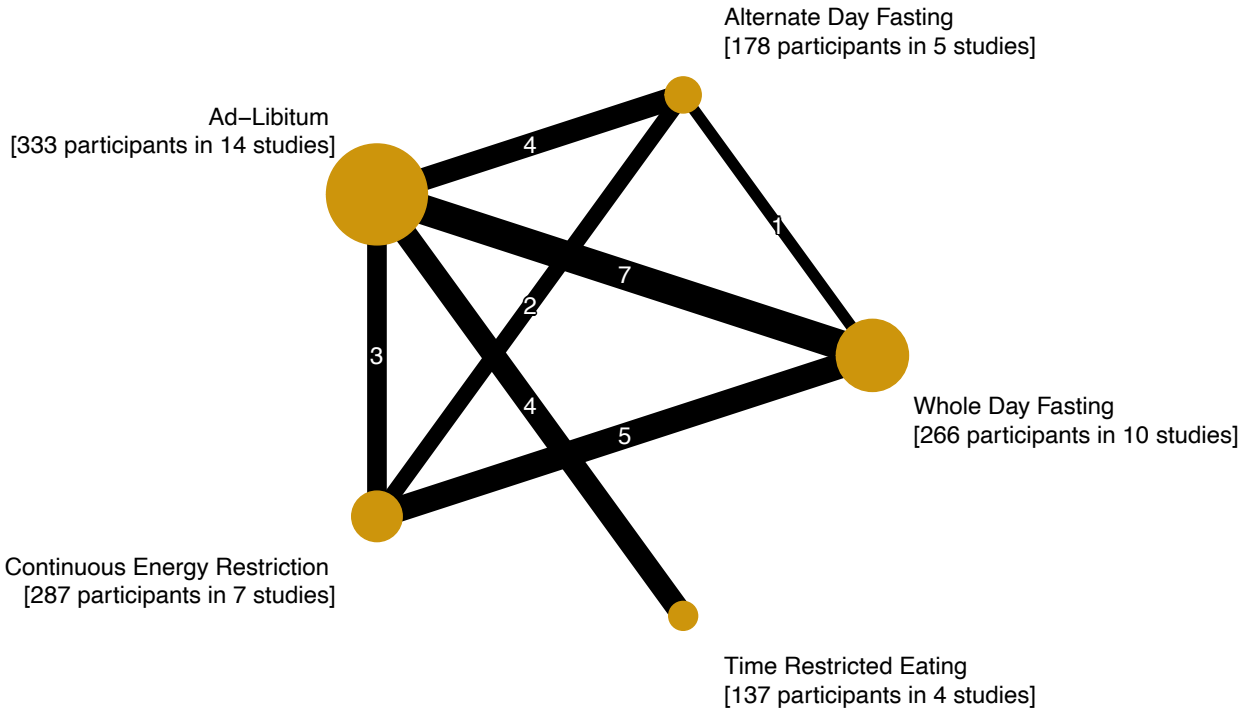
Supplementary Figure 16. Network analysis comparing intermittent fasting strategies, continuous energy restriction, and ad-libitum diets on total cholesterol (mmol/L). Each comparison evaluates the assessment of diet arm 1 compared to diet arm 2. The blue box represents the mean difference (MD) and the line represents the 95% confidence intervals (CI). This is presented for direct estimates and indirect estimates. The red diamond represents the overall network estimate for that comparison, which integrates both direct and indirect estimates. For example, ADF:AdLib comparison shows the MD of ADF compared to ad-libitum. A negative MD suggests diet 1 had greater reduction compared to diet 2; whereas a positive MD suggests diet 2 had a greater reduction compared to diet 1. 'Number of studies' refers to the total number of direct evidence published for the specific comparison. `Direct evidence` refers to the proportion of the evidence available from direct assessments through published literature. 'I^2' refers to the percentage of the total variability in a set of effect sizes due to true heterogeneity.



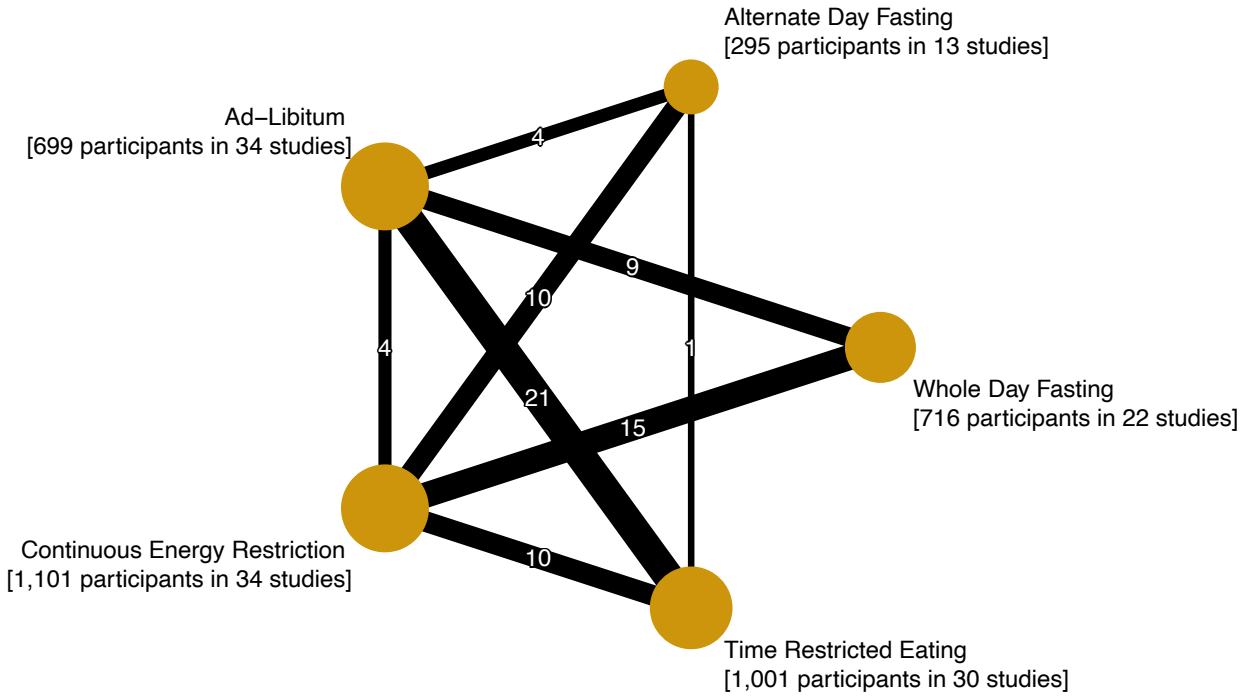
Supplementary Figure 17. Network analysis comparing intermittent fasting strategies, continuous energy restriction, and ad-libitum diets on triglycerides (mmol/L). Each comparison evaluates the assessment of diet arm 1 compared to diet arm 2. The blue box represents the mean difference (MD) and the line represents the 95% confidence intervals (CI). This is presented for direct estimates and indirect estimates. The red diamond represents the overall network estimate for that comparison, which integrates both direct and indirect estimates. For example, ADF:AdLib comparison shows the MD of ADF compared to ad-libitum. A negative MD suggests diet 1 had greater reduction compared to diet 2; whereas a positive MD suggests diet 2 had a greater reduction compared to diet 1. 'Number of studies' refers to the total number of direct evidence published for the specific comparison. `Direct evidence` refers to the proportion of the evidence available from direct assessments through published literature. 'I2' refers to the percentage of the total variability in a set of effect sizes due to true heterogeneity.



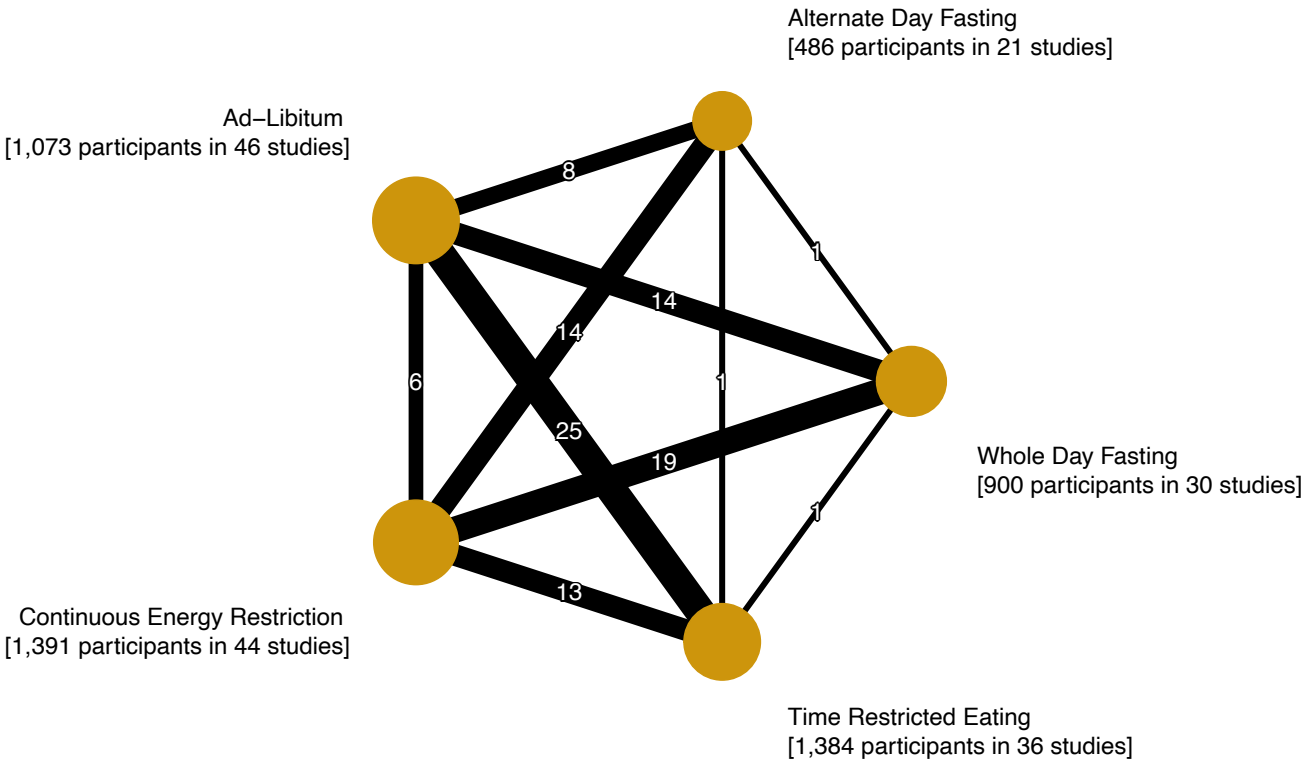
Supplementary Figure 18. Network analysis comparing intermittent fasting strategies, continuous energy restriction, and ad-libitum diets on waist circumference (cm). Each comparison evaluates the assessment of diet arm 1 compared to diet arm 2. The blue box represents the mean difference (MD) and the line represents the 95% confidence intervals (CI). This is presented for direct estimates and indirect estimates. The red diamond represents the overall network estimate for that comparison, which integrates both direct and indirect estimates. For example, ADF:AdLib comparison shows the MD of ADF compared to ad-libitum. A negative MD suggests diet 1 had greater reduction compared to diet 2; whereas a positive MD suggests diet 2 had a greater reduction compared to diet 1. 'Number of studies' refers to the total number of direct evidence published for the specific comparison. `Direct evidence` refers to the proportion of the evidence available from direct assessments through published literature. 'I^2' refers to the percentage of the total variability in a set of effect sizes due to true heterogeneity.



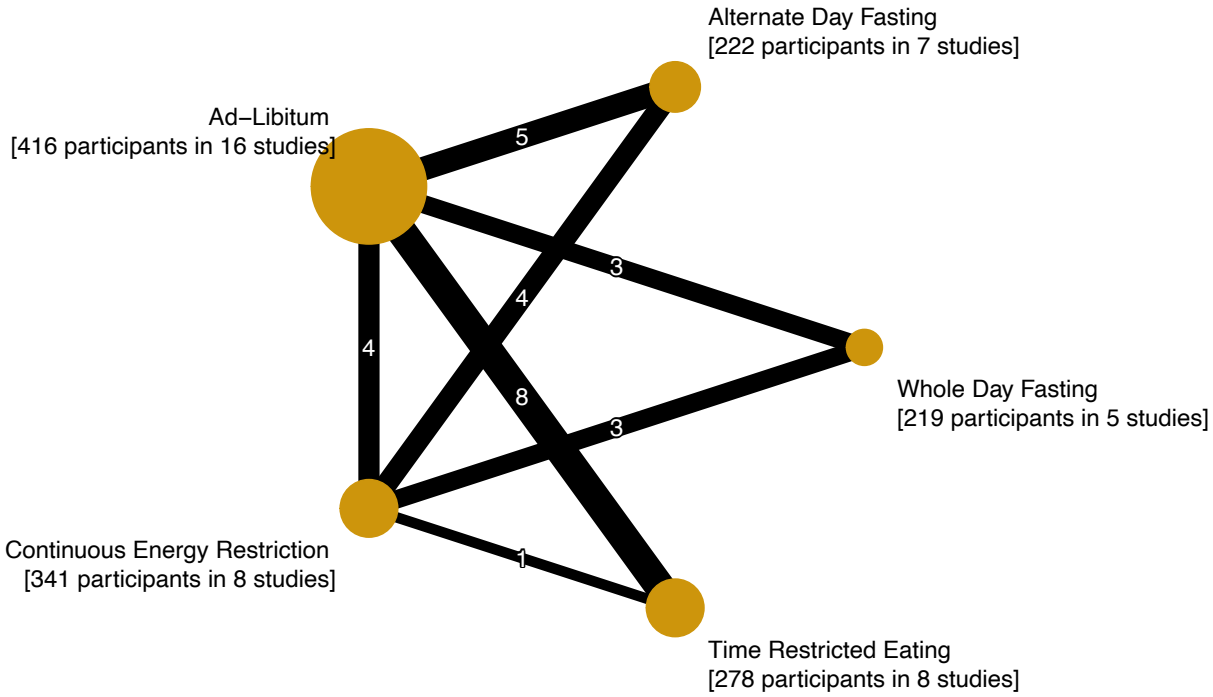
Supplementary Figure 19. Network diagram for randomized clinical trials investigating the association of intermittent fasting strategies and ad libitum diets with ALT. Yellow nodes represent the study size for each diet strategy. The thickness of the turquoise lines represents the number of studies directly comparing one diet strategy to another.



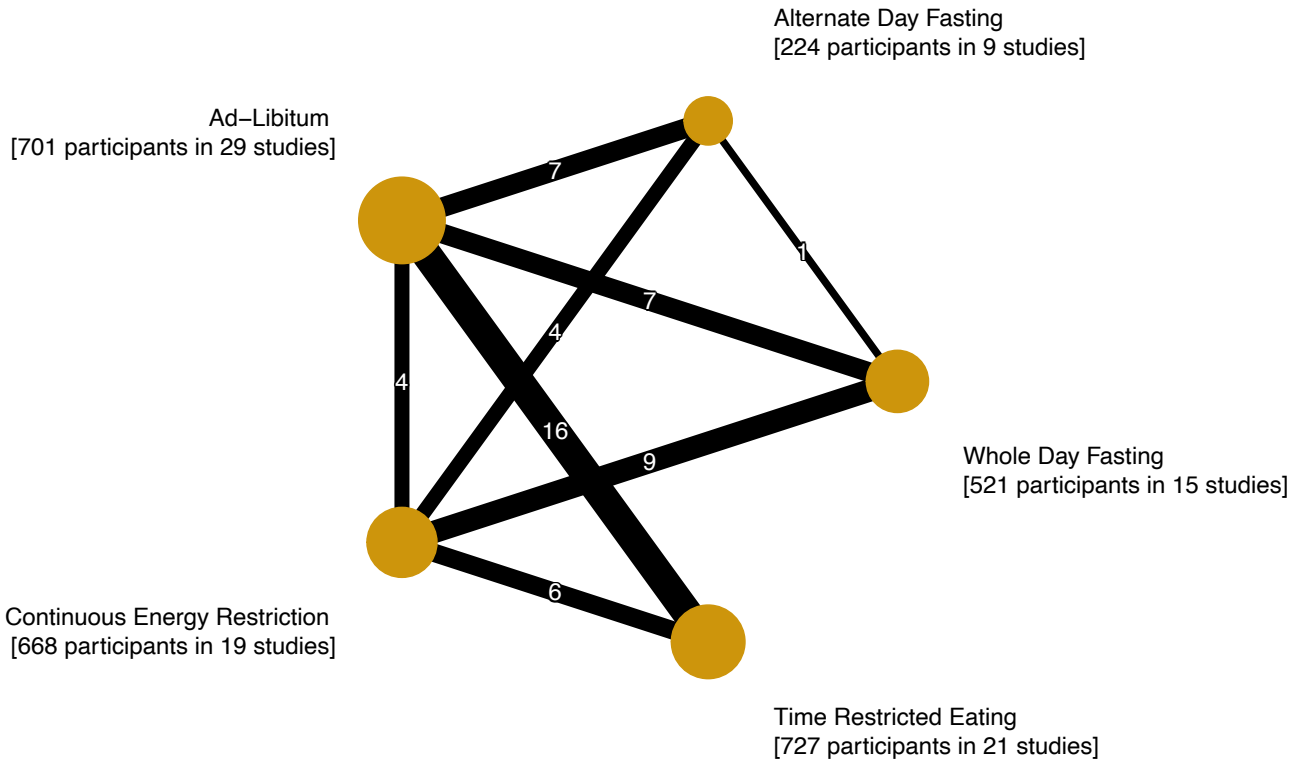
Supplementary Figure 20. Network diagram for randomized clinical trials investigating the association of intermittent fasting strategies and ad libitum diets with body fat. Yellow nodes represent the study size for each diet strategy. The thickness of the turquoise lines represents the number of studies directly comparing one diet strategy to another.



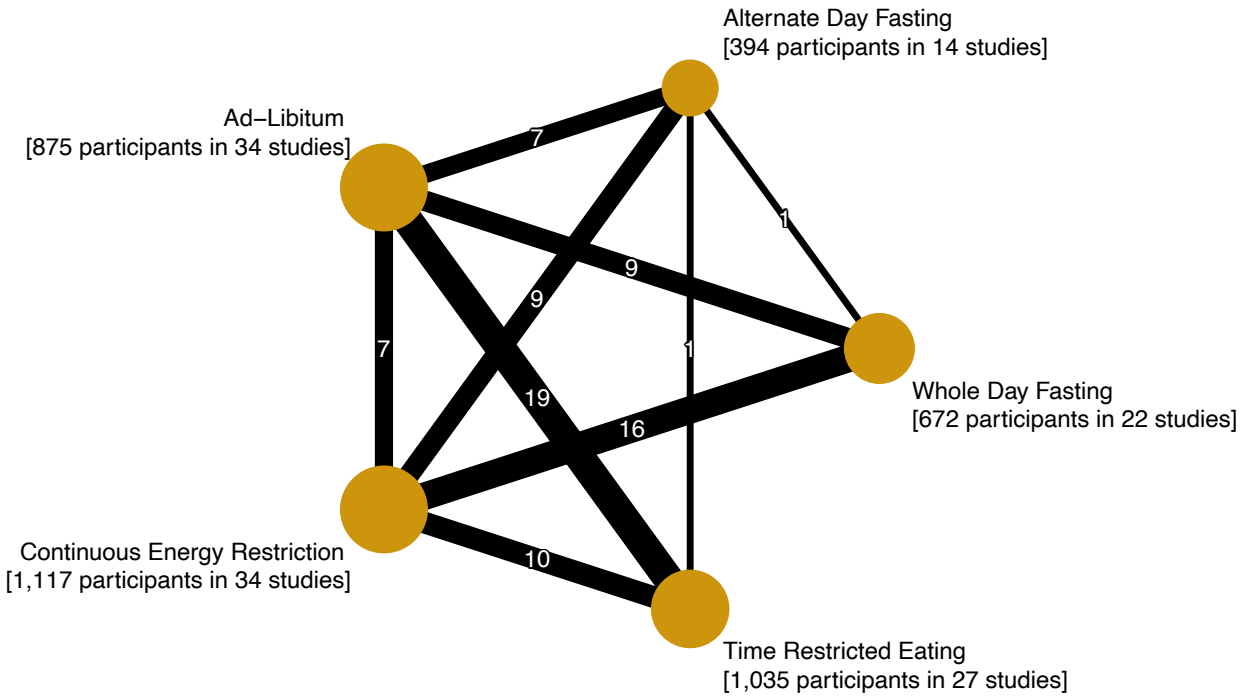
Supplementary Figure 21. Network diagram for randomized clinical trials investigating the association of intermittent fasting strategies and ad libitum diets with BMI. Yellow nodes represent the study size for each diet strategy. The thickness of the turquoise lines represents the number of studies directly comparing one diet strategy to another.



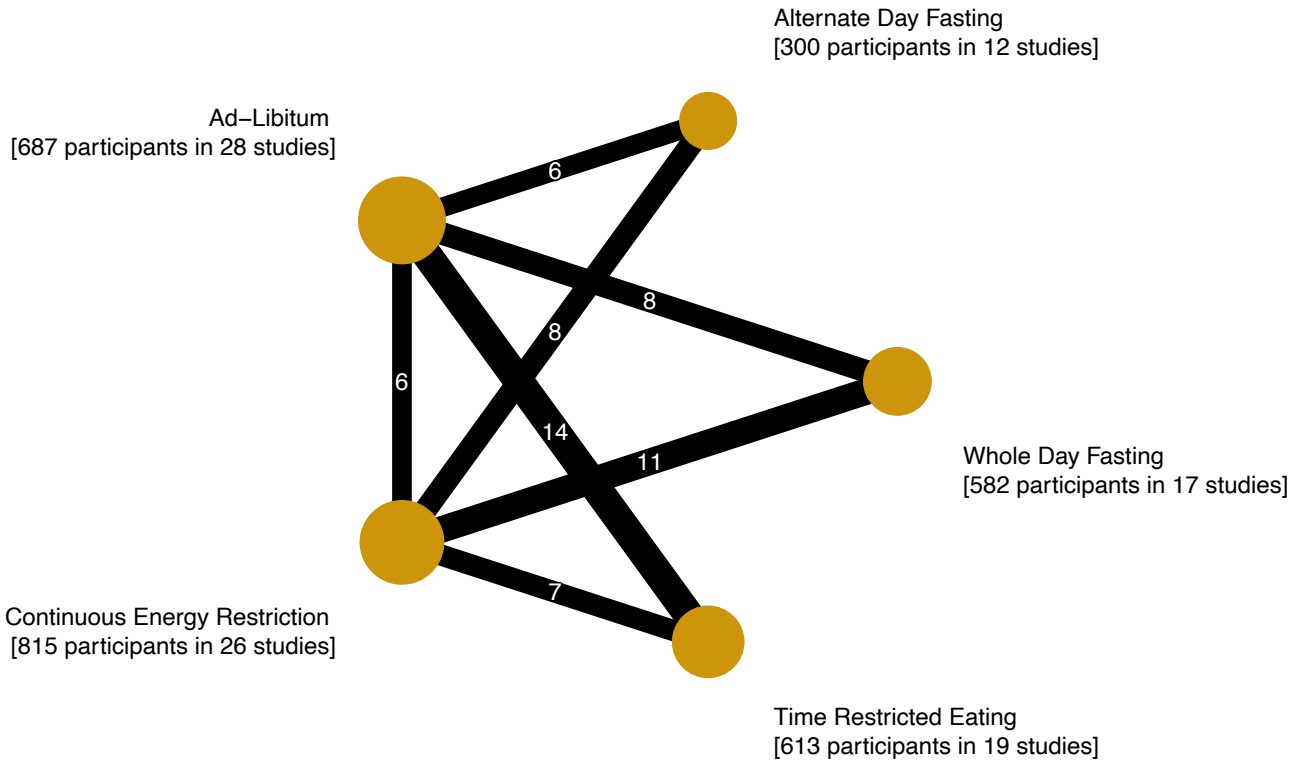
Supplementary Figure 22. Network diagram for randomized clinical trials investigating the association of intermittent fasting strategies and ad libitum diets with CRP. Yellow nodes represent the study size for each diet strategy. The thickness of the turquoise lines represents the number of studies directly comparing one diet strategy to another.



