Public Health England

Protecting and improving the nation's health

Uptake and retention in group-based weight-management services

Literature review and behavioural analysis

Final report July 2018

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Executive summary

The Healthier You: The NHS Diabetes Prevention Programme (NDPP) is a national programme for England that aims to identify people at high risk of Type 2 diabetes and refer them onto a behaviour change programme. The specific nature of the lifestyle and behavioural support/intervention of those identified as having prediabetes will depend on these developmental stages and other factors, such as facilities and resources within reach, locality, existing programmes, and individual versus group-based activities. However, weight-management programmes will form a central component of many NDPP services. Studies show that people who remain engaged with a weight-management programme for longer tend to lose more weight (1 to 4). It is, therefore, important to understand how to encourage people to start (‘uptake’) and remain engaged (‘retention’) with such programmes.

This review and behavioural analysis of group-based weight-management programmes aimed to:

- identify key drivers (ie barriers and facilitators) of whether people initially take up programmes (uptake) and then continue to engage (retention)
- identify specific components of programme recruitment methods and intervention design associated with high uptake and retention, respectively
- identify how programmes can maximise uptake and retention

Public Health England Behavioural Insights commissioned Staffordshire University to review the published qualitative and quantitative literature on group-based weight management, and collate information on the main commercial programmes. The team at Staffs then conducted a behavioural analysis, which investigates the drivers of behaviour using a behavioural framework. They used 2 tools to classify behaviour change: the Theoretical Domains Framework (5) was used to classify drivers of participant uptake and retention; the Taxonomy of Behaviour Change Techniques (BCTs) (6) was used to identify specific behaviour change techniques (in terms of the programme recruitment methods and intervention design) associated with high uptake and retention. These were then mapped on to the behaviour change wheel’s ‘Capability', 'Opportunity', 'Motivation' and 'Behaviour' (COM-B) model (7). The COM-B model was used as a framework to inform recommendations regarding what intervention components promote uptake and retention in group-based weight-management programmes.

Drivers of programme uptake

People who are more motivated to attend are more likely to take up group weight-management programmes. However, for motivation to be effective, it is also important to have capability and opportunity, especially social oportunity. Individuals with the knowledge and psychological skills to change their behaviour were more likely to enrol on group management programmes. Individuals who perceived a lack of social support from family/friends or feared stigma from attending the programmes were less likely to enrol.

Drivers of programme retention

The main drivers of continued engagement were the positive social influences of group-based delivery including social support, peer pressure/accountability and a supportive leader. However, it is also important to consider the flexibility of group sessions, the perceived relevance of sessions, and the inclusion of educational components. Unsurprisingly, associated barriers included a lack of social support outside of the programme (for example, from family and friends) and practicalities of attendance (for example, lack of time, competing commitments). When these were mapped to the COM-B model, social opportunity was shown to be the dominant component in relation to retention. Psychological capability was also important.

Recruitment methods to maximise uptake

A general lack of detail in the description of programme recruitment methods prevented meaningful behavioural analysis; the methods could not be classified in terms of BCTs. Recruitment methods were varied and multiple in most programmes, but patterns in relation to uptake could not be discerned. Given the increasing amount of evidence from behavioural insights that the way in which people are invited to take part affects participation in preventive health programmes (8 to 11), there is need for greater consideration and specificity in the reporting of recruitment methods of group-based weight-management programmes.

Intervention components to maximise retention

Through the behavioural analysis, it was possible to identify the following opportunities or recommendations for group-based weight-management programmes to promote participant retention:

- prioritise efforts to foster social support through:
    - ensuring that the group leader is supportive
    - including activities that encourage support between group members
    - including activities that involve participants' family and friends

- include an educational component to empower participants through increasing knowledge
- include self-monitoring and provision of feedback on behaviour, where possible including biofeedback (eg heart rate monitoring during exercise)
- use graded tasks within programmes to build up sustainable changes in the desired behaviour (eg health-enhancing levels of physical activity; 5 or more fruit and vegetable portions/day) taking the baseline position into account (eg sedentary lifestyle)
- set goals for target behaviours (eg physical activity, diet), as well as for outcomes (eg weight loss, change in % body fat)
- provide sessions that: include exercise classes; are in a convenient location; allow flexibility; ideally, allow choice in delivery mode; are perceived as enjoyable by participants and provide positive reinforcement

1. Introduction

Background

The Healthier You: The NHS Diabetes Prevention Programme (NDPP) is a national programme that aims to identify those at high risk of type 2 diabetes and refer them onto a behaviour change programme (12,13). It started in 2016 with a first wave covering 27 areas of England, with plans to roll-out country-wide by 2020. To be eligible for the NDPP, individuals should have non-diabetic hyperglycaemia (defined as having an HbA1c of 42 to 47 mmol / 6.0 to 6.4% or fasting plasma glucose (FPG) of 5.5 to 6.9 mmol/l). People referred to the NDPP will get tailored, personalised help to reduce their risk of type 2 diabetes including education on healthy eating and lifestyle, help to lose weight and bespoke physical exercise programmes, all of which together have been proven to reduce the risk of developing the condition.

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The specific nature of the lifestyle and behavioural support/intervention given to those identified as having prediabetes will depend on factors such as facilities and resources within reach, locality, existing programmes. They may include activities that are undertaken individually or those done as part of a group. However, given the increased risk of type 2 diabetes from being overweight or obese (14),[1] group-based weight-management programmes will be a central component of many NDPP services. A range of practical, socio-demographic, psycho-social, contextual and behavioural factors will impact upon initial and regular attendance at such interventions. To realise the potential benefit of such programmes, it is, therefore, important to understand how to encourage people to start ('uptake') and remain engaged ('retention') with the programmes.[2]

Overview of approach to the review

This review is descriptive and did not involve meta-analysis. The purpose was to provide a detailed description of the evidence from group-based weight-management programmes to allow behavioural analysis of programme designs in relation to uptake and retention. A behavioural analysis investigates the drivers of behaviour using a behavioural framework. The specific methods employed for each part of this multi-component review are detailed in the respective sections.

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1 Body Mass Index: Healthy range 18.5-24.9 kgm-2; overweight 25.0-29.9 kgm-2; Obese ≥30.0 kgm-2.
2 Uptake: defined as attendance at first session. Retention: remain on programme until final follow-up.

The overall aims were to:

1. Identify key drivers (that is barriers and facilitators) of whether people take up and continue to engage with programmes.
2. Identify specific components of programmes (classified as types of behaviour change technique) in terms of the recruitment methods and intervention design that are associated with higher levels of programme uptake and retention, respectively.
3. Use information from (1) and (2) to identify opportunities for group-based weight-management programmes to maximise uptake and retention through incorporating specific intervention components.

To address these aims, the published qualitative and quantitative literature on group-based weight management was reviewed, and information on the main commercial programmes was collated. Frameworks and classifications for behavioural analysis were applied, using methods and principles related to the Behaviour Change Technique (BCT) Taxonomy, Theoretical Domains Framework (TDF), and the COM-B model.

The COM-B ('capability', 'opportunity', 'motivation' and 'behaviour') model is at the heart of the Behaviour Change Wheel (BCW), a comprehensive framework for designing interventions (15). The components of the COM-B model are interactive and provide a method for understanding the drivers of behaviour: what are the barriers that prevent behaviour change (and therefore need to be addressed) and facilitators of behaviour change (whose presence should be encouraged). The COM-B model divides further into the 14 theoretical domains or drivers of behaviour change of the Theoretical Domains Framework (TDF) (5), on which interventions might focus (Table 1). The Technique (BCT) Taxonomy has been developed as a way of standardising the reporting of interventions, and in particular identifying the 'active ingredients' of effective interventions (6). The BCT Taxonomy is a list of 93 discrete intervention components that may have the potential to change behaviour.

Table 1. Mapping of Behaviour Change Wheel's COM-B components to the domains of the Theoretical Domain Framework

COM-B component		TDF Domain
Capability	Psychological	Knowledge Skills Memory, Attention and Decision Processes Behavioural Regulation
	Physical	Skills
Opportunity	Social	Social Influences
	Physical	Environmental Context and Resources
Motivation	Reflective	Social/Professional Role and Identity Beliefs about Capabilities Optimism Beliefs about Consequences Intentions Goals
	Automatic	Social/Professional Role and Identity Optimism Reinforcement Emotion

(Taken from Cane et al. 2012 (5))

These models and frameworks are useful for identifying key drivers of behaviour (using the TDF), identifying specific intervention components (using the BCT Taxonomy), and for understanding the broader interactive components which need to change in order to elicit a given behaviour (COM-B).

Briefly, this work involved the following:

Section 2:

A review of published qualitative research to identify themes from qualitative data from participants in group-based weight-management programmes that are related to barriers or facilitators of uptake and retention.

A behavioural analysis of published qualitative evidence to identify key drivers (ie barriers and facilitators) of these behaviours (ie uptake and retention) through classifying these themes using the TDF(16).

Section 3:

A review of published quantitative research to identify the recruitment methods and intervention components in group-based weight-management programmes, which can then be examined in relation to levels of uptake and retention, respectively.

An analysis of published quantitative evidence using behavioural frameworks by characterising these recruitment methods and intervention components using the taxonomy of 93 BCTs (6), and examining which are used in programmes with high uptake and retention, respectively.

Section 4:

Narrative review of common commercial group-based programmes to examine common delivery models and characterise them using the BCT Taxonomy.

Section 5:

Mapping of drivers (from Section 2) and Behaviour Change Techniques (from Sections 3 and 4) onto components of the COM-B model (7). This aimed to use the information from Sections 2 to 4 to identify intervention components that promote uptake and retention in group-based weight-management.

Section 6:

Summary and recommendations, based on the behavioural analysis.

2. Review of and behavioural analysis of qualitative evidence

Aim

A review of literature was used to identify qualitative studies that reported themes related to uptake and/or retention (for group-based weight loss programmes) to gain insight into factors that determine whether individuals initially take up a programme (uptake) and then continue to engage with it (retention).

Methods

Search strategy

To find the appropriate articles for the review, several databases were searched including EBSCO, ScienceDirect, Summon, Cochrane Library, Medline, CINAHL, SportDiscus, PsycINFo, PsycARTICLES, PsycBooks, PubMed and PubMed Health. An initial scoping search on Google was also conducted. The literature search was conducted 17th to 31st January 2016.

The search terms included: qualitative, weight management, weight management intervention, weight control, weight control intervention, weight loss, weight loss intervention, intervention, program, trial, uptake, retention, attrition, attend, and group. Initially 1121 articles were identified from searches prior to the following inclusion/exclusion criteria being applied.

Inclusion criteria

For inclusion, studies were required to meet 6 criteria:

1 Published in English language.
2 Published year ≥2000 (to delimit to current types of intervention employed in weight management).
3 Use of a group-based behavioural intervention (including physical activity/exercise programmes, and/or diet and psychological techniques such as motivational interviewing and cognitive behavioural therapy).
4 Participants were adults (aged ≥18 years).
5 Qualitative research (as the intention of the review was to look at individual reasoning).

6 Themes related to uptake and/or retention (as the intention of the review was to look at reasoning behind uptake and/or retention).

Exclusion criteria

Exclusion criteria were:

1 Not relevant to weight management. All studies that did not relate to weight management (for example, being about depression or anxiety) were excluded from the review.
2 Individual-based. Interventions that were individual-based and incorporated pharmacological products, surgery or non-behavioural interventions were excluded. If the study did not clearly specify if the intervention was group- or individual- based then it was excluded. Case studies were excluded as they only give the opinion of one individual.
3 Qualitative studies not based on an intervention. Qualitative studies that did not seek the views of participants and/or personnel who were involved in an intervention were excluded from the review.
4 Themes not relevant to general population. If studies included themes that were relevant to a specific population group then these were excluded (for example, effects of intervention on spinal cord injuries).

Screening process

The following screening process was carried out:

VR conducted initial searches, and screened title and abstracts from 1121 articles to retrieve 53 articles.

Reviews (n=6) included in title and abstract screening were then read to determine if they could be used at face value or whether individual articles had to be screened. As all 6 reviews included articles that were both based on individual- and group-based interventions, they were subsequently excluded and 21 individual articles were extracted leaving a total of 68 included articles.

All 68 articles were then screened by VR to determine if the research was based on an intervention and if the intervention employed was group-based. As a result of this 36 articles were excluded. The remaining 32 articles were then screened by VR and SB to determine if the results were relevant to uptake and retention.

There was 90.6% agreement on the studies screened. There was only disagreement on 3 articles, which were subsequently excluded: one was excluded due to the nature of the intervention (it was a mandatory exercise intervention with severely mentally ill

patients in a secure hospital) and 2 studies focussed on particular patient groups which resulted in the themes only being relevant to these population groups (severely mentally ill and spinal cord injuries). The agreement to exclude these 3 articles was reached in a team meeting (CG, RP, NE, VR & SB). A final sample of 29 studies met all inclusion criteria (Figure 1; Appendix 1).

Analysis

Themes relating to uptake and/or retention from the qualitative data reported in each paper were extracted. Each theme was then mapped to the Theoretical Domains Framework (TDF) to determine the barriers and facilitators (or drivers) of:

- uptake (ie pre-programme)
- retention or continued engagement (ie during the programme)

The TDF is described in detail elsewhere (5). It comprises 14 domains and was developed to simplify and integrate constructs from 33 behaviour change theories. The TDF can be used to understand the 'drivers' of a given behaviour (Table 1). In this case, the behaviours are starting a group-based weight-management programme (uptake) and remaining engaged (retention). Classifying themes from the qualitative research relating to influences on the participants' attendance at such programmes, both initially (uptake) and continuing once engaged (retention), allows the drawing of inferences about the drivers of these behaviours. The TDF also maps to the COM-B model (Table 1), the model of behaviour change that forms the basis of the Behaviour Change Wheel (BCW) (15). In the COM-B model, for a behaviour (B) to occur, individuals need the capability (C), opportunity (O) and motivation (M). By considering the TDF domains in relation to the COM-B components, one can draw inferences about what programme components drive uptake and retention—both in terms of which components are barriers that need to be addressed and which are facilitators that should be present.

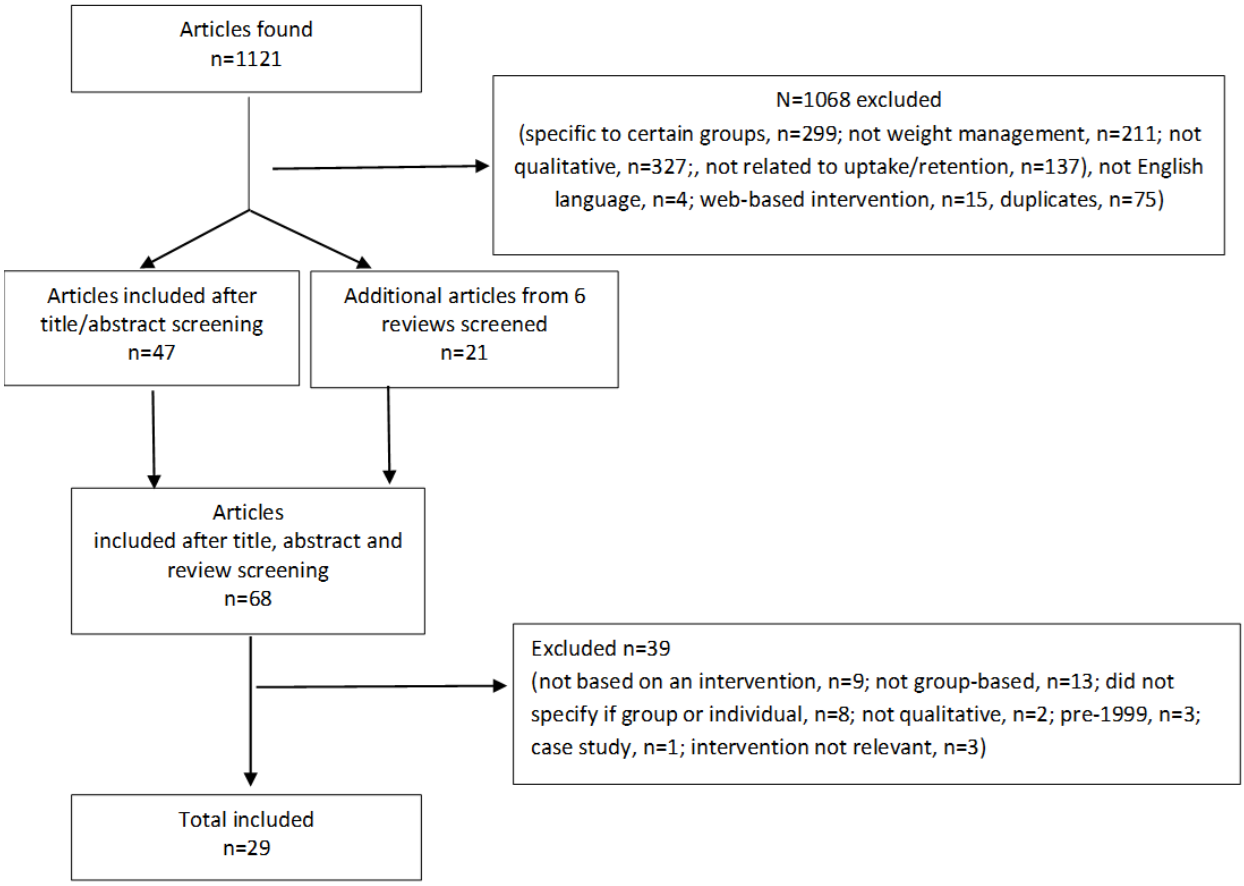

Figure 1. Flow diagram to show the search process for qualitative studies

Results

Participant characteristics

Nine studies included both male and female participants (17 to 25), 9 included only female participants (26 to 34), 6 studies included only male participants (35 to 40) and five studies did not specify (41 to 45).

Five studies included participants between the ages of 24 and 68 (22,25,31 to 33). Nine studies reported the mean age of participants, which ranged from 34 (19) to 62 years (23). Fifteen studies did not report participant age (17,18,38,40,42,44,45,20,26,28 to 30,35 to 37).

Only 7 studies reported ethnicity of participants. Six studies reported that the majority of their sample were white (21,23,27,28,31,33), one study included only South African women (30). Twenty two did not specify the ethnicity of participants (17,18,34 to 43,19,44,45,20,22,24 to 26,29,32).

Nine studies reported mean BMI for participants as a baseline measure, with the lowest being 28.7 (34), and the highest being 35.2 (33). Studies reported participant BMI between 29 (22) and 40 (22). One study reported BMI being over 35 (32). Eighteen studies did not report participant BMI (17 to 21,25,26,29 to 31,35 to 38,40,42,44,45).

Recruitment methods

Recruitment method refers to the method used to recruit participants into the group-based weight-management programme (not the qualitative data collection). Various methods were used (Table 2). The most common recruitment method was use of local media, followed by GP referrals, letters, posters, flyers, town visits and events, and football clubs and home matches. Six studies did not specify what method they used to recruit participants.

Table 2. Summary of recruitment methods used in different weight-management programmes

Recruitment method	Number of programmes	
Local Media	8	(30,34–37,41,42,44)
Doctor Referrals	7	(19,25,27,28,39,41,43)
Not Specified	6	(17,20,22,29,32,40)
Letters	5	(23,33,34,41,43)
Posters	4	(25,27,31,44)
Flyers	3	(24,34,41)
Town Visits and Events	3	(31,32,41)
Football Clubs/Home Matches	3	(35,37,38)
GP Surgeries/Health Centres	2	(26,30)
Television	1	(18)
Health Plan Members	1	(21)
Agencies	1	(27)
Word of Mouth	1	(27)
Leaflets	1	(44)
Another Study	1	(45)
Databases	1	(33)

Intervention type

Appendix 1 summarises the studies included. The programmes in these studies employed a variety of group-based approaches. Some were single component, for example, using only exercise intervention (30,31,36,43), diet-only (29), education (40), or behavioural intervention (24,33,34). More commonly, a combination of 2 or more of these were used, such as exercise and behaviour change (22,37), exercise and education (23,32), diet and behaviour change (26), diet and exercise (27), diet and counselling (42), or all of education, exercise, behaviour change and diet (17,20,35,41,45). Three studies were based on commercial weight loss programmes (18,19,28) (Weight Watchers, Rosemary Conley and Slimming World), which are discussed in more detail in Section 4. For the remaining studies, there was use of health assessment and education (44), behavioural and motivational interviewing (41), health promotion/education (38), whereas one did not specify the intervention type (25) and another did not report sufficient information (39).

Theme extraction and mapping

Tables 3 and 4 show the themes extracted relevant to barriers and facilitators (or drivers) of uptake from the 29 studies included. Each theme has been mapped onto the relevant domain of the TDF.

Table 3 shows that the most common domains of the TDF driving uptake are intention and knowledge. This suggests that people are most likely to take up a weight-

management/loss programme if they intend to lose weight and/or improve their health and have the knowledge to do so.

