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BMJ Open Psychological interventions for weight reduction and sustained weight reduction in adults with overweight and obesity: a scoping review

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ABSTRACT

Introduction Overweight and obesity are growing public health problems worldwide. Both diet and physical activity have been the primary interventions for weight reduction over the past decade. With increasing rates of overweight and obesity, it is evident that a primary focus on diet and exercise has not resulted in sustained obesity reduction within the global population. There is now a case to explore other weight management strategies such as psychological therapies. However, there is a dearth of literature that has mapped the types of psychological interventions and the characteristics of these interventions as a means of achieving weight reduction.

Objectives The key objectives focused on mapping the types and characteristics of psychological interventions versus usual care for weight reduction and sustained weight reduction in adults with overweight or obesity. The study followed the scoping review methodology by Arksey and O'Malley and was reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews guidelines.

Eligibility criteria Intervention studies were included if participants were 18 years and over, classified as overweight or obese (body mass index ≥ 25 kg/m²) and had received a psychological therapy intervention. Studies were excluded if they included a comparison with other active lifestyle interventions (unless classified as usual care), were not available in English, were not full-text articles or were non-peer-reviewed articles.

Sources of evidence Six electronic databases were searched from inception to April 2023 to identify relevant articles.

Charting methods The study employed a systematic charting method and narrative synthesis to organise and synthesise the data.

Results A total of 31 studies met the eligibility criteria and were included in the review. 13 unique psychological interventions for weight reduction in adults with overweight or obesity were identified, with cognitive-behavioural therapy and motivational interviewing being the most common. Eight types of usual care were identified, which largely included education and training on nutrition and physical activity. Gaps in the current research were also identified.

Conclusion The findings highlighted several gaps within the existing literature, largely due to a lack of evidence

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ The scoping review used a robust search strategy including six electronic databases and examined the reference lists of related studies to identify other relevant studies.
- ⇒ The scoping review has been codeveloped with a public advisor who has over 10 years experience living with obesity.
- ⇒ The scoping review provides a comprehensive overview of the types of psychological interventions for weight reduction and sustained weight reduction in adults with overweight or obesity.
- ⇒ The scoping review was limited to comparisons with other psychological interventions, usual care or no intervention and did not include a comparison with other active lifestyle interventions unless classified as usual care.

relating to adults with low socioeconomic status, non-white participants, individuals under 40 years of age and the integration of digital health technologies.

INTRODUCTION

Obesity is a growing public health problem worldwide.¹ Globally, the prevalence of obesity among the adult population (ie, individuals aged 18 and above) has risen to approximately 650 million.² A further 1.25 billion adults are estimated to be overweight, making up nearly 40% of the global population.³ This is an increasing concern given that excessive body weight is known to increase the risks of a wide variety of comorbidities (eg, cardiovascular disease, type 2 diabetes, cancer, hypertension and musculoskeletal disorders).^{4,5} Overweight and obesity are defined by a body mass index (BMI) of 25–29.9 kg/m² and 30 kg/m² or greater, respectively.² Both overweight and obesity have multifaceted aetiologies, with individual (eg, genetics, medical conditions, stress and lifestyle factors) and environmental factors

(eg, socioeconomic aspects and urbanisation) contributing to prevalence.^{1–6} Over the past two decades, although most interventions for weight reduction have focused on individual-level lifestyle modifications (eg, increasing physical activity), some have included surgery (bariatric surgery) and pharmacological medication.^{6–8} These have been accompanied by policy-based approaches (eg, sugar taxes, regulation of advertising, reform of licensing of food outlets)^{7,8} aiming to address obesity at the population level.

Both energy input from food consumption and energy expenditure from physical activity (ie, energy balance) are key factors to weight maintenance and, therefore, diet (energy intake) and physical activity (energy output) are key behavioural determinants of obesity.⁹ Over the last 20 years, diet and physical activity have been the primary interventions recommended for weight loss.¹⁰ However, as many individuals regain the weight lost and with global overweight and obesity rates continuing to rise, it is evident that this approach has not been wholly effective.^{11–12} While increasing energy expenditure and reducing dietary intake¹³ are critical for weight loss (in most cases), they often ignore the complex psychological, emotional, environmental and behavioural factors that underpin overweight and obesity.^{2,14–16} These factors can contribute to disordered eating, low self-esteem, depression, anxiety and stress, which in turn can lead to further weight gain (eg, environmental factors such as access to safe and non-discriminatory recreational spaces and access to healthy, affordable food may exacerbate psychological struggles).^{14,17}

In recent years, there has been increasing recognition of the importance of psychological interventions for weight reduction in adults with overweight and obesity.¹⁸ These interventions support individuals to address the underlying psychological factors (eg, low mood, low self-efficacy, anxiety, body image concerns, emotional eating) that contribute to overweight and obesity, by refining skills and strategies to cope with negative emotions, modifying unhelpful behaviours and encouraging healthy lifestyle changes.^{18–19} They also aim to increase self-efficacy, self-regulation and self-awareness, which are critical for long-term weight reduction.²⁰ By targeting these psychological factors, interventions may be more effective for long-term weight reduction compared with diet and physical activity interventions alone.²¹ These interventions include a variety of components (eg, cognitive behaviour change, mindfulness, relaxation and motivation), are conducted individually or in groups and are typically delivered in clinical, community, workplace or online settings.^{19,20}

Within the last two decades, research in the field of weight reduction (ie, the intentional efforts to decrease body weight) and weight management (ie, long-term approach to maintaining a healthy weight) has rapidly evolved with a particular focus on psychological interventions.²² This is likely due to the recognised need for personalised approaches to weight reduction in which psychological interventions have shown to be effective.^{22,23}

As a consequence of the greater interest in this area of research, numerous systematic reviews have been conducted to assess the effectiveness of psychological interventions for weight reduction in adults with overweight and obesity.^{19,20} However, these reviews are limited by population (including only adults with specific medical conditions related to eating disorders),²³ type of interventions (including only one type of psychological therapy intervention of cognitive-behavioural therapy (CBT))¹⁹ or being substantially outdated.²⁰ With the rapid increase of emerging studies (including novel therapeutic techniques) and growing rates of overweight and obesity, a scoping review is now needed to map the different types of psychological interventions and their core characteristics, while identifying evidence gaps for future research in this field.²⁴

Aim

To explore psychological interventions for adults with overweight or obesity as a means of achieving weight reduction and sustained weight reduction.

Objectives

1. To generate a comprehensive map of the types of psychological interventions for weight reduction and sustained weight reduction in adults with overweight or obesity.
2. To identify the core intervention characteristics including theoretical foundations, techniques, setting, duration, mode, the number of sessions and provider of psychological interventions for weight reduction and sustained weight reduction in adults with overweight or obesity.
3. To identify study characteristics such as length of follow-up, and outcomes which include psychological interventions for weight reduction and sustained weight reduction in adults with overweight or obesity.
4. To generate a map of the types of usual care for weight reduction and sustained weight reduction in adults with overweight or obesity.
5. To identify the core characteristics including components, setting, duration, mode and providers of usual care for weight reduction and sustained weight reduction in adults with overweight or obesity.
6. To identify evidence gaps and areas for future research in the field of psychological interventions for weight reduction and sustained weight reduction in adults with overweight and obesity.

METHODS

Study design

The study followed a scoping review design, adhering to the framework set out by Arksey and O'Malley, which recommends a five-stage review process²⁵:

- ▶ Stage 1: identifying the research question.
- ▶ Stage 2: identifying relevant studies.
- ▶ Stage 3: study selection.
- ▶ Stage 4: charting the data.

- ▶ Stage 5: collating, summarising and reporting the results.

We did not implement the optional sixth stage set out by Arksey and O'Malley as the first five stages were adequate to satisfy the objectives of this review.²⁶ The study was reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA) guidelines (see online supplemental material¹).^{27 28} In addition, the scoping review followed a protocol that was developed and published a priori (DOI: 10.1136/bmjopen-2023-075364).

