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## Viewpoints of overweight and obese adolescents attending lifestyle obesity treatment interventions: a qualitative systematic review

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## Abstract

**Background:** Current UK guidance recommends that adolescents with obesity attend a family-based multi-component obesity intervention. However, these programmes suffer from low recruitment and high rates of attrition. Understanding the views of adolescents is necessary for developing future interventions. The aim of this systematic review was to synthesise and explore the views of adolescents who have attended an obesity intervention.

**Methods:** Published literature was identified by searching six databases. Studies of adolescents (12-17 years) who attended an obesity intervention were examined. Only studies that collected and analysed data qualitatively were included. Full-texts were analysed using thematic synthesis.

**Results:** Twenty-eight studies were included. Thirty-five analytical themes were developed that were broadly divided into seven domains. Key themes included ensuring adolescents receive a 'tailored intervention' that involves 'active engagement'. Support from professionals, family and peers was valued highly. Adolescents expressed 'prior fears of attending interventions' and wanted 'longer-term support'. 'Enjoyment of sport and physical activity' was evident and adolescents were strongly motivated by improving body image and social desirability.

**Discussion:** Considering the views of adolescents attending obesity interventions may help to inform policy makers in the development of future interventions. This may lead to an improvement in recruitment and attrition rates.

## Introduction

Obesity is widely observed as a significant public health issue. A third of children in England are affected by overweight or obesity (1). Worldwide, the prevalence of children (2-19 years) with overweight or obesity has increased by 47.1% between 1980 and 2013 (2). The World Health Organization classifies adolescence as the stage in growth and development occurring between the ages of 10 to 19 (3). Adolescence is a stage where progression of obesity is likely (4). Observational studies highlight the rising prevalence of type 2 diabetes in adolescents with obesity and cardiovascular risk factors such as

hypertension and hyperlipidaemia (5, 6). In addition to cardiovascular risk factors, sleep apnoea is thought to occur in 60% of children affected by obesity globally (7). Obesity during adolescence is also associated with psychosocial consequences such as low self-esteem, self-worth and bullying (8-10). This is especially concerning as a recent systematic review showed 80% of adolescents with obesity remain affected by obesity into adulthood where both these physical and psychosocial factors persist (11, 12). The current recommendations in England and Wales are for adolescents with obesity to attend a family-based multi-component weight management service (13). Multi-component refers to programmes that focus on a combination of healthy eating, physical activity and behaviour change. Cochrane reviews have shown that lifestyle programmes can be effective in reducing adiposity (14-16). However, due to the quantitative nature of these reviews, we do not know why these programmes are effective or why they only successfully recruit between 0.5 and 1.5% of the eligible population (17). For those children that do attend obesity interventions attrition ranges from 8-83% (18, 19). This is of concern, as increased participation is associated with more successful outcomes (20). By learning from adolescents that have attended these interventions, improvements can be made that may help reduce attrition and improve recruitment rates, and therefore weight management. Qualitative research can give a more in-depth understanding of participant perception (21) and has a central role to play in evidence-based health care. A qualitative approach can help to address questions that cannot be answered quantitatively, such as identifying obstacles to change and what is important for the participant (22). A synthesis of qualitative research focusing on the experiences of adults attending weight management interventions has been completed (23), however, systematic reviews that help us decide how to treat obesity in adolescents is limited. While adolescent experiences, along with child, parent and professional views of child and adolescent obesity have been synthesised (24, 25), this is the first to solely examine adolescent views of weight management interventions. This review aims to examine the viewpoints of adolescents with obesity who have attended a weight management intervention in studies that present qualitative data.

## Methods

The protocol for this qualitative systematic review has been registered with PROSPERO (CRD42016039588) (26).

### Search strategy

Published literature was identified primarily by searching MEDLINE, Embase, PsycINFO, ASSIA, CINAHL and Web of Science. The date of the final search was July 2018. Relevant systematic reviews, key journals and reference lists of included studies were manually screened. A specialist librarian was consulted to refine the search. Search terms for the primary database search included concepts for obesity, views, adolescents, diet, activity and behaviour. A pilot search was carried out to identify any adjustments. Search terms were adapted to different databases accordingly. There was no limit on language or year of study (Table S1).

### Inclusion criteria

(i) Studies must have used qualitative methods for data collection and analyses (these may have been presented alongside quantitative outcomes), (ii) included adolescents with overweight and obesity participating in lifestyle interventions with the primary aim of treating obesity, (iii) mean age of 12-17 years at time of the study commencing (to align with the age range used in the Cochrane childhood obesity treatment review series), (iv) Single or multi-component lifestyle interventions, in any setting, any method of delivery, e.g. group, (v) full text articles only.