Looking at the barriers to uptake (Table 5), the most common domains of the TDF preventing programme uptake are social influences, knowledge and emotion. This implies that people who do not have the social support, have poorer knowledge, and have negative emotions (including previous negative experiences, fear of the unknown or lack of confidence) are less likely to take up these programmes.

Table 3. Facilitators of uptake of weight-management programmes mapped to the Theoretical Domains Framework (TDF)

Facilitators for uptake	Number of programmes	Illustrative Quote	TDF
Improve health	12 (18,19,46,47,27,30, 34,36,37,39–41)	"I knew I was overweight, I was feeling unhealthy. That's the main reasons."(p.136) (40)	Intention Emotion
Weight	10 (17,19,25,26,34,40, 42,46,48,49)	"So it's like … 'Well, I don't want to be the fat mum in the playground when everybody else is thin'." (p.8) (19)	Intention Knowledge Emotion
Intervention accessibility	6 (17,37,38,40,49,50)	"I think it was very appropriate, having it at the school because the school is a big part of our community" (p.7) (49)	Environmental Context and Resources
Fitness	5 (17,18,20,37,40)	"I can't run about as much as I would like to and I can't be as active with them [her children] as I would like to be, and I felt that was a big problem…"(p.498) (20)	Intention
Medical assessment	5 (17,19–21,39)	"The doctor telling you you're not well. […] when somebody says 'you've got seriously high blood pressure and it's your life' type of thing, you get off your backside and you try to do something about it."(p.498) (20)	Knowledge
Increasing confidence/self-esteem	4 (18,19,26,46)	"…For myself, I want to lose weight and I want to get in clothes. I hate buying dark colours… I've gone from a right bright wardrobe to black." (p.9) (26)	Intention Emotion
Family history	2 (17,42)	"Death angst – there's a heart attack knocking on my door."(p.101) (42)	Knowledge Beliefs About Consequences
Family pressures	2 (37,39)	"I've had 2 kids in the last 3 years… that was part of the motivation, as well – just getting fitter for my kids… I thought, 'I need to get myself fit for these weans [children]', you know? I need to be aboot [about] for as long as possible."(p.4) (37)	Social Influences
To learn more	1 (30)	No quote available.	Intention
Improve quality of life	1 (40)	No quote available.	Intention
Increasing age	1 (36)	"You miss the colleagues, you miss the regular job, the 37 h a week or whatever; you have to find something to do."(p.70) (36)	Intention
Reduce isolation	1 (20)	No quote available	Intention Environmental Context and Resources

Table 4. Barriers to uptake of weight-management programmes mapped to the Theoretical Domains Framework (TDF)

Barriers to uptake	Number of Studies	Illustrative Quote	TDF
Denial	3 (19,28,51)	"I didn't think I were that bad. I knew I was overweight, but I thought, 'Well, put on the right clothes. Cover it up'." (p.64) (19)	Knowledge
Previous negative experiences	3 (19,20,32)	"…the doctor had to come out and just took one look at us and said 'well, if you don't eat your pies and crisps and fizzy pop…' and he made me feel like that [bad]. Didn't ask me any questions of what was in the house or what I ate, just assumed that I ate all the wrong foods. So I didn't want to answer him or talk to him. I thought, 'I don't want to talk to you. Just get out!'."(p.498) (20)	Emotion
Fear of unknown	3 (19,40,41)	"People [are] apprehensive of what they are going to get into and what is going to be asked of them."(p.7) (41)	Social Influences Emotion
Location	2 (38,41)	"This is a small community—they're nervous about doing something that everybody is going to be watching."(p.7) (41)	Environmental Context and Resources
Lack of confidence	2 (31,43)	"I only live across the road and it's not that physical distance, it was the mental, getting out of the door, getting across there, it was losing the confidence in myself."(p.415) (43)	Emotion
Unsupportive family	1 (20)	"My son, he always says 'you won't be able to do it mum, you won't be able to stick to it, you've said it that many time'. But I've proved him wrong." (p.498) (20)	Social Influences
Stigma (men's health)	1 (38)	"[M]en particularly are reluctant to up take the many health care provisions that there are in our society, this kind of self-image thing and the sense of mortality is a huge barrier to some people."(p.27) (38)	Social Influences
Incompatible with lifestyle	1 (18)	"I work funny hours so of course I can only eat a certain times…I need something and just scoff something, chocolate bars, whatever."(p.76) (18)	Social Influences Environmental Context and Resources
Awareness of programme	1 (38)	"[I]t's quite expensive working out petrol and food, and we always look at the teams on the internet before we set off so we don't buy the programme."(p.26) (38)	Knowledge
Pre-conceived perceptions	1 (44)	"I agreed to attend but was a wee bit worried that it was going to be some sort of diet programme where you starve. I wasn't that keen in attending group neither but they said it worked well and is usually a good laugh so I agreed to give it a try."(p.85) (44)	Knowledge

Themes associated with facilitators and barriers to retention were then drawn from each study. These are summarised in Tables 5 and 6, which detail the different themes, and how each maps to the TDF.

The analysis regarding facilitators for retention (Table 5) shows that the most dominant domain of the TDF in terms of both number of themes and number of studies driving retention is social influences. Other components driving retention, but to a lesser extent, are environmental context and resources, reinforcement and knowledge. This would suggest that the positive social influences of group-based delivery including social support, peer pressure/accountability and a supportive leader are the main drivers of retention. However, the environmental context and resources are also important in that classes need to be flexible, relevant and convenient. An educational component to the programme appears important, but also sessions need use positive reinforcement by highlighting positive results.

Table 5. Facilitators of retention in weight-management programmes mapped to the Theoretical Domains Framework (TDF)

Facilitators of retention	Number of Studies	Illustrative Quote	TDF
Social Support	16 (18,20,23–27,32,36,39,41,45,48,52–54)	"Here I can meet others with the same problems as myself. For everyone have problems due to their weight, right. And we share the same problems. . . . We understand each other."(p.7)"(32)	Social Influences
Peer pressure (accountability)	8 (24,26–28,32,36,47,55)	"That class motivation I felt worked…building up that…friendly atmosphere and team motivation I found worked quite well."(p.255) (28)	Social Influences
Supportive Leader	6 (17,21,26,31,32,45)	"Her attitude was absolutely wonderful. You always felt very comfortable about walking in there and she reinforced all the time that no one was to comment on anyone else or say negative things about anyone. That was really good. She was very supportive and what I liked particularly about her was that if you'd had a bad time she was not negative."(p.6) (17)	Social Influences Reinforcement
Group-based delivery	6 (25–28,30,36)	"It motivated me cause you're getting together with everyone." (p.22) (26)	Social Influences
Educational aspect	5 (21,23,25,27,44)	"I feel like I have the education that I can go forward and keep fit and eat healthy."(p.16) (27)	Knowledge
Flexibility of the intervention	4 (30,39,41,43)	"You personalised it so it was something that would work for you." (p.77) (39)	Environmental Context and Resources
Seeing positive results (physically and psychologically)	5 (27,31,34,42,44)	"I was surprised and pleased I was no longer carrying this weight: 10kg and 9 cm from my waist. I was really proud of myself and it spurred mean to keep going." (p.85) (44)	Reinforcement
Exercise classes	3 (18,23,30)	"I've increased my exercise. I've increased it to doing cycling on the common when the weather is OK, and I go swimming once a week."(p.77)(18)	Environmental Context and Resources
Programme more positive	1 (17)	No quote available.	n/a
Intervention easy to follow	1 (18)	No quote available.	Knowledge
Intervention relevant to everyday life	1 (17)	No quote available.	Environmental Context and Resources
Convenience of intervention	1 (40)	"I think it was something I was looking to do whilst at work. I probably wouldn't do it out of work. Because it was inside work that was a factor for me. . . It's passed my mind quite a few times but I think because it's during work hours it's given me more motivation because I probably wouldn't do anything in the evenings myself. And that's helped a lot for me." (p.138) (40)	Environmental Context and Resources
Monitoring during intervention	1 (21)	"As much as I do not like saying this, the weekly records really, really help . . . it's quick, it's easy. . . . I think a lot of problems that I had before with portion control and serving size [are] not happening now. And I really like that the weekly records are not just about food. I've got, on the same page, my sleep and my exercise. I think that really balances it. Instead of just being about food." (p.5) (21)	Behavioural Regulation
Self-determination	1 (29)	No quote available.	Intention
Social identity with the club (Men Only)	1 (37)	"You feel you're going into the team, a wee bit, don't you?"(p.6) (37)	Social/Professional Role and Identity
Enjoyment	1 (39)	"You actually looked forward to coming"(p.7) (39)	Emotion

Findings regarding the barriers to retention show that the key domains that appear to influence disengagement with programmes are social influences and environmental context and resources. Specifically, a lack of social support external to the programme (for example, from family and friends) together with practicalities (for example, lack of time, competing commitments) were given as reasons for disengagement.

Table 6. Barriers to retention in weight-managment programmes mapped to the Theoretical Domains Framework (TDF)

Barriers to retention	Number of Studies	Illustrative Quote	TDF
Intervention incompatible with lifestyle	8 (24,27–29,39,53,55,56)	"I mean, none of it, nothing you really ask is difficult, it's just time consuming … and some days you are just too busy or things happen, and I just didn't do it.! "People [are] apprehensive of what they are going to get into and what is going to be asked of them."(p.8) (53)	Social Influences Environmental Context and Resources
Lack of social support	5 (21,29,31,34,45)	"My husband had no opinion except that he … wanted to have the usual food with sauce and so on."(p.5) (29)	Social Influences
Health problems	3 (25,29,39)	No quote available.	Knowledge
Lack of knowledge	3 (24,25,34)	"Really, they [healthcare professionals] should give you a bit more information… people turn up and then it's not right for them… if they'd had the information… they wouldn't have come, well waste their time really…" (p.2518) (25)	Knowledge
Insecurity	3 (28,29,39)	"He was a slightly younger guy and I think that could be an intimidating thing."(p.9) (39)	Emotion Social Influences
Fluctuating motivation	2 (34,39)	"Motivation fluctuates quite a lot. . . depend[ing] like, on how busy I am at work, or what's going on in the household—even down to you know what time of the month it is."(p.8) (34)	Intention
Large group sizes	1 (25)	No quote available.	Environmental Context and Resources
Inadequate space	1 (25)	No quote available.	Environmental Context and Resources
Injury	1 (34)	No quote available.	Environmental Context and Resources
Holidays	1 (39)	No quote available.	Environmental Context and Resources
Lack of self-control	1 (29)	No quote available.	Beliefs About Capabilities
Not seeing big enough results	1 (39)	No quote available.	Reinforcement
Educational aspect	1 (28)	"It isn't that I need educating, it's more that I need motivating." (p.255) (28)	Knowledge
Attitude towards staff	1 (25)	"I said to him 'I'm putting on weight doctor' and he says 'that's because you eat too much and don't get enough exercise'. That's pretty blunt isn't it? If you're overweight, the last thing you want someone to tell you is that you're fat." (p.2519) (25)	Emotion

Overall summary from qualitative findings

In summary, the analyses have provided useful insight into the drivers behind uptake and retention in group weight-management programmes. Mapping these findings onto the TDF domains has also helped to understand the potential mechanisms involved. For uptake, people who have a greater intention to attend and have the necessary

knowledge are more likely to take up group weight-management programmes, as long as they have the necessary social support in place, and are not deterred by previous negative experiences, fear of the unknown or lack of confidence (negative emotions). Interestingly, although environmental context and resources, such as the location of the programme do influence peoples' decisions to enrol on a programme, social influence was perceived as a barrier, rather than a facilitator. On further examination, this may be due to a perceived absence of social support from the family, or a fear of stigma from attending the programme, rather than negative perceptions of social support from the group weight-management programme.

Overall, these findings suggest that the way in which these programmes are 'sold' to participants is crucial. Although location and timing are important, so is an understanding of the programme, its content, and an awareness of how it would benefit attendees.

In contrast, the most influential driver for retention was social influence. This would suggest that once people have enrolled onto the programme, the level of support that they gain from the group environment and its leader (or facilitator) is linked with their continued attendance.

Other factors acted as facilitators and/or barriers. One of the most prominent of these is environmental context and resources. Specifically, the compatibility of the programme with the participant's lifestyle is important (for example, flexibility, location and convenience). Also, positive reinforcement, through having a supportive group leader and seeing positive results was found to facilitate retention. Finally, those who gained knowledge and who found the programme to be accessible and easy to follow, were more likely to continue to engage with it. In summary, once people have enrolled on a programme, it is important that it is engaging, supportive, and compatible with their lifestyle.

3. Review and behavioural analysis of quantitative evidence

Aim

To classify programme characteristics associated with high uptake and retention from the published literature of quantitative studies and to identify Behaviour Change Techniques (BCTs) that can be used to promote uptake and/or retention in group-based weight-management programmes.

Methods

Search strategy

This review used a 2-stage approach. The initial aim was to use review-level evidence, rather than conduct a new review of individual studies reporting uptake or retention in group-based weight-management programmes. However, from initial searches it became apparent that there were no reviews that were limited to studies that suited our purpose. The second stage, therefore, was to search within all related reviews to identify appropriate individual studies.

As part of the search strategy, a wide range of databases were used including: Summon, Cochrane Reviews, PsycARTICLES, Science Direct, PubMed, EBSCO (included: MEDLINE, CINAHL Plus with Full Text, SPORTDiscus with Full Text, eBook Collection (EBSCOhost), PsycINFO, PsycARTICLES, PsycBOOKS). The literature search was carried out from 25th Nov 2015 to 22th Dec 2015.

Search terms included: review*, weight management intervention*, uptake and/or retention, group based intervention*, weight loss behav*, attend*, weight loss intervention*, weight control intervention*.

Inclusion criteria

For inclusion, studies were required to meet 7 criteria:

1 Published in an English language.
2 Published from 2000 to 2016 (to limit to current types of intervention employed in weight management).
3 Use of a group-based behavioural intervention (including physical activity/exercise programmes and/or diet; psychological techniques such as motivational

interviewing, Cognitive Behavioural Therapy (CBT)). Individual-based only studies, pharmacological and non-behavioural interventions were excluded.

4 Weight loss and/or management as a primary outcome.
5 Report uptake and/or attendance/retention.
6 Overweight or obese adults (≥18 years of age).
7 General population of adults used.

Selection of reviews

The initial search resulted in 678 reviews. After duplicates were removed and the titles and/or abstracts were checked, 107 reviews were included. After screening 107 review papers, 46 relevant reviews were found. The application of inclusion criteria led to a final number of 11 relevant reviews retrieved from the search (Figure 2). Appendix 2 provides details of the 11 reviews.

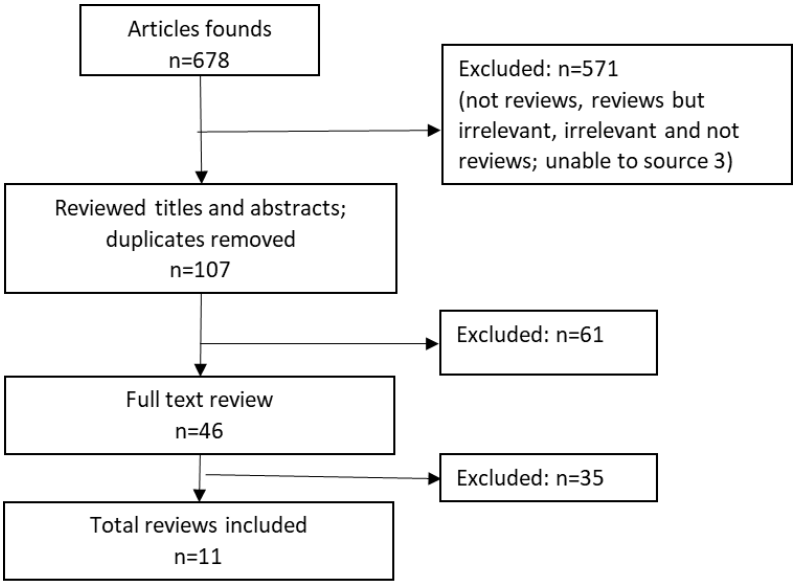

Figure 2. Flow diagram of search strategy and review selection

Study selection

From the 11 identified reviews, relevant individual studies were selected that had met the inclusion criteria above. Figure 3 details how the final number of relevant individual studies were extracted from the 11 identified reviews. Appendix 3 lists studies and data extracted.

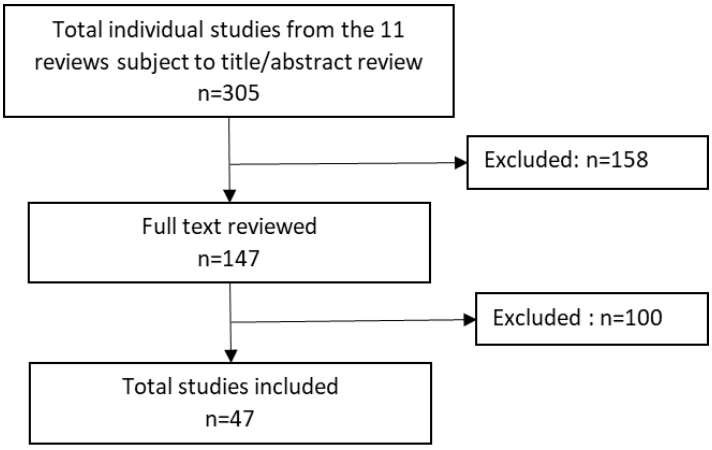

Figure 3. Flow diagram of study selection

Analysis

Data were extracted from the 47 studies and tabulated (Appendix 3). To allow exploration of programme characteristics (and ultimately, BCTs) in relation to uptake and retention, the following definitions were applied (where data reported allowed):

- response rate: percentage of individuals who responded to an initial invitation to join a programme
- uptake: percentage of individuals who started attending a programme (as a proportion of responders, where applicable)
- retention: percentage of individuals who remained in the programme at the final follow-up[3]

Table 7 summarises how levels of uptake and retention were defined to allow meaningful comparisons. These thresholds were determined by both the distribution of uptake and retention levels across the programmes and to allow meaningful between-group comparisons within the sample of studies.

Table 7. Definition of levels of uptake and retention

	Low	Medium	High
Uptake	≤20%	21 to 49%	≥50%
Retention	≤70%	70 to 84%	≥85%

[3] There was variation in programme duration and, therefore, the point at which participants were considered to have 'completed' varied (see Appendices 3 and 5 for details).

The taxonomy of Behaviour Change Techniques (BCTs) was applied to characterise the recruitment methods and the specific intervention components as BCTs. A BCT has been described as an 'observable, replicable and irreducible component of an intervention designed to alter or redirect causal processes that regulate behavior; that is, a technique is proposed to be an 'active ingredient' (for exampl feedback, self-monitoring, reinforcement)' (6, p.82). Classifying intervention components as BCTs, using the 93-item BCTv1 taxonomy (6),[4] was used here to give insight into common components of programmes with high uptake or retention.

The process was as follows:

Four papers were reviewed and BCTs applied by all authors (CG, NE, RP, SB and VR) to agree the process and reach consensus on interpretation. 30 papers were reviewed independently by 2 researchers (SB, VR), with subsequent discussion to agree any discrepancies. For 9 papers where consensus could not be reached on specific BCTs, a third reviewer was involved to discuss and reach consensus (RP). A further 13 papers were reviewed by one researcher (SB) and then checked by a second (VR).

Results

Participant characteristics

The majority of programmes included both male and female participants (31/47), but within these, there were often more females than males (28 programmes). Approximately one-third of programmes (14/47) comprised female-only samples and just one study involved a male-only sample.

Most studies involved samples of approximately middle-aged adults (40/47 programmes with samples whose mean age was 37 to 66 years). Half of programmes reported that participants were predominantly Caucasian (23/47 programmes); one had a mostly Black sample, 2 programmes had a mostly African American sample, and ethnicity was unclear or not stated in the remaining 21.