Search strategy

Six databases were searched to identify relevant articles:

1. Cochrane Central Register of Controlled Trials (CENTRAL via Wiley).
2. WHO International Clinical Trials Registry Platform (ICTRP).
3. EMBASE (Ovid).
4. MEDLINE (Ovid).
5. CINAHL (EBSCOhost).
6. PsycINFO (EBSCOhost).

We searched the above databases and trial registries from their inception to April 2023 (searches conducted on 19 April 2023). A search of clinical trials was conducted through the CENTRAL and ICTRP databases to identify ongoing clinical trials. In addition, we checked the reference lists of all included studies and relevant review articles for additional studies.

The search strategy was conducted in each database based on the following:

- ▶ Population: Adults with overweight or obesity (aged ≥ 18 , with BMI ≥ 25 kg/m²).
- ▶ Intervention: Psychological interventions (eg, CBT, mindfulness, motivational interviewing (MI)).
- ▶ Study type: Randomised controlled trials (RCTs) or non-randomised comparative intervention studies.

The search strategy was developed by the research team in collaboration with an expert information specialist, adapted for each database (see online supplemental material 2) for Medline, Ovid example). The search strategy was based on the strategy outlined in the most relevant Cochrane review by Shaw *et al.*²⁰, but with the addition of further search terms (identified by the research team), and the Canada's drug and health technology research working group (Canadian Agency for Drugs and Technologies in Health (CADTH)) search filter to identify randomised and non-RCTs.^{20 29}

Study selection

All articles identified by the electronic database searches were imported into Rayyan (web application). Once imported, the duplicate removal function within Rayyan was used to remove duplicate articles. Following the removal of duplicates, one reviewer independently screened the titles and abstracts of the search results for eligible studies. The reviewer used the Rayyan software to categorise studies into labelled folders: includes, excludes

or undecided. A second reviewer independently screened studies which were initially categorised as undecided. Once screening of titles and abstracts was completed (establishing includes and excludes), full texts of articles deemed to be eligible after initial screening were retrieved and uploaded onto Rayyan. Following this, two reviewers independently screened the full texts of all potentially eligible studies within the Rayyan software (using the blinding function). Once full-text screening was complete, the two reviewers convened to determine agreement on the eligibility of the articles. Disagreement regarding one article was resolved through discussion with a third reviewer. Following agreement on eligible full texts, both reviewers independently conducted citation screening of the articles to identify any further studies meeting the inclusion criteria. All full-text articles that met the inclusion criteria were charted to summarise the findings. The study selection process was recorded in sufficient detail using a PRISMA flow diagram, reporting reasons for exclusion (see figure 1 and online supplemental material 3).

Data extraction

One reviewer independently extracted data for the included studies using a piloted data extraction form. A second reviewer independently checked and verified all the data extracted by the first reviewer. Data were extracted on the following: study methods, participants, interventions (eg, type, setting and components), outcomes and any other information judged to be important to meet the objectives of the study.

Inclusion criteria

While a scoping review traditionally encompasses a wide range of literature, specific criteria were employed to identify relevant articles for the aim and objectives of the study.

Types of studies

RCTs and non-randomised comparative intervention studies were included. We only included studies reported in full text. If an abstract (eg, conference abstract) meeting the inclusion criteria was identified, the study authors were contacted to establish whether a full text was available.

Types of participants

Studies were included if the participants were ≥ 18 years and were classified as overweight or obese (BMI ≥ 25 kg/m², height/weight could be measured, self-reported or self-measured). Studies were also included when a sample included participants with other classifications of BMI (eg, underweight or healthy weight, BMI < 25 kg/m²) if data relating to those with overweight or obesity could be extracted separately. Studies were also included when participants with overweight or obesity had other comorbidities (eg, musculoskeletal pain, osteoarthritis, diabetes, hypertension, arthritis, hyperuricaemia, gall

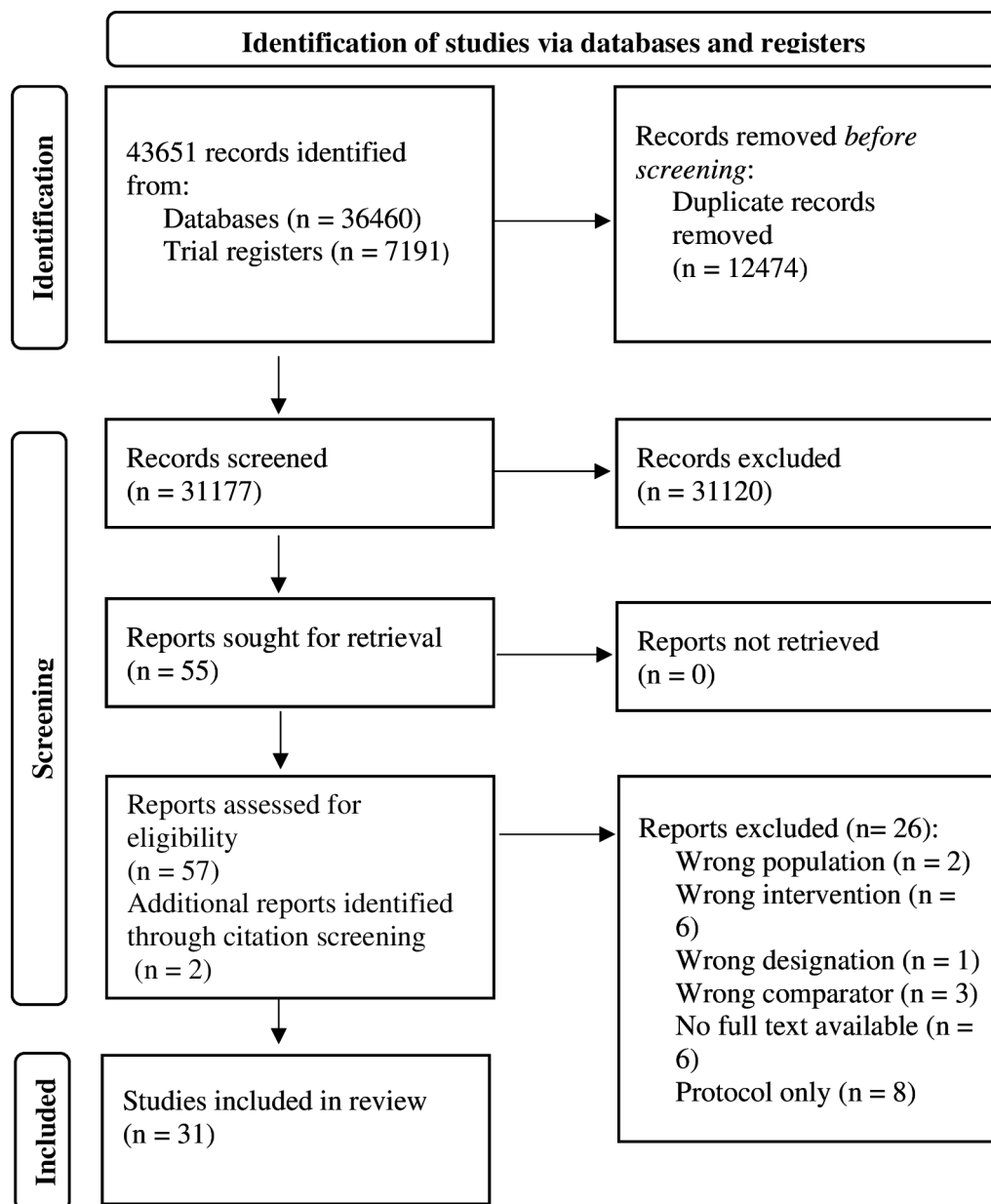


Figure 1 PRISMA flow diagram. PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

bladder disease), as BMI greater than 25 kg/m² has been associated with the incidence of multiple comorbidities.³⁰

Types of interventions

Psychological therapy interventions were defined as those interventions that involved meeting with a therapist (healthcare professional competent in providing psychological therapy) to discuss feelings and thoughts, and how these affect behaviour and well-being.³¹ All psychological interventions were considered for inclusion. Some of these interventions included CBT, mindfulness, psychodynamic therapies, MI, prolonged exposure therapy, hypnotherapy, psychotherapy, rationale emotional therapy and psychodynamic therapy. Interventions delivered one-to-one or in group setting were included.