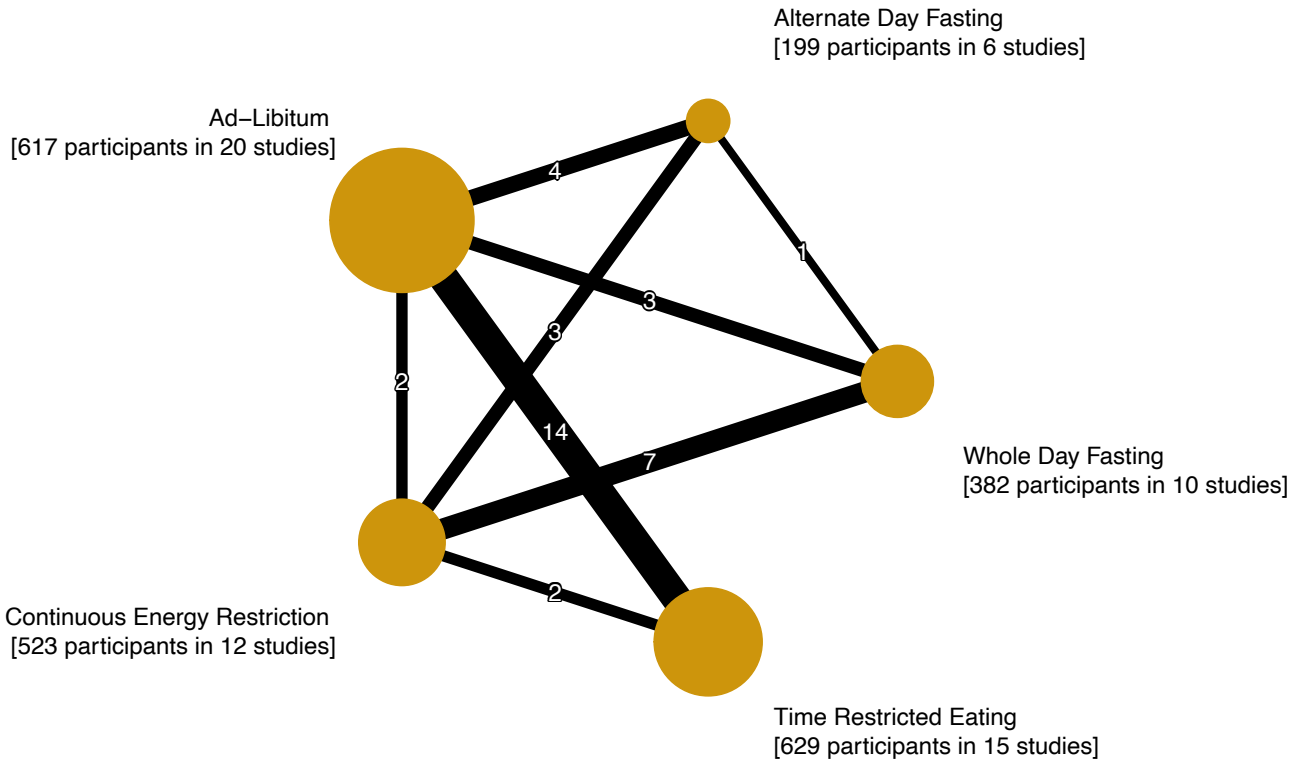
Supplementary Figure 23. Network diagram for randomized clinical trials investigating the association of intermittent fasting strategies and ad libitum diets with DBP. Yellow nodes represent the study size for each diet strategy. The thickness of the turquoise lines represents the number of studies directly comparing one diet strategy to another.



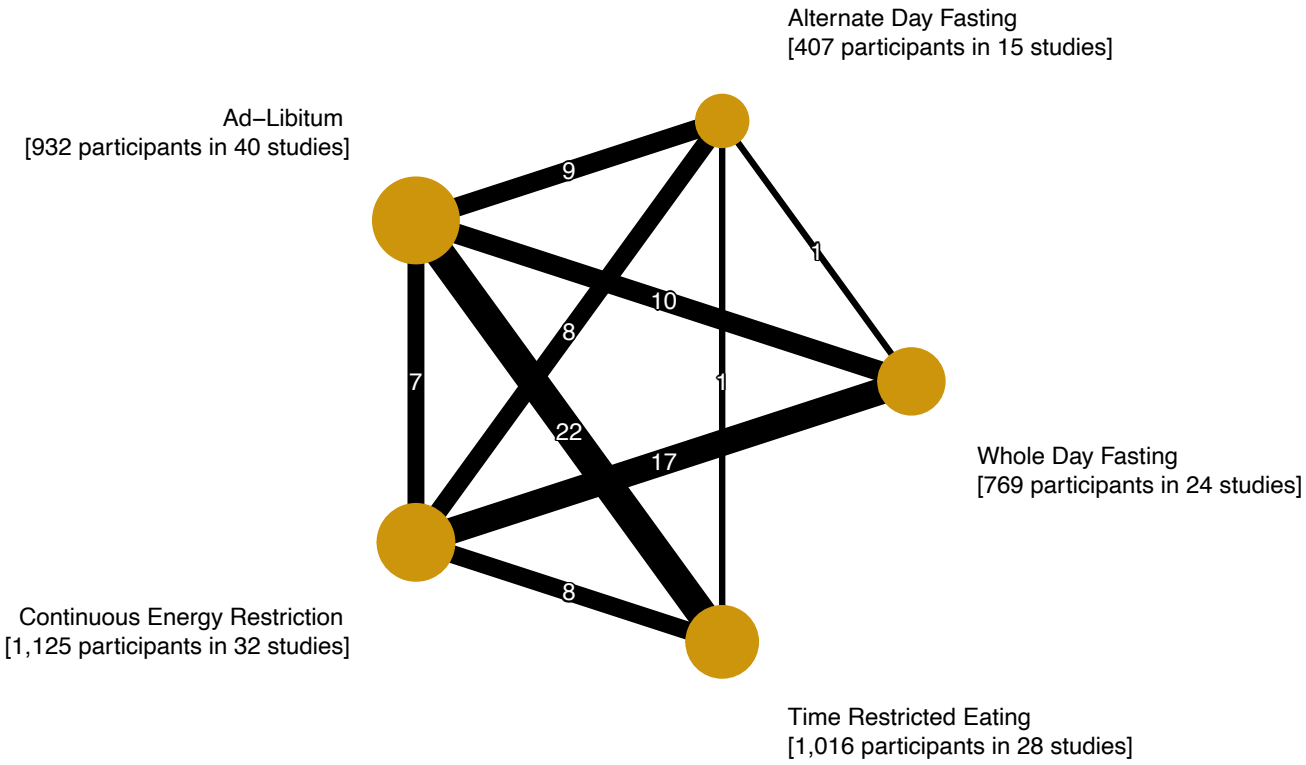
Supplementary Figure 24. Network diagram for randomized clinical trials investigating the association of intermittent fasting strategies and ad libitum diets with fasting glucose. Yellow nodes represent the study size for each diet strategy. The thickness of the turquoise lines represents the number of studies directly comparing one diet strategy to another.



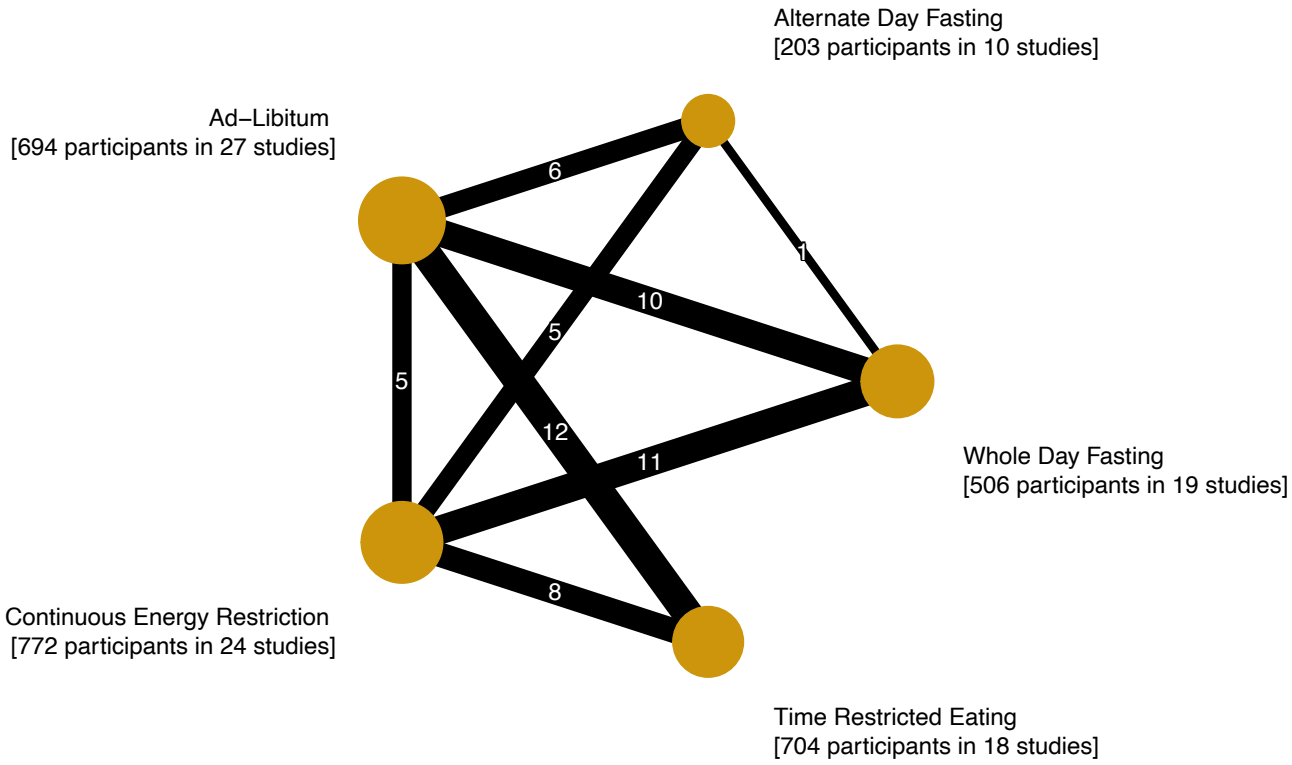
Supplementary Figure 25. Network diagram for randomized clinical trials investigating the association of intermittent fasting strategies and ad libitum diets with fasting insulin. Yellow nodes represent the study size for each diet strategy. The thickness of the turquoise lines represents the number of studies directly comparing one diet strategy to another.



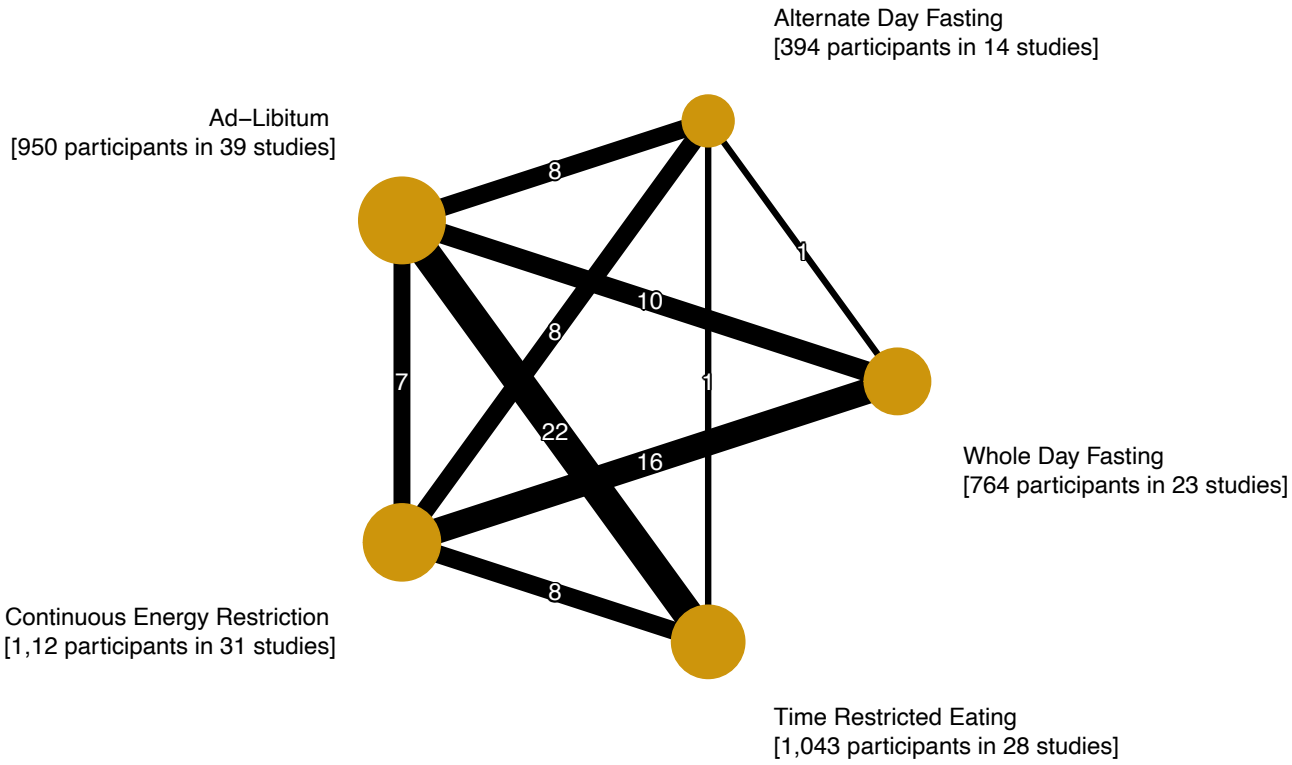
Supplementary Figure 26. Network diagram for randomized clinical trials investigating the association of intermittent fasting strategies and ad libitum diets with HbA1c. Yellow nodes represent the study size for each diet strategy. The thickness of the turquoise lines represents the number of studies directly comparing one diet strategy to another.



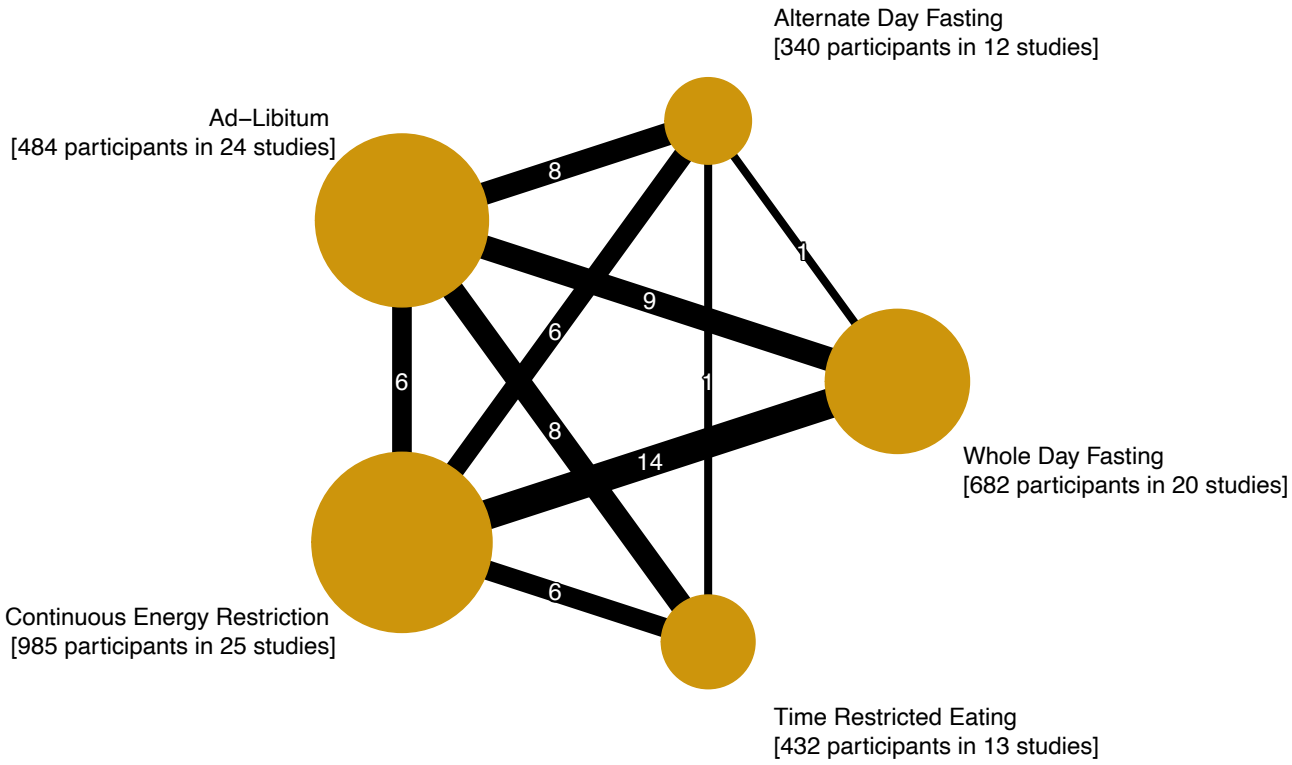
Supplementary Figure 27. Network diagram for randomized clinical trials investigating the association of intermittent fasting strategies and ad libitum diets with HDL. Yellow nodes represent the study size for each diet strategy. The thickness of the turquoise lines represents the number of studies directly comparing one diet strategy to another.



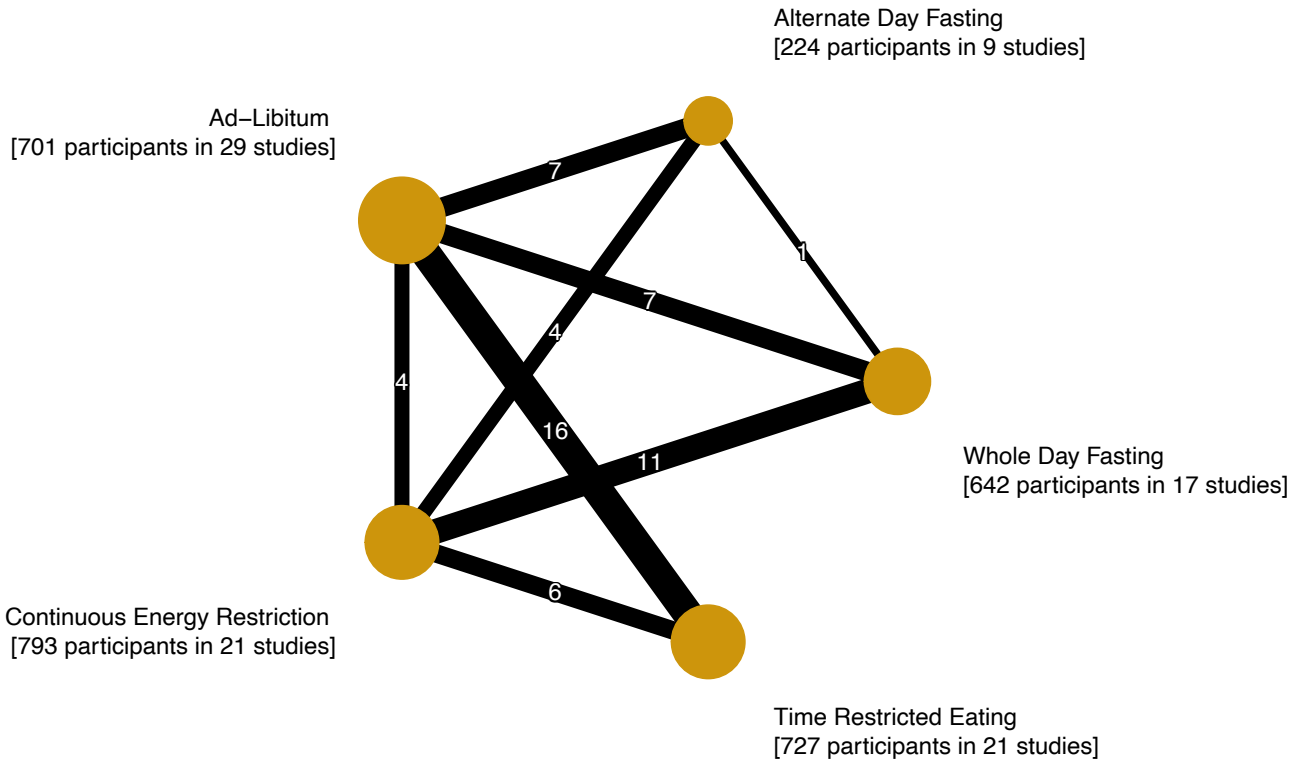
Supplementary Figure 28. Network diagram for randomized clinical trials investigating the association of intermittent fasting strategies and ad libitum diets with HOMA-IR. Yellow nodes represent the study size for each diet strategy. The thickness of the turquoise lines represents the number of studies directly comparing one diet strategy to another.



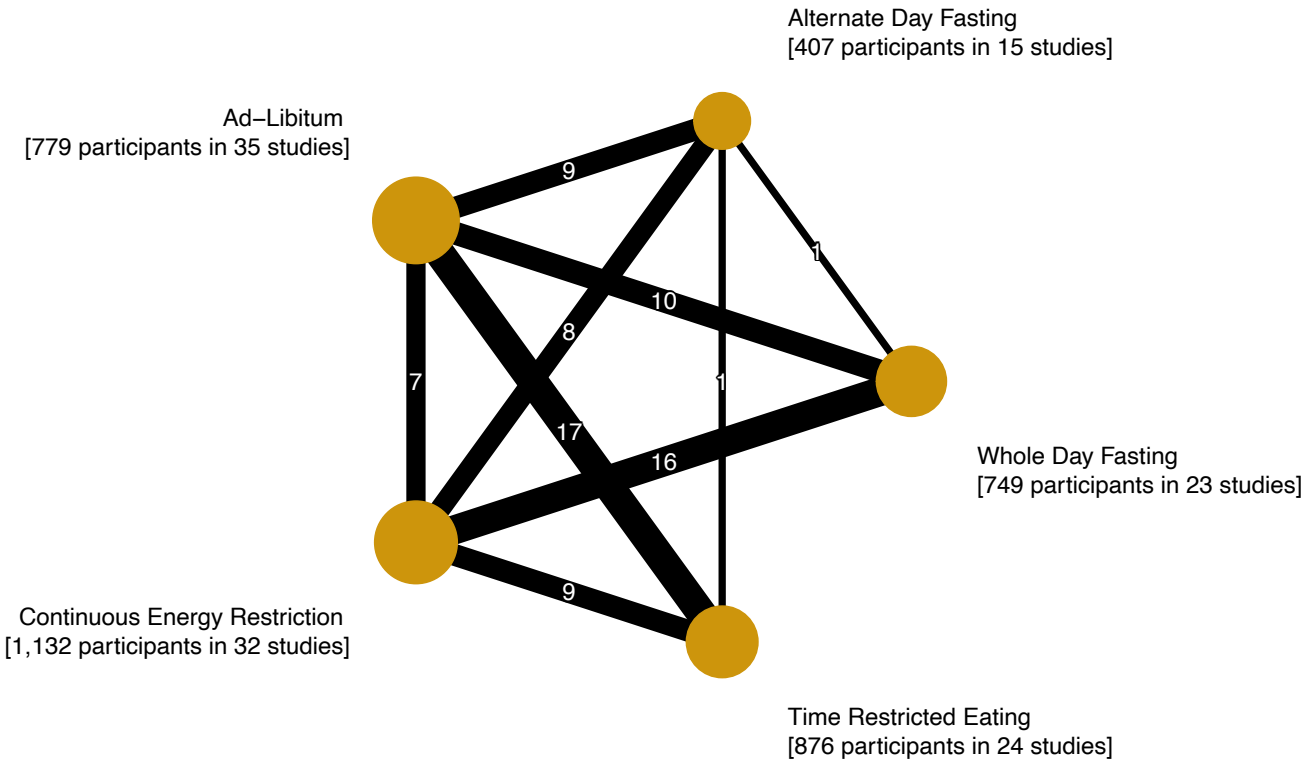
Supplementary Figure 29. Network diagram for randomized clinical trials investigating the association of intermittent fasting strategies and ad libitum diets with LDL. Yellow nodes represent the study size for each diet strategy. The thickness of the turquoise lines represents the number of studies directly comparing one diet strategy to another.