[4] Each study was characterised according to the Taxonomy of 93 Behaviour Change Techniques (BCTs) using the BCTv1 (6). The CALO-RE was explored as a pragmatic alternative, but the greater sensitivity and currency of the BCTv1 was favoured for present purposes

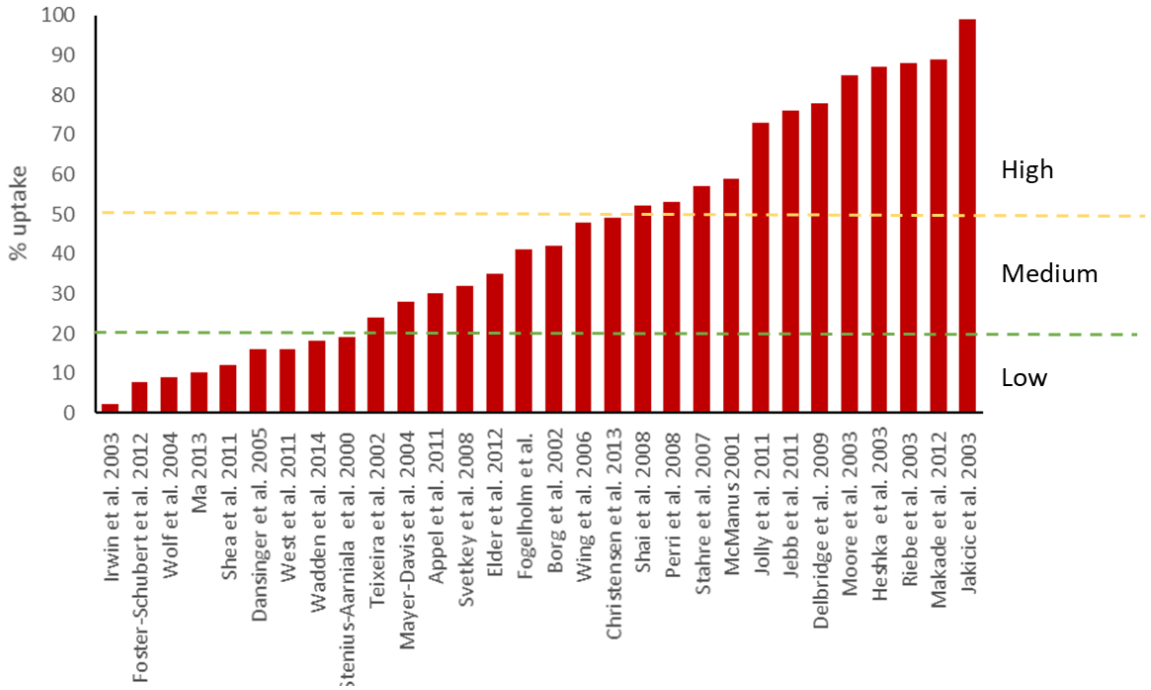

Figure 4. Distribution of uptake levels across studies

Recruitment method and uptake

Various recruitment methods were used (Table 8), with multiple methods being used by most programmes. The most common methods were letters/mailing and flyers, newspaper advertisements followed by TV/media adverts and primary care referrals.

Table 8. Details of recruitment methods used by individual studies

Recruitment method	Number of programmes	
Newspaper advertisements	18	(57) (58) (59) (60) (61) (62) (63) (64) (65) (66) (67) (68) (69) (70) (71) (72) (73) (74)
Brochures/flyers	8	(75) (76) (77) (78) (69) (79) (74) (80)
Emails/web/media	10	(76) (60) (61) (62) (77) (81) (82) (79) (72) (83)
Radio	1	(79)
Word of mouth	2	(63) (69)
Letters/mailing	10	(75) (77) (78) (81) (82) (84) (85) (86) (68) (79)
Clinical records/health centres/GP/referrals/hospital	15	(75) (61) (87) (88) (84) (66) (89) (80) (67) (90) (91) (92) (93) (94) (83)
Other programmes/trials	3	(95) (74) (96)
Survey	1	(97)
Unclear/not stated	6	(98) (96) (99) (100) (101) (102)

Uptake ranged from less than 1% to 99% (Figure 4). For 17 programmes (36%), uptake could not be determined; 9 had low uptake (≤20%); 9 had medium uptake (21 to 49%), and 12 programmes were classified as having high uptake (≥50%).

Table 9 summarises the types of recruitment method used by programmes grouped by level of uptake low-high) and Table 10 summarises the number of different methods used by level of uptake. There do not seem to be any clear patterns when considering level of uptake as most methods were used across programmes with low, medium and high uptake (Table 9). Nor were there any clear differences between programmes with low, medium or high uptake in terms of number of recruitment methods used (Table 10). However, of interest, "word of mouth" was only used in programmes with high uptake, and the most common method of recruitment for programmes with low uptake was through TV or media.

The analysis of BCTs used in recruitment methods only identified Credible Source (9.1)[5] where a health professional was involved with the referral (Appendix 4). It should be noted, however, that the level of information reported for recruitment methods in most studies did not allow BCT classification.

This highlights a gap in the use of BCTs in recruitment to group-based weight-management programmes which could be addressed through more comprehensive reporting.

Table 9. Recruitment methods used in weight-management programmes with high, medium, and low uptake

Uptake (n of programmes)	Recruitment method	% of programmes
High uptake (12)	Letters/mailing/flyers	42
	Primary care/clinic records	33
	Newspaper advertisements	17
	Word of mouth	17
	Unclear/not stated	17
	Survey	8
Medium Uptake (9)	Flyers/brochures/newsletter/poster	56
	Newspaper advertisements	56
	Primary care/health centre/referrals	33
	Letters/mailing	33
	TV/radio	22
	Website	11
	Other programmes	11
Low Uptake (9)	TV/media	33
	Letters/mailing	22
	Newspaper advertisements	22
	Primary care/centre	22
	Other programmes	11
	Unclear/not stated	11

[5] The number refers to category and sub-section within Taxonomy of Behaviour Change Techniques, v1(6)

Table 10. Number of recruitment methods used in weight-management programmes with high, medium, and low uptake

Number of recruitment methods	Uptake*							
	High		Medium		Low		Unclear	
	N	%	N	%	N	%	n	%
1	5	23	2	9	5	23	10	45
2	4	33	2	17	2	17	4	33
3	1	14	3	43	1	14	2	29
4	0	0	2	9	0	0	0	0
NS	2	50	0	0	1	25	1	25
Total	12		9		9		17	

*Low, <20%; Medium 20 to 49%; High ≥50%

% calculated as a proportion of programmes using a certain number of recruitment methods

Programme intervention design and retention

Approximately half of the programmes consisted of diet and exercise components, 11 were diet-only, five were exercise-only, and 2 programmes used motivational interviewing techniques. Eight did not specify (Table 11). Programmes with exercise components used exercise classes or structured exercise programmes as a means of increasing overall physical activity (see Appendix 3 for examples).

Retention across programmes varied from 35 to 98%: 20 programmes were classified as high retention (≥85%), 19 as medium retention, and 12 as low retention (Appendix 5).

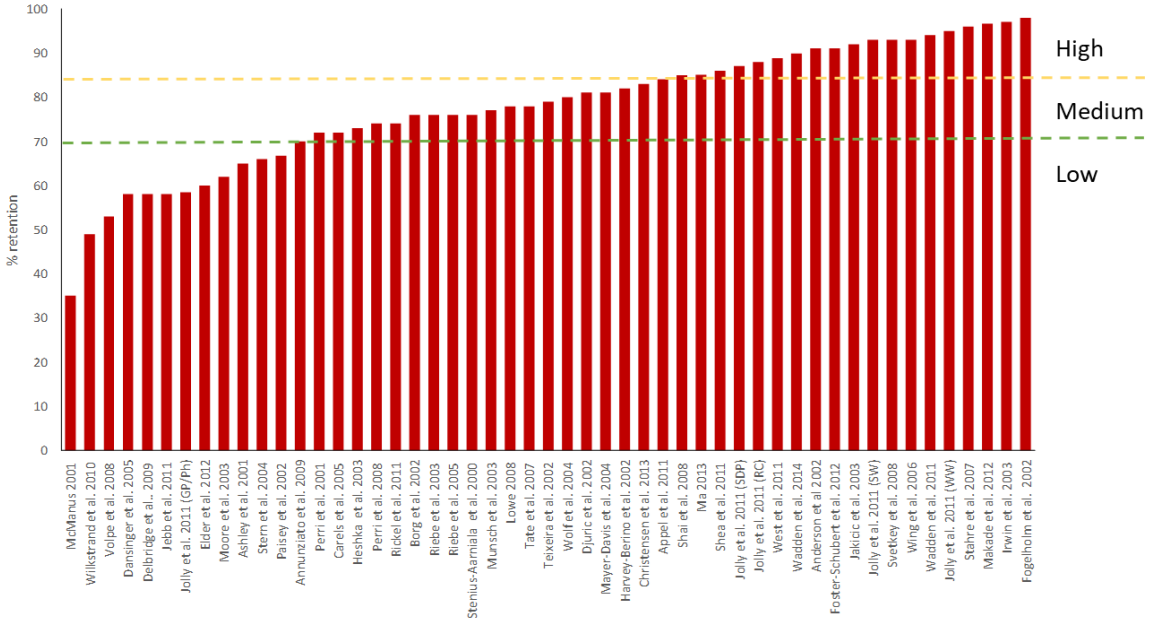

Figure 5. Distribution of retention levels across studies

Table 11. Retention level by intervention type

Retention*	Intervention type							
	Diet + Exercise		Diet		Exercise		Other or unclear	
	N	%	N	%	n	%	n	%
Low	4	15	6	60	1	17	1	13
Medium	9	33	3	30	3	50	4	50
High	14	52	1	10	2	33	3	37
	27		10		6		8	

n, number of programmes; %, proportion of programmes within intervention type
*Low, <70%; Medium 70 to 84%; High ≥85%

When exploring intervention type in relation to rate of participant disengagement, diet-only programmes had the lowest retention levels. It appears that a combination of diet and exercise is associated with better retention, although the relatively small number of programmes using only diet or exercise is a limitation (Table 11).

Table 12 summarises the BCTs used in programme interventions, grouped by level of retention (see Appendix 2 for detail on individual programme intervention design and Appendix 5 for associated BCTs).

Some patterns emerged when comparing BCTs across studies classified by level of retention:

- there was evidence of greater diversity in BCTs used in programmes with a greater total number of BCTs across high retention programmes (34) compared with medium (20) or low (17) retention programmes
- the average number of BCTs used was highest in programmes with high retention (7.9) compare with low (5.5) or medium (5.3) retention)
- the most common BCTs in all 3 types of programme (low, medium and high retention) are: 1.1 Goal setting (behaviour) (68 to 80%), 2.3 Self-monitoring of behaviour (50 to 80%), 4.1 Instruction on how to perform a behaviour (58 to 85%) and 9.1 Credible source (50 to 85%)
- the 3 most common BCTs in high retention studies were: 4.1 Instruction on how to perform a behaviour (85%), 9.1 Credible source (85%) and 2.3 Self-monitoring of behaviour (80%)
- problem-solving (1.2) was more commonly used in programmes with medium (68%) or high retention (60%), than in low retention programmes (25%)
- BCTs commonly used in low retention programmes were Goal setting of outcomes (1.3, 50%), Action Planning (1.4, 17%) and Demonstration of the behaviour (6.1, 25%)
- there was less evidence of social support (unspecified 3.1; emotional 3.3) in the low retention programmes (17%; 0%) compared with medium (26%; 5%) or high retention programmes (45%; 25%)

- although self-monitoring of the behaviour (2.3) and feedback (2.2) were used across all programmes (with highest use in high retention programmes), biofeedback (2.6) was more commonly used in high retention studies (15%)
- many BCTs were only observed in high retention programmes, for example: Review behaviour goal(s) (1.5, 20%); self-monitoring of *outcomes* of behaviours (2.4, 15%); Social comparison (6.2, 15%); Prompts/cues (7.1, 25%)

Overall, many group-based weight-management programmes used a core set of BCTs, such as setting behavioural goals (for example, performance of 30 minutes of exercise each day), self-monitoring of behaviour (for example, maintain a food diary), giving instruction on performance of the behaviour (for example, specific exercise programme; portion size control) and use a 'credible source' in delivery (for example, health professional, individual who has successfully lost weight). However, high retention programmes appeared to incorporate a higher number of BCTs within their delivery models than low or medium retention programmes.

Self-monitoring and feedback appear to be important for retention particularly when used alongside biofeedback (feedback about the body, for example, physiological or biochemical state, using an external monitoring device as part of a behaviour change strategy). In addition, consistent with the findings from the qualitative review (Section 2), there was more evidence of social support in programmes with medium and high retention. Finally, problem-solving techniques were more commonly used in medium and high retention programmes.

This section has examined the quantitative literature and investigated what BCTs are associated with retention in group-based weight-management programmes. The following section explores commercial group-based weight-management programmes and the BCTs used in such commonly available programmes.

Table 12. BCTs used in weight-management programme intervention design

BCT Categories	Type of BCTs	Level of retention (% studies)		
		Low (n=12)	Medium (n=19)	High (n=20)
1.Goals and planning	1.1 Goal setting (behaviour)	75	68	80
	1.2 Problem solving	25	63	60
	1.3 Goal setting (outcome)	50	21	30
	1.4 Action planning	17	5	15
	1.5 Review behaviour goal(s)	0	0	20
	1.7 Review outcome goal(s)	0	0	10
2.Feedback and monitoring	2.1 Monitoring of behaviour by others without feedback	0	5	5
	2.2 Feedback on behaviour	33	16	45
	2.3 Self-monitoring of behaviour	50	68	80
	2.4 Self-monitoring of outcome(s) of behaviour	0	0	15
	2.5 Monitoring outcome(s) of behaviour by others without feedback	8	0	0
	2.6 Biofeedback	0	5	15
	2.7 Feedback on outcome(s) of behaviour	0	0	5
3.Social support	3.1 Social support (unspecified)	17	26	45
	3.3 Social support (emotional)	0	5	25
4.Shaping knowledge	4.1 Instruction on how to perform a behaviour	58	74	85
5.Natural Consequences	5.1 Information about health consequences	0	0	5
	5.6 Information about emotional consequences	0	0	5
6.Comparison of behaviour	6.1 Demonstration of the behaviour	25	16	10
	6.2 Social comparison	0	0	15
7.Associations	7.1 Prompts/cues	8	0	25
8.Repetition and substitution	8.1 Behavioural practice/rehearsal	8	0	5
	8.7 Graded tasks	8	11	15
9.Comparison of outcomes	9.1 Credible source	50	68	85
	9.2 Pros and cons	0	0	5
	9.3 Comparative imagining of future outcomes	0	0	5
10.Reward and threat	10.1 Material incentive (behaviour)	8	26	5
	10.2 Material reward (behaviour)	0	5	15
	10.3 Non-specific reward	0	0	15
	10.4 Social reward	0	0	10
	10.6 Non-specific incentive	8	0	0
	10.9 Self-reward	8	5	5
11.Regulation	11.2 reduce negative emotions	0	0	10
12.Antecedents	12.1 Restructuring the physical environment	0	16	0
	12.6 Body changes	0	0	5
13.Identity	13.2 Framing/reframing	0	16	10
	13.5 Identity associated with changed behaviour	0	0	5
14.Scheduled consequences		0	0	0
15.Self-belief	15.4 Self-talk	0	5	0
	Number of different BCTs across programmes	**17**	**20**	**34**
	Average BCTs per programme	**5.5**	**5.3**	**7.9**
	Top 4 BCTs	**1.1, 4.1, 1.3 / 2.3 / 9.1**	**4.1, 1.1 / 2.3 / 9.1**	**4.1 / 9.1, 1.1 / 2.3**

4. Narrative review of commercially available group-based programmes

Aim

The aim of this review was to examine common delivery models of group-based weight-management/loss programmes offered in commercial settings, and to map the typical group-based weight-management offer against identified Behaviour Change Techniques (BCTs).

Methods

A web-based review to identify common group-based weight-management programmes delivered in commercial settings found 3 main offers: Weight Watchers®, Rosemary Conley and Slimming World. Despite limited information provided online to allow BCT analysis, a published trial comparing these 3 highest profile programmes provided much of the necessary detail on intervention components (84,103). Table 13 summarises the 3 delivery models.

Table 13. Summary of commercial weight-management programme delivery and content (Adapted from (103))

	Weight Watchers®	Slimming World	Rosemary Conley
Group components	Group component. 1- 2-1 for new members and when weighed. Group talk from leader with discussion.	Group component. 1-2-1 when weighed. Group used to share progress and lapses and to find and share solutions.	Group component. 1-2-1 when weighed and to establish calorie allowance. Additional support available via email/ telephone.
Duration* of sessions, frequency, programme length and setting	1-hour sessions. 12 weekly sessions provided as part of Lighten Up study. Community based venues.	1.5-hour sessions. 12 weekly sessions provided as part of Lighten Up study. Access to website, magazines and 1-2-1 telephone support from consultant or other members. Community based venues.	1.5-hour session. 12 weekly sessions provided as part of Lighten Up study. Community based venues.
Content of sessions	Core programme material delivered over 5-weeks: food points system (based on age, gender, height, weight & activity), beating hunger, taking more physical activity, eating out and keeping motivated. Other sessions delivered to whole group cover recipes, health and nutrition and keeping active.	Encouraged to eat mainly low energy dense foods to achieve satiety, plus some extras rich in calcium and fibre, with controlled amounts of high energy dense foods.	Weight loss and improved diet, fitness and improvement of physical condition, motivation and self-esteem, use of group support. Use of portion pots. Motivational video.

*Duration of 12 weeks used in the Lighten Up study, but commercially, programmes run continuously, with no set number of sessions or fixed starting date.

Results

Uptake

Levels of uptake were all above 84% (Table 14). This is in the context of the trial from which these data were taken and refers to uptake in response to a letter from primary care, but still compared favourably with the trial arms offering the NHS Down Size programme (6 group sessions over 12 weeks, with subsequent weigh-ins, with food 'lay' advisers trained by the dietetics department, held in community venues, 74% uptake).

Typically, commercial weight loss programmes are self-referring, and uptake is difficult to estimate. However, these data suggest that, perhaps 12 weeks free participation in a well-known commercial programme that usually costs participants approximately £49 to 55 (for a 12-week programme including group membership)[6] was a useful incentive to take up the offer. It also possible that primary care referral to such programmes may expect better levels of uptake, as the NHS Down Size programme did have good uptake, albeit lower than the commercial offers.

A separate 'Choice' arm of the trial allowed participants to choose from any of the intervention programmes. Uptake in this arm was 95%. In part this can be attributed to the majority, and particularly women, choosing a commercial programme (Weight Watchers® 29%; Slimming World 14%; Rosemary Conley 28%; NHS Size Down programme 16%; non-group programmes held in general practice (3%) or pharmacies (10%)). However, 95% uptake is exceptional and higher than when participants were allocated to a commercial programme. In practice, the feasibility of offering a range of programmes is likely to be a limitation but is worthy of consideration.

Retention

Retention (in terms of the proportion of sessions attended) was highest in Weight Watchers®, followed by Slimming World, then Rosemary Conley (Table 14). There were no discernible patterns in terms of the number of BCTs (WW=11; SW=16; RC=9) in relation to retention. Analysis of BCTs used within the programmes showed that all programmes used:

- Goal setting outcome (1.3).
- Feedback on behaviour (2.2).
- Instruction on how to perform a behaviour (4.1).

[6] Sources: https://www.weightwatchers.co.uk/uk/checkout/#/plan; Jolly et al. Comparison of range of commercial or primary care led weight reduction programmes with minimal intervention control for weight loss in obesity: Lighten Up randomised controlled trial. BMJ. 2011;343:d6500

- Social comparison (6.2).
- Credible source (9.1).
- Non-specific reward (10.3).

The number and variety of BCTs across programmes makes it difficult to identify clear patterns. However, the Rosemary Conley programme, which had lower attendance, did *not* include: Goal setting behaviour (1.1); Review behavioural goal(s) (1.5); Review outcome goals (1.7); or Graded tasks (8.7).

Again, when participants were given the choice of programme, attendance was higher than when programmes were allocated[7] (approximately 74% attended ≥50% sessions; 13% attended 25 to 49% sessions; 13% attended <25% sessions).

Table 14. BCT techniques used in commercial weight-loss programmes in relation to uptake and attendance

Programme	BCTs used	% uptake	Scheduled sessions attended		
			<25%	25 to 49%	≥50%
Weight Watchers	1.1 Goal setting (behaviour) 1.3 Goal setting (outcome) 1.5 Review behavioural goal(s) 1.7 Review outcome goal(s) 2.2 Feedback on behaviour 2.3 Self-monitoring of behaviour 4.1 Instruction on how to perform a behaviour 6.2 Social comparison 8.7 Graded tasks 9.1 Credible source 10.3 Non-specific reward	91	20	10	70
Slimming World	1.1 Goal setting (behaviour) 1.2 Problem solving 1.3 Goal setting (outcome) 1.4 Action planning 1.5 Review behavioural goal(s) 1.7 Review outcome goal(s) 2.2 Feedback on behaviour 3.1 Social Support (unspecified) 3.3 Social Support (emotional) 4.1 Instruction on how to perform a behaviour 6.2 Social comparison 8.7 Graded tasks 9.1 Credible source 9.2 Pros and Cons 10.3 Non-specific reward 10.4 Social reward	87	30	8	62
Rosemary Conley	1.3 Goal setting (outcome) 2.2 Feedback on behaviour 2.3 Self-monitoring of behaviour 3.1 Social Support (unspecified) 4.1 Instruction on how to perform a behaviour 6.2 Social comparison 9.1 Credible source 10.3 Non-specific reward 13.2 Framing/reframing	84	36	12	52

*Please note: Attendance figures are approximate.

[7] See Table 14 for attendance levels when programmes allocated.