We only included studies whereby the intervention was a single-component psychological therapy intervention,

excluding those with multiple intervention components (eg, psychological therapy with integrated physical activity). In addition, we only included studies of psychological therapies that were delivered by a healthcare professional and were designed to reduce weight or increase health promoting behaviour for the purpose of weight reduction and sustained weight reduction (ie, eating behaviour or physical activity). Weight reduction was defined as an intentional effort to decrease body weight, while sustained weight reduction was defined as the successful long-term maintenance of a lower body weight following initial weight loss.

To identify psychological interventions for weight reduction and sustained weight reduction, we included studies with the following comparisons:

- ▶ Psychological therapy versus no intervention (ie, no intervention of any type).
- ▶ Psychological therapy versus usual care, standard care or treatment as usual (as defined by study authors).
- ▶ Comparisons between different types of psychological therapy (eg, CBT, mindfulness, MI).

Studies were excluded if they included a comparison with other active lifestyle interventions unless classified as usual care. To meet objectives four and five, we looked at the usual care reported in the papers extracted from the study selection process.

Outcomes

Where available, information on the study outcomes was collected and charted. Primary outcomes included body weight or indicator of body mass (eg, BMI), cognitive flexibility, psychological function and eating behaviours. Secondary outcomes included adverse events, quality of life, physical activity levels, stress, anxiety, depression, health behaviour, body esteem, psychological health and self-efficacy.

Exclusion criteria

We excluded studies that were not available in English, were not full-text articles (ie, conference abstracts only), and not peer-reviewed articles (eg, magazine articles, letters, editorials, newspaper and commentary articles).

Data synthesis and analysis

A narrative synthesis was employed to synthesise the data, prioritising and ordering data to meet the objectives of the study.³²

Patient and public involvement

A public advisor with more than 10 years' experience of living with obesity provided input throughout all stages of the project and contributed to the write up of the scoping review (ie, improving the lay interpretability of the review through editing of the article).

RESULTS

The database searches identified 43 651 articles from four electronic databases and two trial registries. After duplicates were removed, a total of 31 177 titles and abstracts were screened for eligible studies. During the screening process, a total of 31 120 were deemed³³ ineligible³⁴ for inclusion. A total of 55 studies were extracted for full-text screening. A further two additional articles were identified for inclusion through the citation screening of the original 55 full texts. Following full text and citation screening, 31 studies were eligible for inclusion.^{33–64} A total of 26 articles were excluded for a range of reasons which are detailed in the PRISMA diagram (see [figure 1](#)).

Study characteristics

Of the 31 included studies, 28 were RCTs,^{33 35 37–39 41–63} and 3 were non-randomised intervention studies.^{34 36 40} Studies were conducted across 14 countries; Iran (n=8),

the USA (n=4), Netherlands (n=3), Australia (n=3), Germany (n=2) and Norway (n=2), with one study from each of; Canada, Brazil, Italy, Finland, Portugal, Spain, the UK, Sweden and Thailand (see online supplemental table). The duration of the studies ranged from 2 to 51 months.^{33–64} Interventions were conducted mainly within clinics (n=15), but other settings included medical centres (n=11), universities (n=4) and within the community (n=1). Studies were published between 2007 and 2023, with only five studies published prior to 2012.^{40 59 61–63} See online supplemental table for characteristics of included studies and for details of the excluded studies, refer to online supplemental material 3.

Participant characteristics

The total number of participants within each study ranged from 31 to 1386. A total of 28 studies reported the mean age of the study sample, which ranged from 20.33 to 52.3 years.^{34–53 55 56 58 59 61–64} However, only eight studies reported a mean age below 40 years of age.^{35 38 48–50 56 58 62} Among the included studies, only seven studies reported ethnicity of the sample.^{36 37 39 42 43 45 58} Of these studies, six reported predominantly white participants (>60%).^{36 39 42 43 45 58} Most participants within the included studies were female with a total of 27 studies reporting a greater percentage female compared with male participants.^{35–41 43–63} Notably, 11 studies only included female participants.^{35 38 40 48–51 56 58 59 62}

A total of 28 studies reported the mean BMI of participants which ranged from 28.2 kg/m² to 53.1 kg/m².^{34–37 39–53 55–57 59–64} Just two studies reported socioeconomic status of the participants (both reported percentage of moderate socioeconomic status).^{48 51} All studies stipulated inclusion of participants with a BMI >25 kg/m² (classified as overweight or obese).^{33–64}

Types of psychological interventions

The studies reported a total of 13 types of psychological interventions for weight reduction and sustained weight reduction (see online supplemental table and [table 1](#)).^{33–64}

The most common psychological therapy was CBT (n=11), followed by MI (n=6), acceptance and commitment therapy (ACT) (n=3) and behavioural therapy (n=3) (see online supplemental table). Other therapies such as acceptance-based behavioural treatment (ABT), mindfulness, cognitive remediation therapy (CRT), compassion-focused therapy (CFT), Tapas Acupressure Technique (TAT) with mental steps, psychotherapy (cognitive), emotional freedom technique (EFT), psychodynamic therapy and dialectical behaviour therapy (DBT) were reported but with less frequency (see online supplemental table). Three studies comprised multiple types of psychological therapies as they involved active comparisons between psychological interventions (see online supplemental table and [table 1](#)).

**Table 1** Theoretical underpinning of the types of interventions

Type of intervention	No. of studies	Theoretical underpinning
1. Cognitive-behavioural therapy (CBT)	11 studies	Principles of Judith Beck's CBT Principles of Christopher Fairburn's CBT
2. Motivational interviewing (MI)	6 studies	Concepts of MI by Miller and Rollnick Self-determination theory Principles of the protection motivation theory
3. Acceptance and commitment therapy (ACT)	3 studies	Principles of Steven Hayes (ACT)
4. Behavioural therapy	3 studies	Concepts of social cognitive theory by Albert Bandura Principles of the theory of planned behaviour by Icek Azjen
5. Acceptance-based behavioural treatment	2 studies	Marsha Linehan's principles of behaviour therapy Concepts of Alan Marlatt's Relapse Prevention Model
6. Mindfulness therapy	2 studies	Jon Kabat-Zinn's principles of cognitive therapy
7. Cognitive remediation therapy (CRT)	2 studies	CRT by developed by Kate Tchanturia <i>et al</i> Concepts of Raman <i>et al</i> (CRT)
8. Compassion-focused therapy (CFT)	1 study	Principles of CFT by Paul Gilbert
9. Tapas acupressure technique (TAT) with mental steps	1 study	Principles of Tapas Fleming's TAT with mental steps developed by Elder <i>et al</i>
10. Psychotherapy (cognitive)	1 study	Principles of cognitive psychotherapy by Lisbeth Stahre
11. Emotional freedom technique (EFT)	1 study	Principles developed by Gary Craig (EFT)
12. Psychodynamic therapy	1 study	Principles developed by Jessica Yakeley and Gwen Adshead in combination with the theory of planned behaviour by Icek Azjen
13. Dialectical behaviour therapy (DBT)	1 study	Marsha Linehan's principles of DBT

ACT, Acceptance and commitment therapy; CBT, cognitive-behavioural therapy; CFT, Compassion-focused therapy; CRT, Cognitive remediation therapy; DBT, Dialectical behaviour therapy; EFT, Emotional freedom technique; MI, Motivational Interviewing; TAT, Tapas acupressure technique.