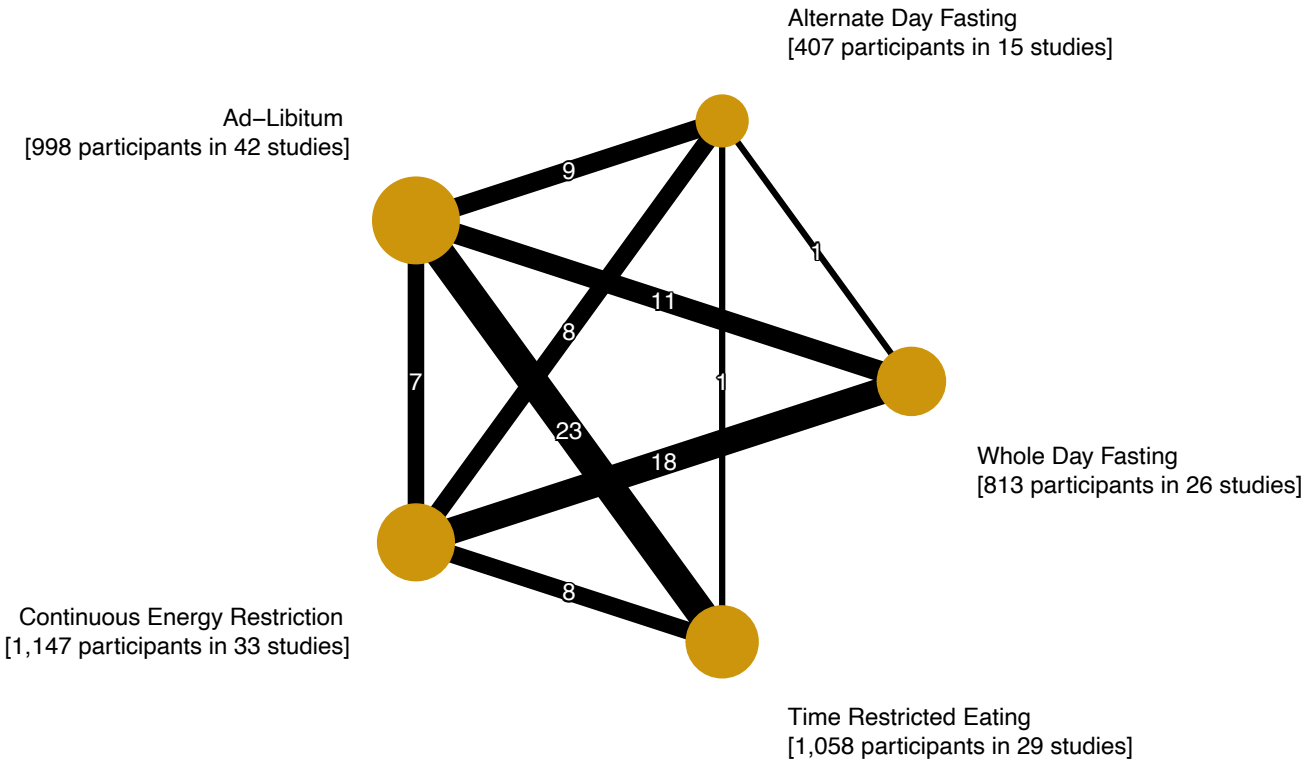
Supplementary Figure 30. Network diagram for randomized clinical trials investigating the association of intermittent fasting strategies and ad libitum diets with non-HDL. Yellow nodes represent the study size for each diet strategy. The thickness of the turquoise lines represents the number of studies directly comparing one diet strategy to another.



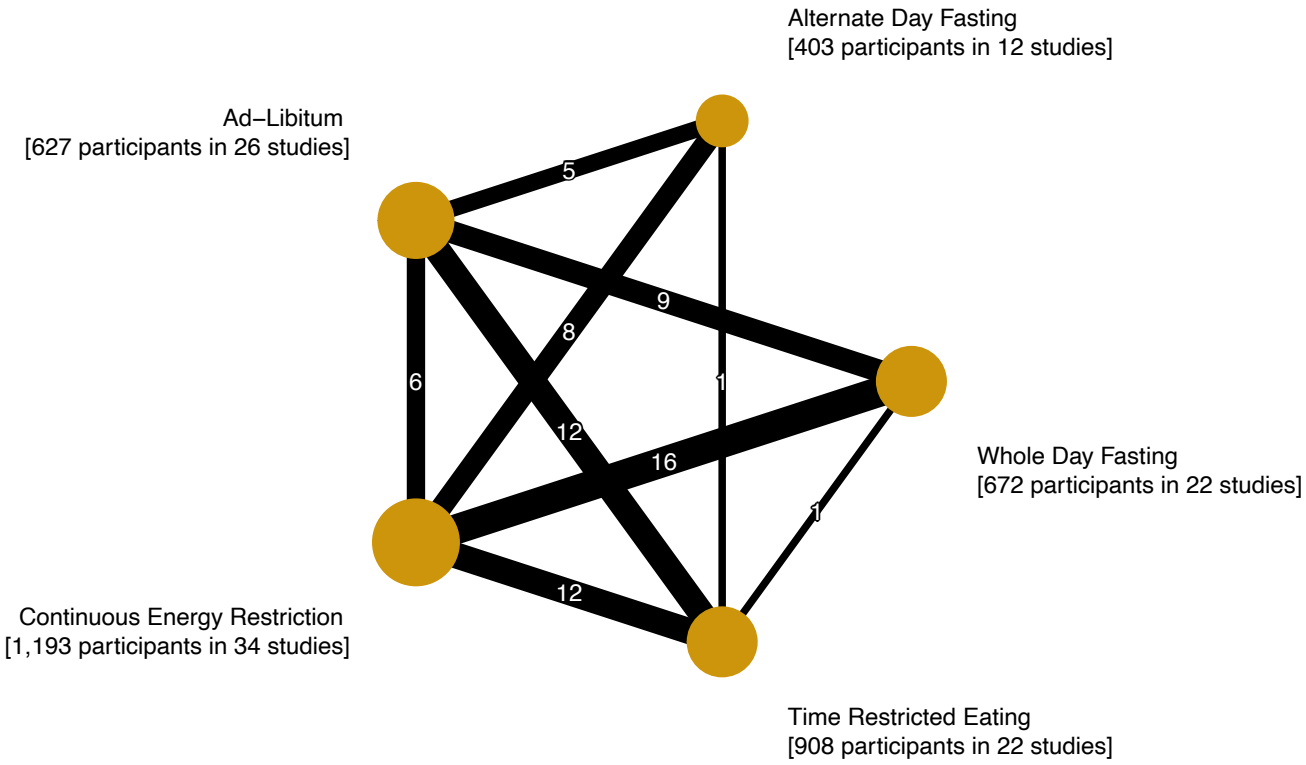
Supplementary Figure 31. Network diagram for randomized clinical trials investigating the association of intermittent fasting strategies and ad libitum diets with SBP. Yellow nodes represent the study size for each diet strategy. The thickness of the turquoise lines represents the number of studies directly comparing one diet strategy to another.



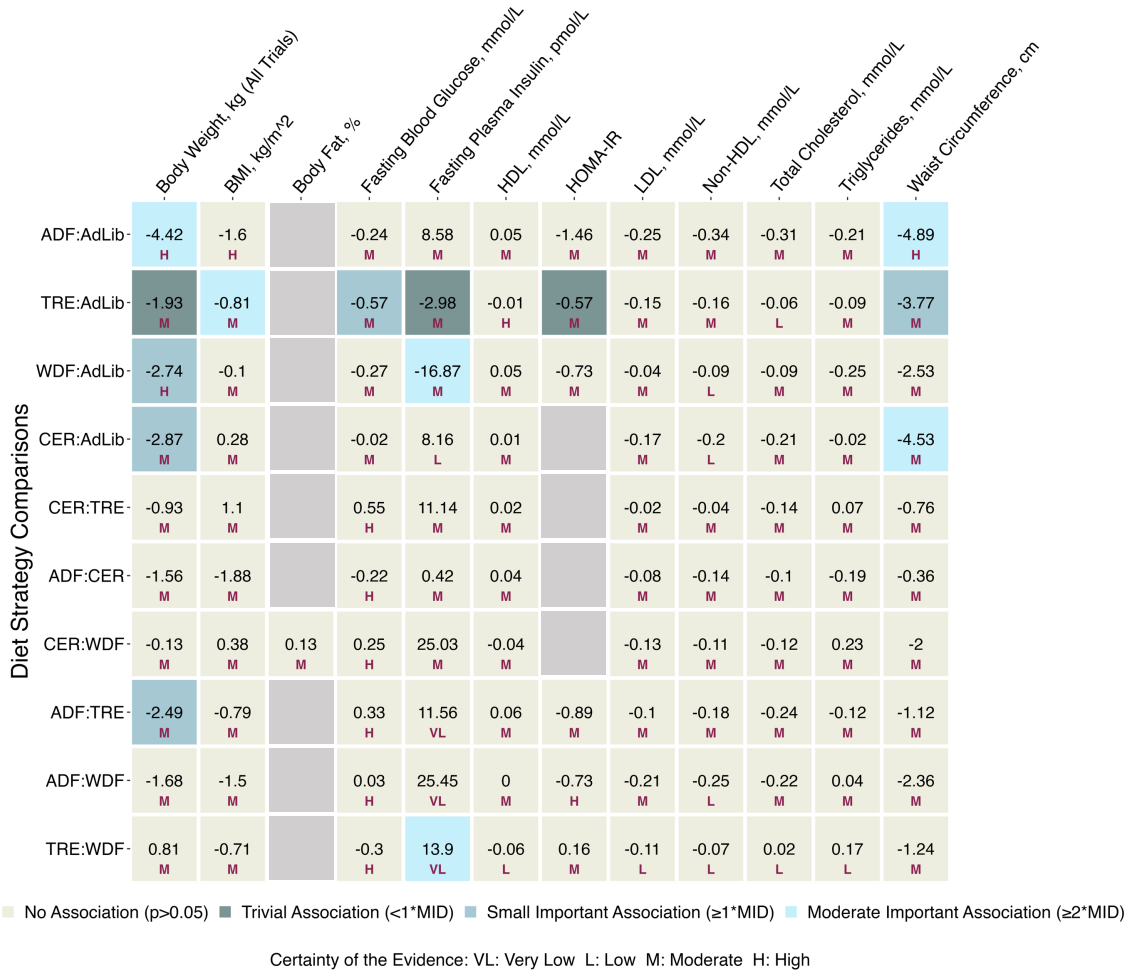
Supplementary Figure 32. Network diagram for randomized clinical trials investigating the association of intermittent fasting strategies and ad libitum diets with Total Cholesterol. Yellow nodes represent the study size for each diet strategy. The thickness of the turquoise lines represents the number of studies directly comparing one diet strategy to another.



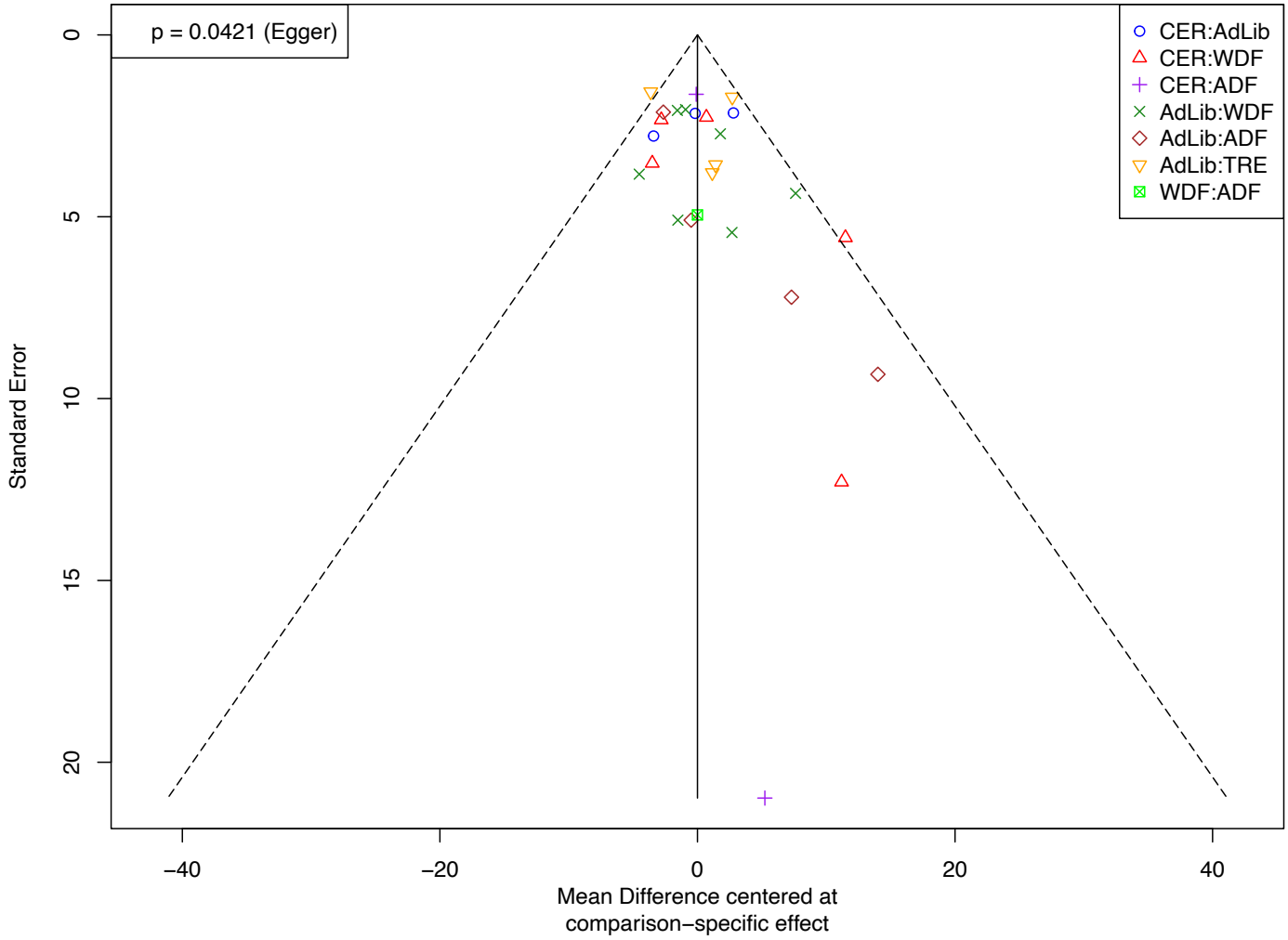
Supplementary Figure 33. Network diagram for randomized clinical trials investigating the association of intermittent fasting strategies and ad libitum diets with triglycerides. Yellow nodes represent the study size for each diet strategy. The thickness of the turquoise lines represents the number of studies directly comparing one diet strategy to another.



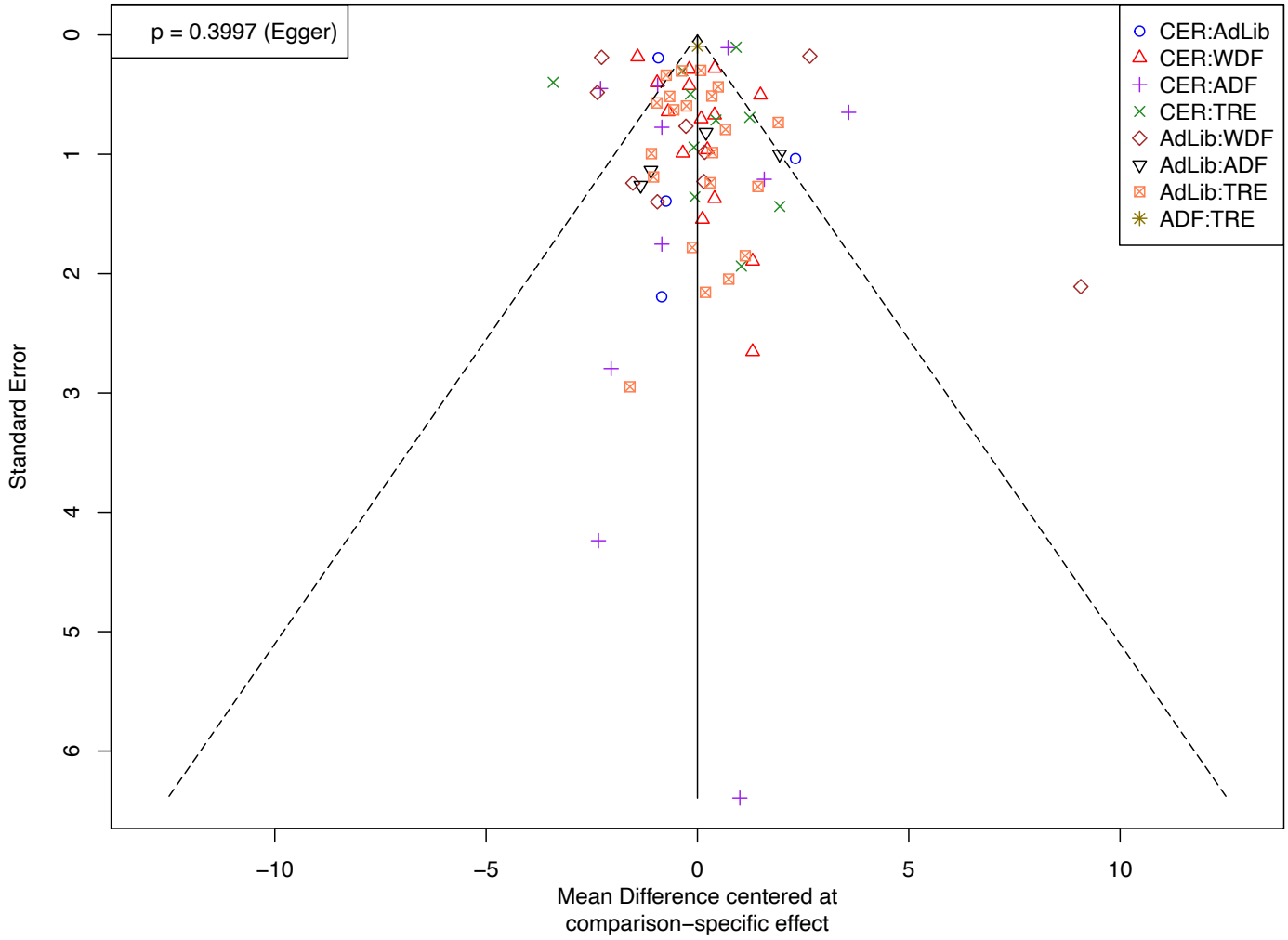
Supplementary Figure 34. Network diagram for randomized clinical trials investigating the association of intermittent fasting strategies and ad libitum diets with waist circumferences. Yellow nodes represent the study size for each diet strategy. The thickness of the turquoise lines represents the number of studies directly comparing one diet strategy to another.



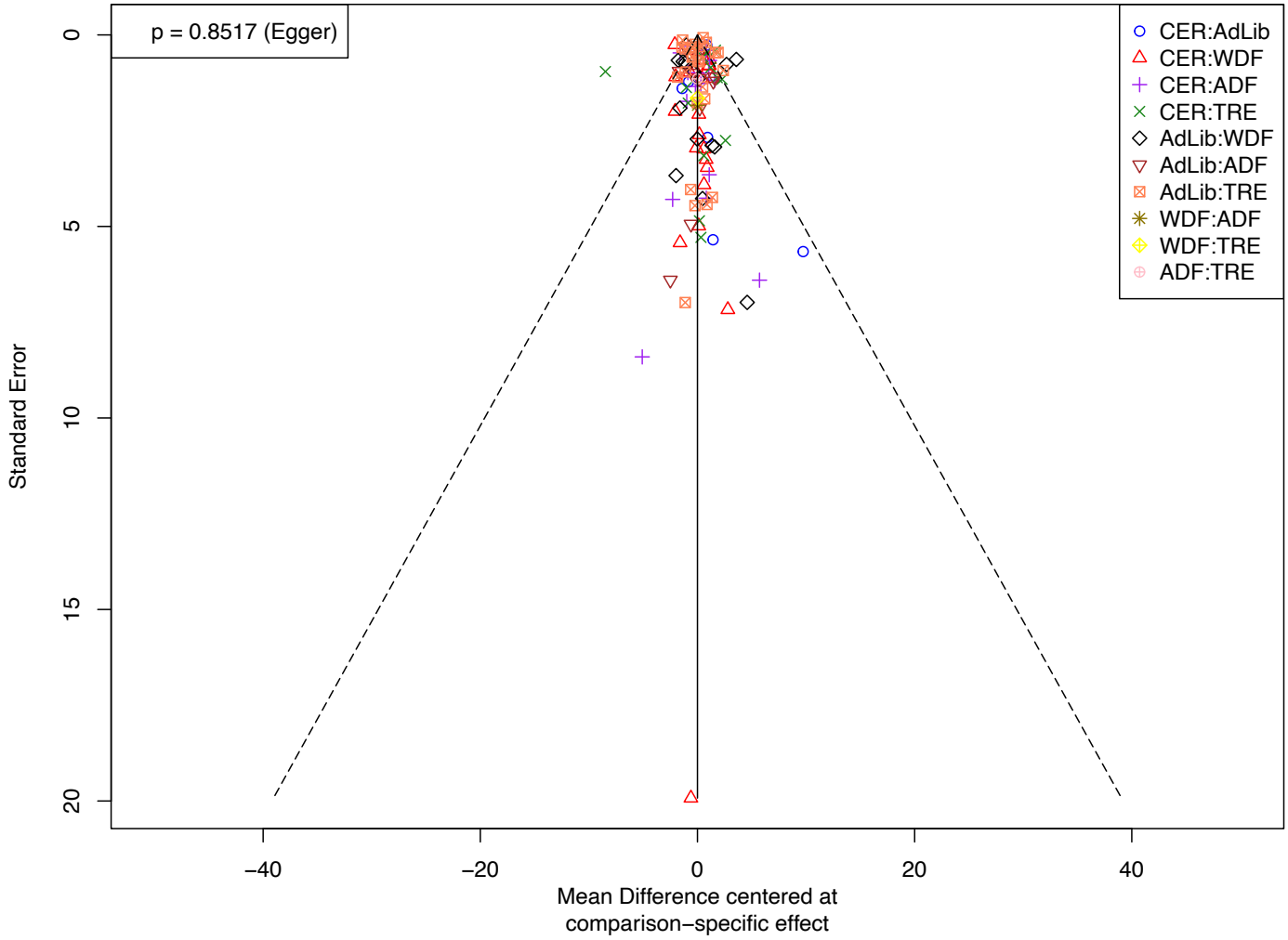
Supplementary Figure 35. Summary heatmap of the network effect size estimates (MD) and CINeMA certainty of the evidence, which applied the GRADE system, for all studies with subjects with diabetes (n=11). Results are given as diet strategy 1 compared to diet strategy 2. For example, ADF:AdLib comparison shows the MD of ADF compared to ad-libitum. A negative MD suggests diet 1 had greater reduction compared to diet 2; whereas a positive MD suggests diet 2 had a greater reduction compared to diet 1. The various shades of teal represent the level of effect based on MID for each outcome (see Supplementary Table 22 for the MIDs). Large important association (≥5*MID) and very large important association (≥108MID) are not shown as no effect size reached this. The beige boxes represent non-significant network effect estimates (p<0.05) and no important effect. The grey box represents no available data. The letters below MD represent the overall certainty of the evidence determined through GRADE for all studies in the review (n=99) - VL: Very low; L: Low; M: Moderate; H: High. MD, mean difference; MID, minimally important difference.