Overall Summary from Review of Commercial Programmes

This review showed that generally the uptake is high amongst commercial programmes, although as most uptake is due to self-referral, it is difficult to get a true estimate. In addition, it appears that giving people flexibility and choice regarding their programme is beneficial, and in particular encourages continued engagement with the programme.

Examination of the BCTs present within the programmes identified similarity across the programmes; for example, all included elements of goal setting and feedback. The findings showed that those programmes with higher retention (Weight Watchers® and Slimming World) did incorporate some additional BCTs not present in the Rosemary Conley programme. From this analysis, there seem to be 2 key differences. First, programmes with higher levels of retention set and reviewed goals for behaviour (such as increase in physical activity, dietary changes) *in addition to* goals for outcomes (weight loss). Second, programmes with higher retention included graded tasks; for example, building towards 10,000 steps per day (Weight Watchers®) or building up to 30 minutes per day of moderate-to-vigorous physical activity (MVPA) on 5 days/week (Slimming World), rather than stating, for example, 45 minutes per day of exercise from the outset (Rosemary Conley). The inclusion of these specific BCTs should be considered in the development of future group-based weight-management programmes.

5. Mapping retention drivers and interventions to the behavioural model

Aim

This mapping exercise was used to identify opportunities for group-based weight-management programmes to maximise retention.

Methods

The TDF domains (identified in Section 2 as drivers of retention), and the BCTs (associated with high retention in published interventions and commercial interventions in Sections 3 and 4) were mapped onto each of the COM-B components. As noted earlier, a general lack of information on recruitment methods precluded meaningful behavioural analysis linking them to uptake. This section, therefore, focuses on retention.

Results

Results of the mapping exercise showed that there is strong evidence that *social opportunity* is the dominant component of the COM-B model in relation to retention. The social influence domain of the TDF was an important driver of retention, not only in terms of social support from within the programme (for example, supportive leader, other participants), but also from family and friends. Analysis of BCTs supported this finding, showing that programmes including BCTs of Social Support (unspecified and emotional) had higher levels of retention.

Psychological capability is also an important component. Evidence from Section 2 showed that knowledge (for example, learning about diet) was the most commonly identified driver of retention from the qualitative literature. BCT analysis showed that higher retention was associated with programmes that included elements of self-monitoring/feedback on behaviour and biofeedback. The BCT of biofeedback (for example, heart-rate or blood pressure monitoring) was mostly identified in high retention programmes (and in no low retention programmes). Graded tasks, which tended to be around gradually increasing physical activity levels, were not commonly used, but featured in the 2 commercially available programmes with the highest retention rates.

There was little evidence for drivers of the TDF related to the *reflective motivation* component of COM-B. However, many programmes (both those in the published literature and commercial programmes) used behavioural goal setting, such as setting

targets for weekly or daily physical activity, percentage of calories from dietary fat, or daily calorie deficit.

The components with least evidence were *physical opportunity*, *automatic motivation* and *physical capability*. For *physical opportunity*, the location, flexibility of the programme and choice of sessions were important drivers of retention. However, the design of programmes did not include any BCTs specific to physical opportunity. The *automatic motivation* component showed that enjoyment of the programme was important. BCT analysis only identified the emotional element of social support as important, which reiterates the important of a supportive social environment. There was no evidence of drivers or use of BCTs relating to physical capability.

Table 15. Summary of mapping of drivers (Theoretical Domains Framework) and Behaviour Change Techniques for high retention onto COM-B

COM-B	Drivers of retention (TDF from Section 2)	BCTs associated with high retention in published interventions (from Section 3)	BCTs associated with high retention in commercial programmes (from Section 4)	Opportunities for future group-based weight-management programmes
Physical capability	n/a	n/a	n/a	
Psychological capability	**Knowledge**: for example, nutritional education facilitated changes, re-education about food was facilitator, information provided reinforced weight loss principles, learning from and relating to own experiences to others encouraged attendance. **Behavioural regulation**: for example, behavioural monitoring facilitated changes in eating habits.	**2.2 Feedback on behaviour**: for example, dietitian feedback on food records; reviewing exercise and dietary logs; feedback on compliance with exercise regimen. **2.3 Self-monitoring of behaviour**: for example, maintaining daily activity logs; self-monitoring of exercise intensity Rate of Perceived Exertion); 24-hour dietary recall; self-monitoring of calorie intake, and exercise. **2.6 Biofeedback:** for example, use of heart rate monitor during exercise; blood pressure monitoring.	**2.2 Feedback on behaviour**: for example, evaluation of progress from food and activity diaries. **8.7 Graded tasks**: for example, building physical activity 10,000 steps/day; building physical activity to 30 mins moderately intense activity 5 days a week.	Psychological capability is important. Programmes require an educational component, methods of self-monitoring and provision of feedback on behaviour, including biofeedback, and graded tasks.
Physical opportunity	**Environmental Context and Resources:** for example, intervention relevant to everyday life, provision of exercise sessions, flexibility of session times, flexibility to come together, locating sessions in workplace, choosing own session times, being able to choose weight-management approach suited to them.	n/a	n/a	The design of the programmes did not include BCTs specific to physical opportunity. However, the provision of exercise classes, convenience and flexibility of sessions appear to be important drivers of retention.
Social opportunity	**Social Influences:** for example, supportive leader; social support from other participants, support from group, shared experiences, supportive environment, developing friendships, supportive family and colleagues, other family members getting involved with diet and exercise, social interaction, peer pressure to lose weight, accountability to self/ other participants /	**3.1 Social support (unspecified):** for example, support from dietitian, peer-led sessions and peer-initiated phone contact, group discussion of progress/barriers, spouses received education to strengthen their support of the participants, participants encouraged to invite 1–3 social support partners to participate with them.	**6.2 Social comparison:** for example, group used to share progress and lapses, and to find and share solutions, group praise for weight loss.	The social support gained from the group-based element of the programmes in addition to the supportive role of the leader and family/friends are key drivers of retention. Including BCTs relating to social opportunity within a programme facilitates continued engagement.

	group leaders, being part of group, gaining approval of other participants, group-based delivery, encouraged competition, exercise with group more motivating.	**3.3 Social support (emotional):** for example, Cognitive Behavioural Therapy (CBT), and motivational interviewing, transactional analysis, dietitian motivational telephone calls with participants who were having difficulty adhering to the diets.		
Reflective Motivation	**Intention:** for example, self-determination - those who reached goals were very motivated and had clear goals. **Social/professional role and identity:** for example, social identity with the football club from which group was run.	**1.1 Goal setting (behaviour):** for example, ultimately achieving 10,000 steps/day, reaching 30 min/day of moderate intensity activity on 5 days/week, 25% of calories from dietary fat and a minimum of 150 minutes of physical activity per week, daily fat gram goals, increase consumption of fruit, vegetables and whole grains, sodium reduction, adherence to the recommended dietary pattern and increasing moderate physical activity (225 minutes/week).	**1.1 Goal setting (behaviour):** for example, ultimately achieving 10,000 steps/day, reaching 30 min/day of moderate intensity activity on 5 days/week, aims for 500 kcals deficit/day.	Although 2 drivers were identified for this component (intention and social/professional role identity), they only appeared in 2 studies. Nevertheless, setting a behavioural goal was one of the most commonly identified BCTs. Therefore, setting a specific, measurable behavioural goal is important and allows for feedback and self-monitoring.
Automatic motivation	**Reinforcement:** for example, supportive Leader provides positive reinforcement, seeing positive results (physically and psychologically) motivating continuation with programmes **Emotion:** for example, enjoyed attending the programme.	**3.3 Social support (emotional):** for example, Cognitive Behavioural Therapy (CBT), and motivational interviewing, transactional analysis, dietitian motivational telephone calls with participants who were having difficulty adhering to the diets.	n/a	Evidence for this component shows that enjoyment and positive reinforcement (for example, through highlighting positive achievements) are important for retention. This can be fostered through the inclusion of emotional social support BCTs in the programme.

Please note:

The following commonly identified BCTs were not mapped to any of the theoretical domains: Problem solving, Persuasive argument, Discrepancy between current behaviour, Self-monitoring of outcome of behaviour, Monitoring of outcome behaviour by others without feedback, and Pharmacological support (16). Similarly, p.156 to 158 of the Michie, Atkins & West *The Behaviour Change Wheel* (2014) (7) show that the following BCTs are not mapped to TDF:

- 9.1 Credible course.
- 1.2 Problem solving.
- 4.1 Instructions on how to perform a behaviour.
- 2.4 Self-monitoring of outcomes of behaviour.

6. Summary and recommendations

Uptake

There was a wide range of programme uptake, from 1 to 99%, which was likely a consequence of differences in reporting. In over a third of programmes, uptake could not be determined due to insufficient information. Varied recruitment methods were used, but, overall, there are no clear patterns linking recruitment methods with level of uptake. ‘Word of mouth’ was only used in programmes with high uptake, and the most common method of recruitment for programmes with low uptake was through TV or media. The level of information reported for recruitment methods in most studies did not allow BCT classification aside from Credible Source (9.1) which was widely used.

Uptake for commercial programmes was generally high, especially when participants were given a choice, rather than being allocated a specific treatment.

Recommendations for uptake include:

- More comprehensive reporting of recruitment methods to enable BCT classification.
- Recognising the value of word of mouth, and incorporate (where possible) into recruitment strategies.
- Allowing people choice over type of programme.

Retention

Retention across programmes was variable, ranging from 35 to 96%. Higher retention was associated with a higher number of BCTs (average of 7.9 per high retention programme), indicating that a range of techniques is preferable. The BCTs that were used in the largest proportion of high retention programmes (≥80%) were instructions on how to perform a behaviour (for example, specific aspects of exercise or dietary programmes), having advice/support from a credible source, self-monitoring of behaviour (typically diet and exercise) rather than the outcomes of the behaviour (ie weight), and goal setting for those behaviours.

High retention studies were also more likely to use feedback on behaviour, including biofeedback (for example, heart-rate or blood pressure monitoring), and problem-solving. Studies with lower retention had less problem-solving and social support (unspecified and emotional). A number of other BCTs were evident in high retention studies only (for example, prompts/cues to elicit specific behaviour, reviewing behavioural goals).

In commercial programmes, it appears that giving people flexibility and choice regarding their programme is beneficial, and in particular encourages retention with the programme. In addition, those programmes with goals for outcomes as well as behaviour, and which used graded tasks, reported higher levels of retention.

In terms of the COM-B model, the results showed that social opportunity—both within and outside the programme—is key to high retention. This includes support from the programme leader and other participants, as well as from family and friends. Psychological capability was also found to be important, highlighting the need for strong educational components of programmes.

Recommendations for group-based weight-management programmes to promote participant retention include:

Programmes should prioritise efforts to foster social support through:

- ensuring that the group leader is supportive and that participants feel well-supported by them
- including activities that encourage support between group members
- including activities that can involve participants' family and friends, to generate social support outside of the group environment

Group leaders and others involved in supporting participants should be perceived as credible and trusted sources of information and advice (for example, credible health professionals, previously successful participants).

Programmes should develop participants' psychological capability to change their behaviour, with a strong educational component. Opportunities for learning can be used such that participants feel empowered, for example, through increased knowledge around dietary and physical activity behaviours, instructions on performing specific aspects of exercise or dietary programmes, and ways to respond to relapses and overcome barriers to implementing and maintaining lifestyle behaviour changes.

Programmes should include self-monitoring and provision of feedback on behaviour. Where appropriate, this would include biofeedback, such as heart rate monitoring during exercise sessions or blood pressure monitoring.

Tasks within programmes that aim to promote the desired behaviour (for example, achieving health-enhancing levels of physical activity; increasing fruit and vegetable consumption) should be graded. The individuals' baseline starting position should be considered and gradual changes implemented towards achieving a sustainable target

(for example, increasing physical activity from 0 to 10 minutes per day in the first instance; incorporating one additional fruit/vegetable portion per day).
Programmes should set goals for target behaviours (for example, physical activity, diet), not only outcomes (for example, weight loss; change in % body fat). As above, using graded tasks, self-monitoring and feedback, these can be structured and implemented to maximise retention.

Programmes should provide sessions that:

- include exercise components
- are in a convenient location
- allow flexibility
- ideally, allow participant choice of delivery mode, although feasibility is likely to limit the range of options
- are perceived as enjoyable by participants and provide positive reinforcement

Guidance for practitioners, commissioners and providers of tier 2 weight-management services

Public Health England have published evidence-based guidance to support practitioners, commissioners and providers of tier 2 weight-management services (104). The guidance supports the design and delivery of services that are effective and accessible for users and takes account of a number of the recommendations detailed in this report. Accompanying this guidance is a resource that provides relevant, evidence-based behaviour change techniques recommended for inclusion in tier 2 weight-management services for weight loss and weight loss maintenance (105). The Public Health England collection on weight-management guidenace for commissioners and providers can be accessed at https://www.gov.uk/government/collections/weight-management-guidance-for-commissioners-and-providers.

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Appendix 1. Included qualitative studies (Section 1)

Author	Article title	Intervention
Kozica et al. 2015 (41)	Engaging rural women in healthy lifestyle programs: Insights from a randomized controlled trial	Single group session then text messages and phone contact
Hammarstrom et al. 2014 (29)	Experiences of barriers and facilitators to weight-loss in a diet intervention - a qualitative study of women in Northern Sweden	Diet intervention - group sessions with dietician
Kozica et al. 2015 (34)	Initiating and continuing behaviour change within a weight gain prevention trial: A qualitative investigation	Same cohort as first “Engaging rural women in healthy lifestyle programs”
Ostberg et al. 2011 (42)	Group treatment of obesity in primary care patients: A qualitative study of patients’ perspectives	All patients attended treatment group sessions including supervised weighing, counselling on diet and exercise and opportunities to talk and discuss freely
Hunt et al. 2013 (35)	“You've got to walk before you run”: Positive evaluations of a walking program as part of a gender-sensitized, weight-management program delivered to men through professional football clubs	12 group walking sessions
Visram, Crosland and Cording 2013 (20)	Triggers for weight gain and loss among participants in a primary care-based intervention	3 levels of intervention. Only level 2 was group based - weekly group meetings (15/20 people), but the paper does not specify which participant is from which level
Muckle 2007 (26)	An evaluation of a primary care-based weight management initiative	Interactive group sessions, monitoring and support
Nielson et al. 2014 (36)	Health promotion: The impact of beliefs of health benefits, social relations and enjoyment on exercise continuation	Team football vs individual cross fit sessions
Herriot et al. 2008 (18)	A qualitative investigation of individuals' experiences and expectations before and after completing a trial of commercial weight-loss programmes	Only 2 of 4 trials included were group-based (Weightwatchers and Rosemary Conley)
Roberts and Bailey 2013 (25)	An ethnographic study of the incentives and barriers to lifestyle interventions for people with severe mental illness	Doesn’t include a clear description of the intervention
Balneaves et al. 2014 (27)	Breast cancer survivors' perspectives on a weight loss and physical activity lifestyle intervention	24-week intervention – mix of diet and exercise
Yarborough et al. 2015 (21)	Improving lifestyle interventions for people with serious mental illnesses: Qualitative results from the STRIDE study	24 weekly meetings including a number of different things (mentions facilitating group interactions and support and 6 monthly group maintenance sessions)
Gallagher et al. 2012 (23)	Participants' perspectives of a multi-component, group-based weight loss programme supplement for cardiac rehabilitation: A qualitative study	Structured exercise plus 4 information sessions over 16 weeks
Cioffi 2002 (17)	Clients’ experiences of a weight-management programme: A qualitative study	10 weekly classes - behaviour, diet and exercise
Viljoen and Christie 2015 (30)	The change in motivating factors influencing commencement, adherence and retention to a supervised resistance training programme in previously sedentary post-menopausal women: A prospective cohort study	24-week programme - progressive resistance training
Hunt et al. 2014 (37)	Do weight management programmes delivered at professional football clubs attract and engage high risk men? A mixed-methods study	Football Fans in Training (FFIT) Programme
Ahern et al. 2013 (28)	Participants' explanatory model of being overweight and their experiences of 2 weight-loss interventions	Weightwatchers vs. 1-2-1 nurse advice

Mills et al. 2012 (43)	Exploring the perceptions of success in an exercise referral scheme: A mixed method investigation	Mixture of group and individual sessions over a period of up to 26 weeks
Todd and Lacey 2004 (19)	Overweight and obesity: Helping clients to take action	Participants attending Slimming World
Dahl 2014 (45)	Personnel and participant experiences of a residential weight loss program. A qualitative study	Group-based intensive exercise, diet
Groven 2010 (32)	Dilemmas in the process of weight reduction: Exploring how women experience training as a means of losing weight	Weekly 1-hour group-exercise programme consisting of cycling, weight lifting and stretching and monthly group discussions
Burke 2009 (33)	Experiences of self-monitoring: Successes and struggles during treatment for weight loss	Group - 32 group cognitive behavioural sessions over 12 months
Sabiston et al. 2009 (31)	Muscle gains and emotional strains: Conflicting experiences of change among overweight women participating in an exercise intervention program	Group - 12-week dragon boat physical activity intervention
Adolfsson et al. 2002 (22)	Treating obesity: A qualitative evaluation of a lifestyle intervention for weight reduction	Group - weekly, fortnightly then monthly meetings where the participants focused, charted and analysed, various behaviours connected to their intake of food and obesity
Gray et al. 2009 (39)	Addressing male obesity: An evaluation of a group-based weight management intervention for Scottish men	Each weight management group (maximum 12 men) met weekly over 3 months for twelve 60-minute evening sessions. The programme used behavioural modification techniques with session subjects including: balanced diet, eating plans, physical activity, and alcohol, recipes for healthier meals, food labels and myths
Witty and White 2010 (38)	The tackling men's health evaluation study: final report	Group - multi-component targeted health promotion intervention
Leishman 2007 (44)	Working with men in groups—experience from a weight management programme in Scotland	Group - 12-week weight loss management programme - primary care nurse-led service offering a range of services
Kim et al. 2008 (24)	The WORD (Wholeness, Oneness, Righteousness, Deliverance): A faith-based weight-loss program utilizing a community-based participatory research approach	Group - groups led by trained community members met for 8 weeks and emphasised healthy nutrition, physical activity, and faith's connection with health
White et al. (40)	Targeting men's weight in the workplace	The weight loss programme ran over a 6-week period and was led by 2 community nurses from the Health of Men team, with guest sessions from a dietician and an activity specialist. First session was a health check and goal setting for weight loss. Other sessions covered issues such as healthy diet, exercise, and motivation to continue.