### Exclusion criteria

(i) Children under 12 years or adults over 18 years, (ii) adolescents who were a healthy weight (>2<sup>nd</sup> to <85<sup>th</sup> percentile), pregnant or breastfeeding, (iii). Interventions aiming to treat adolescents with a medical cause for obesity (E.g. Prader Willi syndrome), (iv) conference abstracts. Three exclusion criteria were not originally set out in the protocol but added later: (v) adolescents with an eating disorder, (vi) adolescents with severe long-term mental health conditions, e.g. schizophrenia, (vii) studies where participants had not experienced an actual programme as it was felt that views of what adolescents think they want from an intervention may be different if they have actually attended an

intervention. Exclusion criteria (vi) and (vii) were set because these groups may require more specialist intervention.

#### [Study selection, data extraction and quality assessment](#)

Screening of titles and abstracts was carried out by two reviewers (HMJ, LA-K, GJMT, OO) independently following a pre-defined screening form. For formal inclusion/exclusion, full texts were retrieved for potentially relevant papers then evaluated by two independent reviewers (HMJ, LA-K, GJMT, OO) following a pre-defined form. Disagreements were resolved by a third reviewer. Data extraction was carried out by two independent reviewers (HMJ, LA-K, OO) following a pre-defined form. Disagreements were resolved through discussion. Criteria developed by the Evidence for Policy and Practice Information and Coordinating Centre (EPPI-Centre) for reviews of school-based interventions was used for quality assessment (Table S2) (27, 28). This tool was chosen as it assessed the extent to which the study privileged adolescent experiences. This tool also assessed the strength of sampling, data collection and analysis, whether the findings were supported by data, as well as breadth and depth of findings. Studies were rated as low, medium or high in terms of trustworthiness and reliability of findings. Studies were also rated low, medium or high in terms of usefulness for this review. Two reviewers assessed quality independently (HMJ, LA-K, OO). Any disagreements were resolved through discussion.

#### [Assessment of confidence in the review findings](#)

The Confidence in the Evidence from Reviews of Qualitative research (CERQual) approach was utilised to summarise the confidence in the findings across studies (29). CERQual assesses confidence in the evidence based on four key components: methodological limitations of included studies, relevance of the included studies to the review question, coherence of the review finding, and adequacy of the data contributing to a review finding. After assessing each of the four components, overall confidence of findings, in this case analytical themes, was judged as high, moderate, low or very low by one reviewer (HMJ) and audited by a second reviewer (GJMT).

## Synthesis

Data were analysed using thematic synthesis as described by Thomas and Harden (30). NVivo version 11 was used. Thematic synthesis took the form of three stages: line-by-line coding, development of descriptive themes and development of analytical themes. Qualitative memos were written by one reviewer (HMJ) throughout the synthesis to record thoughts, reflect on the process and articulate interesting observations. Thematic synthesis was completed by one reviewer (HMJ) and all results were audited by another (GJMT).

## Results

### Study characteristics

24,395 records were screened (title and abstract), with 297 full texts evaluated for formal inclusion/exclusion. Twenty-eight studies (29 records) were then included in the qualitative synthesis (See figure 1). The included studies represent views of 735 adolescent, 662 of which were identifiable by gender (41.0% male, 58.9% female). Nine studies were from the UK, eight from the USA, four from Australia, four from Europe, two from Canada and one from China. Twenty-four of the studies were multi-component interventions (8, 31-53). Three studies were single-component physical activity interventions (54-56) and one was a single-component dietary intervention (57). Seven studies had a technology element to the intervention (e.g. web-based, text or email support, photos, exergame) (49-53, 55, 56). Features of interventions, including direct provision of physical activity or a peer element are shown in Table 1.