Core intervention characteristics

The frequency of sessions within each intervention ranged from 5 to 42 sessions (average of 11 sessions). However, most studies (n=22) reported 10 or fewer sessions.^{34–36 38–41 44 46–50 52–54 56 58–62} The duration of each session ranged from 20 to 180 min, but on average lasted approximately 80 min.^{33–64} The total duration of the interventions ranged from 225 to 5040 min, averaging 1000 min.^{33–64} Largely,

interventions were conducted face to face (n=26), with a minority through telephone or online (n=2) and some hybrid (n=3: face to face and telephone/online) (see online supplemental table). The interventions were delivered by PhD students, research clinicians, psychotherapists, dietitians, endocrinologists, certified trainers, medical doctors, physical therapists, clinical psychologists, MI practitioners, counsellors or psychiatrists.^{33–64}

The majority of the interventions were based on the leading theoretical foundations in their domain, as shown in [table 1](#).

Length of follow-up and outcomes of included studies

Most studies (n=21) included primary outcomes focused on weight reduction or changes in body mass (see online supplemental table). Those that did not, assessed either eating behaviour (including disordered eating behaviour) (n=7), cognitive flexibility (n=1), weight efficacy (n=1) or psychiatric symptomology (n=1) (see online supplemental table). Secondary outcomes included depression, waist circumference, blood pressure, quality of life, general self-efficacy activity levels, psychological health, dietary intake, health behaviours, perceived behavioural control, psychological constructs, attitudes, motivation, stress, body esteem and BMI (see online supplemental table).^{57 61}

Follow-up time points ranged from 6 weeks to 36 months but studies frequently reported follow-up at 8 weeks (n=9), 6 months (n=9) or 12 months (n=15) (see online supplemental table). Of the 31 included studies, 16 measured whether participant's weight reduction had been sustained at 12 months follow-up (see online

supplemental table). Of the 16 studies which determined weight reduction at 12-month follow-up, 6 studies included CBT, 3 included behavioural therapy, 1 included MI, 1 comprised ABT, 1 involved TAT with mental steps, 1 included psychotherapy, 1 encompassed EFT and 1 involved psychodynamic therapy (see online supplemental table). The remaining 15 studies which included therapies, such as CBT (n=4), mindfulness (n=2), MI (n=4), DBT (n=1), CRT (n=2), ABT (n=1), ACT (n=2) and compassion-based therapy (n=1), did not measure outcomes following 6 months to determine if weight reduction was sustained in the longer term (see online supplemental table).

Map of the types of usual care

Of the 31 studies, 16 included psychological interventions that were compared with usual care.^{33 35–37 39 42–45 49–53}

Studies used a range of terms to describe usual care such as treatment as usual, standard care and usual care. There were a total of eight types of usual care described by the included studies (see online supplemental table and [figure 2](#)). One study did not report details of the usual care which had been conducted in the control group.⁴⁴

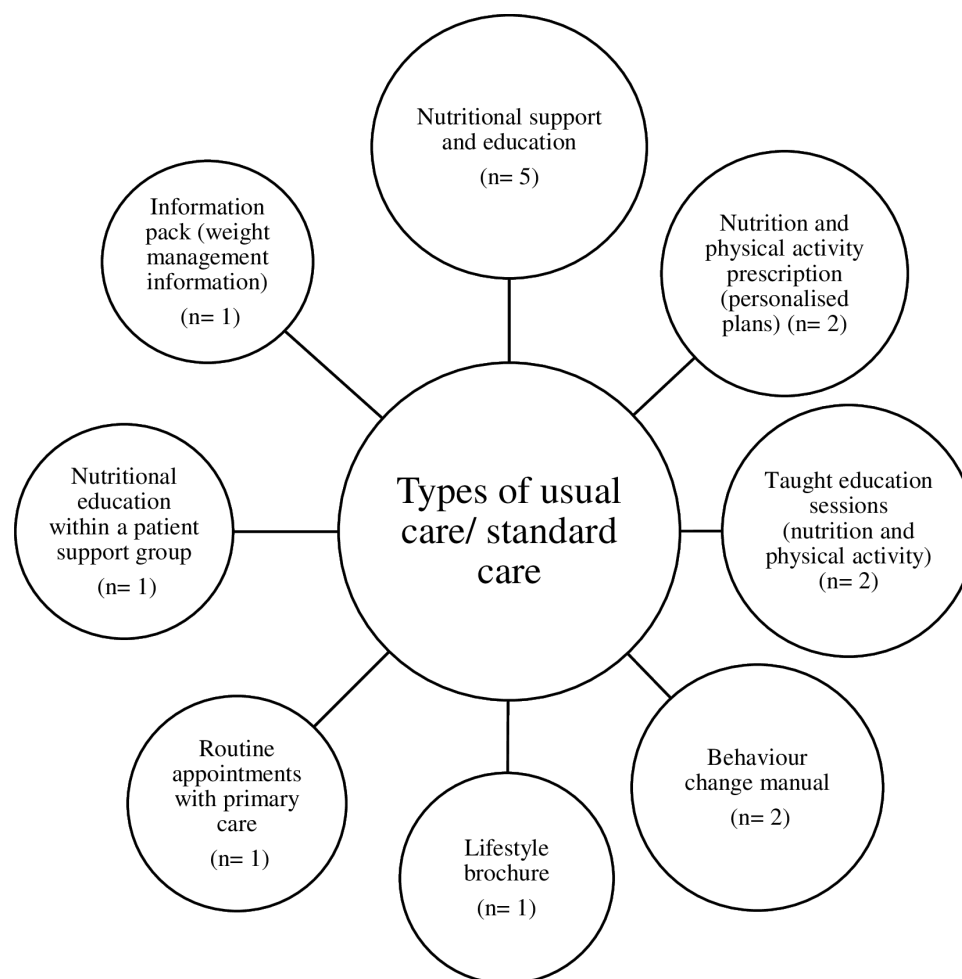


Figure 2 Thematic map of types of usual care for weight reduction and sustained weight reduction in adults with overweight or obesity within included studies.

Core characteristics of usual care

The 16 studies that compared an intervention to usual care reported a diverse range of characteristics related to the control group.^{33 35–37 39 42–45 49–53} A total of five studies included only nutritional education and support, while another two studies included education and support on both nutritional and physical activity (see online supplemental table). A further two studies only provided a leaflet or brochure which contained information on healthy lifestyles. Two studies provided only a manual which was based on weight loss protocols and included aspects of behaviour change and coping strategies for food cravings (see online supplemental table).

Usual care was conducted in a diverse range of settings including clinics (n=3),^{39 45 61} hospitals (n=2),^{53 64} tertiary care centres (n=2),^{36 44} a healthcare centre³⁵ and a research centre.³³ Seven studies did not report the setting of the usual care.^{38 42 43 49–51 57} Usual care was typically delivered by a primary care practitioner (n=6; eg, doctors, nurses)^{33 36 44 48 62 64} or doctoral student (n=1),⁴² although most studies did not report the provider (n=8).^{35 39 42–45 50 51} The frequency of sessions within usual care ranged from one to six sessions, averaging three sessions.^{33 35–37 39 42–45 50–52} The duration of usual care ranged from 2 weeks to 18 months but on average continued for approximately 6 months.^{33 35–37 39 42–45 49–53}

Gaps within the evidence

There were several gaps within the existing evidence identified by the findings of this review. First, there is a dearth of literature relating to younger adults (under 40 years of age) with overweight and obesity who have undertaken psychological therapies as a means of weight reduction and sustained weight reduction. Second, the ethnic diversity of the current evidence appears narrow, with most existing studies involving predominantly white participants (>60%). The limited ethnic representation increases concerns relating to the generalisability of findings to non-white ethnic groups, which is important given that research suggests that people from ethnic minorities (eg, Bangladeshi, Pakistani, black African and black Caribbean populations) may be at greater risk of obesity compared with Caucasians.^{65 66} Third, there is a lack of literature highlighting the impact of how psychological therapies may influence weight reduction in adults with low socioeconomic status. Fourth, few studies have explored digital health technologies (eg, mobile applications, virtual meeting software) as a means of delivering psychological therapy interventions for adults with overweight or obesity. Finally, there is a notable absence of studies exploring therapy approaches such as counselling (integrative, eclectic), guided self-help, interpersonal therapy, cognitive analytic therapy, rational emotive behavioural therapy, exposure therapy, humanistic therapies, existential therapy, artistic therapies, music therapy, psychodrama and systemic therapy. As a consequence, little is known about the potential effectiveness of these psychological therapy interventions as a means of

achieving weight reduction and sustained weight reduction in adults with overweight and obesity.