Appendix 2. Included quantitative reviews (Section 2)

Author	Title	Aims	Findings	Conclusions	Notes
Yoong et al., 2012 (106)	A systematic review of behavioural weight-loss interventions involving primary-care physicians in overweight and obese primary-care patients (1999-2011)	• Examine effectiveness of behavioural weight-loss interventions involving primary care physicians in producing weight loss in overweight and obese primary-care patients	• High intensity weight-loss counselling by primary care physicians led to moderate but not clinically sig. weight loss • But when delivered by non-physicians, meal replacements given with dietician counselling and referral to commercial weight loss programmes, with regular monitoring by physicians, led to clinically sig. weight loss • Dietician delivered care appeared effective in producing weight loss irrespective of level of intervention intensity	• Few studies found on this topic • Methodological rigour of some included studies was poor	Out of 17 potential studies: • Excluded= 13 • Included= 4
Robertson et al. 2015 (107)	Should weight loss and maintenance programmes be designed differently for men? A systematic review of long term randomised controlled trials presenting data for men and women: The ROMEO project	• Systematically review randomised controlled trial (RCT) evidence for long term (>12 months) weight management interventions for obese men in contrast to women to help understand whether programmes should be designed differently for men	• Men under-represented in RCTs of weight loss interventions open to both genders • Men sig. more likely to be trial completers than women • 13 trials showed no sig. difference in weight loss between men and women • But men tended to lose more weight with intensive low fat diets, with/without meal replacements, and structured PA programmes than women • Individual support and tailoring more helpful for both	• Men and women respond differently to, and have different preferences for, varying types of weight management programmes • Important to understand men`s views on weight loss as more likely to improve the uptake and effectiveness of programmes for men	Out of 30 potential studies: • Excluded= 24 • Included= 6
Franz et al. 2007 (108)	Weight loss outcomes: A systematic review and meta-analysis of weight-loss clinical trials with a minimum 1-year follow-up	• To assist health professionals who counsel patients with overweight and obesity, a systematic review was undertaken to determine types of weight-loss interventions that	• Mean weight loss of 5% to 9% was observed during the first 6 months from interventions involving a reduced-energy diet and/or weight-loss medications with weight plateaus at approximately 6 months • In studies extending to 48 months, a mean 3% to 6% of weight loss was maintained with none of the groups experiencing weight regain to baseline	• Weight-loss interventions utilising a reduced energy diet and exercise are associated with moderate weight loss at 6 months • Although there is some regain of weight, weight loss can be maintained • The addition of weight-loss medications somewhat	Out of 80 potential studies: • From titles = included 47 • From year 2000 = included 27 • From 27 articles, 16 excluded and

Author	Title	Aims	Findings	Conclusions	Notes
		contribute to successful outcomes and to define expected weight-loss outcomes from such interventions	• In contrast, advice-only and exercise-alone groups experienced minimal weight loss at any time point • At the 1-year follow-up, the average participant attrition rate across studies was 29% • Overall, attrition was 31% at study end regardless of follow-up length	enhances weight-loss maintenance	included studies =11
Gilmartin & Murphy 2015 (109)	The effects of contemporary behavioural weight loss maintenance interventions for long term weight loss: A systematic review	• To evaluate the effectiveness of behavioural weight-loss interventions in maintaining long term weight loss	• This review presents the findings from 13 randomised controlled trials of weight-loss maintenance utilising interventions that include diet strategies, behavioural strategies, lifestyle counselling and drug therapy, group therapy and the Internet • Results revealed that lifestyle interventions targeting diet and physical activity are effective in sustaining weight loss up to 2 years with extended care • Moreover, pharmacology combined with lifestyle interventions was effective	• There is important evidence that the use of behavioural weight-loss interventions are effective in sustaining long term weight loss, albeit limited. • There was high heterogeneity among the studies; hence caution is required when interpreting the findings. • Also, intentions to treat principles and methods to handle missing data are not clearly reported across some studies. Blinding of participants and outcome assessors is very limited	Out of 13 potential studies: • Excluded = 11 • Included = 2
Dombrowski et al. 2014 (110)	Long term maintenance of weight loss with non-surgical interventions in obese adults: Systematic review and meta-analyses of randomised controlled trials	• To systematically review and describe currently available approaches to supporting maintenance of weight loss in obese adults and to assess the evidence for the effectiveness of these interventions	• 45 trials involving 7788 individuals were included • Behavioural interventions focusing on both food intake and physical activity resulted in an average difference of −1.56 kg in weight regain compared with controls at 12 months	• Behavioural interventions that deal with both diet and physical activity show small but significant benefits on weight loss maintenance.	Out of 43 potential studies: • Excluded = 30 • Included = 13
Williams et al. 2014 (111)	Effectiveness of weight loss interventions-is there a difference between men and women: a	• A systematic review was conducted to determine whether the effectiveness of weight loss interventions differs between men	• 58 studies met the eligibility criteria with 49 studies of higher quality included in the final data synthesis • 11 studies that directly compared weight loss in men and women reported a significant sex difference	• There is little evidence from this review to indicate that men and women should adopt different weight loss strategies • Current evidence supports	Out of 58 potential studies: • Excluded = 53 • Included = 5

Author	Title	Aims	Findings	Conclusions	Notes
	systematic review	and women	• 10 of these reported that men lost more weight than women; however, women also lost a significant amount of weight • Analysis of effect sizes found small differences in weight loss favouring men for both diet (g = 0.489) and diet plus exercise (g = 0.240) interventions	moderate energy restriction in combination with exercise for weight loss in both men and women	
Johns et al. 2014 (112)	Diet or exercise interventions vs. combined behavioural weight management programs: A systematic review and meta-analysis of direct comparisons	• Aimed to examine the clinical effectiveness of combined behavioural weight management programs (BWMPs) targeting weight loss in comparison to single component programs, using within study comparisons	• Pooled results showed no significant difference in weight loss from baseline or at 3 to 6 months between the BWMPs and diet-only arms • However, at 12 months, a significantly greater weight loss was detected in the combined BWMPs • 5 studies met the inclusion criteria for combined BWMP vs. physical activity-only. • Pooled results showed significantly greater weight loss in the combined BWMPs at 3 to 6 months and 12 to 18 months	• Weight loss is similar in the short term for diet-only and combined BWMPs but in the longer term weight loss is increased when diet and physical activity are combined • Programs based on physical activity alone are less effective than combined BWMPs in both the short and long term	Out of 8 potential studies: • Excluded = 7 • Included = 1
Peirson et al. 2015 (113)	Strategies for weight maintenance in adult populations treated for overweight and obesity: A systematic review and meta-analysis	• Review reports on the effectiveness of programs for weight-loss maintenance, as part of a larger review examining treatments for overweight and obese adults	• 8 studies were included. Compared with control participants, intervention participants regained less weight, regardless of whether the intervention was behavioural or pharmacologic plus behavioural • Intervention participants also showed better weight maintenance than the control participants in terms of waist circumference and body mass index • Participants undergoing pharmacologic plus behavioural interventions were more likely to maintain a loss of 5% or more of initial body weight than those in the control group; no difference was found for maintaining a weight loss of 10% or more	• Moderate quality evidence shows that overweight and obese adults can benefit from interventions for weight maintenance following weight loss • However, there is insufficient evidence on the long-term sustainability of these benefits	Out of 11 potential studies: • Excluded = 9 • Included = 2
Curioni & Lourenco 2005 (114)	Long-term weight loss after diet and exercise: A systematic review	• Assess the effectiveness of dietary interventions and exercise in long-term weight loss in overweight and obese	• Total of 33 trials evaluating diet, exercise or diet and exercise were found • Only 6 studies directly comparing diet and exercise vs. diet alone were included (3 additional studies reporting repeated observations were excluded)	• Diet associated with exercise results in significant and clinically meaningful initial weight loss. This is partially sustained after 1 year	Out of 9 potential studies: • Excluded = 7 • Included = 2

Author	Title	Aims	Findings	Conclusions	Notes
		people	• The active intervention period ranged between 10 and 52 weeks across studies. Diet associated with exercise produced a 20% greater initial weight loss • The combined intervention also resulted in a 20% greater sustained weight loss after 1 year than diet alone. In both groups, almost half of the initial weight loss was regained after 1 year		
Booth et al. 2014 (115)	Effectiveness of behavioural weight loss interventions delivered in a primary care setting: A systematic review and meta-analysis	• Aim of this review was to estimate the effect of behavioural interventions delivered in primary care on body weight in overweight and obese adults	• 15 RCTs, with 4539 participants randomized, were selected for inclusion. The studies were heterogeneous with respect to inclusion criteria and type of intervention • Few studies reported interventions informed by behavioural science theory • Pooled results from meta-analysis indicated a mean weight loss of −1.36 kg at 12 months, and −1.23 kg at 24 months	• Behavioural weight-loss interventions in primary care yield very small reductions in body weight, which are unlikely to be clinically significant • More effective management strategies are needed for the treatment of overweight and obesity	Out of 15 potential studies: • Excluded = 12 • Included = 3
Barte et al. 2010 (116)	Maintenance of weight loss after lifestyle interventions for overweight and obesity, a systematic review	• Explore the relation between weight loss during an intervention and weight maintenance after at least 1 year of unsupervised follow-up	• Overall, mean percentage maintenance was 54% • Weight loss during the intervention was not significantly associated with percentage maintenance (r = -0.26; p = 0.13). Percentage maintenance did not differ significantly between interventions with a weight loss of 5-10% vs. >10% • Consequently, net weight loss after follow-up differed between these categories (3.7 vs. 7.0%, respectively; p < 0.01). The analyses within the 4 interventions confirmed these findings	• Percentage maintenance does not clearly depend on initial weight loss. From this perspective, 10% or more weight loss can indeed be encouraged and favoured above lower weight loss goals	Out of 22 potential studies: • Excluded = 15 • Included = 7
Lam et al. 2016 (117)	Strategies for successful recruitment of young adults to healthy lifestyle programmes for the prevention of weight gain: A systematic review	• Review aimed to examine the success of different recruitment strategies	• Of those reporting recruitment, both active (for example, face-to-face) and passive (for example, print-media and mass-mailings) approaches were identified with the latter most frequently employed • Novel strategies such as social media and marketing approaches were identified • Television and radio have potentially high	• Use of formative research to guide recruitment strategies for interventions is recommended • Reporting of success, cost and timelines for recruitment should be included in reporting of future trials • This first synthesis of recruitment information can	

Author	Title	Aims	Findings	Conclusions	Notes
			reach but low efficiency with high cost compared with mass-mailings which yield high numbers of participants • Marketing campaigns appeared to be a promising approach. Incentives demonstrated enhanced recruitment	be used to inform recruitment frameworks for lifestyle programmes seeking to attract young	

Appendix 3. Summary of included studies (Section 2)

Author	Title	Review taken from:	Aims	Intervention	Recruitment Method	Sample
Anderson et al. 2002 (57)	Physiologic changes after diet combined with structured aerobic exercise or lifestyle activity	Williams et al. (2015)	To compare changes in resting metabolic energy expenditure (REE), fat mass (FM), and fat-free mass (FFM) associated with a 12-week weight loss program combined with either: (1) aerobic exercise (AER); or (2) lifestyle activity (LIFE)	2 x (I-D+E) (2 diet and exercise groups): Both groups: Weekly group face-to-face sessions for 1hr duration conducted by psychologists, dietitians, and exercise scientists. P`s were to adhere to a self-selected diet of 1200-1800 kcal/day with food diaries kept to assess compliance. (I-D1) also instructed to do 45min of moderate-vigorous aerobic activity 3-4 days/wk. (I-D2) also instructed to do 30min moderate intensity PA at least 5 days/wk	Local newspaper advertisement	Men and women (69% female) 15 to 50 pounds overweight. Age: 37.6±5.7 BMI: 30.9±2.8 Ethnicity not stated
Annunziato et al. 2009 (58)	A randomized trial examining differential meal replacement adherence in a weight loss maintenance program after one-year follow-up	Dombrowski (2014)	To examine the relationship between patterns of meal replacement (MR) adherence and changes in outcomes during a behaviourally-oriented weight loss program	Interventions: (a) Experimental group: Lifestyle treatment with multi-component nutritional intervention (enhanced nutritional modification programme that emphasized the adoption of a diet lower in energy density) for 14 weeks + 1 Optifast replacement per day for 12 months. (b) Intervention control group: Lifestyle treatment only for 14 weeks Diet: (a) individualized estimates of their caloric requirements for maintenance + 1 Optifast replacement per day for 12 months + multi-component nutritional intervention for 14 weeks (b) individualized estimates of caloric requirements for maintenance PA: (a, b) "increasing exercise” Control: none Format/delivery: group Setting: no details Number of contacts: Total = 14 14 (weekly 90 min sessions for 14 weeks)- 23 weekly GS, each being 90 min long. D+E	Recruited through a column about weight control in a Philadelphia newspaper	Population: obese women. BMI pre-WL: 31.89. Age: 46.71 Gender: all female Most (83.3%) were Caucasian, 15.0% were African American and 1.7% were Native American.

Author	Title	Review taken from:	Aims	Intervention	Recruitment Method	Sample
Appel et al. 2011 (118)	Comparative effectiveness of weight-loss interventions in clinical practice	Gilmartin & Murphy (2015); Booth et al (2014); Yoong et al. (2012)	A randomized, controlled trial to determine the effectiveness of 2 behavioural weight-loss interventions — including one without in-person contact — in obese patients with at least one cardiovascular risk factor	One intervention provided patients with weight-loss support remotely — through the telephone, a study-specific Web site, and e-mail. The other intervention provided in-person support during group and individual sessions, along with the 3 remote means of support. Weight-loss coaches encouraged participants (motivational interviewing techniques) to complete the learning modules and provided positive reinforcement of key behaviours, with an emphasis on self-monitoring of weight, calorie intake, and exercise. Individual sessions (in person or by telephone) were approximately 20 minutes long; group sessions conducted for the group receiving in-person support typically lasted 90 minutes D+E (MI)	Recruited from 6 primary care practices in the Baltimore metropolitan area through physician referral, brochures, and targeted mailings	Obese patients with at least one cardio-vascular risk factor were recruited; 63.6% were women, 56% were White, and the mean age was 54.0 years.
Ashley et al. (76)	Weight control in the physician's office	Franz et al. (2007)	Randomized trial to compare the use of meal replacements in an established university-based weight loss clinic and a primary care physician practice	1-year weight-reduction study consisting of 26 sessions. The women were randomly assigned to 3 different traditional lifestyle-based groups: (1) dietitian-led group intervention (1 hour per session), (2) dietitian-led group intervention incorporating meal replacements (1 hour per session), or (3) primary care office intervention incorporating meal replacements with individual physician and nurse visits (10-15 minutes per visit). D	Selected from a larger sample responding to media announcement and flyers distributed in the local community	Overweight premenopausal women (mean ± SD age, 40.4 ± 5.5 years; weight, 82 ± 10 kg; and BMI= 25-35 ± 3 kg/m2) participated Ethnicity not stated
Borg et al. 2002 (59)	Effects of walking or resistance training on weight loss maintenance in obese, middle-aged men: A randomized trial	Gilmartin & Murphy (2015); Curioni & Lourenco (2005); Dombrowski (2014); Franz et al	To investigate whether walking or resistance training improves weight maintenance after weight loss when added to dietary counselling.	2 months' weight reduction with very-low-energy-diet (VLED) followed by randomization into 3 groups (control, walking, resistance training) for 6 months' weight maintenance (WM) program and 23 months' unsupervised follow-up. During VLED and WM all groups received similar dietary counselling. The subjects had weekly weightings and meetings in small groups (5-12 participants) led by nutritionist D+E	Answered to a newspaper advertisement	Healthy, obese (mean BMI 32.9 kg/m2 and waist 112.5 cm), 35-50 y-old men participated in the study. Ethnicity not stated

Author	Title	Review taken from:	Aims	Intervention	Recruitment Method	Sample
		(2007); Barte et al. (2010)				
Carels et al. 2005 (60)	Applying a stepped care approach to the treatment of obesity	Barte et al. (2010)	In a stepped-care (SC) approach to treatment, more intensive interventions are implemented when less intensive interventions prove to be insufficient. It was hypothesized that a behavioural weight loss program with SC (BWLP+SC) would evidence superior treatment outcomes when compared with a BWLP without SC (BWLP).	The 20-session (24 weeks including holidays) BWLP was based on the LEARN program, a comprehensive, empirically supported approach to weight management. During the intervention, participants made daily recordings of the calories that they expended from activity and the duration of planned physical activity. The program was administered in 75-min weekly sessions in closed groups of 7–12 participants. Participants in the BWLP+SC groups were eligible for additional counselling in addition to the weekly BWLP if they failed to meet their pre-established weight loss goals E	Recruited through local newspaper advertisements and campus email at a Midwestern university	Obese, sedentary adults recruited. 89% Caucasian and female; mean age: 47
Christensen et al. (61)	Comparison of 3 different weight maintenance programs risk, bone, and vitamins in sedentary older adults	Dombrowski (2014)	To compare changes in cardiovascular disease (CVD) risk-factors, nutritional health, and body composition after 1-year weight-loss maintenance achieved by [D]diet, [E]knee-exercise, or [C]control, following weight loss by low-energy-diet.	Interventions: (a) Diet (b) Exercise Diet: (a) provision of formula products (1 Cambridge Weight Plan product per day), no other details. (b) no details. PA: (a) no details. (b) supervised exercise sessions consisted of a warm-up phase (10 min), a circuit training phase (45 min), and a cool down/stretching phase (5 min). Control: (c) usual-care comparison group Format/delivery: (a) no detail, (b) group Number of contacts: (a) Total = 52 (weekly sessions for approximately 1 h) (b) Total = 52 (exercise sessions for 4 periods of 12 weeks and one period of 4 weeks) D+E	Recruited from outpatients' clinic at the Department of Rheumatology at Copenhagen University Hospital at Frederiksberg, Denmark. Study was advertised in newspapers, on the website of the Parker Institute and all potential P`s were contacted by telephone	Population: Obese women and men with knee osteoarthritis. BMI pre-WL: 37.3. Age: 62.5* Gender: 52% female, 48% male* Ethnicity not stated

Author	Title	Review taken from:	Aims	Intervention	Recruitment Method	Sample
Dansinger et al. (62)	Comparison of the Atkins, Ornish, Weight Watchers, and Zone diets for weight loss and heart disease risk reduction: a randomized trial	Williams et al (2015)	To assess adherence rates and the effectiveness of 4 popular diets (Atkins, Zone, Weight Watchers, and Ornish) for weight loss and cardiac risk factor reduction.	Participants were assigned either to an Atkins (carbohydrate restriction), Zone (macronutrient balance), Weight Watchers (calorie restriction), or Ornish (fat restriction) diet groups. After 2 months of maximum effort, participants selected their own levels of dietary adherence. Dietary advice was given to small groups rather than individually. All participants were encouraged to take a non-prescription multivitamin daily, obtain at least 60 minutes of exercise weekly, and avoid commercial support services. D+E	Newspaper advertisements and television publicity (local news coverage), P`s made telephone enquiries	Individuals were enrolled at an academic medical centre in Boston. Adults of any age who were overweight or obese were included Mean age= 49 (11); 51% women; 75% Caucasian
Delbridge et al.. 2009 (63)	One-year weight maintenance after significant weight loss in healthy overweight and obese subjects: does diet composition matter?	Dombrowski (2014)	Objective was to investigate whether macronutrient dietary composition plays a role in weight maintenance and in improvement of cardiovascular disease risk factors.	Interventions: Two dietary intervention groups: (a) High protein + monthly counselling sessions (b) High carbohydrates + monthly counselling sessions Diet: (a,b) Total energy expenditure calculated as BMR multiplied by an activity factor of 1.3 reduce fat intake to <30%, emphasis on reducing saturated fat. Carbohydrates with a low glycemic index (GI) were recommended (a) 30% of their intake as protein (b) 15% of their intake as protein PA: (a,b) encouraged to practice healthy behaviours such as aerobic exercise 3 times/wk. Format/delivery: (a, b) Individual (but not explicitly stated) + Group (cooking classes) D	Recruited by newspaper advertisement and word of mouth	Population: Overweight/obese women and men BMI pre-WL: 38.95 Age: 43.85 Gender: 50% female, 50% male Ethnicity not stated
Djuric et al. (77)	Combining weight-loss counselling with the Weight Watchers plan for	Franz et al (2007)	To develop effective weight loss methods for women who have had breast cancer, because obesity may result in an adverse prognosis.	An individualized approach was applied either alone or combined with the commercial Weight Watchers program (this included group meetings). D	Recruitment sources were direct mail to “Race for the Cure” participants, press releases, and brochures at	Eligible P`s: 18-70 years women; 73% Caucasian; 25% African American; BMI= 30 to 44 kg/m2

Author	Title	Review taken from:	Aims	Intervention	Recruitment Method	Sample
	obese breast cancer survivors				breast clinics	
Elder et al. 2012 (78)	Randomized trial of Tapas acupressure technique for weight loss maintenance	Dombrowski (2014)	This randomized clinical trial tested the efficacy of a novel mind and body technique for weight-loss maintenance.	Interventions: (a) Tapas Acupressure Technique– groups sessions in acupressure (b) Social Support – group social support sessions Diet: (a,b) no details PA: (a,b) no details Control: none Format/delivery: (a,b) group Unclear	Direct-letter contact to KPNW members and study publicity to KPNW members and employees via newsletters, posters, and brochures.	Population: Obese women and men BMI pre-WL: not stated, 34.0 at baseline of WLM phase Age: 56 ±11 Gender: 79% female, 21% male Ethnicity not stated/not clear
Fogelholm et al. (64)	Effects of walking training on weight maintenance after a very-low- energy diet in premenopausal obese women: A randomized controlled trial	Curioni & Lourenco (2005); Dombrowski (2014); Barte et al. (2010)	Study examined the role of physical activity in weight maintenance. Hypotheses were (1) a walking training program of moderate intensity, started after weight reduction by a very-low-energy diet, improves maintenance of weight loss and obesity-related metabolic disorders, and (2) effect of training program is related to the prescribed amount of physical activity, that is, a higher amount (energy expenditure) leads to more favourable results.	The 12-week weight reduction consisted of 3 parts: week 1, low-energy diet based on a meal-exchange system; weeks 2 to 9, very-low-energy diet (Nutrilett; Nycomed-Pharma AS, Oslo, Norway); and weeks 10 to 12, low-energy diet. The subjects met weekly in small groups (5-12 participants). All meetings were overseen by a nutritionist. All subjects participated in weekly meetings in small groups throughout the maintenance program, conducted by an exercise instructor. D+E	Received letters from female volunteers responding to newspaper advertisements	P`s were premenopausal women with a mean BMI of 34.0 kg/m^2. Ethnicity not stated/not clear
Foster-Schubert et al. 2012 (81)	Effect of diet and exercise, alone or combined, on weight and body	Johns et al. (2014)	To determine the effects of a calorie-reduced, low-fat diet (D), a moderate-intensity, facility-based aerobic exercise program (E), or the combination of both interventions (D+E),	The group-based dietary intervention had a weight-reduction goal of ≥10%, and the exercise intervention consisted of a gradual escalation to 45-min aerobic exercise 5 day/week D+E	Targeted mass mailing campaigns and media publicity/ community outreach Invitation letters sent and	P`s were predominantly non-Hispanic white (85%) with a mean age of 58.0 ± 5.0 years, a mean BMI of 30.9 ± 4.0 kg/m^2 and an average of 47.8 ± 4.4% body fat.