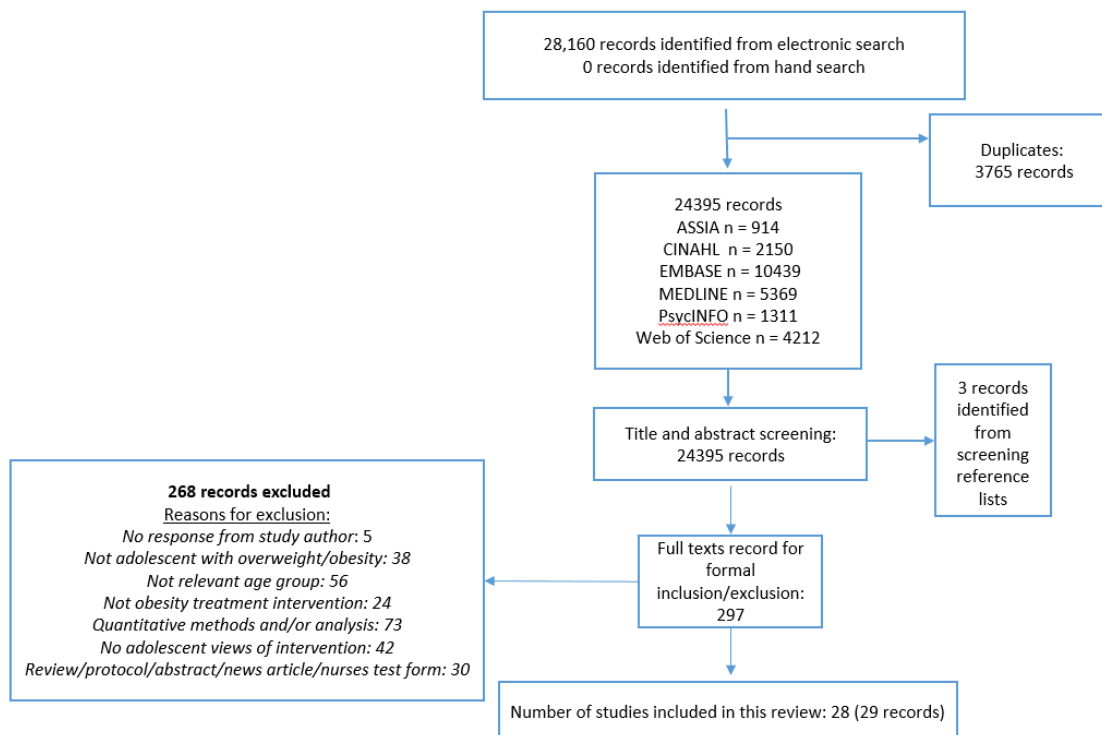


Figure 1. COREQ flow diagram of search results

### Quality assessment and assessment of confidence

In terms of trustworthiness and reliability, 11 studies were of high quality, 13 demonstrated medium quality and four demonstrated low quality. In terms of usefulness for this review, 12 studies were rated high, eight medium and eight low (Table S2). Sensitivity analysis was performed individually for study contribution (how many included studies contributed to each of the seven domains (see below)) and study quality. Sensitivity analysis results were then combined to report the order of domains from most to least sensitive, in terms of quality and contribution. For CerQual, 19 of the analytical themes were assessed to be of high certainty. Fourteen findings were assessed to be of moderate certainty and two of the findings were assessed to be of low certainty (Table S3).



Table 1. Characteristics of included studies

Author (Date)	Aims	Features	Country	Population	Data collection methods	Data analysis methods
<b>Alm (2008)</b> (43)	To examine the reasons for managing weight, to investigate the barriers and facilitators to achieving behaviour goals, and assess how a behaviour coach affects the goal-setting process of inner-city adolescents with obesity in a weight management program	MC	USA	Adolescents with overweight/obesity (n=18) Male: 6, female: 12. Mean age: 14.9 years	Semi-structured telephone interviews	Constant comparative method
<b>Banks (2014)</b> (42)	To examine families' reasons for engaging with, or disengaging from, a child weight management clinic	MC, G	UK	Adolescents with overweight (n = 17) 11-16 years old Completers' and withdrawers	Semi-structured interviews	Analysed thematically.
<b>Campbell-Voytal (2018)</b> (47)	1) To describe the perspectives of African American adolescents and caregivers on participating in an evidence-based weight loss trial; 2) Explore experiential differences of adolescents-caregiver dyads who achieved adolescent weight loss compared to those who did not	MC	USA	Adolescents with Obesity (n=136) Male: 42, Female: 94. Mean age: 13	Semi-structured interviews	Content and thematic analysis
<b>Daley (2008)</b> (54)	To explore the experiences of participants who were randomised to an exercise therapy intervention	S, PA	UK	Adolescents with overweight (n=25) Male: 9, Female: 16. Mean age: 13 years	Semi-structured interviews	Thematic approach
<b>Engström (2016)</b> (46)	To explore adolescents' and young adults' motivation for attending group-based obesity treatment and social and environmental factors that can facilitate or hinder lifestyle change.	MC, PA, G	Norway	Adolescents with obesity (n=14) Male: 7, Female: 7 Age: 13-17 years	Focus group interviews	Systematic text condensation (method for thematic cross-case analysis)
<b>Hammar (1971)</b> (57)	Which method of treatment for obesity (dietary, counselling or group) resulted in the best weight loss over time. Also, to evaluate clinic experience	S, G	USA	Young people with overweight/obesity (n= 65) Male:17, female: 48. Mean age 14.8 years)	Questionnaires. Additional face-to-face meeting or telephone inquiry	Frequency counts and statements