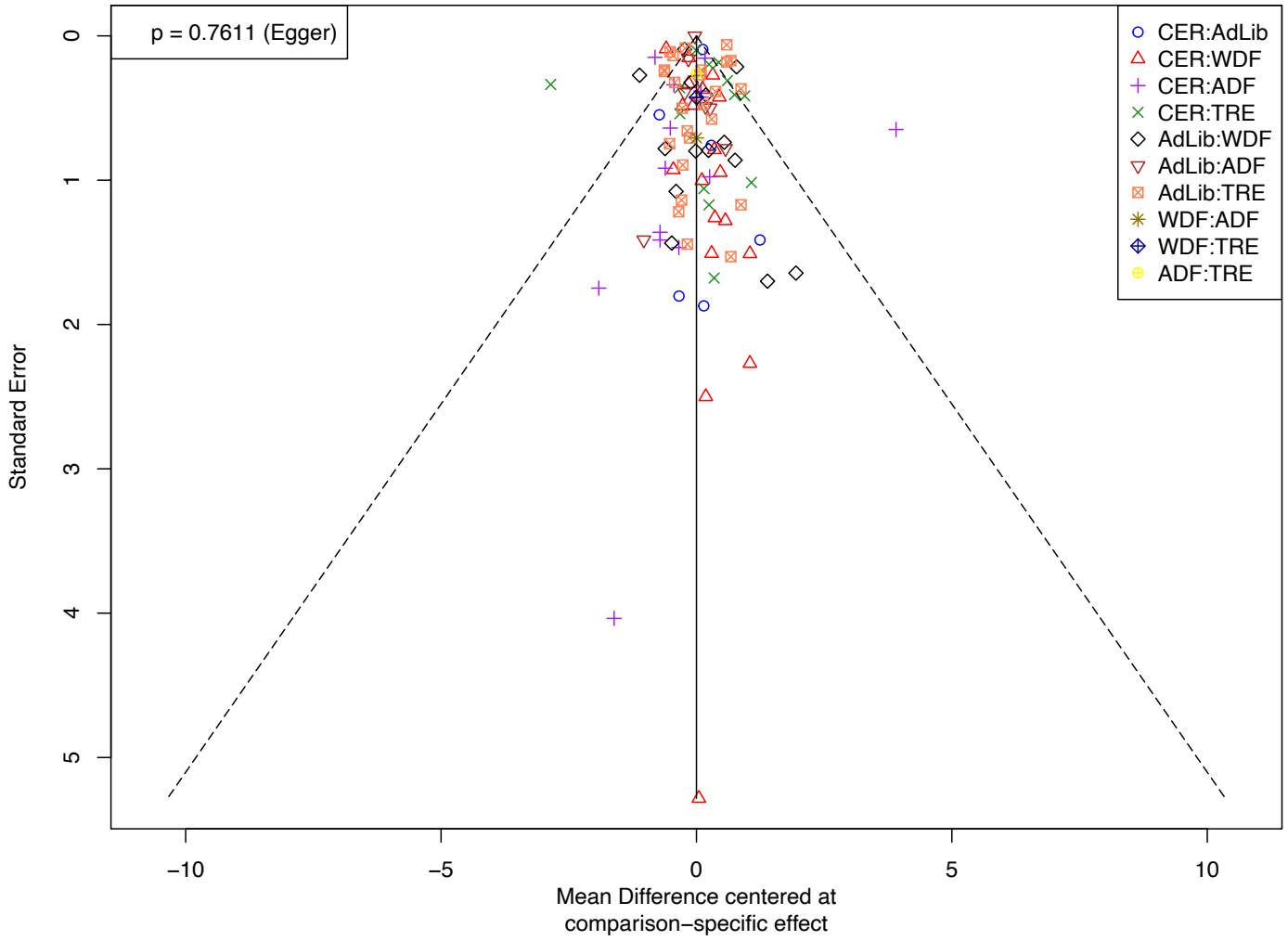
Supplementary Figure 37. Comparison adjusted funnel plot for ALT. The horizontal axis represents an adjusted effect size, presenting the difference between each observed effect size and the mean effect size for the specific comparison being made. The dashed lines represent pseudo 95% confidence intervals.



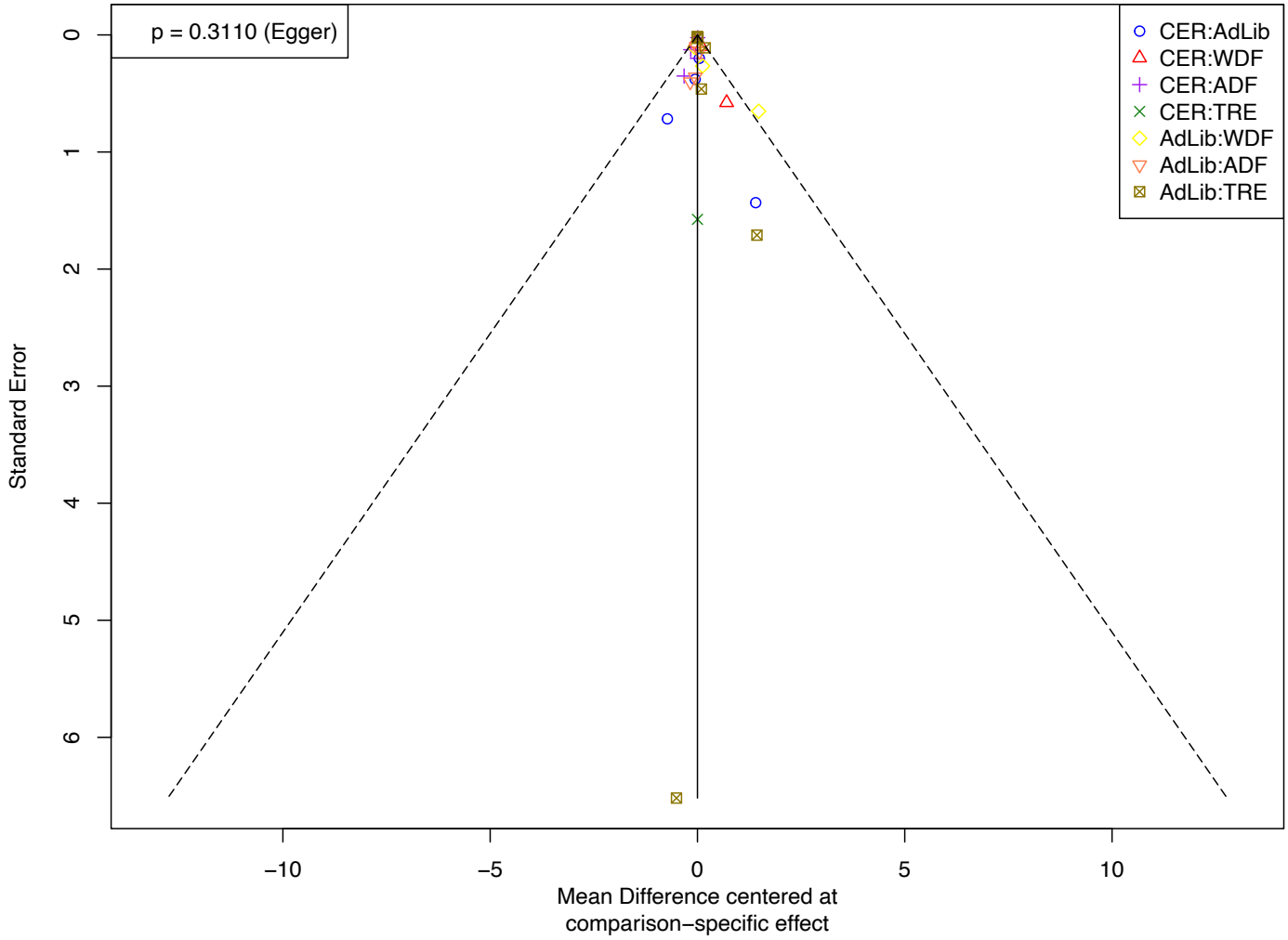
Supplementary Figure 37. Comparison adjusted funnel plot for body fat. The horizontal axis represents an adjusted effect size, presenting the difference between each observed effect size and the mean effect size for the specific comparison being made. The dashed lines represent pseudo 95% confidence intervals.



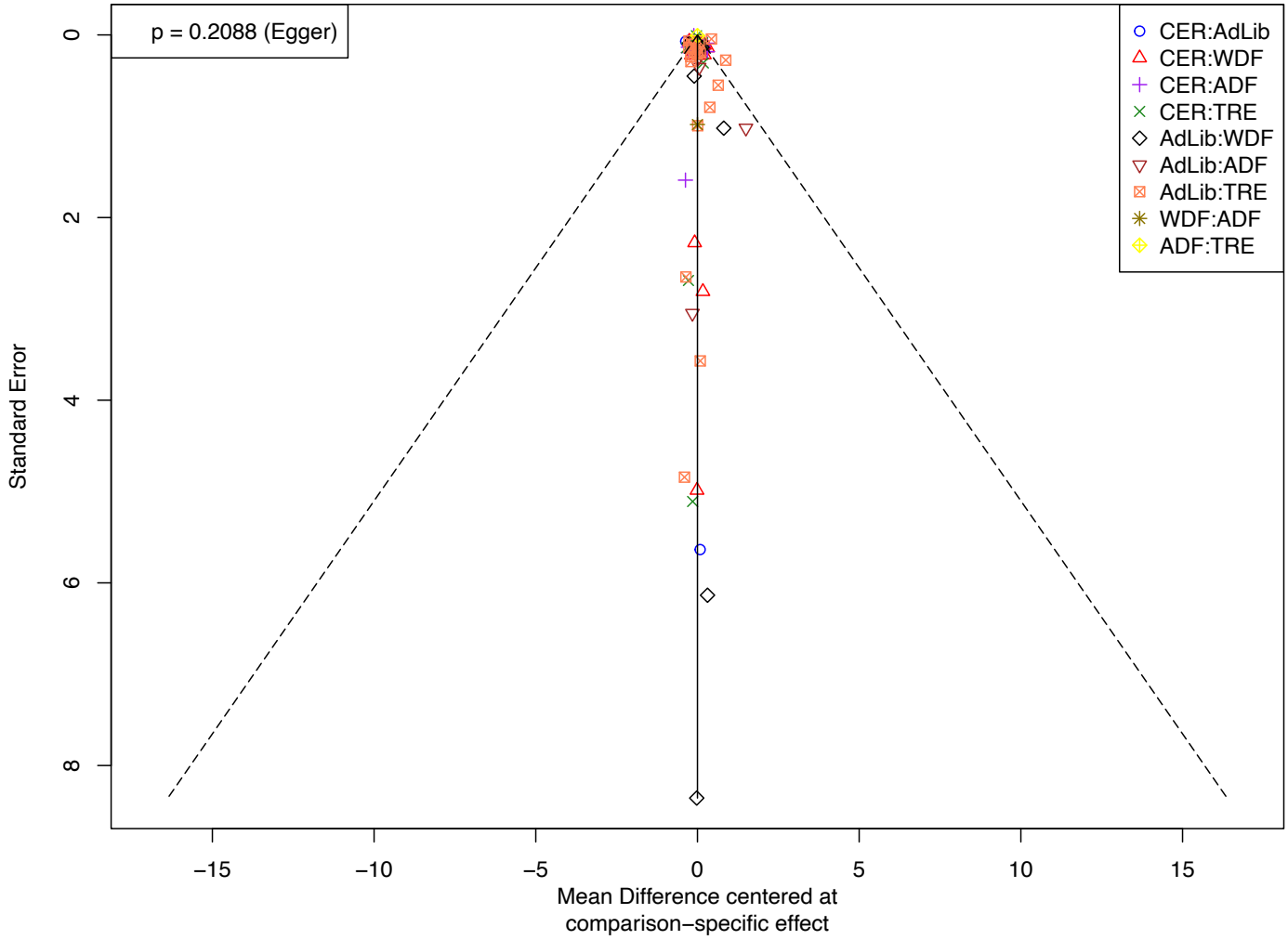
Supplementary Figure 38. Comparison adjusted funnel plot for body weight. The horizontal axis represents an adjusted effect size, presenting the difference between each observed effect size and the mean effect size for the specific comparison being made. The dashed lines represent pseudo 95% confidence intervals.



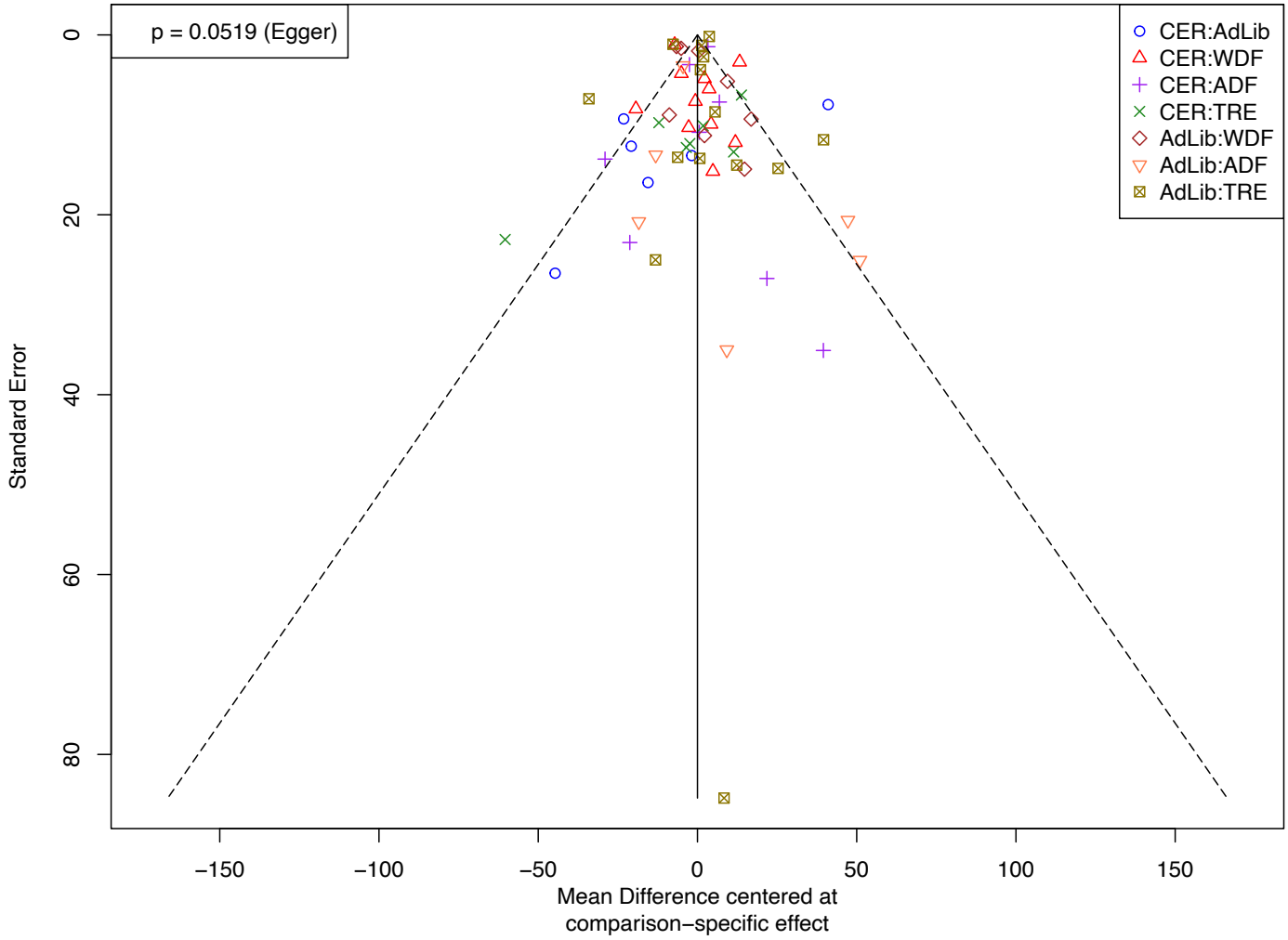
Supplementary Figure 39. Comparison adjusted funnel plot for BMI. The horizontal axis represents an adjusted effect size, presenting the difference between each observed effect size and the mean effect size for the specific comparison being made. The dashed lines represent pseudo 95% confidence intervals.



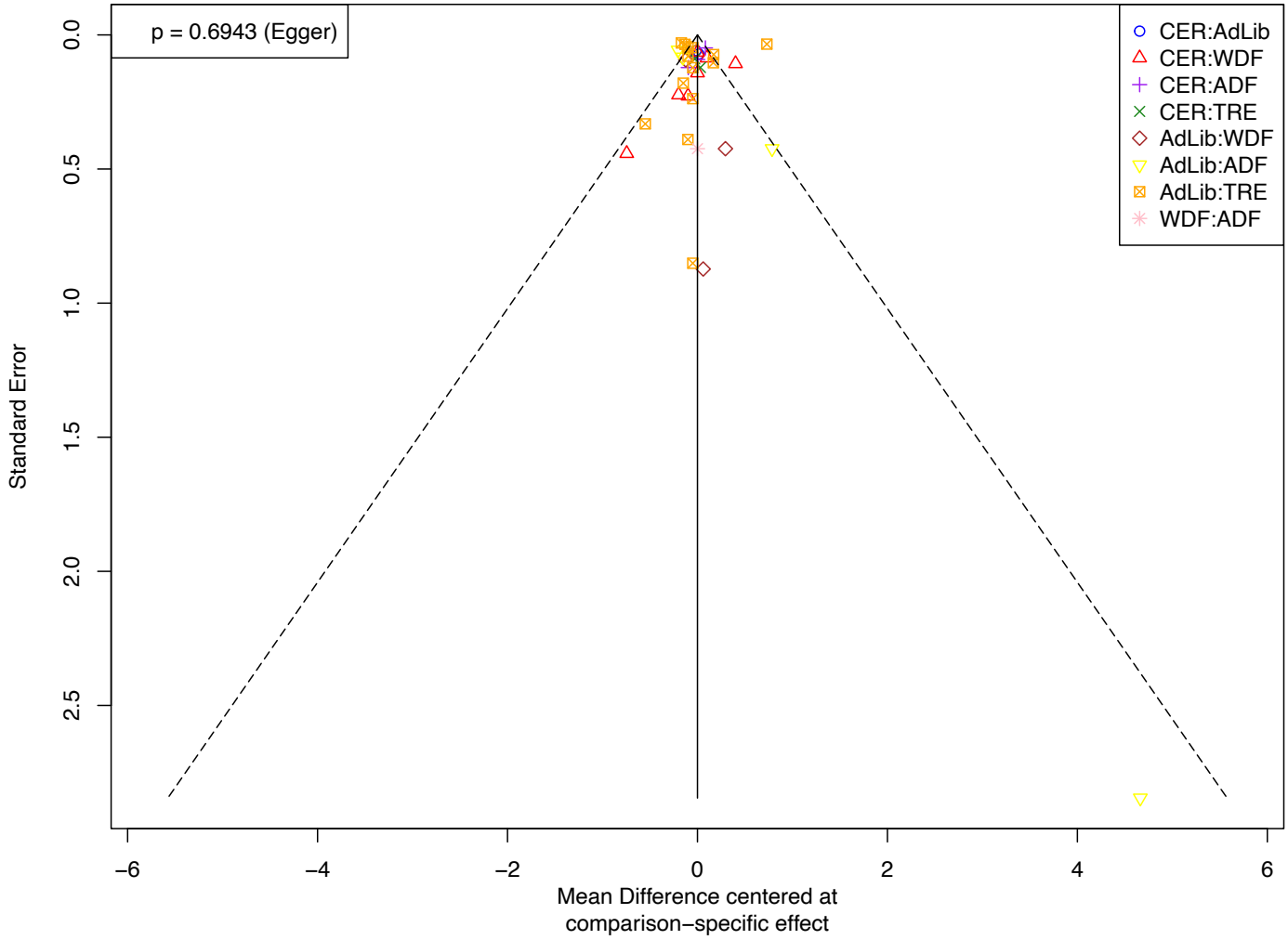
Supplementary Figure 40. Comparison adjusted funnel plot for CRP. The horizontal axis represents an adjusted effect size, presenting the difference between each observed effect size and the mean effect size for the specific comparison being made. The dashed lines represent pseudo 95% confidence intervals.