Author	Title	Review taken from:	Aims	Intervention	Recruitment Method	Sample
	composition in overweight-to-obese postmenopausal women		vs. a no-lifestyle-change control (C) on change in body weight and composition		received media and community outreach-prompted calls	
Harvey-Berino et al. (65)	Does using the Internet facilitate the maintenance of weight loss?	Dombrowski (2014)	To investigate the effectiveness of a weight maintenance program conducted over the Internet.	The 24-week treatment program focused on the modification of eating and exercise habits through the use of behavioural strategies and self-management skills. Meetings were held weekly for 1 h and printed lessons were given out to reinforce the weekly discussion. Format/delivery: (a) Group sessions, + individual phone call, (b) Internet chat sessions, email, (c) Group sessions D+E	Recruited through newspaper advertisements. To assess computer capability of prospective P`s, study Web page was developed	Population: Overweight/obese women and men BMI pre-WL: 32.2 Age: 48.4 ±9.6* Gender: 85% female, 15% male*; 97-100% Caucasian
Heshka et al. (87)	Weight loss with self-help compared with a structured commercial program: a randomized trial	Franz et al (2007)	To compare weight loss and health benefits achieved and maintained through self-help weight loss vs with a structured commercial program	A 2-year, multicentre randomized clinical trial with clinic visits at 12, 26, 52, 78, and 104 weeks conducted at 6 academic research centres in the US. The self-help program consisted of 2 20-minute counselling sessions with a nutritionist and provision of self-help resources, and the commercial weight loss program consisted of a food plan, an activity plan, and a cognitive restructuring behaviour modification plan, delivered at weekly meetings. Weekly group meetings of approximately an hour's duration were led by successful program graduates who act as role models and provide written educational materials, a weekly weigh-in, and social support D+E	Recruited from existing clinic records or by advertising a long-term non medication weight loss study for moderately overweight persons.	Overweight and obese men (n = 65) and women (n = 358) (BMI=27-40) aged 18 to 65 years. Ethnicity not stated
Irwin et al. 2003 (82)	Effect of exercise on total and intra-abdominal body fat in	Franz et al (2007)	To examine the effects of exercise on total and intra-abdominal body fat overall and by level of exercise.	Participants randomly assigned to an intervention consisting of exercise facility and home-based moderate-intensity exercise or a stretching control group. Several techniques for promoting adherence, including individualized attention in facility classes;	Recruited women through a combination of mass mailings and media placements	P`s were overweight postmenopausal women from the greater Seattle area; aged 50-75 years, sedentary at baseline, BMI of more than 25.0;

Author	Title	Review taken from:	Aims	Intervention	Recruitment Method	Sample
	postmenopausal women: a randomized controlled trial			group exercise behaviour–change education classes; weekly telephone calls to promote adherence; individual meetings at baseline and every 3 months to outline goals and provide feedback on progress; incentives; quarterly newsletters; and group activities such as hikes were used. E		majority (86%) non-Hispanic white
Jakicic et al. 2003 (98)	Effect of exercise duration and intensity on weight loss in overweight, sedentary women	Franz et al. (2007)	To compare the effects of different durations and intensities of exercise on 12-month weight loss and cardiorespiratory fitness	Participants were randomly assigned to 1 of 4 exercise groups (vigorous intensity/high duration; moderate intensity/high duration; moderate intensity/moderate duration; or vigorous intensity/moderate duration). Participants were scheduled to attend behavioural group meetings throughout the 12-month intervention period. Meetings were conducted weekly during the initial 24 weeks of treatment, and biweekly for the remainder of the study period. In addition to group meetings, participants received a biweekly telephone call from a member of the intervention team during months 7 through 12. E	Unclear	Women (mean [SD] age, 37.0 [5.7] years; mean [SD] BMI= 32.6 [4.2]) participated in a university-based weight control program; 81% Caucasian
Jebb et al. 2011 (88)	Primary care referral to a commercial provider for weight loss treatment versus standard care: a randomised controlled trial	Yoong et al. (2012)	To compare weight loss with standard treatment in primary care with that achieved after referral by the primary care team to a commercial provider in the community	Participants received either 12 months of standard care as defined by national treatment guidelines, or 12 months of free membership to a commercial programme (CG) (Weight Watchers), and followed up for 12 months. Participants were encouraged to attend weekly meetings for a weigh-in and group discussion, behavioural counselling, and motivation. D	Recruited from 39 primary care practices in Germany,	Overweight and obese adults were recruited by primary care practices in Australia, Germany, and the UK. 86-88% women; age=46·5 (13·5)- 48·2 (12·2) years; BMI=31·5 (2·6)-31·3 (2·6) Ethnicity not stated
Jolly et al. 2011 (84)	Comparison of range of commercial or primary care led	Robertson et al. (2015)	To assess the effectiveness of a range of weight management programmes in terms of weight loss	Weight loss programmes of 12 weeks' duration: Weight Watchers (WW); Slimming World; Rosemary Conley; group based, dietetics led programme; general practice one to one counselling; pharmacy led one to one	Invited to participate by a standard letter from GP, which included	Obese or overweight men and women with a comorbid disorder recruited

Author	Title	Review taken from:	Aims	Intervention	Recruitment Method	Sample
	weight reduction programmes with minimal intervention control for weight loss in obesity: lighten up randomised controlled trial			counselling; choice of any of the 6 programmes. The comparator group was provided with 12 vouchers enabling free entrance to a local leisure (fitness) centre D+E	patients' information leaflet and a free telephone number	25-36% men; mean age= 47.45 (14.35) - 50.71 (14.56) years; 83-90% White British /Irish; 48-56%; BMI of 31-34.
Lowe 2008 (66)	The effect of training in reduced energy density eating and food self-monitoring accuracy on weight loss maintenance	Dombrowski (2014)	The goal of this study was to compare 2 novel group interventions, both aimed at improving weight loss maintenance, with a control group	Interventions: (a) CBT (b) CBT plus EFMA (Enhanced Food Monitoring accuracy) (c) CBT plus EFMA plus a REDE (Reduced Energy Density Eating) programme Diet: (a) follow the food guide pyramid and Dietary Guidelines for Americans (b) follow the food guide pyramid and Dietary Guidelines for Americans + skills for accurate food recordings (c) follow the food guide pyramid and Dietary Guidelines for Americans + skills for accurate food recordings + Reduced Energy Density Eating PA: (a,b,c) no details Format/delivery: (a,b,c) Group sessions D	Recruited through a newspaper story by a local columnist, advertisements in local newspapers, and through affiliated physicians	Population: Overweight/obese women BMI pre-WL: 31.9 Age: 43.9* Gender: all female; 61.2% were Caucasian, 35.9% were African Americans
Ma 2013 (89)	Translating the diabetes prevention program lifestyle intervention for weight loss into primary care: a randomized	Robertson et al. (2015)	To evaluate 2 adapted DPP lifestyle interventions among overweight or obese adults who were recruited from 1 primary care clinic and had pre-DM and/or metabolic syndrome.	Participants were randomized to (1) a coach-led group intervention (n = 79), (2) a self-directed DVD intervention (n = 81), or (3) usual care (n = 81). During a 3-month intensive intervention phase, the DPP-based behavioural weight-loss curriculum was delivered by lifestyle coach–led small groups or home-based DVD Unclear	Recruited from a single primary care clinic	At baseline, mean age of 52.9±10.6 years, mean BMI of 32.0±5.4 kg/m2, 47% female, 78% Non-Hispanic white

Author	Title	Review taken from:	Aims	Intervention	Recruitment Method	Sample
	trial					
Mayer-Davis et al. 2004 (80)	Pounds off with empowerment (POWER): a clinical trial of weight management strategies for black and white adults with diabetes who live in medically underserved rural communities	Booth et al (2014)	To evaluate lifestyle interventions for diabetic persons who live in rural communities. The goal of our study was to develop, implement, and evaluate a 1 -year primary care-based lifestyle intervention for weight management that was designed to improve metabolic control among individuals who have type 2 diabetes and live in medically underserved communities.	Participants were randomised into 1 of 3 interventions: intensive lifestyle intervention, reimbursable-lifestyle intervention, or usual care. The intensive lifestyle intervention was developed from the lifestyle intervention of the DPP. The program focused on moderate weight loss with a goal of 25"/o of calories from dietary fat and a minimum of 150 minutes of physical activity per week. Modifications included regular use of group sessions. The intensive lifestyle condition included group sessions; the reimbursable-lifestyle intervention included 3 group sessions D+E	Identified through diabetes registries at each health centre and local publication efforts (posters, etc.),	Overall, 80% of participants were women, 82% were Black, the average age was 60 years, and the average BMI was 36.7 kg/m~.
McManus 2001 (85)	A randomized controlled trial of a moderate-fat, low-energy diet compared with a low fat, low-energy diet for weight loss in overweight adults	Franz et al. (2007)	To evaluate a diet moderate in fat based on the Medi-terranean diet compared to a standard low-fat diet for weight loss when both were controlled for energy	A randomized, prospective 18 month trial in a free-living population. It involved subjects being enrolled into a group education class which met weekly for 1 h. Participation was defined as attending group or individual counselling sessions D	Advertised study in letters mailed to primary care physicians at Brigham and Women's Hospital (BWH) and in posted announcements	Over-weight men and women. Inclusion criteria - 18 – 70 yrs, & willingness to attend weekly classes for duration of study. 88-100% female; 78-100% Caucasian
Moore et al. 2003 (67)	Improving management of obesity in primary care: cluster randomised trial	Yoong et al. (2012)	To evaluate a training programme intended to improve the management of obesity, delivered to general practice teams	4.5 hour training programme promoting an obesity management model. Three 90 minute sessions, intended to be delivered at intervals of no less than one week and no more than 2 weeks apart, to the 22 intervention practices. All general practitioners and practice nurses were asked to attend all 3 sessions. Four dietitians were trained in the standardized delivery of the training and then delivered the programme to small group, multi-disciplinary	Recruited practices from 4 health authority areas in the Northern and Yorkshire region of England. Invited all 161 practices in selected primary	44 general practices invited consecutively attending obese adults to participate 25-27% men; BMI=37; 48-49 mean years of age Ethnicity not stated

Author	Title	Review taken from:	Aims	Intervention	Recruitment Method	Sample
				general practice teams. Model of obesity management entailed practitioners seeing patients regularly (about every 2 weeks) until they had lost 10% of their original body weight and then less regularly (about every one to 2 months) for maintenance of weight over a sustained period. Prescription of a moderate energy deficit diet was advocated E	care groups to participate	
Munsch et al. 2003 (90)	Evaluation of a lifestyle change programme for the treatment of obesity in general practice	Booth et al (2014); Yoong et al. (2012)	To evaluate a treatment programme for obesity with the main focus on changing nutrition and life-style (BASEL), adapted from the programme LEARN, in clinical practice.	The group treatment consisted of a total of 16 sessions of 90 min each, standardised according to the therapy concept of the BASEL programme. In the first group-session the patients were presented with the standardised manual-based procedure. D+E	Patients from the clinical centre, patients from general practices as well as patients who replied to newspaper advertisements	Men and women with an average age of 45.2 years (SD: 23.9) were recruited. Part of inclusion criterion was presence of obesity (BMI ≥30 kg/m2); Ethnicity not stated
Makade et al. 2012 (86)	Behavioural change during weight loss program and one-year follow-up: Saku Control Obesity Program (SCOP) in Japan	Williams (2014)	This study evaluated effects of a behavioral approach which placed emphasis on tailored behavior counseling, diet, weight loss and weight maintenance.	I-D+E) (diet + exercise) vs. (C): The (I-D+E) group received 30 min individual counselling sessions and 20 min group sessions from dietitians and exercise instructors at baseline, 1, 3, 6, & 9 months. Each month a diet/eating behaviour & exercise goal was set for each month and this was the basis of the counselling sessions. Additionally, participants were required to self-monitor and log daily step counts and diet. In the weeks when sessions were not scheduled, participants mailed their progress reports to the dietitian who then returned feedback. Diet education was provided but a specific diet plan was not prescribed or suggested. (C) group received no support for the 12 months. D+E	Recruitment was conducted by the Saku Health Dock Center. A letter was sent directly to eligible P`s who visited the Dock Center	Men and women (51% female) aged 40-64 years, BMI >28.4. Duration: 24 months – 12 months active intervention, 12 months passive follow-up for (I) group only Ethnicity not stated
Paisey et al. 2002 (91)	Five-year results of a prospective very low calorie diet	Franz et al. (2007)	To complete 5-year follow-up of an intensive weight loss programme in established type 2 diabetic subjects.	Group sessions of 8 to 15 subjects continued weekly for 6 months, then monthly for 12 months with prospective recording at 3, 6 and 12 months and then annually of measures like quality of life, BMI, waist/hip ratio. In the first 3	Recruited from hospital clinics and general practice	Obese type 2 diabetic subjects, expressed interest in an intensive weight loss programme; age= 22-70 years; over

Author	Title	Review taken from:	Aims	Intervention	Recruitment Method	Sample
	or conventional weight loss programme in type 2 diabetes			months, activities in weekly sessions included: weight check, feedback of any investigations, gentle exercise to music, education and group discussion. During 3-6 months, activities in the weekly sessions included: quizzes, food labelling, preparation of food, cooking demo, supermarket tours, physio and psychology advice. D+E		50% female, BMI=33-38 Ethnicity not stated
Perri et al. 2008 (68)	Extended care programs for weight management in rural communities : the treatment of obesity in underserved rural settings (TOURS) randomized trial	Peirson et al (2015)	Study hypothesized that the interventions delivered either by telephone or by face-to-face sessions would produce better maintenance of lost weight than the control condition and that the beneficial effects of extended care would be mediated by improved adherence to behavioural weight-management strategies.	The extended-care programs entailed problem-solving counselling delivered in 26 biweekly sessions via telephone or face to face. Control group participants received 26 biweekly newsletters containing weight-control advice. Other	Study announcements were mailed to households in 6 rural 17 counties in northern Florida	Study included women, aged 50-75 years, with BMI ≥30 and a body weight less than 159.1 kg. 67-83% Caucasian
Perri et al. 2001 (119)	Relapse prevention training and problem-solving therapy in the long-term management of obesity	Dombrowski (2014)	This study compared 2 extended therapy programs for weight management with standard behavioural treatment (BT) without additional therapy contacts.	Interventions: (a) Relapse Prevention Therapy (RPT) (b) Problem-solving therapy (PST) Diet: (a,b,c) no detail PA: (a,b,c) no detail Control: (c) no intervention control Format/delivery: (a,b) group Number of contacts: Total = 26 (biweekly sessions for 12 months) Unclear	Newspaper advertisements	Population: Overweight/obese women (men excluded from analysis as too few available) BMI pre-WL: 35.8 Age: 46.6 Gender: all female Ethnicity not stated
Rickel et al. 2011 (96)	Differential response of African American and	Peirson et al (2015)	The current study examined racial/ethnic differences in patterns of weight loss and regain in response to an initial	The initial 6 month lifestyle intervention for weight management involved weekly group-based sessions (Phase I), and participants were then randomized to one of 3 12-month extended-care conditions with bi-weekly	P`s from an initial lifestyle intervention	Study included women, aged 50 to 75 years, with a BMI greater than 30 and a body weight less than 159.1 kg.

Author	Title	Review taken from:	Aims	Intervention	Recruitment Method	Sample
	Caucasian women to extended care programs for obesity management		behavioral weight loss intervention followed by an extended-care maintenance program.	contact (Phase II). Phase II of the intervention included 3 extended-care programs that included 26 bi-weekly sessions of either face-to-face counseling, telephone counseling, or an educational control condition with mail-only contact. Other		Majority= Caucasian
Riebe et al. 2003 (69)	Evaluation of a healthy-lifestyle approach to weight management	Barte et al. (2010)	The purpose of the current study was to evaluate the efficacy of this healthy-lifestyle weight management program for producing changes in anthropometric, dietary, exercise, and biochemical outcomes	The 6-month clinical program was provided to groups of 11–15 participants. The program began with an intensive, 3-month phase during which participants attended 2 2-h sessions each week. Each session involved 1 h of behavioral or dietary instruction and 1 h of exercise. Following the intensive phase, participants attended a 3-month tapering phase during which the amount and frequency of clinical contact decreased. During this phase, participants met for 1 h once per week for 4 weeks and then once every other week for the following 8 weeks, for a total of 8 visits over 3 months. D+E	Recruited by advertisements in local newspapers, flyers, and by word of mouth	Overweight and obese adults BMI=32.5+/-3.8) participated in a 6-month clinic based weight management program. Age= 50.2 (9.2); Caucasian (97%) men and women
Riebe et al. 2005 (99)	Long-term maintenance of exercise and healthy eating behaviours in overweight adults	Barte et al. (2010)	This study presents 24-month outcomes of a healthy-lifestyle weight management program designed to promote long-term changes in diet and exercise behaviors.	All subjects completed a 6-month clinical weight management program. The multidisciplinary program, delivered to groups of 11–15 participants, focused on changing lifestyle rather than weight loss per se. The program began with an intensive 3-month phase during which subjects attended 2 2-h sessions each week. Each session involved 1 h of behavioral or dietary instruction and 1 h of exercise. Following the intensive phase, participants attended a tapering phase where subjects met for a total of 8 visits over 3 months. D+E	Not stated/ clear	Overweight and obese adults (n = 144; BMI = 32.5 F 3.8) Age= 50.2 (9.2); Caucasian (97%) men and women
Shai et al. 2008 (100)	Weight loss with a low-carbohydrate	Robertso n et al. (2015)	We conducted the 2-year Dietary Intervention Randomized Controlled	a. Individual or group: Group Description: Low-fat, restricted calorie diet. Participants were counselled to consume low	Not clear? conducted trial in a workplace at	Moderately obese subjects (mean age=52 years; mean BMI= 31;

Author	Title	Review taken from:	Aims	Intervention	Recruitment Method	Sample
	Mediterranean, or low-fat diet		Trial (DIRECT) to compare the effectiveness and safety of 3 nutritional protocols: a low-fat, restricted-calorie diet; a Mediterranean, restricted-calorie diet; and a low-carbohydrate, non–restricted-calorie diet.	fat grains, vegetables, fruit and legumes and to limit additional fats, sweets and high fat snacks. b. Individual or group: Group Description: Mediterranean, restricted calorie diet. Main sources of fat were 30-45g olive oil and <20g nuts per day. Participants were counselled to consume a diet rich in vegetables and low in red meat. c. Individual or group: Group Description: Low carbohydrate, non-restricted calorie diet. Total calorie, protein and fat intakes were not limited but participants were counselled to choose vegetarian sources of fat and protein to avoid trans-fat. Based on the Atkins diet. There were 18 group meetings in total lasting 90 minutes each. D	a research centre with an on-site medical clinic	male sex=86%) Ethnicity not stated
Shea et al. 2011 (101)	The effect of intentional weight loss on all-cause mortality in older adults: results of a randomized controlled weight-loss trial	Williams (2015)	The objective was to determine the effect of intentional weight loss on all-cause mortality by using follow-up data from a randomized trial completed in 1995 that included a weight-loss arm.	3 x (I-D) groups (3 diet groups) vs (C). (I-D1) was aimed at dietary weight loss with a target of -4.5kg. (I-D2) was aimed at sodium reduction, target <1800mg/d. (I-D3) combined both weight loss and sodium reduction. Participants attended small group or individual meetings with the nutritionist and exercise counsellor for lifestyle techniques to change eating and PA behaviour. Follow-up visits occurred every 3 months. (C) maintained usual lifestyle control with no advice from nutritionist of exercise counsellor. Duration: 28 mo – 4mo intensive weight loss intervention, 4mo prevention of relapse phase, 20mo additional weight maintenance phase. D+E	Unclear	Men and women (52% female), BMI >25; majority (70-75% Caucasian) Age: 65.5±4.5 BMI: (I-D): 30.6±1.6- 31.8±2.5 (C):30.2±1.6- 31.8±2.7
Stahre et al. 2007	A randomized	Barte et al.	Main objective: to describe method and evaluate the	The program included elements from cognitive therapy (CT) and psycho education. Each	After a health survey directed to	Women (ie those having a BMI ≥ 30 kg/m2)