DISCUSSION

This review provides an up-to-date synthesis of existing therapy interventions used to promote weight reduction in adults with overweight and obesity.^{20 23 67} This scoping review identified the types and characteristics of psychological therapy interventions and usual care for weight reduction and sustained weight reduction in adults with overweight and obesity. A total of 13 types of psychological interventions for weight reduction and sustained weight reduction in adults with overweight and obesity were identified by the review. These interventions were primarily delivered face to face by healthcare professionals, and on average, composed of 11 sessions lasting 80 min each. In addition, eight types of usual care were identified, typically involving education and training on nutrition and physical activity. Individuals receiving usual care received fewer appointments from their primary healthcare provider compared with those receiving psychological therapy interventions.

The findings of this scoping review expand on older reviews that have documented the types of psychological therapy interventions for adults with overweight and obesity.^{20 23 67 68} In addition to interventions such as CBT, DBT, behaviour therapy, psychotherapy, MI and mindfulness which have been identified by older reviews,^{20 67 68} this scoping review identified four additional psychological therapy interventions that have emerged within publications over the past 5 years (ie, ACT, EFT, CRT and compassion-based therapy).^{20 23 68} Although these interventions may be novel in this field of research, our review shows that the evidence is limited by small sample sizes and short-term follow-up. In addition, the current findings also highlight that there is some uncertainty about which psychological interventions are effective, which therapy types may result in the greatest weight reduction, and which have sufficient certainty of evidence for recommendations into clinical practice.

This review identified several types of usual care that were employed as comparators for psychological therapy interventions across the included studies. Typically, usual care composed of information and support to improve patient nutritional intake, although in addition, several usual care groups also received guidance on increasing their levels of physical activity (through information packs and leaflets). These components are consistent with the guidance from key organisations (ie, National Institute for Health and Care Excellence and WHO) and health services (ie, National Health Service, NHS), which advocate that the main treatment for overweight and obesity should focus on increasing energy expenditure (physical activity) and reducing energy intake (dietary modifications).^{3 69 70} This review shows that usual care interventions offered by primary care practitioners generally do not include psychological components to support individuals

with weight reduction. Given the complex psychological, emotional and behavioural factors that likely underpin excess weight, usual care which does not incorporate a psychological component may not be wholly effective at reducing the prevalence of population overweight and obesity.^{16 71} With that said, the inclusion of psychological therapy interventions into usual care practice may require additional resources and investment.⁵² To determine whether these interventions could be delivered at scale within the NHS (through incorporation into usual care), further research in the form of an economic evaluation is needed.

This review highlighted several key evidence gaps which are consistent with findings already available in the literature that have highlighted an under-representation of younger adults and adults with obesity from different socioeconomic status backgrounds.^{26 66} Further research is required to improve understanding of how psychological therapies may impact weight reduction in these groups. In addition, an up-to-date comprehensive systematic review is needed to determine the effectiveness of the different types of psychological interventions for weight reduction (in adults with overweight and obesity), given that the most recent comprehensive systematic review in this area was last published in 2005.²⁰ Further research is also needed to explore the effectiveness of psychological interventions which integrate digital technologies as a means to achieve weight reduction in adults with overweight and obesity. With the recent rise in smartphone applications, wearable devices, virtual reality and online platforms, digital health technology holds the potential to enhance the effectiveness of psychological therapies and reduce waiting times for patients.^{72 73} This potential has been evidenced by previous reviews that show psychological interventions which incorporate digital technology (eg, computer-assisted therapy, smartphone apps and wearable technologies), can be effective for the treatment of important clinical outcomes (eg, depression and anxiety).^{74 75}

Strengths and limitations

One of the notable strengths of this scoping review is the methodology employed. Given the objectives of this review, using a scoping review methodology allowed for more expansive inclusion criteria (compared with a systematic review methodology), ensuring all relevant studies relating to psychological therapy interventions for adults with overweight and obesity could be included. The methodology ensured that specific gaps within the existing knowledge base (which are useful in shaping future research initiatives) were identified. In contrast, a systematic review on the same topic would have likely restricted the inclusion criteria to only include higher-quality evidence (eg, RCTs) and excluded studies examining different types of therapy or those that did not report specific outcomes. However, an important limitation of this scoping review is that it did not include complex multicomponent interventions or studies comparing

psychological therapy interventions to active nutritional and/or physical activity interventions, and as such there is a degree of uncertainty as to whether there may be other psychological therapy interventions for adults with overweight and obesity not described within this scoping review. A further limitation of this review is that it only included RCT and non-randomised intervention studies. Consequently, studies with alternative designs would not have been included, despite the potential that they may have been relevant to the findings of this review. An additional limitation is that the eligibility criteria regarding psychological therapy interventions may have limited the inclusion of studies relevant to mapping the types of usual care for weight reduction and sustained weight reduction in adults with overweight or obesity. As a consequence, some types of usual care may not have been included in the findings of this review. A final limitation of this study relates to the search strategy, in which there was a notable reduction in studies from 31 177 initial database hits to a total of 31 included studies. This reduction deviates from the ratio of database hits to included studies observed in other scoping studies.^{76 77} This substantial drop in numbers raises concerns regarding the efficiency and specificity of our search strategy which could have been prevented with additional search limits (eg, adult age group restrictions, along with refinement of the search terms). Revisions to the search strategy would have likely aligned our search numbers with those seen in other reviews, improving the efficiency of the screening process.

CONCLUSION

This review identified a total of 13 types of psychological therapy interventions which promoted weight reduction in adults with overweight and obesity. The most common interventions identified by this review were CBT and MI. Psychological interventions were predominantly delivered in multiple face-to-face sessions by healthcare professionals (based in different settings), with participants receiving an average of a thousand minutes of therapy. The primary outcomes of the studies focused on weight reduction and changes in body mass, while secondary outcomes often measured depression, waist circumference, quality of life and health behaviours. In contrast, eight types of usual care were identified which typically involved educating and training focused on nutrition and physical activity. Usual care was largely delivered by primary care practitioners through multiple appointments across several months. The findings highlight several gaps within the existing literature, largely due to a lack of evidence relating to adults with low socioeconomic status, non-white participants and individuals under 40 years of age. Further research is required in the form of high-quality RCTs to explore how psychological therapies may impact weight reduction in these groups. Further research is also needed in the form of a comprehensive systematic review to determine the effectiveness

of the different types of psychological interventions for weight reduction in adults with overweight and obesity.

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Contributors OH was responsible for the conception, design, study selection, data extraction, analysis and writing of the manuscript. EPB and CW provided support throughout the conception, design and writing of the manuscript. EPB and JAK contributed to the study selection process, data extraction and writing of the manuscript. AB provided PPI input throughout the project, including contributions to the outcomes, background, results and writing of the lay summary. CH designed the search strategy and performed the preliminary database searches. ES provided clinical input to support the development of the manuscript and potential implications for clinical practice. All authors read and approved the final manuscript. OH is responsible for the overall content as guarantor.