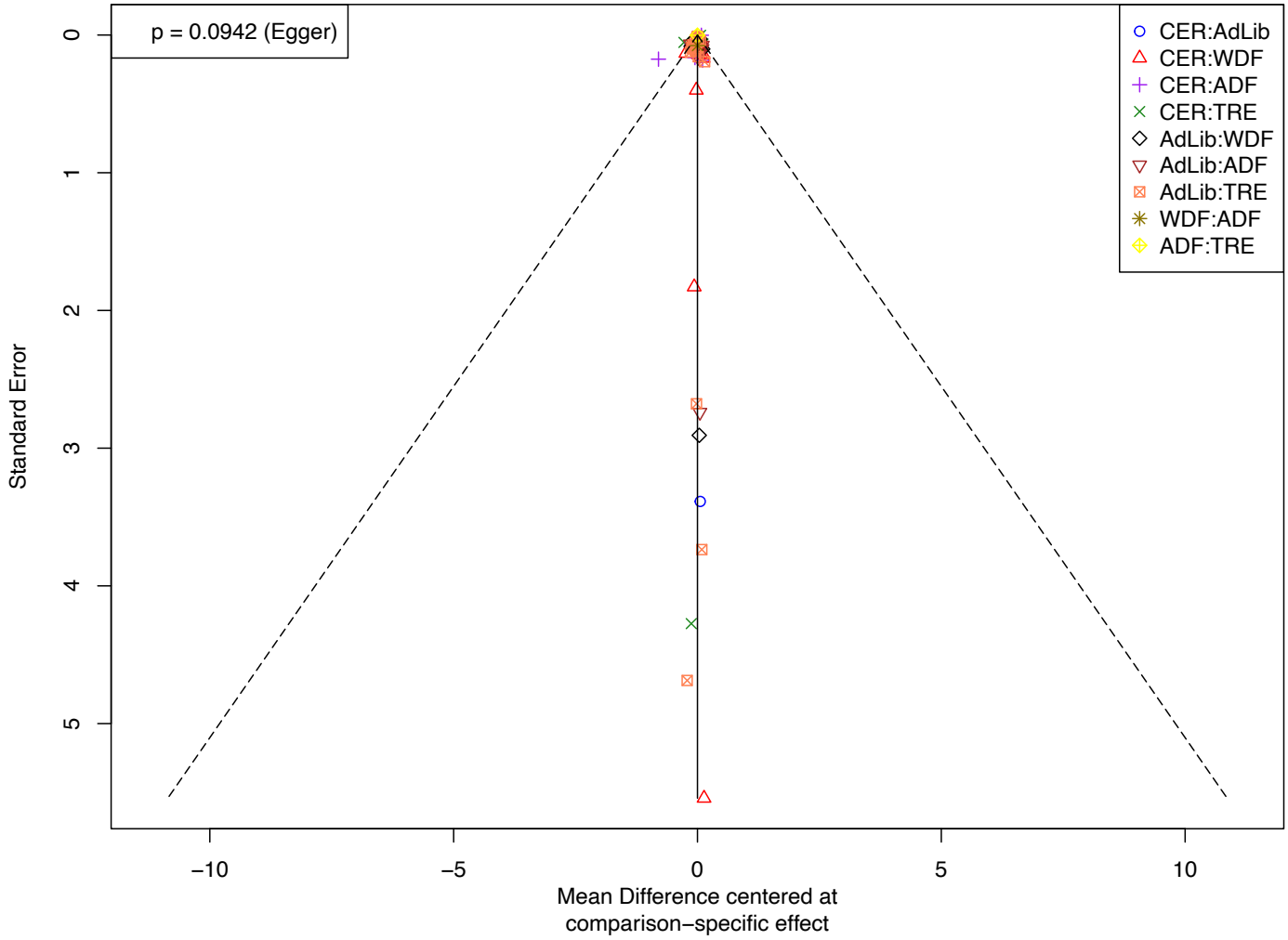
Supplementary Figure 41. Comparison adjusted funnel plot for fasting glucose. The horizontal axis represents an adjusted effect size, presenting the difference between each observed effect size and the mean effect size for the specific comparison being made. The dashed lines represent pseudo 95% confidence intervals.



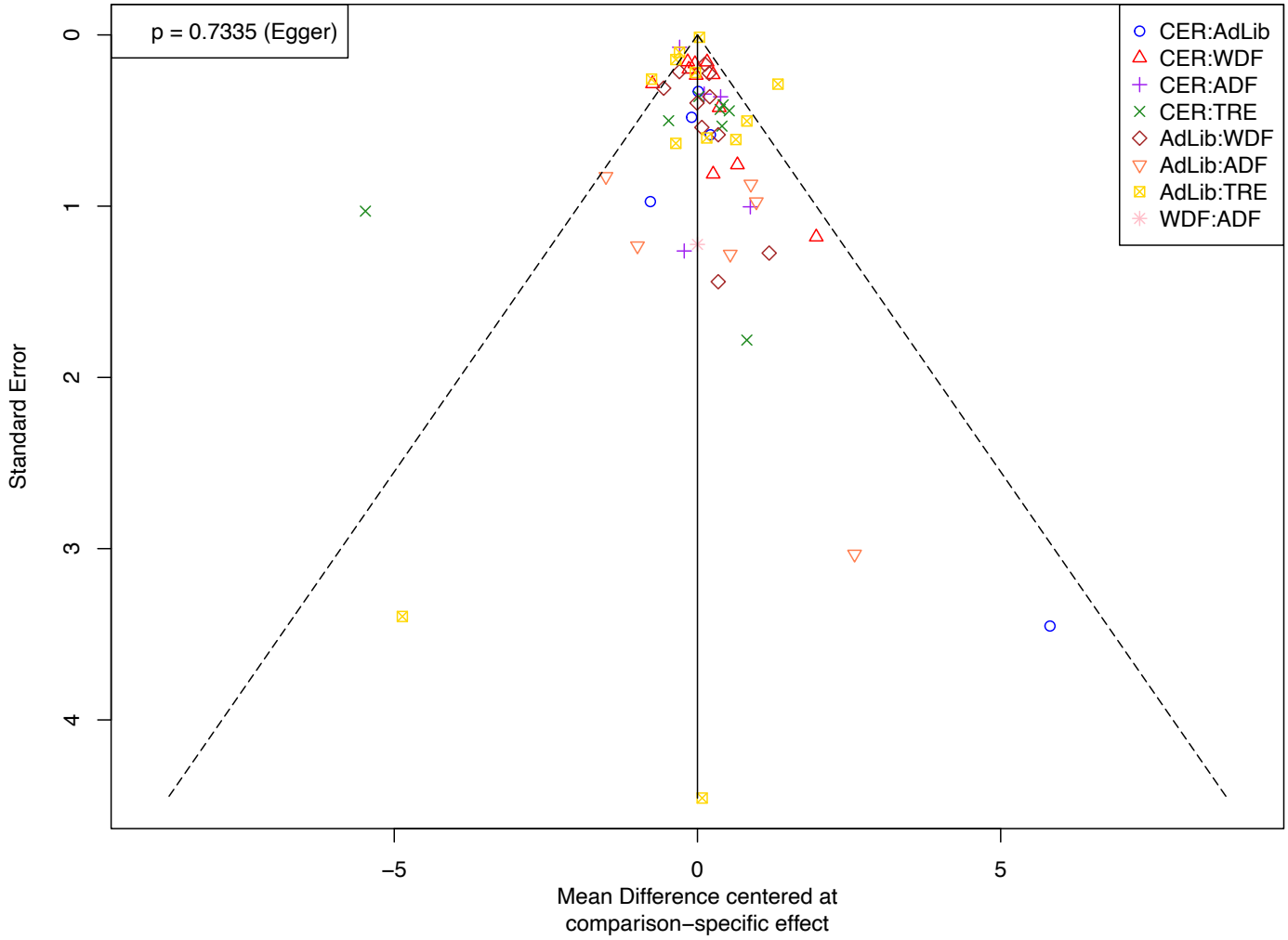
Supplementary Figure 42. Comparison adjusted funnel plot for fasting insulin. The horizontal axis represents an adjusted effect size, presenting the difference between each observed effect size and the mean effect size for the specific comparison being made. The dashed lines represent pseudo 95% confidence intervals.



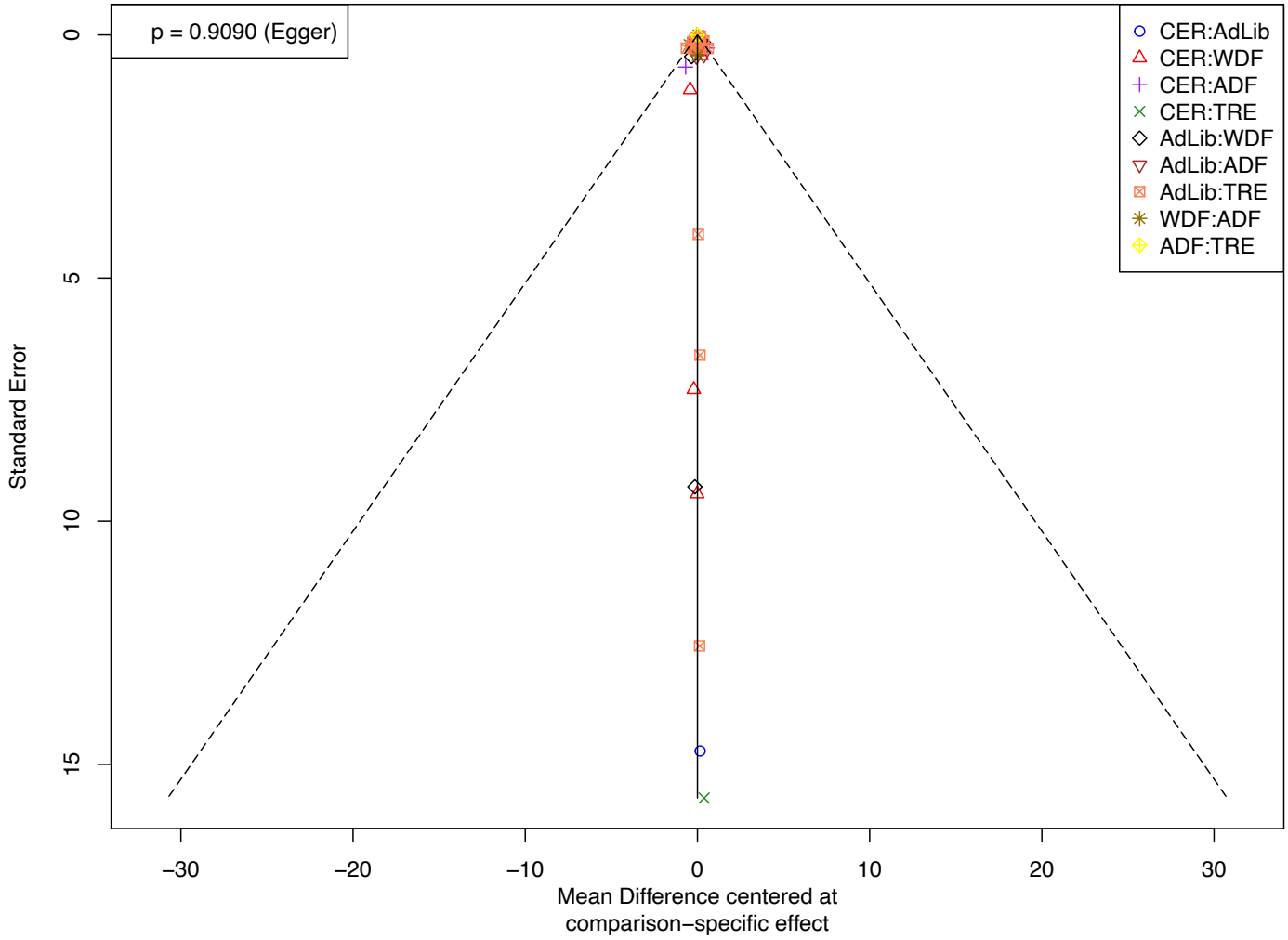
Supplementary Figure 43. Comparison adjusted funnel plot for HbA1c. The horizontal axis represents an adjusted effect size, presenting the difference between each observed effect size and the mean effect size for the specific comparison being made. The dashed lines represent pseudo 95% confidence intervals.



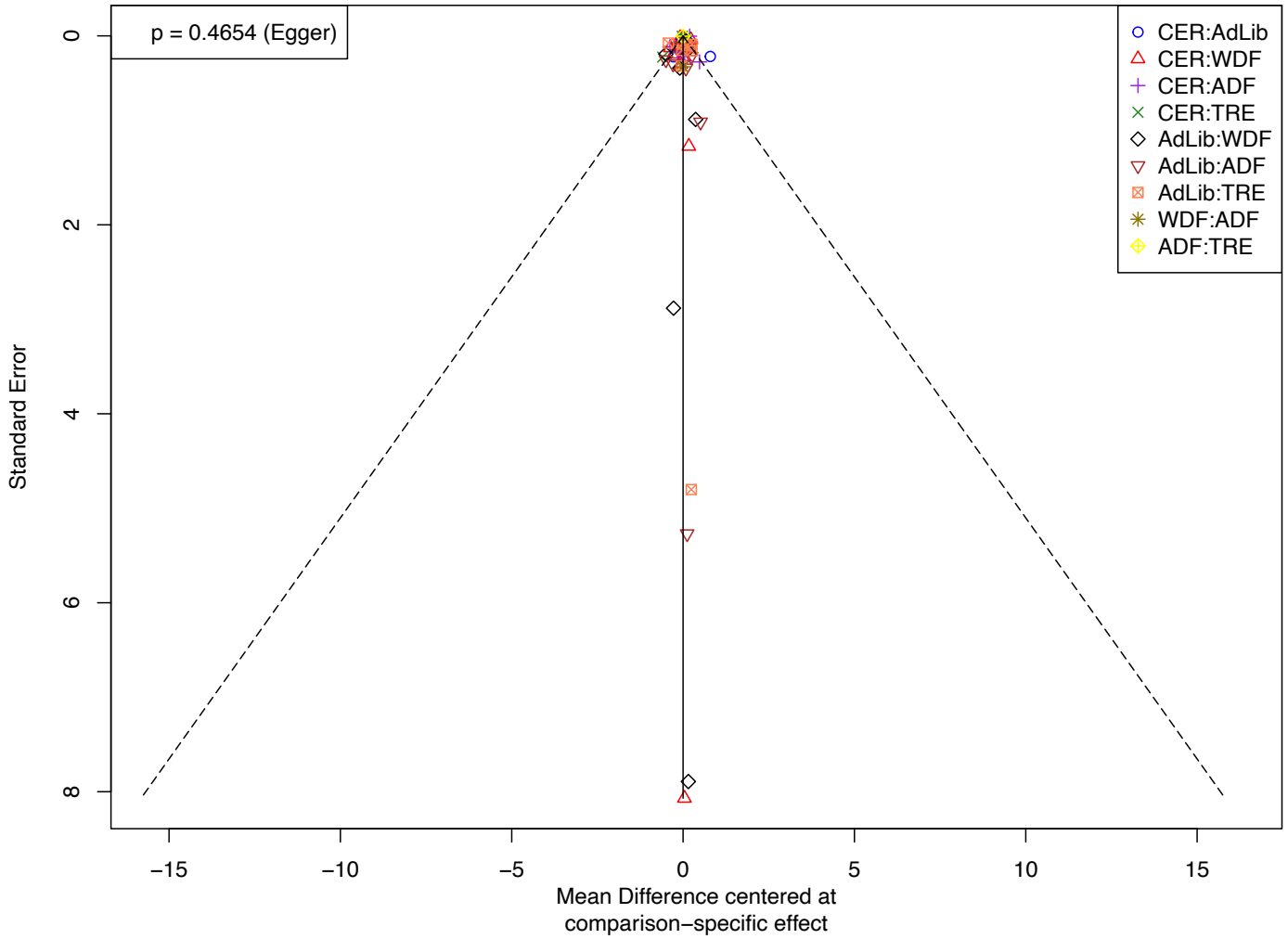
Supplementary Figure 44. Comparison adjusted funnel plot for HDL. The horizontal axis represents an adjusted effect size, presenting the difference between each observed effect size and the mean effect size for the specific comparison being made. The dashed lines represent pseudo 95% confidence intervals.



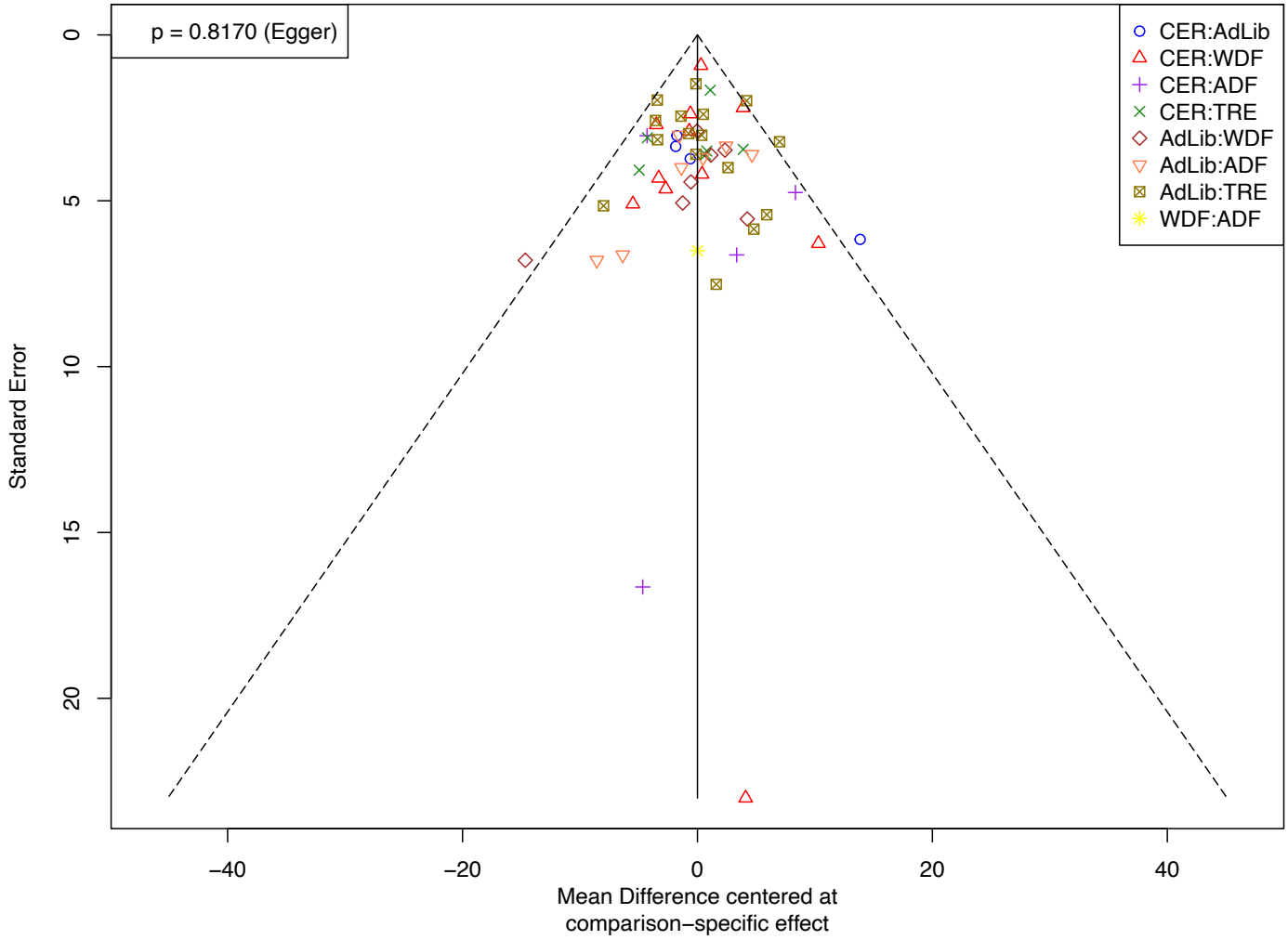
Supplementary Figure 45. Comparison adjusted funnel plot for HOMA-IR. The horizontal axis represents an adjusted effect size, presenting the difference between each observed effect size and the mean effect size for the specific comparison being made. The dashed lines represent pseudo 95% confidence intervals.



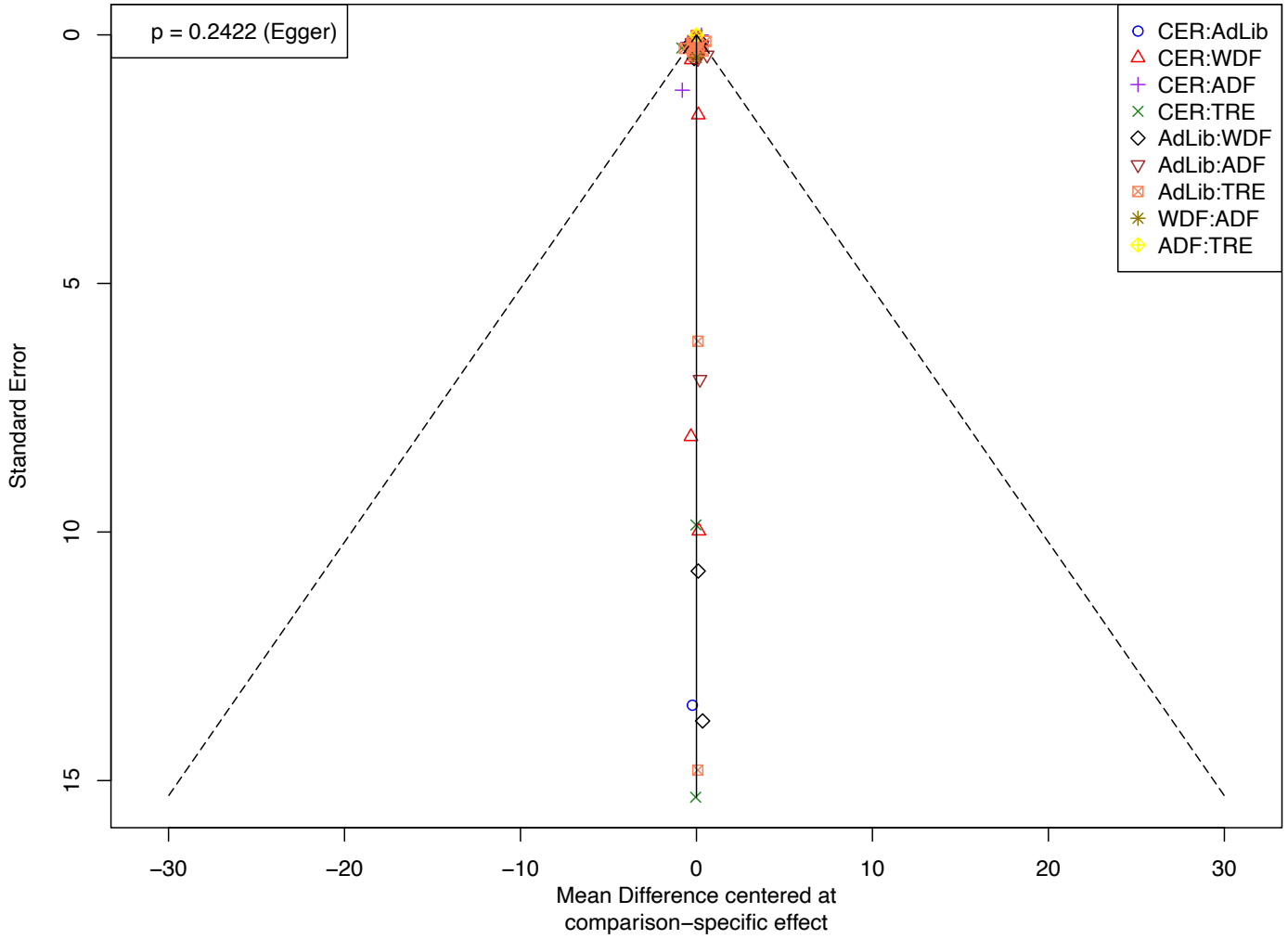
Supplementary Figure 46. Comparison adjusted funnel plot for LDL. The horizontal axis represents an adjusted effect size, presenting the difference between each observed effect size and the mean effect size for the specific comparison being made. The dashed lines represent pseudo 95% confidence intervals.