Author	Title	Review taken from:	Aims	Intervention	Recruitment Method	Sample
(97)	controlled trial of 2 weight reducing short-term group treatment programs for obesity with an 18-month follow-up	(2010)	long-term efficacy (weight reduction 18 months after treatment) of a slight modification of the same cognitive treatment program as used in Stahre and Hällström (2005) in a randomized controlled study. In the present study, a control group received another active treatment for the same length of time (10 weeks) as the cognitive treatment group. Another objective: to show to what extent the 2 programs delivered program-specific knowledge to the P`s.	program consisted of 20 hours divided into 10 lessons, with each lesson given once a week (ie the programs extended over a 10-week period). Each lesson was structured and arranged into 4 blocks: A, B, C, and D. Block A: Questionnaire manual. Block B: Previous lesson's homework. The lesson concerned group discussion and participant analysis of the previous lesson's homework. Block C: Theme of the lectures. Block D: New homework. Other	child care providers, participants were identified	participated Mean age of P`s in the cognitive treatment group= 50.1 years and in the control group= 47.0 years Ethnicity not stated
Stenius-Aarniala et al. 2000 (70)	Immediate and long term effects of weight reduction in obese people with asthma: randomised controlled study	Franz et al (2007)	To investigate the influence of weight reduction on obese patients with asthma.	Supervised weight reduction programme including 8 week very low energy diet. The treatment group took part in a weight reduction programme that included 12 group sessions and lasted 14 weeks, including 8 weeks—"the dieting period"—in which participants took a very low energy dietary preparation (Nutrilett (Nycomed Pharma, Oslo)). D	Recruited by advertisements in 2 daily newspapers	Obese patients with asthma (BMI (kg/m2) 30 to 42). Over 50% female; age= 49.7 (34-60)- 48.3 (23-60); Ethnicity not stated
Stern et al. 2004 (92)	The effects of low-carbohydrate vs conventional weight loss diets in severely obese adults: One-year follow-up of a randomized	Franz et al (2007)	To review the 1-year outcomes between the low-carbohydrate and conventional weight loss diets.	Participants received counselling to either restrict carbohydrate intake to <30 g per day (low-carbohydrate diet) or to restrict caloric intake by 500 calories per day with <30% of calories from fat (conventional diet). Diet groups met in weekly counselling sessions for 4 weeks, followed by 11 monthly sessions. D	Recruited from the outpatient practices of The Philadelphia Veterans Affairs Medical Centre	Obese adults with BMI 35 kg/m2 or greater; 83% had diabetes/ metabolic syndrome; age= 53+/-9. Majority African American and then white

Author	Title	Review taken from:	Aims	Intervention	Recruitment Method	Sample
	trial					
Svetkey et al. 2008 (79)	Comparison of strategies for sustaining weight loss: the weight loss maintenance randomized controlled trial	Dombrowski (2014)	To compare 2 weight loss maintenance interventions with a self-directed control group.	After the phase 1 weight-loss program, participants were randomized to one of the following groups for 30 months: monthly personal contact, unlimited access to an interactive technology–based intervention, or self-directed control. The phase 1 intervention was a group-based behavioural intervention. A trained interventionist led 20 weekly group sessions over approximately 6 months. Other	Recruitment relied on mass mailings, posted flyers, radio advertisements, and print media	Overweight or obese adults participated, 38% African American, 63% women; mean age= 55.6 (8.7)
Tate et al. 2007 (71)	Long-term weight losses associated with prescription of higher physical activity goals. Are higher levels of physical activity protective against weight regain?	Williams et al (2015)	To determine in a randomized prospective design whether encouraging 2500 kcal physical activity/wk produced greater 30-mo weight losses than did the standard 1000 kcal physical activity/wk prescription.	Participants were allocated to either 18mo of standard behavioural treatment (SBT) with an exercise goal of 1000 kcal/wk or a high physical activity (HPA) treatment with a goal of 2500 kcal/wk. Both treatments involved behaviour therapy for obesity conducted in small groups (for example, 10–20 participants) that met weekly during the first 6 mo, biweekly during months 7–12, and monthly during months 13–18. Groups were led by nutritionists, exercise physiologists, or psychologists. E	Recruited through advertisements in local newspapers	Overweight adults were recruited evenly between the University of Minnesota School of Public Health and the Miriam Hospital P`s had a mean age of 42.2 +/- 6.4 y; 58% were female, 80% were white, and average base-line BMI was 31.7 +/- 2.6
Teixeira et al. 2002 (72)	Weight loss readiness in middle-aged women: psychosocial predictors of success for behavioural weight reduction	Barte et al. (2010)	To identify baseline psychosocial correlates of short-term (4-month) changes in body weight in middle-aged women participating in a lifestyle weight loss intervention.	After baseline testing, subjects randomly assigned to 4 groups of approx. equal size (27–29 subjects/group), which met with the intervention team once a week, for 150 min per session, over 16 consecutive weeks. Physical activity, nutrition, psychology, and behaviour modification experts presented subjects with information and interactive activities targeting healthier lifestyles and weight reduction. All groups received the same 16-week intervention. Subjects were encouraged to make progressive and realistic changes in their lifestyle, primarily reducing energy intake and	Recruited from the community through newspaper and TV advertisements	Overweight and obese middle-aged women (age, 47:8 § 4:4 years; BMI, 31:4 § 3:9 kg/m2). 86% non-Hispanic

Author	Title	Review taken from:	Aims	Intervention	Recruitment Method	Sample
				increasing physical activity and energy expenditure, resulting in a moderate daily energy deficit (less 300–500 kcal/day). Individualized goals for energy intake (EI) and expenditure (EE) were provided to all subjects, and slow, progressive weight loss (about 0.5 kg a week) was recommended. Cognitive behavioural strategies used to improve compliance included self-monitoring, self-efficacy enhancement, relapse prevention, contingency management, and social support. D+E		
Volpe et al. 2008 (73)	Effect of diet and exercise on body composition, energy intake and lep-tin levels in overweight women and men	Robertson et al. (2015)	To investigate the effect of diet alone (D), exercise alone (E), and a combination of diet and exercise (DE) on body weight, body composition, energy intake, blood pressure, serum lipid and leptin levels, and fitness levels in mildly obese sedentary women and men.	The 3 interventions were compared in a randomized longitudinal study design. The exercise programs were supervised for 6 months, after which participants in E and DE were provided with exercise equipment to take home. Nutritional classes were also involved. D+E	Recruited by advertisements placed in the University and local newspapers	Overweight women and men (age: 44.2 +/-7.2 years; BMI +/-30.5 +/- 2.7 kg/m2). Ethnicity not stated
Wadden et al. 2011 (94)	Four-year weight losses in the Look AHEAD study: factors associated with long-term success	Robertson et al. (2015)	Analysis of the year 4 weight losses in the Look AHEAD (Action for Health in Diabetes) study and identifies factors associated with long-term success.	ILI (intensive lifestyle intervention) participants were provided approximately weekly group or individual treatment in year 1; continued but less frequent contact was provided in years 2–4. DSE (diabetes support and education) participants received 3 group educational sessions in all years. D+E	Recruited from 16 centres across U.S	Overweight/ obese men and women, aged 45–76 years, with T2DM 63% non-Hispanic white; 59-60% female
Wadden et al. 2014 (93)	Eight-year weight losses with an intensive lifestyle intervention: the look	Robertson et al. (2015)	To evaluate 8-year weight losses achieved with intensive lifestyle intervention (ILI) in the Look AHEAD (Action for Health in Diabetes) study.	As Look Ahead post-randomisation for first year. a. DSE: For the first 4 years, participants provided with 3 1-hour group meetings per year discussing diet, physical activity and social support. Years 5-8 provided one yearly	Recruited from 16 centres across U.S	Average age: 58.7±6.8 years; BMI= 36.0±5.9 kg/m2; 63% non-Hispanic white, majority women

Author	Title	Review taken from:	Aims	Intervention	Recruitment Method	Sample
	AHEAD study			session. b. ILI: In years 2-8, intervention focused principally on maintaining the weight losses and duration of physical activity achieved during the first year, as well as helping unsuccessful individuals achieve study goals. Lifestyle counselling was provided in individual monthly on-site meetings. Further email or telephone contact from a second individual approximately 2 weeks later was provided until year 5. All sites offered monthly group meetings where members weighed-in, reviewed diet and activity records and participated in a lifestyle modification session. Sites also offered at least one yearly refresher group, typically lasting 6-8 weeks. Other		
West et al. 2011 (95)	A motivation-focused weight loss maintenance program is an effective alternative to a skill-based approach	Dombrowski (2014)	A novel weight loss maintenance program that specifically targets motivational factors was evaluated.	Interventions: (a) Skill based intervention (b) Motivation-focused maintenance programme Diet: (a,b) Reduced calorie goals were recommended until 10% weight loss goal was achieved, and then dietary intake goals focused on weight stability. Meal replacement coupons (one meal and one snack) continued to be provided to both groups. PA: (a,b) Exercise goals remained at 200 min/week for both conditions Format/delivery: (a,b) group. Number of contacts: (a,b) Total = 24 sessions (bi-weekly group meetings for 1h) D+E	Recruited as part of a randomized clinical trial. Screened by telephone	Population: Overweight and obese women with urinary incontinence BMI pre-WL: 36.0 Age: 53.0* Gender: all female Ethnicity not stated
Wilkstrand et al. 2010 (83)	Very low calorie diet (VLCD) followed by a randomized trial of corset	Dombrowski (2014)	To investigate the feasibility and cost-effectiveness of weight reduction using very low calorie diet (VLCD) in groups. Also, to investigate whether subsequent corset	Interventions: (a) Diet + Corset + 2 meeting with GP (b) Diet Diet: (a,b) individual calorie restricted diet PA: (a,b) no details Control: none	Recruited after advertising in the local press or were referred from other physicians	Population: Obese women and men BMI pre-WL: 35.75 Age: 47.0 Gender: 71% women, 29% men

Author	Title	Review taken from:	Aims	Intervention	Recruitment Method	Sample
	treatment for obesity in primary care		treatment could maintain the weight reduction long term.	Format/delivery: (a) group + individual (b) group Number of contacts: (a) Total = 8 6 (group meetings at weeks 2, 5, 7, 13, 21, and 29 after randomization) + 2 (GPs meetings at weeks 3 and 9) (b) Total = 6 (group meetings at weeks 2, 5, 7, 13, 21, and 29 after randomization) D		Ethnicity unclear/not stated
Wing et al. 2006 (74)	A self-regulation program for maintenance of weight loss	Dombrowski (2014)	The results of the Study to Prevent Regain (STOP Regain), a randomized clinical trial testing the efficacy of a face-to-face program and an Internet-based program, as compared with a newsletter control group, in preventing weight regain over a period of 18 months are reported. They hypothesized that the interventions, delivered face to face or over the Internet, would decrease average weight regain and reduce the proportion of participants who regained 2.3 kg or more during a period of 18 months.	Interventions: (a) Face-to-face group (b) Internet Diet: (a,b) either initial approach to weight loss or a standard behavioural approach involving a low-calorie, low-fat diet (Several cans of SlimFast meal replacement and eating behaviours which have been reported to maintain weight loss) PA: (a,b) various exercise behaviours aimed to be exercising 60 minutes a day Control: information only control group Format/delivery: (a) Group + individual weigh-in, (b) Internet Number of contacts: (a,b) Total = 21 4 (weekly meetings for the first month) and 17 (thereafter monthly meetings for 18-month period) D+E	Newspaper advertisements, brochures, and contacts with commercial and research weight-control programmes	Population: Previously overweight and obese women and men BMI pre-WL: no details, 28.6 at WLM start Age: 51.3 Gender: 81% female, 19% male Ethnicity unclear/not stated
Wolf et al. 2004 (102)	Translating lifestyle intervention to practice in obese patients with type 2 diabetes: improving	Franz (2007)	To assess the efficacy of a lifestyle intervention program that can be readily translated into clinical practice for obese patients with type 2 diabetes.	One RD case manager met with participants individually, in groups, and by phone for assessment, goal setting, education, and support. Individual sessions occurred 6 times throughout the year, totalling 4 h. Participants attended 6 1-h small-group sessions. Brief monthly phone contacts provided support.	Unclear	Study consisted of a 12-month randomized controlled trial of health plan members with T2DM and obesity (BMI 27 kg/m2) Majority women Caucasian; age= 53.4 +/-

Author	Title	Review taken from:	Aims	Intervention	Recruitment Method	Sample
	control with activity and nutrition (ICAN) study			Other		8.0

Appendix 4. BCT classification of recruitment methods, response rate and uptake for each study (Section 2)

Author	Title	Response rate (RR)	Uptake	Recruitment Method	BCTs Identified
Anderson et al 2002 (57)	Physiologic changes after diet combined with structured aerobic exercise or lifestyle activity	X	X	Local newspaper advertisement (Screened by phone conversation, and underwent physical examination, medical history, maximal treadmill test and biochemical blood analysis)	
Annunziato et al. 2009 (58)	A randomized trial examining differential meal replacement adherence in a weight loss maintenance program after one-year follow-up	X	X	Recruited through a column about weight control in a Philadelphia newspaper	
Appel et al. 2011 (118)	Comparative effectiveness of weight-loss interventions in clinical practice	X	Medium	Recruited from 6 primary care practices in the Baltimore metropolitan area through physician referral, brochures, and targeted mailings. Some registered at recruitment Web site, some pre-screened by phone and some screened In-person	9.1 Credible source
Ashley et al. (76)	Weight control in the physician's office	X	X	Selected from a larger sample responding to media announcement and flyers distributed in the local community	
Borg et al. 2002 (59)	Effects of walking or resistance training on weight loss maintenance in obese, middle-aged men: A randomized trial	X	Medium	Answered to a newspaper advertisement	
Carels et al. 2005 (60)	Applying a stepped care approach to the treatment of obesity	X	X	Recruited through local newspaper advertisements and campus email at a Midwestern university.	
Christensen et al. (61)	Comparison of 3 different weight maintenance programs risk, bone, and vitamins in sedentary older adults	X	Medium	Recruited from outpatients' clinic at the Department of Rheumatology at Copenhagen University Hospital at Frederiksberg, Denmark. GPs in the local area were informed about the possibility to assign patients to the project. Study was advertised in newspapers, on the website of the Parker Institute and all potential P`s were contacted by telephone	
Dansinger et al. (62)	Comparison of the Atkins, Ornish, Weight Watchers, and Zone diets for weight loss and heart disease risk reduction: a randomized trial	X	Low	Newspaper advertisements and television publicity (local news coverage), P`s made telephone enquiries	

Author	Title	Response rate (RR)	Uptake	Recruitment Method	BCTs Identified
Delbridge et al.. 2009 (63)	One-year weight maintenance after significant weight loss in healthy overweight and obese subjects: does diet composition matter?	X	High	Recruited by newspaper advertisement and word of mouth	
Djuric et al. (77)	Combining weight-loss counselling with the Weight Watchers plan for obese breast cancer survivors	X	X	Recruitment sources were direct mail to “Race for the Cure” participants, press releases, and brochures at breast clinics	
Elder et al. 2012 (78)	Randomized trial of Tapas acupressure technique for weight loss maintenance	X	Medium	Direct-letter contact to Kaiser Permanente Northwest (KPNW) members and study publicity to KPNW members and employees via newsletters, posters, and brochures. Interested individuals contacted the study to schedule a group information session.	
Fogelholm et al. (64)	Effects of walking training on weight maintenance after a very-low- energy diet in premenopausal obese women: A randomized controlled trial	X	Medium	Received letters from female volunteers responding to newspaper advertisements	
Foster-Schubert et al. 2012 (81)	Effect of diet and exercise, alone or combined, on weight and body composition in overweight-to-obese postmenopausal women	RR= 4.4%	Low	Targeted mass mailing campaigns and media publicity/ community outreach Invitation letters sent and received media and community outreach-prompted calls. Some had phone interviews, others attended information sessions, and some screened in clinic	
Harvey-Berino et al. (65)	Does using the Internet facilitate the maintenance of weight loss?	X	X	Recruited through newspaper advertisements. To assess computer capability of prospective P`s, study Web page was developed. Interested P`s were further screened for eligibility via phone.	
Heshka et al. (87)	Weight loss with self-help compared with a structured commercial program: a randomized trial	X	High	Recruited from existing clinic records or by advertising a long-term non medication weight loss study for moderately overweight persons.	
Irwin et al. 2003 (82)	Effect of exercise on total and intra-abdominal body fat in postmenopausal women: a randomized controlled trial	RR=6.8%	Low	Recruited women through a combination of mass mailings (recruitment packets mailed) and media placements	
Jakicic et al. 2003 (98)	Effect of exercise duration and intensity on weight loss in overweight, sedentary women	X	High	Unclear	
Jebb et al. 2011 (88)	Primary care referral to a commercial provider for weight loss treatment versus standard care: a randomised controlled trial	X	High	Recruited from 39 primary care practices in Germany, 70 practices in Australia & 6 practices in the UK. P`s screened for eligibility by a primary care provider in the UK, or first by primary care provider, then research team in Australia and Germany.	
Jolly et al. 2011 (84)	Comparison of range of commercial or primary care led weight reduction programmes with minimal intervention control for weight loss in obesity: lighten up randomised controlled trial	RR=11%	High	Invited to participate by a standard letter from GP, which included patients’ info leaflet & a free telephone number for a call centre managing recruitment & randomisation. Nurses at call centre provided more info about trial, collected baseline info, got verbal consent & randomised P`s to trial arms.	9.1 credible source

Author	Title	Response rate (RR)	Uptake	Recruitment Method	BCTs Identified
Lowe 2008 (66)	The effect of training in reduced energy density eating and food self-monitoring accuracy on weight loss maintenance	X	X	Recruited through a newspaper story by a local columnist, advertisements in local newspapers, and through affiliated physicians	9.1 credible source
Ma 2013 (89)	Translating the diabetes prevention program lifestyle intervention for weight loss into primary care: a randomized trial	X	Low	Recruited from a single primary care clinic and contacted by primary care provider. Potential P`s identified in the electronic health records & approved by primary care providers	9.1 credible source
Mayer-Davis et al. 2004 (80)	Pounds off with empowerment (POWER): a clinical trial of weight management strategies for black and white adults with diabetes who live in medically underserved rural communities	X	Medium	Identified through diabetes registries at each health centre and local publication efforts (posters, etc.), contacted by phone or attended initial screening visit	
McManus 2001 (85)	A randomized controlled trial of a moderate-fat, low-energy diet compared with a low fat, low-energy diet for weight loss in overweight adults	X	High	Advertised study in letters mailed to primary care physicians at Brigham and Women's Hospital (BWH) and in posted announcements	
Moore et al. 2003 (67)	Improving management of obesity in primary care: cluster randomised trial	X	High	Recruited practices from 4 health authority areas in the Northern and Yorkshire region of England, by local dieticians. Invited all 161 practices in selected primary care groups to participate. Patients recruited by practices	9.1 credible source
Munsch et al. 2003 (90)	Evaluation of a lifestyle change programme for the treatment of obesity in general practice	X	X	Patients from the clinical centre, patients from general practices as well as patients who replied to newspaper advertisements	
Nakade et al. 2012 (86)	Behavioural change during weight loss program and one-year follow-up: Saku Control Obesity Program (SCOP) in Japan	RR=27%	High	Recruitment was conducted by the Saku Health Dock Center. Saku Health Dock Center database used to identify P`s, a letter was sent directly to eligible P`s who visited the Dock Center	
Paisey et al. 2002 (91)	Five-year results of a prospective very low calorie diet or conventional weight loss programme in type 2 diabetes	X	X	Recruited from hospital clinics and general practice. After a series of group discussions, P`s invited to choose the intervention they preferred	
Perri et al. 2008 (68)	Extended care programs for weight management in rural communities: the treatment of obesity in underserved rural settings (TOURS) randomized trial	X	High	Study announcements were mailed to households in 6 rural counties in northern Florida designated in whole or in part as health professional shortage areas.	
Perri et al. 2001 (119)	Relapse prevention training and problem-solving therapy in the long-term management of obesity	X	X	Newspaper advertisements	

Author	Title	Response rate (RR)	Uptake	Recruitment Method	BCTs Identified
Rickel et al. 2011 (96)	Differential response of African American and Caucasian women to extended care programs for obesity management	X	X	P`s recruited from an initial lifestyle intervention (from Perri et al, 2008-previously mentioned)	
Riebe et al. 2003 (69)	Evaluation of a healthy-lifestyle approach to weight management *same intervention?	X	High	Recruited by advertisements in local newspapers, flyers, and by word of mouth. Also, P`s screened by phone, then attended an initial briefing meeting & signed informed consent.	
Riebe et al. 2005 (99)	Long-term maintenance of exercise and healthy eating behaviours in overweight adults	X	X	Not stated/ clear (use of same intervention already mentioned-Riebe et al, 2003)	
Shai et al. 2008 (100)	Weight loss with a low-carbohydrate, Mediterranean, or low-fat diet	X	High	Not clear? conducted trial in a workplace at a research centre with an on-site medical clinic	
Shea et al. 2011 (101)	The effect of intentional weight loss on all-cause mortality in older adults: results of a randomized controlled weight-loss trial	X	Low	A pre-screen contact, and then 2 screening visits before randomization. Unable to find further information	
Stahre et al. 2007 (97)	A randomized controlled trial of 2 weight reducing short-term group treatment programs for obesity with an 18-month follow-up	X	High	After a health survey directed to child care providers, participants were identified	
Stenius-Aarniala et al. 2000 (70)	Immediate and long term effects of weight reduction in obese people with asthma: randomised controlled study	X	Low	Recruited by advertisements in 2 daily newspapers, and telephone interviews held with potential P`s	
Stern et al. 2004 (92)	The effects of low-carbohydrate vs conventional weight loss diets in severely obese adults: One-year follow-up of a randomized trial	X	X	Recruited from the outpatient practices of The Philadelphia Veterans Affairs Medical Centre	
Svetkey et al. 2008 (79)	Comparison of strategies for sustaining weight loss: the weight loss maintenance randomized controlled trial	X	Medium	Recruitment relied on mass mailings, posted flyers, radio advertisements, print media (printed advertisements in local newspapers), email broadcasts, screening events and word of mouth	
Tate et al. 2007 (71)	Long-term weight losses associated with prescription of higher physical activity goals. Are higher levels of physical activity protective against weight regain?	X	X	Recruited evenly between University of Minnesota School of Public Health and the Miriam Hospital through advertisements in local newspapers	
Teixeira et al. 2002 (72)	Weight loss readiness in middle-aged women: psychosocial predictors of success for behavioural weight reduction	X	Medium	Recruited from the community through newspaper and TV advertisements	