					with a clinic nurse if necessary	
<b>Hemetek (2015)</b> (41)	To optimise therapy measures in the treatment of children and adolescents with obesity	MC, PA, G	Germany	Adolescents with overweight (n=7) Male: 4, Female: 3 Mean age: 14.6 years	Interviews	Qualitative context analysis
<b>Hester (2009)</b> (33)	To uncover qualitative accounts of intervention impact from young people with obesity after attending a residential weight-loss camp	MC, PA, G	UK	Adolescents with overweight (n=5) Male: 3, Female: 2. 14-16 years old.	Semi-structured interviews	Inductive analysis.
<b>Holt (2005)</b> (38)	Examined children's perceptions of attending a residential paediatric weight-loss camp	MC, PA, G	UK	Adolescents with overweight (n=15) Male: 9, Female: 6 Mean age: 13.65 years	Semi-structured interviews	Micro-analysis and constant comparative method.
<b>Howie (2016)</b> (45)	To identify practical strategies for practitioners implementing interventions in community settings by exploring experiences of adolescents with overweight or obesity	MC, PA, G	Australia	Adolescents with overweight/obesity (n=37) Age: 12-16 years	Qualitative interviews and focus groups	Thematic analysis
<b>Jogova (2013)</b> (49)	A process evaluation of the Living Green, Healthy and Thrifty (LiGHT) program: a novel virtual child obesity management program	MC	Canada	Adolescents with overweight/obesity (n = 28) Male: 14, female: 14 Mean age: 14.3 years	Semi-structured interviews, focus group and survey with open-ended questions	Thematic analysis for post intervention groups
<b>Li (2016)</b> (48)	To investigate the operations of a weight loss camp for children in China and to explore the experiences and perceptions of children in relation to these camps	MC, PA, G	China	Adolescents with overweight/obesity (n=119) (2 participants were a 'normal' weight) Male: 9, Female:10 Mean age: 12.4 years	Ethnographic techniques (field observation) and semi-structured interviews	Thematic analysis
<b>Melnyk (2007)</b> (39)	a) Determine feasibility of implementing the interventions b) obtain feedback c) examine the preliminary efficacy of the programme on the adolescents' weight	MC, PA, G	USA	Adolescents with overweight/obesity (n=23) Male: 19, female: 4 Mean age 15.9 years	Questionnaire (including open-ended)	Not stated
<b>Morinder (2011)</b>	To describe adolescents' perceptions of obesity treatment.	MC, PA, G	Sweden	Adolescents with obesity (n = 18)	Semi-structured interviews	Phenomonographic approach

(36)				Male: 6, female: 12. Mean age: 15 years		
<b>Nguyen (2014)</b> (50)	1) Report findings from the process evaluation of the Loozit programme including adolescent perception of the programme 2) provide recommendations for future trials	MC, PA, G	Australia	Adolescents with overweight/obesity (n=14) Mean age: 14.1 years	Evaluation forms and telephone interviews	Qualitative items identified and coded
<b>Owen (2009)</b> (44)	To explore childrens' and parents' views and experiences of attending a hospital-based childhood obesity clinic	MC	UK	Children with obesity (n = 11) Male: 5, female: 6. Age: 5-18 years	Interviews	Thematic analysis
<b>Peeters (2012)</b> (27)	To investigate adolescents' experiences during their participation in the HEARTY RCT	MC, PA, G	Canada	Adolescents with overweight/obesity (n= 44) Male: 23, female: 21 Mean age: 16.7 years	Semi-structured telephone interview	Content analysis
<b>Reece (2015)</b> (8)	To explore the adolescent experience of living with obesity and their engagement with obesity treatments	MC, PA, G	UK	Adolescents with overweight/obesity (n = 12) Male: 4, female: 8. 11-16-year olds	Interviews and focus groups	Framework method
<b>Riiser (2013)</b> (55)	To describe the process of development and evaluation of usability of a web-based program for increasing physical activity in adolescents who are overweight	S,	Norway	Adolescents with overweight/obesity (n = 15) 12-16-year olds	Observation, questionnaire and focus group	Content analysis
<b>Rudolf (2006)</b> (32)	To ascertain if the programme was successfully implemented, impact on children and their families and the outcome on the health of the young people involved	MC, PA, G	UK	Adolescents with overweight/obesity (n=20) Male: 14, female: 6 Mean age: 12.2 years	Semi-structures interviews & focus groups	framework analysis
<b>Smith (2014a)</b> (47)	To explore the opinions of adolescents who are overweight and their parents regarding the use of text messages support during the maintenance period following an intervention	MC, PA, G	Australia	Adolescents with overweight/obesity (n = 12) Male: 1, female: 11 Mean age 14.3 years	Focus groups	Thematic analysis
<b>Smith (2014b)</b> (53)	To identify key individual, family and community enablers/barriers to the implementation of a multi-disciplinary family-	MC, PA, G	Australia	Adolescents with overweight/obesity (n = 44) Male: 21, female: 23 12-16 years old	Focus groups and interviews	Thematic analysis