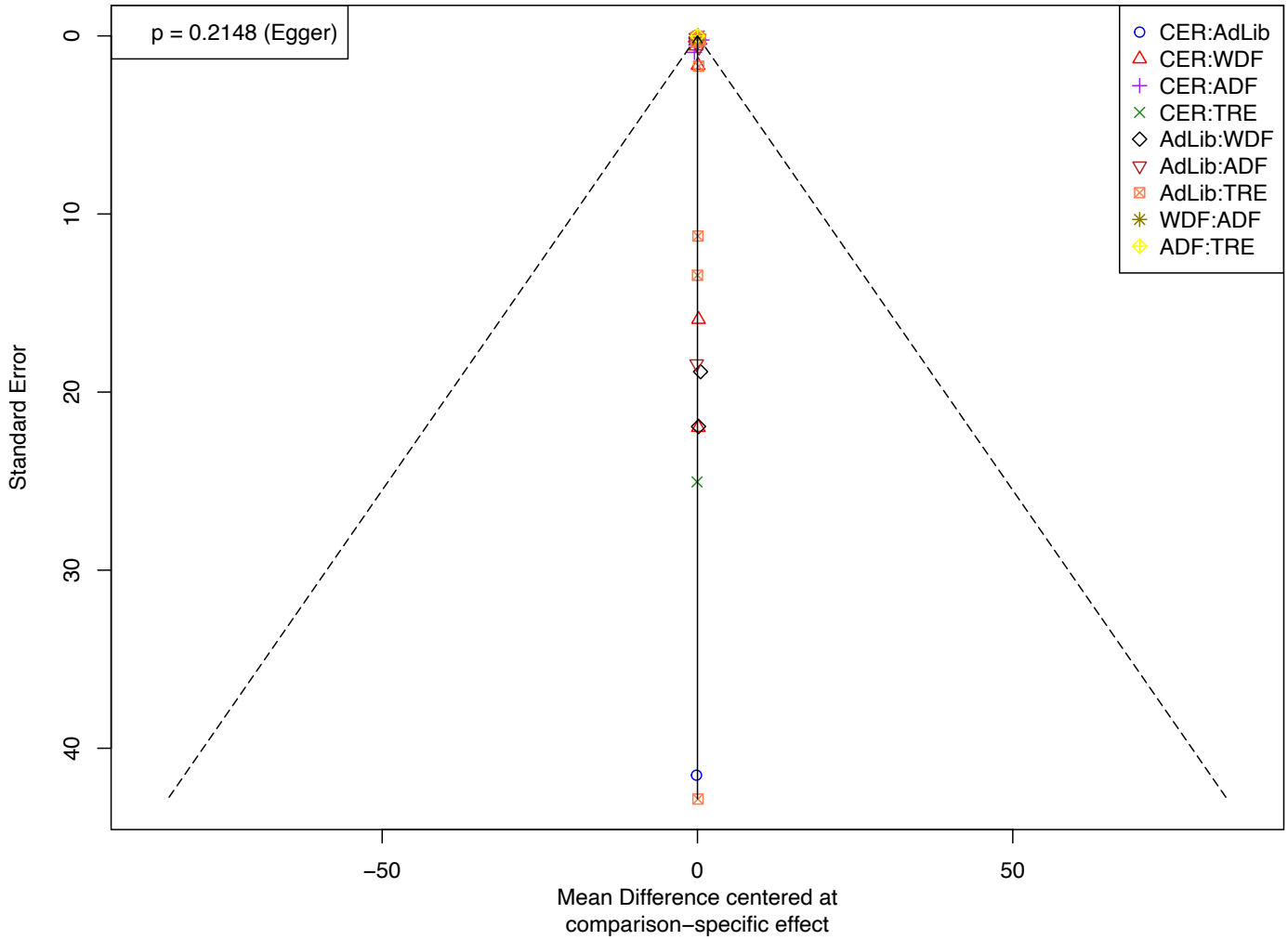
Supplementary Figure 47. Comparison adjusted funnel plot for non-HDL. The horizontal axis represents an adjusted effect size, presenting the difference between each observed effect size and the mean effect size for the specific comparison being made. The dashed lines represent pseudo 95% confidence intervals.



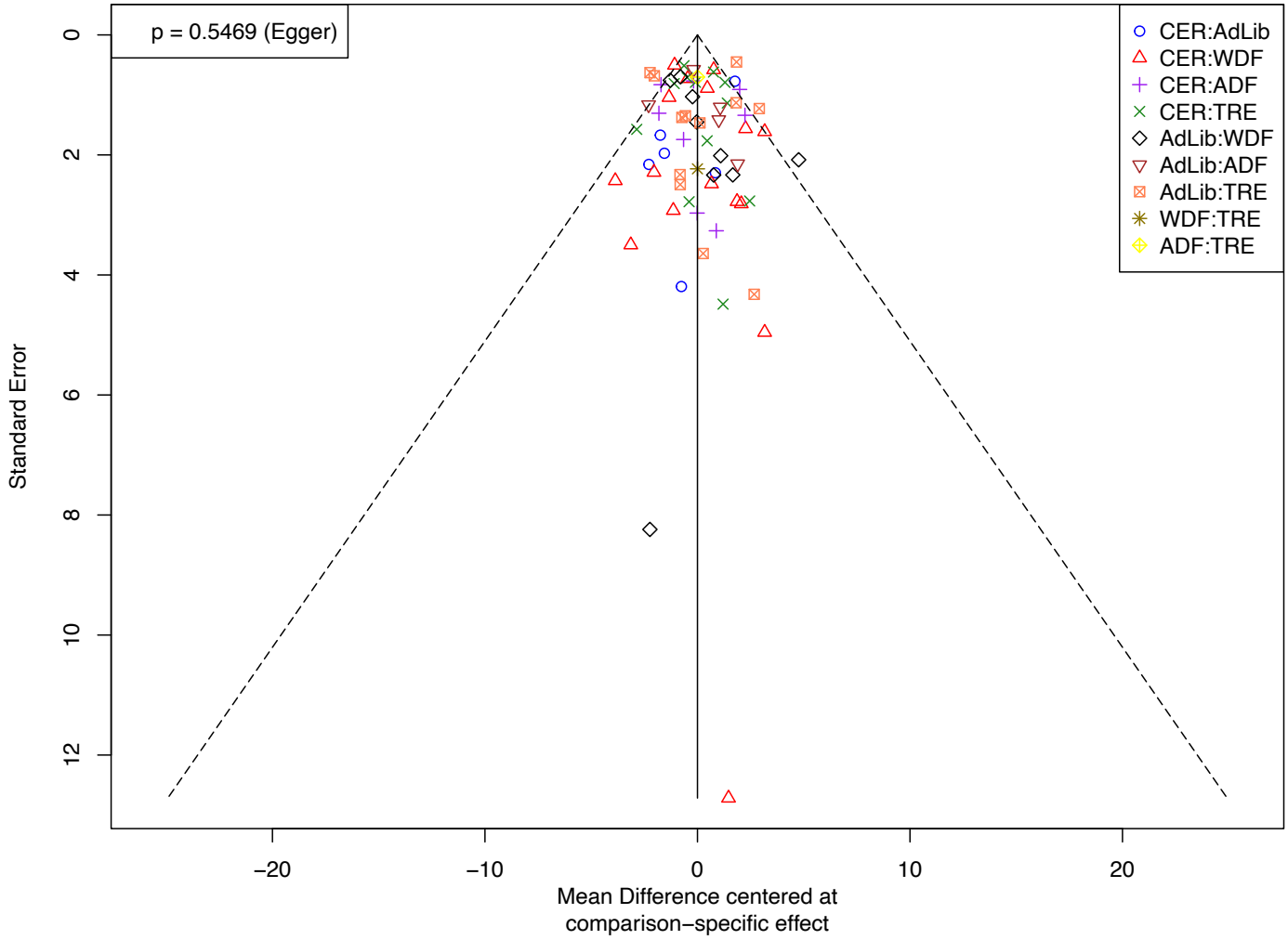
Supplementary Figure 48. Comparison adjusted funnel plot for SBP. The horizontal axis represents an adjusted effect size, presenting the difference between each observed effect size and the mean effect size for the specific comparison being made. The dashed lines represent pseudo 95% confidence intervals.



Supplementary Figure 49. Comparison adjusted funnel plot for Total Cholesterol. The horizontal axis represents an adjusted effect size, presenting the difference between each observed effect size and the mean effect size for the specific comparison being made. The dashed lines represent pseudo 95% confidence intervals.



Supplementary Figure 50. Comparison adjusted funnel plot for triglycerides. The horizontal axis represents an adjusted effect size, presenting the difference between each observed effect size and the mean effect size for the specific comparison being made. The dashed lines represent pseudo 95% confidence intervals.



Supplementary Figure 51. Comparison adjusted funnel plot for waist circumference. The horizontal axis represents an adjusted effect size, presenting the difference between each observed effect size and the mean effect size for the specific comparison being made. The dashed lines represent pseudo 95% confidence intervals.

Appendix

Appendix A. Articles Excluded in Full Text Review.

Title	Authors	Published Year	Journal	Volume	Issue	DOI
Effects of Different Types of Intermittent Fasting Interventions on Metabolic Health in Healthy Individuals (EDIF): A Randomised Trial with a Controlled-Run in Phase.	Herz, Daniel; ; Karl, Sebastian; Weis, Johannes; Zimmermann, Paul; Haupt, Sandra; Zimmer, Rebecca Tanja; Schierbauer, Janis; Wachsmuth, Nadine Bianca; Erlmann, Maximilian Paul; Niedrist, Tobias; Khoramipour, Kayvan; Voit, Thomas; Rilstone, Sian; Sourij, Harald; Moser, Othmar	2024	Nutrients	16	8	https://dx.doi.org/10.3390/nu16081114
Time-Restricted Eating Versus Daily Calorie Restriction: Effect on Sleep in Adults with Obesity over 12 Months.	Lin, Shuhao; ; Cienfuegos, Sofia; Ezpeleta, Mark; Gabel, Kelsey; Pavlou, Vasiliki; Alexandria, Shaina J; Varady, Krista A	2024	Nutrients	16	20	https://dx.doi.org/10.3390/nu16203528
Effect of time restricted eating versus daily calorie restriction on sex hormones in males and females with obesity.	Lin, Shuhao; ; Cienfuegos, Sofia; Ezpeleta, Mark; Pavlou, Vasiliki; Runchey, Mary-Claire; Varady, Krista A	2024	European journal of clinical nutrition	78	9	https://dx.doi.org/10.1038/s41430-024-01461-5
The acute effect of time-restricted feeding (12 & 16 h) and varying exercise intensities on fat-oxidation rate in inactive young adults - a randomized control trial.	Loren, Yavelberg; ; Norman, Gledhill; Veronica, Jamnik	2024	BMC sports science, medicine & rehabilitation	16	1	https://dx.doi.org/10.1186/s13102-024-00959-6
Gut microbiome remodeling and metabolomic profile improves in response to protein pacing with intermittent fasting versus continuous caloric restriction.	Mohr, Alex E; ; Sweazea, Karen L; Bowes, Devin A; Jasbi, Paniz; Whisner, Corrie M; Sears, Dorothy D; Krajmalnik-Brown, Rosa; Jin, Yan; Gu, Haiwei; Klein-Seetharaman, Judith; Arciero, Karen M; Gumpricht, Eric; Arciero, Paul J	2024	Nature communications	15	1	https://dx.doi.org/10.1038/s41467-024-48355-5
Effects of dietary interventions and intermittent fasting on HDL function in obese individuals with T2DM: a randomized controlled trial.	Pammer, Anja; ; Obermayer, Anna; Stadler, Julia T; Pferschy, Peter N; Tripolt, Norbert J; Habisch, Hansjorg; Madl, Tobias; Sourij, Harald; Marsche, Gunther	2024	Cardiovascular diabetology	23	1	https://dx.doi.org/10.1186/s12933-024-02426-5
Associations between dietary fatty acid and plasma fatty acid composition in non-alcoholic fatty liver disease: secondary analysis from a randomised trial with a hypoenergetic low-carbohydrate high-fat and intermittent fasting diet.	Tillander, Veronika; ; Holmer, Magnus; Hagstrom, Hannes; Petersson, Sven; Brismar, Torkel B; Stal, Per; Lindqvist, Catarina	2024	The British journal of nutrition		az4, 0372547	https://dx.doi.org/10.1017/S0007114524001673
Fasting, ketogenic and anti-inflammatory diets stabilized active relapsing-remitting multiple sclerosis over 18 months, a randomized, controlled study	Bahr L.S.; ; Bellmann-Strobl J.; Koppold D.A.; Rust R.; Schmitz-Hubsch T.; Olszewska M.; Stadlbauer J.; Bock M.; Scheel M.; Chien C.; Multmeier J.; Krannich A.; Michalsen A.; Paul F.; Mahler A.	2024	medRxiv		(Bahr, Bellmann-Strobl, Rust, Schmitz-Hubsch, Chien, Paul, Mahler) Charite - Universitatsmedizin Berlin, Freie Universitat Berlin, Humboldt- Universitat zu Berlin, Experimental and Clinical Research Center (ECRC), Lindenberger Weg 80, Berlin 13125, German	https://dx.doi.org/10.1101/2024.08.13.24311863
Fasting as an intervention to alter the impact of simulated night-shift work on glucose metabolism in healthy adults: a cluster randomised controlled trial	Centofanti S.; ; Heilbronn L.K.; Wittert G.; Dorrian J.; Coates A.M.; Kennaway D.; Gupta C.; Stepien J.M.; Catcheside P.; Yates C.; Grosser L.; Matthews R.W.; Banks S.	2024	Diabetologia		(Centofanti, Dorrian, Coates, Stepien, Yates, Grosser, Banks) Behaviour-Brain-Body Research Centre, UniSA Justice and Society, University of South Australia, Adelaide, SA, Australia(Heilbronn, Wittert) Lifelong Health Theme, South Australian Health and Me	https://dx.doi.org/10.1007/s00125-024-06279-1
Effectiveness of time-restricted eating with caloric restriction vs. caloric restriction on anthropometric parameters in overweight and obese adults	Cresnovar T.; ; Habe B.; Praznikar Z.J.; Petelin A.	2024	Clinical Nutrition ESPEN	63	(Cresnovar, Habe, Praznikar, Petelin) University of Primorska, Faculty of Health Science, Izola, Slovenia	https://dx.doi.org/10.1016/j.clnesp.2024.07.480
AEROBIC TRAINING AND INTERMITTENT FASTING REGIMEN FOR WOMEN WITH DIABESITY	Elsayed E.; ; El-Nahas N.G.; Hakim S.A.; Abdelhady A.A.; Beltagi A.A.	2024	Cardiopulmonary Physical Therapy Journal	35	1	https://dx.doi.org/10.1097/CPT.0000000000000243
Intermittent fasting, caloric restriction, and ketogenic diet increase bioenergetic health index in monocytes and improve metabolic outcome in subjects with obesity via changes in gut microbiota	Velazquez-Villegas L.A.; ; Hernandez-Gomez K.G.; Pichardo-Ontiveros E.; Lopez-Barradas A.M.; Condado-Huerta M.C.C.; Sanchez-Tapia M.; Gonzalez-Salazar L.E.; Leon-Hernandez V.; Serralde-Zuniga A.E.; Medina-Vera I.; Noriega L.G.; Granados-Portillo O.; Olin-Sandoval V.; Torres N.; Tovar A.R.; Guevara-Cruz M.	2023	Clinical Nutrition ESPEN	58	(Velazquez-Villegas, Hernandez-Gomez, Pichardo-Ontiveros, Lopez-Barradas, Condado-Huerta, Sanchez-Tapia, Leon-Hernandez, Noriega, Granados-Portillo, Torres, Tovar, Guevara-Cruz) Departamento de Fisiologia de la Nutricion(Gonzalez-Salazar, Serralde-Zuniga)	https://dx.doi.org/10.1016/j.clnesp.2023.09.363
Effects of time-restricted eating and low-carbohydrate diet on psychosocial health and appetite in individuals with metabolic syndrome: a secondary analysis of a randomized controlled trial	Zheng Y; ; Wang X; Wang J; Yang J; Wang T; Li Q; Zhu W; Wang Y; Sui J; Qiang W; Guo H; Shi B; He M	2024		43	10	https://doi.org/10.1016/j.clnu.2024.08.029
Obesity Genetic Risk Scores and Weight Loss in Participants From the Daily Caloric Restriction Versus Intermittent Fasting Trial (DRIFT)	Yeo EN; ; Scadden AW; Cole JB; Pan Z; Borengasser S; James KL; Bessesen DH; Catenacci VA; Litowski EM; MacLean PS; Melanson EL; Ostendorf DM; Lozupone C; Stamislawski MA	2024		8		https://doi.org/10.1016/j.cdnut.2024.103521
Study on the Dynamic Effects of Different Dietary Interventions on Weight and Other Biochemical Indicators Based on Randomized Controlled Trials		2024				
Randomized controlled trial of once-per-week intermittent fasting for health improvement: the WONDERFUL trial.	Bartholomew, Ciera L; Muhlestein, Joseph B; May, Heidi T; Le, Viet T; Galenko, Oxana; Garrett, Kelly Davis; Brunker, Cherie; Hopkins, Ramona O; Carlquist, John F; Knowlton, Kirk U; Anderson, Jeffrey L; Bailey, Bruce W; Horne, Benjamin D	2021	European heart journal open	1	2	https://dx.doi.org/10.1093/ehjopen/oeab026
Intermittent calorie restriction alters T cell subsets and metabolic markers in people with multiple sclerosis.	Fitzgerald, Kathryn C; Bhargava, Pavan; Smith, Matthew D; Vizthum, Diane; Henry-Barron, Bobbie; Kornberg, Michael D; Cassard, Sandra D; Kapogiannis, Dimitrios; Sullivan, Patrick; Baer, David J; Calabresi, Peter A; Mowry, Ellen M	2022	EBioMedicine	82	101647039	https://dx.doi.org/10.1016/j.ebiom.2022.104124

Title	Authors	Published Year	Journal	Volume	Issue	DOI
Effect of Time-Restricted Eating versus Daily Calorie Restriction on Mood and Quality of Life in Adults with Obesity.	Lin, Shuhao; Cienfuegos, Sofia; Ezpeleta, Mark; Pavlou, Vasiliki; Chakos, Kaitlin; McStay, Mara; Runchey, Mary-Claire; Alexandria, Shaina J; Varady, Krista A	2023	Nutrients	15	20	https://dx.doi.org/10.3390/nu15204313
Cardiometabolic effects of early v. delayed time-restricted eating plus energetic restriction in adults with overweight and obesity: an exploratory randomised clinical trial.	Queiroz, Jessica do Nascimento; Macedo, Rodrigo Cauduro Oliveira; Dos Santos, Gabriela Cristina; Munhoz, Samuel Vargas; Machado, Carlos Leonardo Figueiredo; de Menezes, Rodrigo Leal; Menzem, Elisa Nascimento; Moritz, Cesar Eduardo Jacintho; Pinto, Ronei Silveira; Tinsley, Grant M; de Oliveira, Alvaro Reischak	2022	The British journal of nutrition		az4, 0372547	https://dx.doi.org/10.1017/S0007114522001581
Calorie restriction by time restricted intermittent fasting is better than standard calorie restriction in improving the metabolic profile and hepatic fibrosis in patients with non-alcoholic fatty liver disease	Aggarwal D.; Duseja A.K.; De A.; Bhadada S.; Kalra N.; Sahni N.	2023	Journal of Hepatology	78	Supplement 1	https://dx.doi.org/10.1016/S0168-8278%2823%2900518-4
Effectiveness of Time-restricted Intermittent Fasting in Patients with Non-alcoholic Fatty Liver Disease - A Randomized Controlled Trial	Aggarwal D.; Duseja A.; De A.; Sahni N.; Bhadada S.; Kalra N.	2023	Journal of Clinical and Experimental Hepatology	13	Supplement 1	https://dx.doi.org/10.1016/j.jceh.2023.07.198
Comparison of hypocaloric mediterranean diet plus intermittent fasting against classic hypocaloric mediterranean diet on body composition and metabolic parameters in obese individuals	Barkas F.; Maggiorou E.; Kokkinos A.; Tentolouris N.K.; Liberopoulos E.	2022	Atherosclerosis	355	(Barkas, Maggiorou) Department Of Internal Medicine, Faculty of Medicine, School of Health Sciences, University of Ioannina, Ioannnina, Greece(Kokkinos, Tentolouris, Liberopoulos) First Department Of Propaedeutic Internal Medicine, Medical School, Nationa	https://dx.doi.org/10.1016/j.atherosclerosis.2022.06.753
ShiftingWeight in Night ShiftWorkers: Results From a 24 Week, Parallel, Multi-Site, Randomised Controlled Trial (SWIFt)	Bonham M.; Banks S.; Clarke A.; Coates A.; Davis C.; Davis R.; Dorrian J.; Huggins C.; Kellow N.; Leung G.; Phoi Y.Y.; Rogers M.; Sletten T.	2023	Current Developments in Nutrition	7	Supplement 1	https://dx.doi.org/10.1016/j.cdnut.2023.100722
Dietary Protein Supplementation During Time Restricted Feeding Does Not Affect Body Composition or Sleep, but Improves Mood, in Adults With Overweight or Obesity	Boudrey S.; Hawley A.; Bowie R.; Romana C.; Thomas A.-M.; Komp M.; Baum J.	2023	Current Developments in Nutrition	7	Supplement 1	https://dx.doi.org/10.1016/j.cdnut.2023.100621
Intermittent fasting versus calorie restriction on blood pressure and the renin-angiotensin-aldosterone system: A secondary analysis of a randomised controlled trial in adults at elevated risk of developing type 2 diabetes	Charrouf R.; Liu K.; Teong X.T.; Hutchison A.; Leonie H.	2022	Obesity Reviews	23	Supplement 2	https://dx.doi.org/10.1111/obr.13503
Changes in Body Weight and Glucoregulatory Markers by Eight-Hour Time-Restricted Eating vs. Daily Calorie Restriction: A 6-Month Randomized Controlled Trial	Cienfuegos S.; Lin S.; Gabel K.; McStay M.; Mulas A.; Varady K.	2022	Diabetes	71	Supplement 1	https://dx.doi.org/10.2337/db22-547-P
Alternate-Day Fasting Combined with Endurance Exercise for the Treatment of Fatty Liver Disease	Ezpeleta M.; Gabel K.; Varady K.; Lin S.; Cienfuegos S.	2022	Diabetes	71	Supplement 1	https://dx.doi.org/10.2337/db22-121-OR
Alternate Day Fasting Combined With Endurance Exercise for the Treatment of Fatty Liver Disease	Ezpeleta M.; Gabel K.; Cienfuegos S.; Lin S.; Kalam F.; Varady K.; Pavlou V.	2022	Obesity	30	Supplement 1	https://dx.doi.org/10.1002/oby.23626
Randomized clinical trial of intermittent calorie restriction in people with Multiple Sclerosis: effects on immunometabolic and cognitive measures	Ghezzi L.; Tosti V.; Cantoni C.; Salter A.; Lancia S.; Shi L.; Don A.; Zhou Y.; Obert K.; Mikesell R.; Sen M.; Cross A.; Naismith R.; Piccio L.	2023	Multiple Sclerosis Journal	29	3 Supplement	https://dx.doi.org/10.1177/13524585238523
Fasting Leads to Disease Activity Suppression and Sustained Weight Loss in Rheumatoid Arthritis	Hansen B.; Aho V.T.E.; Frachet-Bour A.; Habier J.; Hanslian E.; Hartmann A.; Koppold D.; Laczny C.C.; Michalsen A.; Mollenhauer B.; Ostaszewski M.; Roomp K.; Schade S.; Schneider J.; Steckhan N.; Wilmes P.	2023	Current Developments in Nutrition	7	Supplement 1	https://dx.doi.org/10.1016/j.cdnut.2023.101470
Effects of Intermittent Compared With Continuous Energy Restriction on Blood Pressure Control in Overweight and Obese Patients With Hypertension	He C.-J.; Fei Y.-P.; Zhu C.-Y.; Yao M.; Qian G.; Hu H.-L.; Zhai C.-L.	2021	Frontiers in Cardiovascular Medicine	8	(He, Fei, Qian, Hu, Zhai) Department of Cardiology, The First Hospital of Jiaxing, The Affiliated Hospital of Jiaxing University, Jiaxing, China(Zhu, Yao) Department of Anesthesiology, The First Hospital of Jiaxing, The Affiliated Hospital of Jiaxing Univ	https://dx.doi.org/10.3389/fcvm.2021.750714
The Fasting and Shifted Timing (FAST) of Eating Study: a pilot feasibility randomized crossover intervention assessing the acceptability of three different fasting diet approaches	Turner-McGrievy GM; Wirth MD; Bernhart JA; Aydin H	2022		176		https://doi.org/10.1016/j.appet.2022.106135
5 days of time-restricted feeding increases fat oxidation rate but not affect postprandial lipemia: a crossover trial	Chiu CH; Chen CH; Wu MH; Lan PT; Hsieh YC; Lin ZY; Chen BW	2022		12	1	https://doi.org/10.1038/s41598-022-13387-8
Effects of intermittent fasting compared to daily calorie restriction on intermediary metabolism in humans	Liu K.; Teong X.T.; Vincent A.D.; Wittert G.A.; Liu B.; Larance M.; Hutchison A.T.; Heilbronn L.K.	2022	Obesity Reviews	23	Supplement 2	https://dx.doi.org/10.1111/obr.13502
Changes in Eating Frequency but Not in Food Quality During Time Restricted Eating: Analysis from the See Food Study	Malaeb S.; Harindhanavudhi T.; Katrina D.; Esch N.; Emily M.; Panda S.; Mashek D.; Qi W.; Chow L.S.	2020	Journal of the Endocrine Society	4	Supplement 1	https://dx.doi.org/10.1210/jendso/bvaa046.906
Effects of 6-weeks of Time-Restricted Feeding in Normal Weight Middle-Aged and Older Adults	Nagy E.E.; Rossman M.J.; Mazzo M.R.; Denman B.A.; Jankowski L.R.; Richey J.J.; Johnson S.A.; Wang Y.; Peterson C.M.; Chonchol M.B.; Seals D.R.; Martens C.R.	2019	FASEB Journal	33	SUPPL 1	https://dx.doi.org/10.1096/fasebj.2019.33.1_supplement.590.2
Randomized clinical trial of intermittent energy restriction in people with multiple sclerosis	Tosti V; Ghezzi L; Rahmani F; Cantoni C; Salter A; Lancia S; Cross A; Naismith R; Zhou Y; Obert K; Mikesell R; Raji C; Piccio L	2022		28	3	https://doi.org/10.1177/13524585221123687
Effect of 8-Hour Time Restricted Eating Versus Daily Calorie Restriction on Body Weight and Glycemic Control in Adults With Type 2 Diabetes	Pavlou V.; Cienfuegos S.; Ezpeleta M.; Mulas A.; Varady K.; Lin S.	2023	Current Developments in Nutrition	7	Supplement 1	https://dx.doi.org/10.1016/j.cdnut.2023.101560