Author	Title	Response rate (RR)	Uptake	Recruitment Method	BCTs Identified
Volpe et al. 2008 (73)	Effect of diet and exercise on body composition, energy intake and lep-tin levels in overweight women and men	X	X	Recruited by advertisements placed in the University and local newspapers	
Wadden et al. 2011 (94)	Four-year weight losses in the Look AHEAD study: Factors associated with long-term success	X	X	Recruited from 16 centres across U.S	
Wadden et al. 2014 (93)	Eight-year weight losses with an intensive lifestyle intervention: the look AHEAD study	X	Low	Recruited from 16 centres across U.S. went through pre-screening and attended clinic screening examinations.	
West et al. 2011 (95)	A motivation-focused weight loss maintenance program is an effective alternative to a skill-based approach	X	Low	Recruited as part of a randomized clinical trial. Screened by telephone	
Wilkstrand et al. 2010 (83)	Very low calorie diet (VLCD) followed by a randomized trial of corset treatment for obesity in primary care	X	X	Recruited after advertising in the local press or were referred from other physicians	9.1 credible source
Wing et al. 2006 (74)	A self-regulation program for maintenance of weight loss	X	Medium	Newspaper advertisements, brochures, and contacts with commercial and research weight-control programs in the Rhode Island area	
Wolf et al. 2004 (102)	Translating lifestyle intervention to practice in obese patients with type 2 diabetes: improving control with activity and nutrition (ICAN) study	X	Low	Unclear Southern Health Services (SHS) served 156,000 people (2,950 with diabetes) across Virginia with commercial programs. Of those members with diabetes, 9% contacted the study,	

Appendix 5. BCT classification of programmes, and drop-out and retention rates for each study (Section 2 and 3)

Author	Title	Retention			BCTs
		Time-point	%	Category	
Anderson et al 2002 (57)	Physiologic changes after diet combined with structured aerobic exercise or lifestyle activity	3	91	High	1.1 Goal setting (behaviour) 2.3 Self-monitoring of behaviour 4.1 Instruction on how to perform a behaviour 5.6 Information about emotional consequences 9.1 Credible source
Annunziato et al. 2009 (58)	A randomized trial examining differential meal replacement adherence in a weight loss maintenance program after one-year follow-up	12	70	Medium	1.1 Goal setting (behaviour) 3.3 Social support (emotional) 4.1 Instruction on how to perform a behaviour
Appel et al. 2011 (118)	Comparative effectiveness of weight-loss interventions in clinical practice	24	84.1	High	1.3 Goal setting (outcome) 2.2 Feedback on behaviour 2.3 Self-monitoring of behaviour 2.4 Self-monitoring of outcome(s) of behaviour 9.1 Credible source
Ashley et al. 2001 (76)	Randomized trial to compare the use of meal replacements in an established university-based weight loss clinic and a primary care physician practice	12	65	Low	1.1 Goal setting (behaviour) 1.5 Review behaviour goal(s) 1.7 Review outcome goal(s) 2.3 Self-monitoring of behaviour 4.1 Instruction on how to perform a behaviour 9.1 Credible source
Borg et al. 2002 (59)	Effects of walking or resistance training on weight loss maintenance in obese, middle-aged men: A randomized trial	12	76	Medium	1.1 Goal setting (behaviour) 1.2 Problem solving 2.3 Self-monitoring of behaviour 2.6 Biofeedback 4.1 Instruction on how to perform a behaviour 9.1 Credible source
Carels et al. 2005 (60)	Applying a stepped care approach to the treatment of obesity	6	72	Medium	1.2 Problem solving 1.3 Goal setting (outcome)? 2.3 Self-monitoring of behaviour
Christensen et al. 2013 (61)	Comparison of 3 different weight maintenance programs risk,	13	83	Medium	4.1 Instruction on how to perform a behaviour

Author	Title	Retention			BCTs
	bone, and vitamins in sedentary older adults				
Dansinger et al. 2005 (62)	Comparison of the Atkins, Ornish, Weight Watchers, and Zone diets for weight loss and heart disease risk reduction: a randomized trial	12	58	Low	1.1 Goal setting (behaviour) 2.3 Self-monitoring of behaviour 4.1 Instruction on how to perform a behaviour 9.1 Credible source
Delbridge et al. 2009 (63)	One-year weight maintenance after significant weight loss in healthy overweight and obese subjects: does diet composition matter?	12	58	Low	1.1 Goal setting (behaviour) 1.2 Problem solving* 1.3 Goal setting (outcome) 2.3 Self-monitoring of behaviour 4.1 Instruction on how to perform a behaviour 6.1 Demonstration of behaviour
Djuric et al. 2002 (77)	Combining weight-loss counselling with the Weight Watchers plan for obese breast cancer survivors	12	81	Medium	1.1 Goal setting (behaviour) 1.2 Problem solving 1.3 Goal setting (outcome) 2.2 Feedback on behaviour 2.3 Self-monitoring of behaviour 3.3 Social support (unspecified) 4.1 Instruction on how to perform a behaviour 9.1 Credible source 10.1 Material incentive (behaviour)
Elder et al. 2012 (78)	Randomized trial of Tapas acupressure technique for weight loss maintenance	12	60	Low	1.1 Goal setting (behaviour) 1.2 Problem solving* 2.3 Self-monitoring of behaviour 3.1 Social support (unspecified) 4.1 Instruction on how to perform a behaviour 8.1 Behavioural practice / rehearsal 9.1 Credible source
Fogelholm et al. 2002 (64)	Effects of walking training on weight maintenance after a very-low- energy diet in premenopausal obese women: A randomized controlled trial	3	98	High	1.1 Goal setting (behaviour) 1.2 Problem solving* 2.3 Self-monitoring of behaviour 2.6 Biofeedback 4.1 Instruction on how to perform a behaviour 9.1 Credible source
Foster-Schubert et al. 2012 (81)	Effect of diet and exercise, alone or combined, on weight and body composition in overweight-to-obese post-menopausal women	12	91	High	1.1 Goal setting (behaviour) 1.2 Problem solving 1.3 Goal setting (outcome) 1.5 Review behaviour goal(s) 2.2 Feedback on behaviour 2.3 Self-monitoring of behaviour 2.6 Biofeedback 9.1 Credible source

Author	Title	Retention			BCTs
					12.6 Body changes
Harvey-Berino et al. 2002 (65)	Does using the Internet facilitate the maintenance of weight loss?	6	82	Medium	1.1 Goal setting (behaviour) 1.2 Problem solving* 1.3 Goal setting (outcome) 2.2 Feedback on behaviour 2.3 Self-monitoring of behaviour 3.1 Social support (unspecified)* 4.1 Instruction on how to perform a behaviour 9.1 Credible source 10.1 Material incentive (behaviour)
Heshka et al. 2003 (87)	Weight loss with self-help compared with a structured commercial program: a randomized trial	6	73	Medium	3.1 Social support (unspecified) 4.1 Instruction on how to perform a behaviour 9.1 Credible source 10.1 Material incentive (behaviour) 13.2 Framing/reframing
Irwin et al. 2003 (82)	Effect of exercise on total and intra-abdominal body fat in postmenopausal women: a randomized controlled trial	12	97	High	1.1 Goal setting (behaviour) 2.3 Self-monitoring of behaviour 2.4 Self-monitoring of outcome(s) of behaviour 2.6 Biofeedback Instruction on how to perform a behaviour
Jakicic et al. 2003 (98)	Effect of exercise duration and intensity on weight loss in overweight, sedentary women. A randomized trial	12	92	High	1.1 Goal setting (behaviour) 2.2 Feedback on behaviour 2.3 Self-monitoring of behaviour 4.1 Instruction on how to perform a behaviour
Jebb et al. 2011 (88)	Primary care referral to a commercial provider for weight loss treatment versus standard care: a randomised controlled trial	12	58	Low	1.3 Goal setting (outcome) 2.3 Self-monitoring of behaviour 3.1 Social support (unspecified)* 4.1 Instruction on how to perform a behaviour* 9.1 Credible source 10.6 Non-specific incentive
Jolly et al. 2011 (84)[8]	Comparison of range of commercial or primary care led weight reduction programmes with minimal intervention control for weight	3	95	High	Weight Watchers 1.1 Goal setting (behaviour) 1.3 Goal setting (outcome) 1.7 Review outcome goal(s) 2.2 Feedback on behaviour

8 For programmes within this study, retention figures reflect the proportion of participants engaged at the end of the intervention (for follow-up measures); these figures are different to the % attendance figures reported elsewhere in the report (which reflect the % of sessions attended in each programme)

Author	Title	Retention			BCTs
	loss in obesity: Lighten Up randomised controlled trial				2.3 Self-monitoring of behaviour 4.1 Instruction on how to perform a behaviour 6.2 Social comparison 8.7 Graded tasks 10.3 Non- specific reward
		3	93	High	Slimming World 1.1 Goal setting (behaviour) 1.2 Problem solving 1.3 Goal setting (outcome) 1.4 Action planning 1.7 Review outcome goal(s) 2.2 Feedback on behaviour 2.3 Self-monitoring of behaviour 3.1 Social Support (unspecified) 3.3 Social Support (emotional) 4.1 Instruction on how to perform a behaviour 6.2 Social comparison 8.7 Graded tasks 9.1 Credible source 9.2 Pros and Cons 10.3 Non-specific reward 10.4 Social reward
		3	88	H	Rosemary Connelly 1.3Goal setting (outcome) 2.2 Feedback on behaviour 2.3 Self-monitoring of behaviour 3.1 Social Support (unspecified) 4.1 Instruction on how to perform a behaviour 6.2 Social comparison 9.1 Credible source 10.3 Non-specific reward 13.2 Framing/reframing
		3	87	H	Size Down Programme 1.1 Goal setting (behaviour) 1.2 Problem solving 1.5 Review behavioural goal(s) 2.3 Self-monitoring of behaviour 3.1 Social Support (unspecified) 4.1 Instruction on how to perform a behaviour 7.1 Prompts/cues

Author	Title	Retention			BCTs
		3	58.5	L	9.1 Credible source GP + Pharmacy Programmes 1.1 Goal setting (behaviour) 1.2 Problem solving 1.3 Goal setting (outcome) 1.4 Action Planning 2.2 Feedback on behaviour 2.3 Self-monitoring of behaviour 8.7 Graded tasks 10.9 Self-reward 10.1 Material incentive (behaviour)
Lowe 2008 (66)	The effect of training in reduced energy density eating and food self-monitoring accuracy on weight loss maintenance	5.5	78	Medium	1.2 Problem solving 2.2 Feedback on behaviour 2.3 Self-monitoring of behaviour 3.1 Social support (unspecified)* 4.1 Instruction on how to perform a behaviour 6.1 Demonstration on how to perform a behaviour 10.1 Material incentive 10.9 Self-reward* 12.1 Restructuring the environment 15.4 Self-talk
Ma 2013 (89)	Translating the Diabetes Prevention Program lifestyle intervention for weight loss into primary care: A randomized trial	3	85.1	High	1.1 Goal setting (behaviour) 1.2 Problem solving 2.2 Feedback on behaviour 2.3 Self-monitoring of behaviour 4.1 Instruction on how to perform a behaviour 7.1 Prompts/Cues 9.1 Credible source
Mayer-Davis et al. 2004 (80)	Pounds Off With Empowerment (POWER): A clinical trial of weight management strategies for black and white adults with diabetes who live in medically underserved rural communities	12	81	Medium	1.1 Goal setting (behaviour) 1.4 Action planning 2.3 Self-monitoring of behaviour 4.1 Instruction on how to perform a behaviour 9.1 Credible source
McManus 2001 (85)	A randomized controlled trial of a moderate-fat, low-energy diet compared with a low fat, low-energy diet for weight loss in overweight adults	18	35	Low	1.1 Goal setting (behaviour) 2.2 Feedback on behaviour 2.3 Self-monitoring of behaviour 2.5 Monitoring outcome(s) of behaviour by others without feedback 4.1 Instruction on how to perform a behaviour 6.1 Demonstration of the behaviour

Author	Title	Retention			BCTs
Moore et al. 2003 (67)	Improving management of obesity in primary care: cluster randomised trial	18	62	Low	1.1 Goal setting (behaviour) 1.3 Goal setting (outcome) 4.1 Instruction on how to perform a behaviour 9.1 Credible source
Munsch et al. 2003 (90)	Evaluation of a lifestyle change programme for the treatment of obesity in general practice	4	77	Medium	1.2 Problem solving 2.3 Self-monitoring of behaviour 4.1 Instruction on how to perform a behaviour 9.1 Credible source 13.2 Framing/reframing
Makade et al. 2012 (86)	Behavioural change during weight loss program and one-year follow-up: Saku Control Obesity Program (SCOP) in Japan	9	96.6	High	1.1 Goal setting (behaviour) 2.2 Feedback on behaviour 2.3 Self-monitoring of behaviour 2.4 Self-monitoring of outcome(s) of behaviour 2.7 Feedback on outcome (s) of behaviour 3.1 Social support (unspecified) 4.1 Instruction on how to perform a behaviour 6.1 Demonstration of the behaviour 8.1 Behavioural practice/rehearsal 9.1. Credible source
Paisey et al. 2002 (91)	Five year results of a prospective very low calorie diet or conventional weight loss programme in type 2 Diabetes	12	66.7	Low	1.1 Goal setting (behaviour) 1.3 Goal setting (outcome) 2.2 Feedback on behaviour 2.3 Self-monitoring of behaviour 6.1 Demonstration of behaviour 9.1 Credible source
Perri et al. 2008 (68)	Extended-care programs for weight management in rural communities	6	74	Medium	1.1 Goal setting (behaviour) 1.2 Problem solving 2.3 Self-monitoring of behaviour 4.1 Instruction on how to perform a behaviour 6.1 Demonstration of behaviour 9.1 Credible source
Perri et al. 2001 (119)	Relapse prevention training and problem-solving therapy in the long-term management of obesity	12	72	Medium	1.1 Goal setting (behaviour) 1.2 Problem solving 2.1 Monitoring of behaviour by others without feedback 2.3 Self-monitoring of behaviour 4.1 Instruction on how to perform a behaviour 9.1 Credible source 13.2 Framing/reframing
Rickel et al. 2011 (96)	Differential response of African-American and Caucasian women to extended-care programs for obesity Management	6	74	Medium	Same as Perri et al. 2008 (68)

Author	Title	Retention			BCTs
Riebe et al. 2003 (69)	Evaluation of a healthy-lifestyle approach to weight management	6	76	Medium	1.1 Goal setting (behaviour) 1.2 Problem solving 2.2 Feedback on behaviour 2.3 Self-monitoring of behaviour 8.7 Graded tasks 9.1 Credible source 12.1 Restructuring the physical environment
Riebe et al. 2005 (99)	Long-term maintenance of exercise and healthy eating behaviors in overweight adults	6	76	Medium	Same as Riebe et al. 2003 (69)
Shai et al. 2008 (100)	Weight loss with a low-carbohydrate, mediterranean, or low-fat diet	24	85	High	1.1 Goal setting (behaviour) 1.2 Problem solving 1.4 Action planning 2.2 Feedback on behaviour 2.3 Self-monitoring of behaviour 3.1 Social support (unspecified) 3.3 Social support (emotional) 4.1 Instruction on how to perform a behaviour 5.1 Information about health consequences 7.1 Prompts/cues 8.7 Graded tasks 9.1 Credible source
Shea et al. 2011 (101)	The effect of intentional weight loss on all-cause mortality in older adults: results of a randomized controlled weight-loss trial	28	86	High	1.1 Goal setting (behaviour) 1.2 Problem solving 2.1 Monitoring of behaviour by others without feedback 2.3 Self-monitoring of behaviour 9.1 Credible source
Stahre et al. 2007 (97)	A randomized controlled trial of 2 weight-reducing short-term group treatment programs for obesity with an 18–month follow–up	2.5	96	High	4.1 Instruction on how to perform a behaviour 9.1 Credible source 6.1 Demonstration of behaviour 11.2 Reduce negative emotions
Stenius-Aarniala et al. 2000 (70)	Immediate and long term effects of weight reduction in obese people with asthma: randomised controlled study	3.5	76	Medium	None
Stern et al. 2004 (92)	The effects of low-carbohydrate versus conventional weight loss diets in severely obese adults: one-year follow-up of a randomized Trial	12	66	Low	1.1 Goal setting (behaviour) 4.1 Instruction on how to perform a behaviour 9.1 Credible source
Svetkey et al. 2008 (79)	Comparison of strategies for sustaining weight loss:	6	93	High	1.1 Goal setting (behaviour) 1.2 Problem solving

Author	Title	Retention			BCTs
	the weight loss maintenance randomized controlled trial				1.4 Action planning 2.3 Self-monitoring of behaviour 3.1 Social support (unspecified) 3.3 Social support (emotional) 4.1 Instruction on how to perform a behaviour 7.1 Prompts/cues 9.1 Credible source
Tate et al. 2007 (71)	Long-term weight losses associated with prescription of higher physical activity goals. Are higher levels of physical activity protective against weight regain?	30	78	Medium	1.1 Goal setting (behaviour) 3.1 Social support (unspecified) 9.1 Credible source 10.1 Material incentive (behaviour) 10.2 Material reward (behaviour)
Teixeira et al. 2002 (72)	Weight Loss readiness in middle-aged women: Psychosocial predictors of success for behavioral weight reduction	4	79	Medium	1.1 Goal setting (behaviour) 1.2 Problem solving 2.3 Self-monitoring of a behaviour 4.1 Instruction on how to perform a behaviour 9.1 Credible source 3.1 Social support (unspecified)
Volpe et al. 2008 (73)	Effect of diet and exercise on body composition, energy intake and leptin levels in overweight women and men	12	53	Low	1.1 Goal setting (behaviour) 1.3 Goal setting (outcome) 1.4 Action planning 2.3 Self-monitoring of behaviour 4.1 Instruction on how to perform a behaviour 7.1 Prompts/cues 9.1 Credible source
Wadden et al. 2011 (94)	Four-year weight losses in the Look AHEAD study: Factors associated with long-term success	48	94	High	1.1 Goal setting (behaviour) 1.2 Problem solving 1.5 Review behaviour goal(s) 2.3 Self-monitoring of behaviour 3.1 Social support (unspecified) 3.3 Social support (emotional) 4.1 Instruction on how to perform a behaviour 9.1 Credible source 10.2 Material reward (behaviour)
Wadden et al. 2014 (93)	Eight-year weight losses with an intensive lifestyle intervention: The Look AHEAD study	96	89.9	High	Same as Wadden et al. 2011 (94)
West et al. 2011 (95)	A motivation-focused weight loss maintenance program is an effective alternative to a skill-based approach	18	88.9	High	1.1 Goal setting (behaviour) 1.2 Problem solving 1.3 Goal setting (outcome) 2.3 Self-monitoring of behaviour 3.1 Social support (unspecified)

Author	Title	Retention			BCTs
					4.1 Instruction on how to perform a behaviour 7.1 Prompts/cues 9.1 Credible source 9.3 Comparative imagining of future outcomes 10.1 Material incentive (behaviour) 10.9 Self-reward 11.2 Reducing negative emotions 13.2 Framing/reframing 13.5 Identity associated with changed behaviour*
Wilkstrand et al. 2010 (83)	Very low calorie diet (VLCD) followed by a randomized trial of corset treatment for obesity in primary care	12	49	Low	1.1 Goal setting (behaviour)
Wing et al. 2006 (74)	A self-regulation program for maintenance of weight loss	18	93	High	1.2 Problem solving 2.3 Self-monitoring of behaviour 4.1 Instruction on how to perform a behaviour 9.1 Credible source 10.2 Material reward (behaviour) 10.4 Social reward
Wolf et al. 2004 (102)	Translating lifestyle intervention to practice in obese patients with type 2 diabetes	12	80	Medium	1.1 Goal setting (behaviour) 1.3 Goal setting (outcome) 4.1 Instruction on how to perform a behaviour