	centred intervention for adolescents who are overweight					
<b>Staiano (2012) (56)</b>	To investigate effects of cooperative versus competitive exergame play during an intervention with youth with overweight or obesity	S, PA, G	USA	Adolescents with overweight/obesity (n = 31) Male: 16, female: 15. Mean age: 16.2 years Also asked drop outs reasons for withdrawing	Individual interviews	Thematic analysis
<b>Twiddy (2011) (35)</b>	The aim of the present qualitative study was to explore the views of the key stakeholders involved in child weight management programme	MC, PA, G	UK	Children with overweight/obesity (n= 23) Male: 13, female: 10 9-18-year olds (15 were 12- 18 years old) Range of completers and drop outs	Semi-structured interviews & focus groups	Template analysis
<b>Watson (2016) (34)</b>	To explore children's accounts of their experiences of MEND	MC, PA, G	UK	Adolescents with overweight/obesity (n = 14) Male: 8, female: 6. Mean age: 12.6 years	Semi structured interviews	Interpretative Phenomenological Analysis (IPA)
<b>Woolford (2010) (45)</b>	Test the feasibility and acceptability of a computerised system to send tailored messages to the mobile phones of adolescents with obesity enrolled in a weight management programme	MC, PA, G	USA	Adolescents with obesity (n = 20) Male: 13, female: 17 Mean age: 14 years	Survey and semi-structures interview	Unclear
<b>Woolford (2012a) (52)</b>	Explore the Photovoice method to improve engagement and retention among adolescents with obesity enrolled in an intensive weight management program	MC, PA, G	USA	Adolescents with obesity (n = 23) Male: 5, female: 18 Mean age: 14 years	Photovoice and semi-structured interviews	Thematic analysis
<b>Woolford (2012b) (40)</b>	To explore participants' perceptions of the MPOWER program	MC, PA, G	USA	Adolescents with overweight/obesity (n = 25) Male: 4, female: 21 12-18-year olds	Semi-structured phone interviews	Thematic analysis

\*G = Group programme with peer element. PA = Direct provision of physical activity. MC = Multi-component programme. S = Single component intervention.

## Adolescent views

Analysis resulted in 184 descriptive codes, which led onto the development of 35 analytical themes. Analytical themes have been broadly divided into seven domains: intervention content, support, barriers to attending a weight management programme and being healthy, physical activity vs diet, motivations, maintenance and technology. A network diagram of all domains and analytical themes is shown in Figure S5. Representative quotes for each theme can be seen in Table S4.

## Summary of the findings

This review identified key themes which included ensuring adolescents receive a ‘tailored intervention’ that involves ‘active engagement’. Additionally, support from professionals, family and peers was valued highly. Adolescents expressed ‘prior fears of attending interventions’ and wanted ‘longer-term support’. ‘Enjoyment of sport and physical activity’ was evident and adolescents were strongly motivated to lose weight to improve body image and social desirability. Adolescents enjoy using technology as part of an intervention.

The most salient themes within each domain are presented below. Section 2.1 examines findings on intervention content, section 2.2 explores the importance of supportive relationships whilst section 2.3 highlights the barriers adolescents face not only with attending weight management interventions, but being healthy. Section 2.4 explores the importance of incorporating both physical activity and diet education into an intervention and section 2.5 identifies the motivations behind adolescents attending interventions. The difficulty of maintaining weight loss after an intervention has finished is detailed in section 2.6 and adolescents use of technology is examined in section 2.7.

### 2.1. Intervention content

Themes that relate to intervention content will now be discussed:

#### 2.1.1 Tailored intervention

One factor that appears to be very important when planning and delivering an adolescent weight management programme is tailoring it to the individual, including different ethnicities, cultures, and to the specific age group (8, 36, 38, 40, 42, 49, 51-53, 56). In a study that described adolescent’s experiences of text message support through the maintenance period of an intervention (53), no consensus was found that suggested adolescents preferred a specific time to receive text messages, or how often, highlighting the need for individual tailoring. Adolescents reported that they wanted to attend an intervention that was created with their age group in mind.

Often interventions were designed for wider age ranges (E.g. 8-16 years). There was a strong feeling of lack of services aimed at adolescents (8, 42). One study involved home visits for adolescents and their families taking part in an intervention (40). This opportunity for tailored advice in the home environment received positive feedback.