Title	Authors	Published Year	Journal	Volume	Issue	DOI
A Six-Month Periodic Fasting Reduces Microalbuminuria and Improves Metabolic Control in Patients with Type 2 Diabetes and Diabetic Nephropathy: A Randomized Controlled Study	Sulaj A.; Kopf S.; Rauchhaupt E.V.; Kliemank E.; Brune M.; Kender Z.; Bartl H.; Garcia-Cortizo F.; Klepac K.; Han Z.; Kumar V.; Longo V.; Teleman A.; Okun J.G.; Morgenstern J.; Fleming T.H.; Szendroedi J.M.; Herzig S.	2022	Diabetes	71	Supplement 1	https://dx.doi.org/10.2337/db22-389-P
Intermittent fasting has short-term effects on albuminuria, AGE formation and acylcarnitines in patients with type 2 diabetes	Sulaj A.; Kopf S.; Fleming T.; Teleman A.; Okun J.; Szendroedi J.; Herzig S.; Nawroth P.	2021	Diabetologia	64	Supplement 1	https://dx.doi.org/10.1007/s00125-021-05519-y
A randomized controlled trial to compare early intermittent fasting versus calorie restriction on glycemic control in adults at increased risk of developing type 2 diabetes	Teong X.T.; Liu K.; Vincent A.; Liu B.; Zhao L.; Feinle-Bisset C.; Wittert G.; Hutchison A.; Heilbronn L.	2022	Obesity Reviews	23	Supplement 2	https://dx.doi.org/10.1111/obr.13502
EFFECT OF INTERMITTENT FASTING IN OVERWEIGHT FEMALES ON WEIGHT LOSS AND METABOLIC BIOMARKERS	Tivya S.; Mustafa N.; Manaf Z.A.; Amiliyaton M.R.	2021	Journal of the ASEAN Federation of Endocrine Societies	36	(Tivya, Mustafa, Amiliyaton) Endocrine Unit, Universiti Kebangsaan Malaysia Medical Centre, Kuala Lumpur, Malaysia(Manaf) Dietetic Unit, Faculty of Health Sciences, National University of Malaysia, Kuala Lumpur, Malaysia	https://dx.doi.org/10.15605/jafes.036.S17
Randomized Clinical Trial of Intermittent Calorie Restriction in People with Multiple Sclerosis: Eects on Immunometabolic and Cognitive Measures	Tolentino M.; Ghezzi L.; Tosti V.; Cantoni C.; Salter A.; Lancia S.; Zhou Y.; Obert K.; Mikesell R.; Sen M.K.; Cross A.; Naismith R.; Piccio L.	2023	Journal of Immunology	210	1 Supplement	https://dx.doi.org/10.4049/jimmunol.210.Supp.165.05
Randomized clinical trial of intermittent energy restriction in people with multiple sclerosis	Tosti V.; Ghezzi L.; Rahmani F.; Cantoni C.; Salter A.; Lancia S.; Cross A.; Naismith R.; Zhou Y.; Obert K.; Mikesell R.; Raji C.; Piccio L.	2022	Multiple Sclerosis Journal	28	3 Supplement	https://dx.doi.org/10.1177/13524585221123687
Efficacy and Safety of Intermittent Fasting in People With Insulin-Treated Type 2 Diabetes (INTERFAST-2)—A Randomized Controlled Trial	Obermayer A; Tripolt NJ; Pferschy PN; Kojzar H; Aziz F; Muller A; Schauer M; Oulhaj A; Aberer F; Sourij C; Habisch H; Madl T; Pieber T; Obermayer-Pietsch B; Stadlbauer V; Sourij H	2023		46	2	https://doi.org/10.2337/dc22-1622
Cardiometabolic effects of early v. delayed time-restricted eating plus energetic restriction in adults with overweight and obesity: an exploratory randomised clinical trial	Queiroz JDN; MacEdo RCO; Dos Santos GC; Munhoz SV; MacHado CLF; De Menezes RL; Menzem EN; Moritz CEJ; Pinto RS; Tinsley GM; De Oliveira AR	2023		129	4	https://doi.org/10.1017/S0007114522001581
8-Hour Time Restricted Eating Plus Exercise on Body Composition in Older Adults With Obesity	Gabel K; Ezpeleta M; Cienfuegos S; Lin S; Cruz C; Varady K	2022		30		https://doi.org/10.1002/oby.23625
Effect of time-restricted feeding on body composition and cardio-metabolic risk in middle-aged women in Taiwan	Lin YJ; Wang YT; Chan LC; Chu NF	2022		93		https://doi.org/10.1016/j.nut.2021.111504
Randomized controlled trial for time-restricted eating in healthy volunteers without obesity	Xie Z; Sun Y; Ye Y; Hu D; Zhang H; He Z; Zhao H; Yang H; Mao Y	2022		13	1	https://doi.org/10.1038/s41467-022-28662-5
Effects of intermittent (5: 2) or continuous energy restriction on basal and postprandial metabolism: a randomised study in normal-weight, young participants	Gao Y; Tsintzas K; Macdonald IA; Cordon SM; Taylor MA	2022		76	1	https://doi.org/10.1038/s41430-021-00909-2
Impact of Intermittent Fasting on Lipid Profile-A Quasi-Randomized Clinical Trial.	Ahmed, Naseer; Farooq, Javeria; Siddiqi, Hasan Salman; Meo, Sultan Ayoub; Kulsoom, Bibi; Laghari, Abid H; Jamshed, Humaira; Pasha, Farooq	2020	Frontiers in nutrition	7	101642264	https://dx.doi.org/10.3389/fnut.2020.596787
The Effects of Time Restricted Feeding on Overweight, Older Adults: A Pilot Study.	Anton, Stephen D; Lee, Stephanie A; Donahoo, William T; McLaren, Christian; Manini, Todd; Leeuwenburgh, Christiaan; Pahor, Marco	2019	Nutrients	11	7	https://dx.doi.org/10.3390/nu11071500
The effect of alternate-day caloric restriction on the metabolic consequences of 8 days of bed rest in healthy lean men: a randomized trial.	Harder-Lauridsen, Nina Majlund; Nielsen, Signe Tellerup; Mann, Sebastian Porsdam; Lyngbaek, Mark Preben; Benatti, Fabiana Braga; Langkilde, Annika Reynberg; Law, Ian; Wedell-Neergaard, Anne-Sophie; Thomsen, Carsten; Moller, Kirsten; Karstoft, Kristian; Pedersen, Bente Klarlund; Krogh-Madsen, Rikke	2017	Journal of applied physiology (Bethesda, Md. : 1985)	122	2	https://dx.doi.org/10.1152/japplphysiol.00846.2016
Alternate-day fasting in nonobese subjects: effects on body weight, body composition, and energy metabolism.	Heilbronn, Leonie K; Smith, Steven R; Martin, Corby K; Anton, Stephen D; Ravussin, Eric	2005	The American journal of clinical nutrition	81	1	
Randomized cross-over trial of short-term water-only fasting: metabolic and cardiovascular consequences.	Horne, B D; Muhlestein, J B; Lappe, D L; May, H T; Carlquist, J F; Galenko, O; Brunisholz, K D; Anderson, J L	2013	Nutrition, metabolism, and cardiovascular diseases : NMCD	23	11	https://dx.doi.org/10.1016/j.numecd.2012.09.007
An Intermittent Fasting Mimicking Nutrition Bar Extends Physiologic Ketosis in Time Restricted Eating: A Randomized, Controlled, Parallel-Arm Study.	Huang, Angie W; Wei, Min; Caputo, Sara; Wilson, Melissa L; Antoun, Joseph; Hsu, William C	2021	Nutrients	13	5	https://dx.doi.org/10.3390/nu13051523
Ramadan Fasting Improves Body Composition without Exacerbating Depression in Males with Diagnosed Major Depressive Disorders.	Jahrami, Haitham; BaHammam, Ahmed S; Haji, Eman Ahmed; Bragazzi, Nicola L; Rakha, Ihab; Alsabbagh, Amani; Nugraha, Boya; Pasiakos, Stefan M	2021	Nutrients	13	8	https://dx.doi.org/10.3390/nu13082718
Early Time-Restricted Feeding Improves 24-Hour Glucose Levels and Affects Markers of the Circadian Clock, Aging, and Autophagy in Humans.	Jamshed, Humaira; Beyl, Robbie A; Della Manna, Deborah L; Yang, Eddy S; Ravussin, Eric; Peterson, Courtney M	2019	Nutrients	11	6	https://dx.doi.org/10.3390/nu11061234
Changes in subjective measures of appetite during 6 months of alternate day fasting with a low carbohydrate diet.	Kalam, Faiza; Gabel, Kelsey; Cienfuegos, Sofia; Wiseman, Eric; Ezpeleta, Mark; Pavlou, Vasiliki; Varady, Krista A	2021	Clinical nutrition ESPEN	41	101654592	https://dx.doi.org/10.1016/j.clnesp.2020.10.007
A nonrandomized controlled clinical pilot trial on 8 wk of intermittent fasting (24 h/wk).	Kessler, Christian S; Stange, Rainer; Schlenkermann, Maike; Jeitler, Michael; Michalsen, Andreas; Selle, Antonia; Raucci, Franca; Steckhan, Nico	2018	Nutrition (Burbank, Los Angeles County, Calif.)	46	beu, 8802712	https://dx.doi.org/10.1016/j.nut.2017.08.004

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Optimizing Chronic Pain Treatment with Enhanced Neuroplastic Responsiveness: A Pilot Randomized Controlled Trial.	Pratscher, Steven; Mickle, Angela M; Marks, John G; Rocha, Harold; Bartsch, Felix; Schmidt, Jeffrey; Tejera, Lazaro; Garcia, Steven; Custodero, Carlo; Jean, Federlin; Garvan, Cynthia; Johnson, Alisa J; Pop, Ralisa; Greene, Anthony; Woods, Adam J; Staud, Roland; Fillingim, Roger B; Keil, Andreas; Sibille, Kimberly T	2021	Nutrients	13	5	https://dx.doi.org/10.3390/nu13051556
Time-restricted eating for 12 weeks does not adversely alter bone turnover in overweight adults	Lobene, Andrea J.; Panda, Satchidananda; Manoogian, Emily N. C.; Mashek, Douglas G.; Chow, Lisa S.; Hill Gallant, Kathleen M.	2021	Nutrients	13	4	http://dx.doi.org/10.3390/nu13041155
Effect of intermittent compared with continuous energy restriction on glycaemic control in patients with type 2 diabetes	Carter, Sharayah; Clifton, Peter; Keogh, Jennifer	2019	Obesity Research and Clinical Practice	13	3	http://dx.doi.org/10.1016/j.orcp.2018.11.027
Intermittent compared to continuous energy restriction on weight loss and weight maintenance: effects after 12 months	Headland, Michelle; Clifton, Peter; Keogh, Jennifer	2019	Obesity Research and Clinical Practice	13	3	http://dx.doi.org/10.1016/j.orcp.2018.11.095
Calorie restriction diets and changes in the metabolome in people with multiple sclerosis	Fitzgerald, K.; Cassard, S.; Mowry, E.; Vizthum, D.; Henry Barron, B.; Baer, D.; Sullivan, P.	2017	Multiple Sclerosis Journal	23	3 Supplement 1	http://dx.doi.org/10.1177/1352458517731406
Intermittent Fasting vs. Continuous energy restriction: A pilot study in people with type 2 diabetes and overweight and obesity	Overland, Jane; Griffiths, Charmaine; Gauld, Amanda; Gibson, Alice; Franklin, Janet; Toth, Krisztina; Sainsbury, Amanda; Wong, Jencia	2017	Diabetes	66	Supplement 1	
A randomised controlled trial assessing the impact of intermittent energy restriction (IER) on weight loss and insulin sensitivity in healthy men and women with central obesity. "the Met-IER study"	Pinto, A.; Bordoli, C.; Buckner, L.; Kaplan, P.; Arenal, I.; Jefcock, E.; Kim, C.; Hall, W.; Johnston, K.	2017	Obesity Facts	10	Supplement 1	http://dx.doi.org/10.1159/000468958
A randomised controlled trial assessing the impact of intermittent vs continuous energy restriction on blood pressure and anthropometry in healthy subjects with central obesity. "the Met-IER study"	Pinto, A.; Bordoli, C.; Buckner, L.; Kaplan, P.; Arenal, I.; Jefcock, E.; Kim, C.; Hall, W.; Johnston, K.	2017	Obesity Facts	10	Supplement 1	http://dx.doi.org/10.1159/000468958
Alternate-day fasting	Varady, Krista	2016	Menopause	23	12	http://dx.doi.org/10.1097/GME.0000000000000783
Effect of intermittent versus continuous energy restriction on compensatory mechanisms activated during weight reduction	Coutinho, S.R.; Glsbakk, S.; Halset, E.H.; Kulseng, B.; Martins, C.; Truby, H.	2015	Obesity Facts	8	SUPPL. 1	http://dx.doi.org/10.1159/000382140
Alternateday fasting and daily calorie restriction similarly affect visceral adiposity and circulating inflammatory cytokine concentrations	Trepanowski, John; Kroeger, Cynthia; Barnosky, Adrienne; Hoddy, Kristin; Varady, Krista	2015	FASEB Journal	29	1 Meeting Abstracts	
Effect of 1 year of alternate day fasting versus daily calorie restriction on type 2 diabetes risk	Kroeger, Cynthia; Trapanowski, John; Barnosky, Adrienne; Klempel, Monica; Varady, Krista	2015	FASEB Journal	29	1 Meeting Abstracts	
Effects of intermittent compared to continuous energy restriction on weight loss and diet quality after one year	Pedersen, E.; Jennifer B Keogh, J.; Kristina Petersen, K.; Peter, M.; Clifton, P.	2014	Obesity Reviews	15	SUPPL. 2	http://dx.doi.org/10.1111/obr.12151
Intermittent energy restriction improves weight loss efficiency in obese men	Byrne, N.; King, N.; Sainsbury, A.; Wood, R.; Hills, A.	2014	Obesity Reviews	15	SUPPL. 2	http://dx.doi.org/10.1111/obr.12148
Alternateday fasting versus daily calorie restriction for weight loss and cardio-protection	Trepanowski, John; Kroeger, Cynthia; Klempel, Monica; Calvo, Yolian; Varady, Krista	2014	FASEB Journal	28	1 SUPPL. 1	
Alternate day fasting with or without exercise: Effects on endothelial function and adipokines in obese humans	Bhutani, Surabhi; Klempel, Monica C.; Kroeger, Cynthia M.; Trepanowski, J.F.; Varady, Krista A.; Phillips, Shane A.; Norkeviciute, Edita	2013	e-SPEN Journal	8	5	http://dx.doi.org/10.1016/j.clnme.2013.07.005
Alternate day fasting when combined with endurance exercise reduces leptin but not adiponectin and resistin	Bhutani, S.; Klempel, M.C.; Kroeger, C.M.; Varady, K.A.	2013	Journal of Investigative Medicine	61	4	
Short- and long-term effects of continuous versus intermittent restrictive diet approaches on body composition and the metabolic profile in overweight and obese postmenopausal women: A pilot study		2012	Menopause	19	8	http://dx.doi.org/10.1097/gme.0b013e318250a287
Intermittent dietary carbohydrate restriction enables weight loss and reduces breast cancer risk biomarkers	Harvie, M.; Wright, C.; Pegington, M.; Mitchell, E.; Evans, D.G.; Jebb, S.; Clarke, R.; Goodacre, R.; Dunn, W.; Mattson, M.; Howell, A.	2011	Cancer Research	71	24 SUPPL. 3	http://dx.doi.org/10.1158/0008-5472.SABCS11-P3-09-02
Effect of intermittent versus continuous energy restriction on weight loss and breast cancer risk biomarkers	Harvie, M.; Pegington, M.; Howell, A.; Cuzick, J.; Frystyk, J.; Flyvbjerg, A.; Jebb, S.; Mattson, M.	2010	Breast Cancer Research	12	SUPPL. 1	http://dx.doi.org/10.1186/bcr2525
The effect of intermittent versus continuous energy restriction on biomarkers of breast cancer risk	Harvie, M.; Chapman, M.; Howell, A.; Cuzick, J.; Flyvbjerg, A.; Jebb, S.; Mattson, M.	2009	Cancer Research	69	2 Suppl. S	http://dx.doi.org/10.1158/0008-5472.SABCS-506
Intermittent and continuous energy restriction result in similar weight loss, weight loss maintenance, and body composition changes in a 6 month randomized pilot study	Steger FL, Donnelly JE, Hull HR, Li X, Hu J, Sullivan DK	2020				
MATCHED WEIGHT LOSS THROUGH INTERMITTENT OR CONTINUOUS ENERGY RESTRICTION DOES NOT RESULT IN COMPENSATORY ADAPTATIONS IN APPETITE: a PROOF OF CONCEPT RCT		2019	MATCHED WEIGHT LOSS THROUGH INTERMITTENT OR CONTINUOUS ENERGY RESTRICTION DOES NOT RESULT IN COMPENSATORY ADAPTATIONS IN APPETITE: a PROOF OF CONCEPT RCT	38		
Dietary adherence and macronutrient intake during 12 months of alternate day fasting	Varady KA, Gabel K	2017		31	1	
Effects of intermittent versus continuous energy restriction for weight loss on diet quality and eating behavior. A randomized trial	Sundfor TM, Tonstad S, Svendsen M	2018				
Effect of intermittent compared to continuous energy restriction on weight loss and weight maintenance after 12 months in healthy overweight or obese adults	Headland ML, Clifton PM, Keogh JB	2018		(no pagination)		
Effect of intermittent versus continuous energy restriction on weight loss, maintenance and cardiometabolic risk: a randomized 1-year trial	Sundfor TM, Svendsen M, Tonstad S	2018		(no pagination)		
243 Interim Results of the MANGO Trial: Modified Intermittent Fasting in Psoriasis	Grine, L. Hilhorst, N. T. Michels, N. Abbeddou, S. De Henauw, S. Lambert, J.	2021	Journal of Investigative Dermatology	141	10 Supplement	https://dx.doi.org/10.1016/j.jid.2021.08.248