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Disclaimer The views expressed are those of the authors and not necessarily those of the NHS, the NIHR, or the Department of Health and Social Care.

Competing interests None declared.

Patient and public involvement Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Methods section for further details.

Patient consent for publication Not applicable.

Ethics approval Ethical approval was not required to conduct this scoping review.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data sharing is not applicable as no datasets were generated and/or analysed for this study.

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SUPPLEMENTARY MATERIAL 1

Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	Page 1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	Page 2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	Page 4
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	Page 5
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	Page 5
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	Pages 7 & 8
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	Page 6
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Pages 27 & 28
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	Pages 6 & 7
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	Pages 6 & 7

Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	Page 8
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	NA
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	Pages 7 & 8
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	Pages 8 – 19
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	Pages 8 – 19
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	NA
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	Pages 8 – 16
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	Pages 17 - 19
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	Pages 17 - 19
Limitations	20	Discuss the limitations of the scoping review process.	Page 19
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	Pages 17 & 18
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	Page 1

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

SUPPLEMENTARY MATERIAL 2

Example search strategy

Ovid MEDLINE(R) ALL <1946 to February 27, 2023>

1	Obesity/	211963	
2	Adiposity/	15199	
3	Weight Gain/	35111	
4	Weight Loss/	42881	
5	body mass index/	147269	
6	(obes* or adipos* or overweight* or over weight*).tw.	466238	
7	(weight adj (reduc* or loss or losing or lose or maint* or decreas* or watch* or diet* or control* or manage*)).tw.	127938	
8	or/1-7	672434	
9	exp Psychotherapy/	216317	
10	(psychological therap* or psychological service* or psychological intervention* or psychological treatment* or psychotherap*).tw.	61353	
11	counse?ling.tw.	112154	
12	(interpersonal adj therap*).tw.	434	
13	aversion therap*.tw.	187	
14	behavio?r therap*.tw.	8063	
15	behavio?r modific*.tw.	3108	
16	colo?r therap*.tw.	27	
17	(cognitiv* adj1 therap*).tw.	4261	
18	gestalt therap*.tw.	94	
19	music therap*.tw.	3010	
20	milieu therap*.tw.	314	
21	(assert* adj training).tw.	324	
22	(nondirectiv* therap* or non directiv* therap*).tw.	47	
23	((problem solving or problemsolving) adj therap*).tw.	504	
24	((self control or selfcontrol) adj therap*).tw.	22	
25	person cent*.tw.	8676	
26	client cent*.tw.	1829	
27	paradoxic* techni*.tw.	7	
28	rational emoti*.tw.	289	
29	reality therap*.tw.	189	
30	(relax* adj train*).tw.	1436	
31	mindfulness.tw.	11581	
32	(sociotherap* or socio therap*).tw.	288	
33	(socioenvironment* or socio environment*).tw.	1681	
34	supportiv* therap*.tw.	5428	
35	humanistic therap*.tw.	26	
36	(person centered therap* or person centred therap*).tw.	42	
37	psychodynamic therap*.tw.	619	
38	motivational interviewing.tw.	4826	
39	hypnotherapy.tw.	1216	
40	or/9-39376330		
41	(Randomized Controlled Trial or Controlled Clinical Trial or Pragmatic Clinical Trial or Clinical Study or Adaptive Clinical Trial or Equivalence Trial).pt.	684949	

- 42 (Clinical Trial or Clinical Trial, Phase I or Clinical Trial, Phase II or Clinical Trial, Phase III or Clinical Trial, Phase IV or Clinical Trial Protocol).pt. 608099
- 43 Multicenter Study.pt. 331074
- 44 Clinical Studies as Topic/ 782
- 45 exp Clinical Trial/ or exp Clinical Trials as Topic/ or Clinical Trial Protocol/ or Clinical Trial Protocols as Topic/ or exp "Clinical Trial (topic)"/ 1265276
- 46 Multicenter Study/ or Multicenter Studies as Topic/ or "Multicenter Study (topic)"/ 350118
- 47 Randomization/ 106905
- 48 Random Allocation/ 106905
- 49 Double-Blind Method/ 174454
- 50 Double Blind Procedure/ 0
- 51 Double-Blind Studies/174454
- 52 Single-Blind Method/ 32528
- 53 Single Blind Procedure/ 0
- 54 Single-Blind Studies/ 32528
- 55 Placebos/ 35925
- 56 Placebo/ 0
- 57 Control Groups/ 1911
- 58 Control Group/ 1911
- 59 Cross-Over Studies/ or Crossover Procedure/ 54748
- 60 (random* or sham or placebo*).ti,ab,hw,kf. 1779092
- 61 ((singl* or doubl*) adj (blind* or dumm* or mask*).ti,ab,hw,kf. 264573
- 62 ((tripl* or trebl*) adj (blind* or dumm* or mask*).ti,ab,hw,kf. 1544
- 63 (control* adj3 (study or studies or trial* or group*).ti,ab,hw,kf. 1894433
- 64 (clinical adj3 (study or studies or trial*).ti,ab,hw,kf. 1411390
- 65 (Nonrandom* or non random* or non-random* or quasi-random* or quasirandom*).ti,ab,hw,kf. 53387
- 66 (phase adj3 (study or studies or trial*).ti,ab,hw,kf. 174884
- 67 ((crossover or cross-over) adj3 (study or studies or trial*).ti,ab,hw,kf. 75902
- 68 ((multicent* or multi-cent*) adj3 (study or studies or trial*).ti,ab,hw,kf. 401960
- 69 allocated.ti,ab,hw. 81914
- 70 ((open label or open-label) adj5 (study or studies or trial*).ti,ab,hw,kf. 43646
- 71 ((equivalence or superiority or non-inferiority or noninferiority) adj3 (study or studies or trial*).ti,ab,hw,kf. 11683
- 72 (pragmatic study or pragmatic studies).ti,ab,hw,kf. 575
- 73 ((pragmatic or practical) adj3 trial*).ti,ab,hw,kf. 7471
- 74 ((quasiexperimental or quasi-experimental) adj3 (study or studies or trial*).ti,ab,hw,kf. 11671
- 75 trial.ti,kf. 300216
- 76 or/41-75 3732550
- 77 8 and 40 and 76 5462
- 78 limit 77 to English language 5302

Supplementary material 3

Excluded studies table.