#### 2.1.2. Active engagement

Enjoyment and fun are of large importance to adolescents when attending an obesity intervention (34, 40, 45). This sense of fun appears to be driven by hands on activities. Active engagement and fun has been highlighted in depth by Watson et al., (34) regarding exercise and classroom-based learning of healthy eating. The importance of ensuring active engagement rather than passive is an important theme to recognise in intervention content. Fun seemed an important aspect to reduce anxiety among participants attending an intervention. This sense of fun created an environment where it did not seem that learning was taking place; sessions were effortless and flowed.

### 2.2. Support

Data from this synthesis highlights the importance of social support in adolescents being successful with their weight loss attempts, from professionals, family and peers:

#### 2.2.1. Professional support valued

This prominent domain of support is weighted in favour of professional support, with 15 included studies supporting this theme. Professional support appears to be valued more so than support coming from peers and family (8, 31-33, 35, 36, 38, 40, 43, 44, 48, 50, 54, 55, 57). The friendly and fun nature of this supportive relationship was particularly welcomed by adolescents who appreciated professionals encouraging attitude towards them (38, 43). Adolescents appeared to value being given personal attention by professionals. The feeling of finally being given the support they have needed and having someone to talk to (36). This appreciation appears to be emphasised when that professional is experienced and specialises in childhood obesity (36). Adolescents felt comforted by this; it gave them a sense that they were not the only one who was overweight. A non-forceful approach from professionals was appreciated and adolescents valued gentle encouragement (35, 38). Additionally, adolescents valued receiving support that focused on more than just weight loss, such as self-esteem and well-being (36, 57). Negative comments about professional support were to do with the absence of a more personal relationship, leading to feelings of neglect and frustration, which in turn can lead to the adolescent defying all recommendations. There was a general desire from adolescents

to work more closely with regular professionals, whether this be an individual professional or a team, to develop this deeper and more meaningful relationship (36).

#### 2.2.2. Importance of family support

Another avenue of support that appears to be valued highly by adolescents was their own family (8, 31, 33, 34, 36, 37, 39, 40, 43, 45-49, 51). Family support gave adolescents continued motivation and encouragement to continue with their weight loss attempts (31). Adolescents particularly found family supportive when they joined in with behaviour change efforts and valued the effect this had on bringing the family closer together (39, 43). Themes from this synthesis clearly show that family support can assist in providing a positive framework for behaviour change and providing important encouragement to make healthier choices. This encouragement appears to be coming more from the mother within families, highlighting this important family figure. Although adolescents benefited from positive family support, sometimes lack of knowledge from a parent around weight management, healthy eating and behaviour change caused a barrier to weight loss for the adolescent (33, 43). This lack of family support appeared more common in those adolescents reporting no success. The absence of understanding and knowledge from family members can lead to frustration, despair and can create a sense of self-blaming.

#### 2.2.3. Peer support valued

Adolescents also valued support from their peers (8, 31, 33, 34, 36-40, 43, 46, 48, 49, 51, 53, 56, 57). Adolescents described being around their peers as a security blanket, allowing them to feel comfortable and confident (34). This peer support gave adolescents with obesity a sense of belonging by allowing them to talk to adolescents in a similar position to them, sharing their struggles and issues. This feeling of acceptance is something they may not have experienced outside of the intervention (38, 40). Adolescents commented on their initial motivations for taking part that related to peer support and socialising. Adolescents took part to make friends outside of school and improve their social skills (36 and 44). Peer support was often mentioned in relation to exercise, with adolescents enjoying exercising with other adolescents (31) and engaging in competitive activities (31, 34).

### 2.3. Barriers to attending a weight management programme and being healthy

This synthesis identified many barriers to engagement with weight management programmes and successful outcomes:

#### 2.3.1. Prior fears of attending interventions

Adolescents from seven of the included studies reported prior fears of attending an intervention (32, 33, 37, 38, 40, 46, 54). Many of these worries related to the intensity of weight loss activities, type of food on offer or incorrect

preconceptions. These pre-conceptions stem from the interventions not being portrayed as fun, something that has been described earlier in the theme 'active engagement' as an important element. Also, some adolescents had prior worries about being bullied, group dynamics and not being accepted (38). Additional worries related to previous negative experiences with health professionals and not having someone to attend with, reiterating the importance of family and/or peer support (32, 37).

#### 2.3.2. Obesity treatment bringing about feelings of failure, guilt and shame

Adolescents commented on being fearful of being told off by a health professional for not losing weight and feeling like a failure (36, 43). These feelings would lead to adolescents not continuing with the intervention, which led to feelings of guilt and shame. Attending obesity interventions also appeared to bring out a greater focus on weight, which in turn could lead to lower self-esteem (36, 42). These negative feelings can also be seen after an intervention when there is a struggle with weight loss maintenance (33). Longer-term support that considers the mental health of adolescents is needed when planning interventions.