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Intermittent fasting and increased galectin-3 reveal a potential protective mechanism against risk of heart failure and type 2 diabetes	Horne, B. D. Anderson, J. L. May, H. T. Le, V. T. Galenko, O. Drakos, S. G. Bair, T. L. Knowlton, K. U. Muhlestein, J. B.	2021	Circulation	144	SUPPL 1	https://dx.doi.org/10.1161/circ.144.suppl_1.10312
Intermittent fasting interacts with red cell distribution width to differentially improve cardiometabolic health	Horne, B. D. Muhlestein, J. B. May, H. T. Le, V. T. Bair, T. L. Knowlton, K. U. Anderson, J. L.	2021	Circulation	144	SUPPL 1	https://dx.doi.org/10.1161/circ.144.suppl_1.10330
Effects of christian orthodox fasting versus time‐restricted eating on plasma irisin concentrations among overweight metabolically healthy individuals	Karras, S. N. Koufakis, T. Adamidou, L. Dimakopoulos, G. Karalazou, P. Thisiadou, K. Makedou, K. Kotsa, K.	2021	Nutrients	13	4	https://doi.org/10.3390/nu13041071
Differential Effects of One Meal per Day in the Evening on Metabolic Health and Physical Performance in Lean Individuals	Meessen, E. C. E. Andresen, H. van Barneveld, T. van Riel, A. Johansen, E. I. Kolnes, A. J. Kemper, E. M. Olde Damink, S. W. M. Schaap, F. G. Romijn, J. A. Jensen, J. Soeters, M. R.	2021	Frontiers in physiology	12		https://dx.doi.org/10.3389/fphys.2021.771944
Effects of intermittent (5:2) or continuous energy restriction on basal and postprandial metabolism: a randomised study in normal-weight, young participants	Gao, Yangfan Tsintzas, Kostas Macdonald, Ian A. Cordon, Sally M. Taylor, Moira A.	2022	European journal of clinical nutrition	76	1	https://dx.doi.org/10.1038/s41430-021-00909-2
The rationale and design of a Mediterranean diet accompanied by time restricted feeding to optimise the management of type 2 diabetes: The MedDietFast randomised controlled trial	Papamichou, Dimitra Panagiotakos, Demosthenes B. Holmes, Elaine Koutsakis, Polychronis Katsoulotos, Hariklia Loo, Ruey L. Itsiopoulos, Catherine	2022	Nutrition, metabolism, and cardiovascular diseases : NMCD	32	1	https://dx.doi.org/10.1016/j.numecd.2021.09.031
Effects of 8 wk of 16:8 Time-restricted Eating in Male Middle- and Long-Distance Runners	Brady, A. J.; Langton, H. M.; Mulligan, M.; Egan, B.	2021	Med Sci Sports Exerc	53	3	10.1249/MSS.0000000000002488
Adaptation of energy metabolism of overweight women to alternating and continuous low energy intake	de Groot, L. C.; van Es, A. J.; van Raaij, J. M.; Vogt, J. E.; Hautvast, J. G.	1989	Am J Clin Nutr	50	6	10.1093/ajcn/50.6.1314
Time-restricted feeding influences immune responses without compromising muscle performance in older men	Gasmi, M.; Sellami, M.; Denham, J.; Padulo, J.; Kuvacic, G.; Selmi, W.; Khalifa, R.	2018	Nutrition	51-52		10.1016/j.nut.2017.12.014
Eating two larger meals a day (breakfast and lunch) is more effective than six smaller meals in a reduced-energy regimen for patients with type 2 diabetes: a randomised crossover study	Kahleova, H.; Belinova, L.; Malinska, H.; Oliyarnyk, O.; Trnovska, J.; Skop, V.; Kazdova, L.; Dezortova, M.; Hajek, M.; Tura, A.; Hill, M.; Pelikanova, T.	2014	Diabetologia	57	8	10.1007/s00125-014-3253-5
Efficacy of fasting calorie restriction on quality of life among aging men	Teng, N. I.; Shahar, S.; Manaf, Z. A.; Das, S. K.; Taha, C. S.; Ngah, W. Z.	2011	Physiol Behav	104	5	10.1016/j.physbeh.2011.07.007
Effects of a very low calorie diet on weight, thyroid hormones and mood	Wadden, T. A.; Mason, G.; Foster, G. D.; Stunkard, A. J.; Prange, A. J.	1990	Int J Obes	14	3	
The effect of short periods of caloric restriction on weight loss and glycemic control in type 2 diabetes	Williams, K. V.; Mullen, M. L.; Kelley, D. E.; Wing, R. R.	1998	Diabetes Care	21	1	10.2337/diacare.21.1.2
Year-long weight loss treatment for obese patients with type II diabetes: does including an intermittent very-low-calorie diet improve outcome?	Wing, R. R.; Blair, E.; Marcus, M.; Epstein, L. H.; Harvey, J.	1994	Am J Med	97	4	10.1016/0002-9343(94)90302-6
Impact of Ramadan Diurnal Intermittent Fasting on Hypoglycemic Events in Patients With Type 2 Diabetes: A Systematic Review of Randomized Controlled Trials and Observational Studies	Abdelrahim, Dana Faris, MoezAlIslam E. Shakir, Ayman Z. Yusuf, Ayesha M. Hassanein, Mohamed Almeneessier, Aljohara S. BaHammam, Ahmed S.	2021	Frontiers in Endocrinology	12		http://dx.doi.org/10.3389/fendo.2021.624423
Intermittent fasting for the prevention of cardiovascular disease	Allaf, Mohammed Elghazaly, Hussein Mohamed, Omer G. Fareen, Mohamed Firas Khan Zaman, Sadia Salmasi, Abdul-Majeed Tsilidis, Kostas Dehghan, Abbas	2021	The Cochrane database of systematic reviews	1		https://dx.doi.org/10.1002/14651858.CD013496.pub2
The effect of intermittent fasting and exercise on some physiological parameters	Berk, Y. Unver, S. Avlayan, H.	2021	Pakistan Journal of Medical and Health Sciences	15	9	http://dx.doi.org/10.53350/pjmhs211592793
Watching, keeping and squeezing time to lose weight: Implications of time-restricted eating in daily life	Bjerre, N. Holm, L. Quist, J. S. Faerch, K. Hempler, N. F.	2021	Appetite	161		http://dx.doi.org/10.1016/j.appet.2021.105138
Exerciser identity and device-measured physical activity in a behavioral weight loss trial	Caldwell, A. Grau, L. Ostendorf, D. Catenacci, V.	2021	Obesity	29	SUPPL 2	https://dx.doi.org/10.1002/oby.23328
Prevalence, etiology and management of gastroesophageal reflux disease among adult females in Hail Region, Saudi Arabia	Fatima, S. B. Mutlaq, S. Alhejji, R. J. S. Alkamali, R. N. S. Almalaq, O. A.	2021	Endocrine Practice	27	12 SUPPL	https://dx.doi.org/10.1016/j.eprac.2021.11.025
Exerciser identity and device-measured physical activity in a behavioral weight loss trial	Caldwell, A. Grau, L. Ostendorf, D. Catenacci, V.	2021	Obesity	29	SUPPL 2	https://dx.doi.org/10.1002/oby.23328
Prevalence, etiology and management of gastroesophageal reflux disease among adult females in Hail Region, Saudi Arabia	Fatima, S. B. Mutlaq, S. Alhejji, R. J. S. Alkamali, R. N. S. Almalaq, O. A.	2021	Endocrine Practice	27	12 SUPPL	https://dx.doi.org/10.1016/j.eprac.2021.11.025
Improvements in physical activity and some dietary behaviors in a community health worker-led diabetes self-management intervention for adults with low incomes: Results from a randomized controlled trial	Gray, K. E. Hoerster, K. D. Taylor, L. Krieger, J. Nelson, K. M.	2021	Translational behavioral medicine	11	12	https://dx.doi.org/10.1093/tbm/ibab113
243 Interim Results of the MANGO Trial: Modified Intermittent Fasting in Psoriasis	Grine, L. Hilhorst, N. T. Michels, N. Abbeddou, S. De Henauw, S. Lambert, J.	2021	Journal of Investigative Dermatology	141	10 Supplement	https://dx.doi.org/10.1016/j.jid.2021.08.248
Periodic fasting prevents fat penalties in females	Heilbronn, L. K.	2021	Nature Metabolism	3	10	http://dx.doi.org/10.1038/s42255-021-00472-x
Novel dietary interventions for adolescents with obesity: A narrative review	Hoare, J. K. Jebeile, H. Garnett, S. P. Lister, N. B.	2021	Pediatric Obesity	16	9	http://dx.doi.org/10.1111/ijpo.12798
SGLT2 Inhibitors as Calorie Restriction Mimetics: Insights on Longevity Pathways and Age-Related Diseases	Hoong, C. W. S. Chua, M. W. J.	2021	Endocrinology (United States)	162	8	http://dx.doi.org/10.1210/endocr/bqab079
The effects of a macronutrient-based diet and time-restricted feeding (16:8) on body composition in physically active individuals-a 14-week randomised controlled trial	Isenmann, E. Dissemond, J. Geisler, S.	2021	Nutrients	13	9	http://dx.doi.org/10.3390/nu13093122
Time-restricted eating and concurrent exercise training reduces fat mass and increases lean mass in overweight and obese adults	Kotarsky, C. J. Johnson, N. R. Mahoney, S. J. Mitchell, S. L. Schimek, R. L. Stastny, S. N. Hackney, K. J.	2021	Physiological reports	9	10	http://dx.doi.org/10.14814/phy2.14868
Intermittent fasting and sleep: A review of human trials	McStay, M. Gabel, K. Cienfuegos, S. Ezpeleta, M. Lin, S. Varady, K. A.	2021	Nutrients	13	10	http://dx.doi.org/10.3390/nu13103489
Differential Effects of One Meal per Day in the Evening on Metabolic Health and Physical Performance in Lean Individuals	Meessen, E. C. E. Andresen, H. van Barneveld, T. van Riel, A. Johansen, E. I. Kolnes, A. J. Kemper, E. M. Olde Damink, S. W. M. Schaap, F. G. Romijn, J. A. Jensen, J. Soeters, M. R.	2021	Frontiers in physiology	12		https://dx.doi.org/10.3389/fphys.2021.771944

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Food as medicine	Michalsen, A.	2021	Complementary Medicine Research	28	SUPPL 1	https://dx.doi.org/10.1159/000514476
Isolated and combined effects of high-intensity interval training and time-restricted eating on glycaemic control in reproductive-aged women with overweight or obesity: Study protocol for a four-armed randomised controlled trial	Moholdt, T. Silva, C. P. Lydersen, S. Hawley, J. A.	2021	BMJ Open	11	2	https://dx.doi.org/10.1136/bmjopen-2020-040020
Intermittent fasting and the possible benefits in obesity, diabetes, and multiple sclerosis: A systematic review of randomized clinical trials	Morales-Suarez-varela, M. Sanchez, E. C. Peraita-Costa, I. Llopis-Morales, A. Soriano, J. M.	2021	Nutrients	13	9	http://dx.doi.org/10.3390/nu13093179
Machine Learning-based Meal Detection Using Continuous Glucose Monitoring on Healthy Participants: An Objective Measure of Participant Compliance to Protocol	Palacios, Victor Woodbridge, Diane Myung-Kyung Fry, Jean L.	2021	Annual International Conference of the IEEE Engineering in Medicine and Biology Society. IEEE Engineering in Medicine and Biology Society. Annual International Conference	2021		https://dx.doi.org/10.1109/EMBC46164.2021.9630408
Intermittent Fasting and Obesity-Related Health Outcomes: An Umbrella Review of Meta-analyses of Randomized Clinical Trials	Patikorn, C. Roubal, K. Veettil, S. K. Chandran, V. Pham, T. Lee, Y. Y. Giovannucci, E. L. Varady, K. A. Chaiyakunapruk, N.	2021	JAMA network open	4	12	https://dx.doi.org/10.1001/jamanetworkopen.2021.39558
Effects of Periodic Religious Fasting for Decades on Nutrient Intakes and the Blood Biochemical Profile	Petridou, Anatoli Rodopaios, Nikolaos E. Mougios, Vassilis Koulouri, Alexandra-Aikaterini Vasara, Eleni Papadopoulou, Sousana K. Skepastianos, Petros Hassapidou, Maria Kafatos, Anthony	2021	Nutrients	13	11	https://dx.doi.org/10.3390/nu13113963
Optimizing chronic pain treatment with enhanced neuroplastic responsiveness: A pilot randomized controlled trial	Pratscher, S. Mickle, A. M. Marks, J. G. Rocha, H. Bartsch, F. Schmidt, J. Tejera, L. Garcia, S. Custodero, C. Jean, F. Garvan, C. Johnson, A. J. Pop, R. Greene, A. Woods, A. J. Staud, R. Fillingim, R. B. Keil, A. Sibille, K. T.	2021	Nutrients	13	5	http://dx.doi.org/10.3390/nu13051556
Effect of early time-restricted feeding on the metabolic profile of adults with excess weight: A systematic review with meta-analysis	Pureza, I. R. D. O. M. Macena, M. D. L. da Silva Junior, A. E. Praxedes, D. R. S. Vasconcelos, L. G. L. Bueno, N. B.	2021	Clinical Nutrition	40	4	http://dx.doi.org/10.1016/j.clnu.2020.10.031
Intermittent Fasting: A User-Friendly Method for Type 2 Diabetes Mellitus	Saeed, Mahreen Ali, Moeez Zehra, Tehreem Haider Zaidi, Saiyed Ali Tariq, Rihab	2021	Cureus	13	11	https://dx.doi.org/10.7759/cureus.19348
The Gut Microbiota during a Behavioral Weight Loss Intervention	Stanislawski, Maggie A. Frank, Daniel N. Borengasser, Sarah J. Ostendorf, Danielle M. Ir, Diana Jambal, Purevsuren Bing, Kristen Wayland, Liza Siebert, Janet C. Bessesen, Daniel H. MacLean, Paul S. Melanson, Edward L. Catenacci, Victoria A.	2021	Nutrients	13	9	https://dx.doi.org/10.3390/nu13093248
A six-month periodic fasting reduces microalbuminuria and improves metabolic control in patients with type 2 diabetes and diabetic nephropathy: A randomized controlled study	Sulaj, A. Kopf, S. von Rauchhaupt, E. Kliemank, E. Brune, M. Kender, Z. Bartl, H. Cortizo, F. G. Klepac, K. Han, Z. Kumar, V. Longo, V. Teleman, A. Okun, J. G. Morgenstern, J. Fleming, T. Szendroedi, J. Herzig, S. Nawroth, P. P.	2021	medRxiv			https://dx.doi.org/10.1101/2021.12.01.21266958
Time-limited eating and continuous glucose monitoring in adolescents with obesity: A pilot study	Vidmar, A. P. Naguib, M. Raymond, J. K. Salvy, S. J. Hegedus, E. Wee, C. P. Goran, M. I.	2021	Nutrients	13	11	https://dx.doi.org/10.3390/nu13113697
Nutrition Concepts for the Treatment of Obesity in Adults	Wiechert, Meike Holzapfel, Christina	2021	Nutrients	14	1	https://dx.doi.org/10.3390/nu14010169
The comparison of the effects between continuous and intermittent energy restriction in short-term bodyweight loss for sedentary population: A randomized, double-blind, controlled trial	Xu, M. Li, J. Zou, Y. Xu, Y.	2021	International Journal of Environmental Research and Public Health	18	21	https://dx.doi.org/10.3390/ijerph182111645
Management of Paediatric Fatty Liver Disease by Intermittent Fasting - a Pilot study	Acharyya, B. C. Mukhopadhyay, M. Acharyya, S.	2022	Journal of Clinical and Experimental Hepatology	12	Supplement 1	https://dx.doi.org/10.1016/j.jceh.2021.10.069
Practical, Evidence-Based Approaches to Nutritional Modifications to Reduce Atherosclerotic Cardiovascular Disease: An American Society For Preventive Cardiology Clinical Practice Statement	Belardo, Danielle Michos, Erin D. Blankstein, Ron Blumenthal, Roger S. Ferdinand, Keith C. Hall, Kevin Klatt, Kevin Natajaran, Pradeep Ostfeld, Robert J. Reddy, Koushik Rodriguez, Renee Sriram, Urshila Tobias, Deirdre K. Gulati, Martha	2022	American journal of preventive cardiology	10		https://dx.doi.org/10.1016/j.ajpc.2022.100323
Intermittent Fasting in Weight Loss and Cardiometabolic Risk Reduction: A Randomized Controlled Trial	Chair, Sek Ying Cai, Hua Cao, Xi Qin, Yuelan Cheng, Ho Yu Ng, Michael Timothy	2022	The journal of nursing research : JNR	30	1	https://dx.doi.org/10.1097/jnr.0000000000000469
The effect of 4-h versus 6-h time restricted feeding on sleep quality, duration, insomnia severity and obstructive sleep apnea in adults with obesity	Cienfuegos, Sofia Gabel, Kelsey Kalam, Faiza Ezpeleta, Mark Pavlou, Vicky Lin, Shuhao Wiseman, Eric Varady, Krista A.	2022	Nutrition and health	28	1	https://dx.doi.org/10.1177/02601060211002347
Intermittent fasting & performance: The iFast clinical trial protocol	El-Outa, A. Ghandour, L. Hamade, H. Borgi, C. Fares, E. J. Gherbal, T. Mufarrij, A.	2022	Contemporary Clinical Trials Communications	25		https://dx.doi.org/10.1016/j.conctc.2021.100766
Association of prolonged nightly fasting with cardiovascular, renal, inflammation, and nutritional status biomarkers in community-dwelling older adults	Estrada-deLeon, Daniela B. Struijk, Ellen A. Caballero, Francisco Felix Ortola, Rosario Guallar-Castillon, Pilar Banegas, Jose R. Rodriguez-Artalejo, Fernando Lopez-Garcia, Esther	2022	The American journal of clinical nutrition			https://dx.doi.org/10.1093/ajcn/nqac021
Intermittent calorie restriction alters T cell subsets and metabolic markers in people with multiple sclerosis	Fitzgerald, K. C. Bhargava, P. Smith, M. D. Vizthum, D. Henry-Barron, B. Kornberg, M. D. Cassard, S. D. Kapogiannis, D. Sullivan, P. Baer, D. J. Calabresi, P. A. Mowry, E. M.	2022	medRxiv			https://dx.doi.org/10.1101/2022.01.11.22269094
Effects of intermittent (5:2) or continuous energy restriction on basal and postprandial metabolism: a randomised study in normal-weight, young participants	Gao, Yangfan Tsintzas, Kostas Macdonald, Ian A. Cordon, Sally M. Taylor, Moira A.	2022	European journal of clinical nutrition	76	1	https://dx.doi.org/10.1038/s41430-021-00909-2
Chrononutrition in Cardiometabolic Health	Katsi, Vasiliki Papakonstantinou, Ilias P. Soulaidopoulos, Stergios Katsiki, Niki Tsioufis, Konstantinos	2022	Journal of clinical medicine	11	2	https://dx.doi.org/10.3390/jcm11020296
Effect of time-restricted feeding on body composition and cardio-metabolic risk in middle-aged women in Taiwan	Lin, Yan-Ju Wang, Yun-Ting Chan, Lin-Chien Chu, Nain-Feng	2022	Nutrition (Burbank, Los Angeles County, Calif.)	93		https://dx.doi.org/10.1016/j.nut.2021.111504

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Antioxidant Potential, DNA Damage, Inflammation, Glycemic Control and Lipid Metabolism Alteration: A Mediation Analysis of Islamic Sunnah Intermittent Fasting on Cognitive Function among Older Adults with Mild Cognitive Impairment	Ooi, T. C. Meramat, A. Rajab, N. F. Shahar, S. Sharif, R.	2022	The journal of nutrition, health & aging	26	3	https://dx.doi.org/10.1007/s12603-022-1757-0
The rationale and design of a Mediterranean diet accompanied by time restricted feeding to optimise the management of type 2 diabetes: The MedDietFast randomised controlled trial	Papamichou, Dimitra Panagiotakos, Demosthenes B. Holmes, Elaine Koutsakis, Polychronis Katsoulotos, Hariklia Loo, Ruey L. Itsiopoulos, Catherine	2022	Nutrition, metabolism, and cardiovascular diseases : NMCD	32	1	https://dx.doi.org/10.1016/j.numecd.2021.09.031
Early Time-Restricted Feeding Amends Circadian Clock Function and Improves Metabolic Health in Male and Female Nile Grass Rats	Ramanathan, Chidambaram Johnson, Hayden Sharma, Suman Son, Wangkuk Puppa, Melissa Rohani, Saba Neyson Tipirneni-Sajja, Aaryani Bloomer, Richard J. van der Merwe, Marie	2022	Medicines (Basel, Switzerland)	9	2	https://dx.doi.org/10.3390/medicines9020015
Effect of different types of intermittent fasting on biochemical and anthropometric parameters among patients with metabolic-associated fatty liver disease (MAFLD)-A systematic review	Rozanski, G. Pheby, D. Newton, J. L. Murovska, M. Zalewski, P. Slomko, J.	2022	Nutrients	14	1	https://dx.doi.org/10.3390/nu14010091
A scoping review of intermittent fasting, chronobiology, and metabolism	Santos, H. O. Genario, R. Tinsley, G. M. Ribeiro, P. Carteri, R. B. Coelho-Ravagnani, C. F. Mota, J. F.	2022	The American journal of clinical nutrition	115	4	https://dx.doi.org/10.1093/ajcn/nqab433
Association of breakfast skipping with cardiovascular outcomes and cardiometabolic risk factors: an updated review of clinical evidence	Santos, Heitor O. Genario, Rafael Macedo, Rodrigo C. O. Pareek, Manan Tinsley, Grant M.	2022	Critical reviews in food science and nutrition	62	2	https://dx.doi.org/10.1080/10408398.2020.1819768
ShiftingWeight in Night ShiftWorkers: results From a 24 Week, Parallel, Multi-Site, Randomised Controlled Trial (SWIFt)	Bonham M; Banks S; Clarke A; Coates A; Davis C; Davis R; Dorrian J; Huggins C; Kellow N; Leung G; Phoi YY; Rogers M; Sletten T	2023		7		https://doi.org/10.1016/j.cdnut.2023.100722
Dietary Protein Supplementation During Time Restricted Feeding Does Not Affect Body Composition or Sleep, but Improves Mood, in Adults With Overweight or Obesity	Boudrey S; Hawley A; Bowie R; Romana C; Thomas A-M; Komp M; Baum J	2023		7		https://doi.org/10.1016/j.cdnut.2023.100621
Intermittent dietary carbohydrate restriction versus calorie restriction and cardiometabolic profiles: a randomized trial	Dou Y; Jiang Y; Chen X; Zhang Y; Wang Y; Chen H; He W; Yan W	2023		31	9	https://doi.org/10.1002/oby.23855
Nutritional Intervention-induced Weight Loss During the Oncological Treatment of Obesity-related Breast Cancer		2023	Evaluation of Changes in the Methylome and Prognosis of Obesity-related Breast Cancer After Nutritional Intervention-induced Weight Loss During the Oncological Treatment			
Prolonged fasting outperforms short-term fasting in terms of glucose tolerance and insulin release: a randomised controlled trial	Solianik R; Židoniene K; Eimantas N; Brazaitis M	2023		130	9	https://doi.org/10.1017/S0007114523000557
The acute effect of time-restricted feeding (12 & 16 hrs) and varying exercise intensities on fat-oxidation rate		2023				
Fasting-mimicking Diet and Periodontitis (FMD)		2023	The Effect of a Fast-mimicking Diet on Periodontal Clinical and Systemic Response to Non-surgical Treatment of Stage III-IV Periodontitis: a Multi-centre Randomised Controlled Trial With Internal Pilot			
A study on the effect of intermittent fasting in reducing the blood sugar level and number of medicines in type 2 diabetic patients		2023	Open label randomized controlled trial evaluating the effect of three months intermittent fasting on polypharmacy in patients with type II diabetes mellitus. - NIL			
Safety and efficacy of intermittent fasting and exercise in overweight people with type 2 diabetes – a randomized controlled trial		2023	Safety and efficacy of intermittent fasting and exercise in overweight people with type 2 diabetes – a randomized controlled trial - InterFast 3			
Intermittent fasting and sleep: A review of human trials	McStay, M. Gabel, K. Cienfuegos, S. Ezpeleta, M. Lin, S. Varady, K. A.	2021	Nutrients	13	10	http://dx.doi.org/10.3390/nu13103489
Differential Effects of One Meal per Day in the Evening on Metabolic Health and Physical Performance in Lean Individuals	Meessen, E. C. E. Andresen, H. van Barneveld, T. van Riel, A. Johansen, E. I. Kolnes, A. J. Kemper, E. M. Olde Damink, S. W. M. Schaap, F. G. Romijn, J. A. Jensen, J. Soeters, M. R.	2021	Frontiers in physiology	12		https://dx.doi.org/10.3389/fphys.2021.771944
Machine Learning-based Meal Detection Using Continuous Glucose Monitoring on Healthy Participants: An Objective Measure of Participant Compliance to Protocol	Palacios, Victor Woodbridge, Diane Myung-Kyung Fry, Jean L.	2021	Annual International Conference of the IEEE Engineering in Medicine and Biology Society. IEEE Engineering in Medicine and Biology Society. Annual International Conference	2021		https://dx.doi.org/10.1109/EMBC46164.2021.9630408
EFFECTS OF THE KETOGENIC DIET AND INTERMITTENT FASTING ON SYSTEMIC BLOOD PRESSURE AND VASCULAR REACTIVITY IN A COHORT OF WOMEN WITH OBESITY AND ARTERIAL HYPERTENSION (DIET-TO-HTN)	Pala B; Tifi P; Di Marzio S; Tocci G; Volpe M	2022		29	5	https://doi.org/10.1007/s40292-022-00541-6
5 days of time-restricted feeding increases fat oxidation rate but not affect postprandial lipemia: a crossover trial	Chiu CH; Chen CH; Wu MH; Lan PT; Hsieh YC; Lin ZY; Chen BW	2022		12	1	https://doi.org/10.1038/s41598-022-13387-8