Excluded study (Citation)	Reasons for exclusion
Baur, J., Krohmer, K., Naumann, E., & Svaldi, J. (2022). Efficacy and mechanisms of change in exposure-based and cognitive stand-alone body image interventions in women with overweight and obesity. <i>Behaviour research and therapy</i> , 159, 104210.	Exclude -Wrong designation - not weight loss focused on body dissatisfaction and interview-based shape concerns
Blevins, N. (2009). Mindfulness meditation as an intervention for body image and weight management in college women: a pilot study. <i>Dissertation Abstracts International: Section B: The Sciences and Engineering</i> . 69.	Exclude -Abstract, no full text available
Cattivelli, R & Guerrini U, Anna M, Gian , Riboni, F & Pietrabissa, G, Musetti, Alessandro & Franceschini, Christian & Varallo, G, Spatola, C, Giusti, E. Castelnovo, G, Molinari, E. (2021). ACTonFood. Acceptance and Commitment Therapy-Based Group Treatment Compared to Cognitive Behavioral Therapy-Based Group Treatment for Weight Loss Maintenance: An Individually Randomized Group Treatment Trial. <i>International Journal of Environmental Research and Public Health</i> . 18. 9558.	Exclude - Wrong intervention - included exercise training sessions in combination with psychological therapy and also had an active comparator.
Castelnovo, G., Manzoni, G. M., Villa, V., Cesa, G. L., Pietrabissa, G., & Molinari, E. (2011). The STRATOB study: design of a randomized controlled clinical trial of Cognitive Behavioral Therapy and Brief Strategic Therapy with telecare in patients with obesity and binge-eating disorder referred to residential nutritional rehabilitation. <i>Trials</i> , 12, 114.	Exclude - Protocol only
Cooney, L. G., Milman, L. W., Hantsoo, L., Kornfield, S., Sammel, M. D., Allison, K. C., Epperson, C. N., & Dokras, A. (2018). Cognitive-behavioral therapy improves weight loss and quality of life in women with polycystic ovary syndrome: a pilot randomized clinical trial. <i>Fertility and sterility</i> , 110(1), 161–171.e1.	Excude - Wrong comparator - nutritional active control
Dehrouyeh, S., Olia Emadian, S., Tavakoli, N., & Tavakoli, N. (2022). The Effectiveness of Dialectical Behavior Therapy on Emotion Regulation, Food Cravings and Body Mass Index in Obese Female Students. <i>Razavi International Journal of Medicine</i> , 10(3), 9-15.	Exclude - Wrong population - high school/ adolescent students under 18 years of age
Perri, M.G., Limacher, M.C., von Castel-Roberts, K., Daniels, M.J., Durning, P.E., Janicke, D.M., Bobroff, L.B., Radcliff, T.A., Milsom, V.A., Kim, C. and Martin, A.D. (2014), Comparative effectiveness of three doses of weight-loss counselling. <i>Obesity journal symposium</i> .	Exclude -Abstract, no full text available
Preuss, H. (2013). Evaluation of group psychotherapies to improve the self-regulation of overweight/obese people. <i>German Clinical Trials Register: DRKS-ID: DRKS00005250</i>	Exclude - Protocol only
Snjezana P. Role of cognitive-behavioral therapy in the treatment of obesity. <i>Endocrine Abstracts</i> (2017) 49 EP712.	Exclude -Abstract, no full text available

Giada, P. (2018). Group Motivation-Focused Interventions for Patients With Obesity and Binge Eating Disorder. <i>Frontiers in Psychology</i> 9.	Exclude -Abstract, no full text available
Kachooei M, Hasani J, Taghizadeh F. Comparison of effectiveness of cognitive reappraisal and mindfulness based interventions in modulating body mass index (BMI), Food craving and binge eating in overweight women. <i>Feyz</i> 2021; 25(3): 951-62	Exclude - Protocol only
Babakhan, K. (2019). Comparison of Effectiveness of Integrative Group Psychotherapy and Cognitive-Behavioral Stress Management Therapy Group on the Body Image, Somatic Symptom, Mindful Eating and The Satisfaction With Therapy and Therapist in Obese People. WHO clinical Trials registry Irc20181214041964N1, 2019	Exclude - Protocol only
Kebriti, H. (2020). Effect of mindfulness-based stress management therapy on the emotion regulation ,anxiety ,depression and food addiction in obese people. WHO clinical Trials registry: IRICT20190804044436N1.	Exclude - Protocol only
Jandaghian, M. (2020). The effect of dialectical behavior therapy on psychological symptoms and Body measurement indices. WHO clinical Trials registry: Irc20190827044626N1.	Exclude - Protocol only
Rostami, M. (2020) The effectiveness of cognitive Hypnotherapy on the coping self-efficacy, executive functions, Cognitive Emotional Regulation, mental health, Food Craving and weight loss of Women with Obesity. WHO clinical Trials registry: Irc20200622047889N1.	Exclude - Protocol only
Zergani, M. (2020) Effect of mindfulness training on weight loss. WHO clinical Trials registry: Irc20200919048767N1.	Exclude - Protocol only
Iturbe I, Pereda-Pereda E, Echeburúa E, Maiz E. (2019) The Effectiveness of an Acceptance and Commitment Therapy and Mindfulness Group Intervention for Enhancing the Psychological and Physical Well-Being of Adults with Overweight or Obesity Seeking Treatment: The Mind&Life Randomized Control Trial Study Protocol. <i>International Journal of Environmental Research and Public Health</i> . 20(4).	Exclude -Protocol only
Iturbe I, Pereda-Pereda E, Echeburúa E, Maiz E. (2021) The Effectiveness of an Acceptance and Commitment Therapy and Mindfulness Group Intervention for Enhancing the Psychological and Physical Well-Being of Adults with Overweight or Obesity Seeking Treatment: The Mind&Life Randomized Control Trial Study Protocol. <i>International Journal of Environmental Research and Public Health</i> , 18(9):4396.	Exclude -Abstract, no full text available
Jackson, J. B., Pietrabissa, G., Rossi, A., Manzoni, G. M., & Castelnuovo, G. (2018). Brief strategic therapy and cognitive behavioral therapy for women with binge eating disorder and comorbid obesity: A randomized clinical trial one-year follow-up. <i>Journal of Consulting and Clinical Psychology</i> , 86(8), 688–701.	Exclude - Wrong intervention - included exercise training sessions and Mediterranean diet in combination with psychological therapy.]
Kanaya A. M. (2012). ACP Journal Club. Enhanced brief lifestyle counseling for obesity was better than usual care for weight loss at 2 years. <i>Annals of internal medicine</i> , 156(6), JC3–JC10.	Exclude - No Full Text.
Levin, M. E., Petersen, J. M., Durward, C., Bingeman, B., Davis, E., Nelson, C., & Cromwell, S. (2021). A randomized controlled trial of online acceptance and commitment therapy to improve diet and physical activity among adults who are overweight/obese. <i>Translational Behavioral Medicine</i> , 11(6), 1216-1225.	Exclude - Wrong intervention - solely online - no psychological input

Mallorqui-Bague, Nuria; Lozano-Madrid, Maria; Vintro-Alcaraz, Cristina; Forcano, Laura; Diaz-Lopez, Andres; Galera, Ana; Fernandez-Carrion, Rebeca; Gr (2021). Effects of a psychosocial intervention at one-year follow-up in a PREDIMED-plus sample with obesity and metabolic syndrome. <i>Scientific Reports</i> , 11(1)	Exclude - Wrong intervention - included receiving a diet in combination with psychological
Moritz, S., Göritz, A.S., Schmotz, S. et al. (2019). Imaginal retraining decreases craving for high-calorie food in overweight and obese women: A randomized controlled trial. <i>Transl Psychiatry</i> 9, 319.	Exclude - Wrong intervention - solely online - no psychological input by a person at any point
Nourizadeh, R., Azami, S., Farshbaf-Khalili, A., & Mehrabi, E. (2020). The Effect of Motivational Interviewing on Women with Overweight and Obesity Before Conception. <i>Journal of nutrition education and behavior</i> , 52(9), 859–866.	Exclude - Wrong comparator - active nutritional intervention
Perri, M. (2014) Effects of Behavioral Treatment on Long-Term Weight Loss: Lessons Learned From the Look AHEAD Trial. <i>Obesity</i> .	Exclude – Abstract only
Raman, J., Tchanturia, K., & Hay, P. (oral presentation, May 2016). Manualised cognitive remediation therapy for adult obesity: A randomised controlled trial. World Congress Behavioural and Cognitive Therapies WCBCT 2016	Exclude -Abstract, no full text available
Wadden, T. A., Hollander, P., Klein, S., Niswender, K., Woo, V., Hale, P. M., & Aronne, L. (2014). Weight maintenance and additional weight loss with liraglutide after low-calorie-diet-induced weight loss: The SCALE Maintenance randomized study. <i>International journal of obesity</i> 2005, 39(1), 187.	Exclude - Wrong intervention - included receiving a diet (meal replacements) in combination with psychological

Table 1. Characteristics of included studies.