#### 2.4. Physical activity vs. Diet

Physical activity was well received and several themes developed in this section. Although physical activity was spoken about more often than the diet element of interventions, adolescents did speak positively about their experiences of learning to eat healthily:

##### 2.4.1. Enjoyment from learning to eat healthily

Adolescents from three multi-component interventions (33, 39, 45) highlighted the benefits of understanding the nutritional content of different foods and drinks as well as giving them a better awareness of what foods should be eaten in moderation. Additionally, adolescents appeared to prefer healthy eating related activities that were more practical and hands-on (40). These visual activities seemed to engage adolescents more than tasks that involved lots of writing. The element of having more practical and interactive activities is discussed in more detail previously within the theme 'active engagement'.

##### 2.4.2. Enjoyment of sports and physical activity

Most adolescents commented on their enjoyment of taking part in exercise (31, 33, 38, 40, 41, 43, 44-46, 50, 51, 54). Again, fun was an important element. Many adolescents enjoyed being able to use a gym facility (31), whilst others commented on their enjoyment of sports and other activities such as cycling and basketball (51). Adolescents commented on how physical activity made them feel, both physically and mentally, which created that sense of accomplishment.



## 2.5. Motivations

It is important to try to understand what motivates adolescents to take part in obesity interventions to improve attrition and recruitment rates:

### 2.5.1. Weight loss as primary motivation

Understanding adolescent's primary motivations for taking part in an intervention is vital to improve engagement.

Adolescents from nine out of the 24 included studies commented on weight loss being their primary goal for taking part in an intervention (31, 33, 35, 36, 38, 43, 50, 54, 57). Although not the primary reason for motivating weight loss, some adolescents were driven to lose weight to prevent health sequelae (36, 43). In some cases, being aware of preventing health sequelae was due to having family members with a health condition (43).

### 2.5.2. Being a healthy weight as 'normal' and socially desirable

Many adolescents viewed being a healthy weight as 'normal' and held this as the key to being accepted socially (8, 31, 33, 35, 38, 41, 43, 54). Normality, from the point of view of an adolescent in these studies suggested having a boyfriend and the ability to socialise and play with friends (8, 41, 43). As well as seeing weight loss as the key to social desirability, some adolescents felt that losing weight would reduce the bullying they received, which would lead to a normal and happy life (8, 38).

### 2.5.3. Adolescents recognising personal responsibility and personal motivation for weight loss

Adolescents highlighted a strong personal drive that motivated their weight loss (8, 31, 35, 36, 41, 43, 44, 51); this was often initiated through experiencing a 'light bulb' moment (36). Sometimes this came from reminders of past negative experiences or not wanting to be overweight like other family members (51). This personal drive appeared also in part due to adolescents realising their own responsibility in losing weight and following a healthy lifestyle. This is contradictory to another finding within this review where adolescents appreciated a prescriptive and regulated diet and exercise routine set by a professional (41,57) (See Table S4 & Figure S5). Nonetheless, more data supported the use of concise and practical messages throughout interventions (36, 53, 54). Adolescents liked gaining evidence-based knowledge, bringing the responsibility back to the individual. Adolescents spoke of a desire to lose weight to feel proud, which motivated their weight loss and personal drive (44).

## 2.6. Maintenance

Adolescents often spoke about their struggles with continuing and maintaining weight loss efforts after an intervention had finished:

### 2.6.1. Transferring skills learnt into a home environment and routine

Many adolescents commented on their struggles with adjusting to and transferring newly learnt skills and knowledge into everyday life (8, 33, 36, 38-41, 43, 48). With many interventions taking place in a clinical or artificial setting and with professional support being more regular, the transition from an intense intervention back to a normal routine can be difficult. Adolescents also commented on the challenge of changing their eating habits for the longer term, the need for these eating habits to be engrained into normal everyday life. A sense that weight loss or weight loss maintenance was something that you must continually work at and the frustration surrounding this. Other adolescents found the transition from intervention into real life easier and felt that they had learnt and remembered valuable skills and knowledge that could be carried out in a home environment (33).