Author(s) and year	Study location	Number of participants (n)	Type of psychological intervention*	Mode	Number of sessions – (total duration)	Comparison	Type of usual care/ intervention comparison	Primary outcomes	Secondary outcomes	Follow-up time points
Abedishargh et al, 2021	Iran	90	Cognitive Behavioural Therapy (CBT)	Hybrid	42 (5040 minutes)	Usual care	Nutritional support and education	Body mass	Stress, anxiety, and depression	6 weeks
Asadollahi et al, 2015	Iran	60	Mindfulness	Face-to-face	8 (960 minutes)	No intervention	No treatment	Body mass	Eating behaviour	8 weeks
Azami et al, 2020	Iran	70	Motivational interviewing (MI)	Face-to-face	6 (540 minutes)	Usual care	Not reported	Body mass	Energy intake	2 & 6 months
Barnes et al, 2017	USA	89	Motivational interviewing (MI)	Face-to-face	5 (140 minutes)	Usual care	Routine appointments with primary care provider	Body mass	Motivation, depression, blood pressure and eating behaviour	3 & 12 months
Berk et al, 2018	Netherlands	158	Cognitive Behavioural Therapy (CBT) (group)	Face-to-face	15 (Not reported)	Usual care	Nutritional support and education	Body mass	Waist circumference, blood pressure, cholesterol, depression, anxiety, self-esteem, quality of life, fatigue, and physical activity	2, 3, 12 & 24 months
Cancian et al, 2019	Brazil	31	Dialectical Behaviour Therapy (DBT)	Face-to-face	10 (1200 minutes)	No intervention	No treatment	Eating behaviour	Emotion regulation and psychiatric symptoms	8 weeks
Cassin et al, 2016	Canada	47	Cognitive Behavioural Therapy (CBT)	Online/ Telephone	6 (270 minutes)	Usual care	Nutrition education within a monthly support group	Eating behaviour	Psychosocial functioning	7 weeks
Cresci et al, 2007	Italy	141	Cognitive Behavioural Therapy (CBT)	Face-to-face	10 (900 minutes)	Active psychological intervention	CBT	Weight loss	Physical activity, dietary intake, and drug use	3, 6 & 12, 36 months
Elder et al, 2012	USA	285	Tapas Acupressure Technique (TAT) with mental steps	Face-to-face	9 (270 minutes)	Active psychological intervention	Social support intervention	Weight loss	Personal health, perceived stress, insomnia, and quality of life	6 & 12 month
Forman et al, 2013	USA	128	Acceptance-based behavioural treatment (ABT)	Face-to-face	30 (2250 minutes)	Usual care	Behaviour change manual	Body mass	Quality of life, food habits, depression, and food cravings	10, 20, 40 weeks, & 6 month
Forman et al, 2016	USA	190	Acceptance-based behavioural treatment (ABT)	Face-to-face	16 (1200 minutes)	Usual care	Behaviour change manual	Weight loss	Health behaviours, food cravings and depression	12 months
Gade et al, 2015	Norway	80	Cognitive Behavioural Therapy (CBT)	Face-to-face	10 (Not reported)	Usual care	Not reported	Body mass	Eating behaviour and depression	12 months

Hilbert et al, 2022	Germany	270	Cognitive remediation therapy (CRT)	Face-to-face	8 (960 minutes)	No intervention	No intervention	Body mass	BMI, executive function, weight management behaviours, self-efficacy, mental health, quality of life, physical health, hip and waist circumference, blood pressure, bioelectrical impedance, and subscapularis skinfolds	6 months
Hjelmsaeth et al, 2015	Norway	61	CBT focusing on self-monitoring	Hybrid	11 (Not reported)	Usual care	Nutritional support and education	Eating behaviour	Depression and BMI	12 & 48 months
Jamshidi et al, 2023	Iran	60	Cognitive Behavioural Therapy (CBT)	Face-to-face	8 (720 minutes)	No intervention	No intervention	Weight Efficacy	BMI, waist circumference and body fat percentage	8 weeks
Jarvela-Reijone et al, 2018	Finland	219	Acceptance and commitment therapy (ACT)	Face-to-face	6 (540 minutes)	No intervention	No intervention	Eating behaviour	Stress, and general health	8 & 36 weeks
Mirkarimi et al, 2015	Iran	150	Motivational Interviewing (MI)	Face-to-face	5 (225-300 minutes)	Usual care	Nutritional support and education	Body weight	Protection motivation theory constructs	8 weeks
Mirkarimi et al, 2017	Iran	150	Motivational Interviewing (MI)	Face-to-face	5 – (225-300 minutes)	Usual care	Nutritional support and education	Body weight	Protection motivation theory constructs	8 weeks
Palmiera et al, 2017	Portugal	73	Mindfulness, ACT, and compassion-based therapy	Face-to-face	12 (1800 minutes)	Usual care	Nutrition & physical activity prescription plans	Eating behaviour	BMI, quality of life, activity levels, cholesterol, psychological function, and weight stigma	14 weeks
Paul et al, 2021	Netherlands	128	Cognitive Behavioural Therapy (CBT)	Face-to-face	10 (450 minutes)	Usual care	Routine appointments with primary care provider	Body mass	Eating behaviour, eating disorders, depression, quality of life, and overall psychological health	10 weeks & 12 months
Porca et al, 2021	Spain	437	Group behavioural therapy	Face-to-face	6 (360 minutes)	Usual care	Nutrition & physical activity prescription plans	Body mass	Change of lifestyle adherence and lifestyle habits	12 months
Raman et al, 2018	Australia	80	Cognitive remediation therapy for obesity (CRT)	Face-to-face	8 (360 minutes)	No intervention	No intervention	Cognitive flexibility	Weight change, binge eating, BMI, depression, and quality of life	8 weeks & 3 months
Rieger et al, 2017	Australia	201	CBT with support person (CBT)	Face-to-face	26 – (2340 minutes)	Active psychological intervention	Not reported	Body mass	Self-efficacy, quality of life, treatment acceptability, body esteem and binge eating	12 & 24 months
Saffari et al, 2014	Iran	327	Motivational Interviewing (MI)	Face-to-face	5 (300 minutes)	No intervention	No intervention	Eating behaviour	BMI and metabolic assessment	12 months
Shemirani et al, 2021	Iran	45	CBT and ACT	Face-to-face	9 (810 minutes)	No intervention	No intervention	Eating behaviour	Health promoting behaviour	8 weeks
Simpson et al, 2015	UK	166	Motivational Interviewing (MI)	Hybrid	15 (540 minutes)	Usual care	Information pack	BMI	Waist and hip circumference, physical activity levels, diet, quality of life, alcohol	8 weeks

									consumption, eating behaviour and dietary intake	
Stahre et al, 2005	Sweden	105	Psychotherapy (cognitive)	Face-to-face	10 (1800 minutes)	No intervention	No intervention	Weight loss	None	6, 12 & 18 months
Stapleton et al, 2017	Australia	178	Emotional Freedom Technique and CBT	Face-to-face	8 (960 minutes)	No intervention	No intervention	Psychiatric symptomatology	BMI and general health	6 and 12 months
Van Wier et al, 2009	Netherlands	1,386	Behaviour therapy	Online/Phone	10 (Not reported)	Usual care	Lifestyle brochures	Body mass	Perceived health, empowerment, self-efficacy concerning weight control, physical activity and eating habits, work performance, waist circumference, sum of skin folds, blood pressure, total blood cholesterol level and fitness	6, 12, 18 & 24 months
Waleekhachonl oet et al, 2007	Thailand	132	Behaviour therapy (group and individual)	Face-to-face	5 (360-480 minutes)	Active psychological intervention	Behavioural therapy	Weight loss	BMI, dietary intake, healthy dieting behaviour, perceived behavioural control, attitude, and subjective norms	3, 6, & 12 months
Wiltink et al, 2007	Germany	267	Psychodynamic therapy	Face-to-face	Not reported	No intervention	Not reported	Body mass	Eating behaviour, physical complaints, interpersonal problems, locus of control, general self-efficacy, satisfaction with weight and treatment satisfaction	36 months