### 2.6.2. Longer term support

Several studies included in this synthesis noted comments from adolescents suggesting that they would have benefited from more sessions as part of an intervention and post intervention (8, 31, 33, 36, 39-41, 43, 45, 48, 50, 54). Feedback from five interventions that lasted six to eight weeks all suggested that these programmes were too short (8, 39, 41, 50, 54). Another study that provided support after a multi-component intervention (41) found that those participants that had been successful in losing weight through the initial programme found the additional post-intervention sessions positive. However, those that were unsuccessful felt the follow-on sessions lacked physical activity opportunities and did not motivate participants. Adolescents did express their concerns and worries about maintaining their weight loss after an intervention (33). This may be due to their recognition of the challenge of losing weight as well as their recognition of individual responsibility (8, 33). Adolescents commented on their struggles with lacking motivation after an intervention had finished and relapsing back into old habits due to the amount of focus required post-intervention (33, 41). Some adolescents commented on the support they received from professionals and family members post-intervention, both positively and negatively (31, 33). For some, continued support from professionals was helpful (33), whilst for others, over time, in terms of taking part in physical activity, was less important (31). Adolescents felt that physical activity was lacking in the school environment (43). Improving physical activity opportunities within schools will help to provide longer-term support for adolescents with overweight and obesity. The importance of family support in the maintenance period is also important, but this appeared to decrease over time (31).

## 2.7. Technology

Seven studies contained data that related to the use of technology in an intervention (49-53, 55, 56). Technology in this instance, included telephone and electronic communication, web and online programmes, exergames and photography. Three themes emerged within this domain:

### 2.7.1. Adolescents enjoy using technology and do so with ease

Most studies using technology suggested that adolescents enjoyed their use (49-52, 55, 56). Through observations and semi-structured telephone interviews, most adolescents gave the impression of using certain technologies, such as exergames, internet and taking photographs, with ease.

## Discussion

### Situating within the wider literature

Adolescents described a clear desire for professional and peer support. These avenues of support were also identified in a systematic review of qualitative evidence that investigated components valued by adult weight management service users (58). Having support from family members was also important to adolescents and has been highlighted as important to younger children as well in a review of lifestyle weight management programmes (59). There is some discrepancy in what adolescents say they want from an intervention. Although support from professional, family and peers was discussed frequently, adolescents also placed great emphasis on their personal responsibility for achieving a healthy weight; identified previously in a qualitative systematic review on adolescent's general experiences of obesity (25). However, adolescents in this review have also stated preferences for receiving concise and prescriptive advice, which draws away from that personal responsibility. Additionally, the inflexible nature of a prescriptive diet and exercise plan will make the transition period into the home after an intervention has finished more difficult, a finding that this review has highlighted. Finding the correct balance between personal responsibility and prescription is key. This concurs with the findings from a review of overweight adult's views who also noted this tension between dependence on the programme and autonomy (23). Active engagement was valued highly by adolescents in this review, when learning about both healthy eating and physical activity. Similar views have been shown in younger children, who prefer practical and interactive experiences, rather than receiving didactic information (59). Understanding adolescent motivations towards weight loss and attending interventions is important for initial engagement and improving attrition. Most adolescents included in this review were primarily motivated by weight loss rather than health improvements. This review recognised that a heavy focus on weight loss could lead to lower self-esteem, perhaps due to this emphasis on personal responsibility. Adolescents described feelings of failure and

guilt when their desired weight loss was not achieved; when designing interventions, it is important to find a balance between weight loss, health and psychosocial outcomes. The impact of weight management on adolescent's mental health long-term is important. Approaches that offer more than health education to adolescents and their families, is important. Motivations for weight loss stemmed mostly from a social point of view. Adolescents felt that being a healthy weight was more desirable socially, and would lead to increased confidence, more friends and less bullying. This is supported by another review which examined adolescent's views of obesity (25) that emphasised social consequences related to body size. There was wide variation in dose among interventions included in this review. This wide variation has been highlighted in a review that aimed to understand the link between dose and outcome (60). Only one study in this review (39) explored the length of individual sessions highlighting a need for improved reporting and exploration of intervention dose.

#### Strengths and limitations

This is the first qualitative systematic review, of which the researchers are aware, that synthesises views of adolescents attending obesity interventions. There is growing recognition of the value of qualitative research, the synthesis of which can be used to inform policy and practice. This review included studies from eight developed countries (Table 1). Nine studies were UK based, giving a strong basis of generalisability to the UK at a time when there is an urgent need for targeted, evidence-based interventions for older children. As with all reviews, some relevant literature may have been missed. However, a sensitive and broad search of bibliographic databases was completed, supplemented by hand searching reference lists, relevant systematic reviews and key journals. This synthesis is further enhanced by having two reviewers involved at the initial screen, full-text screen, data extraction and quality assessment stages. There were no limits on language reducing potential reviewing bias. Authors of potentially relevant studies were also contacted for clarity on inclusion criteria. Thematic synthesis was conducted by the first reviewer; all findings were discussed with a second reviewer. A limitation is that conference abstracts were not included, however these usually have limited data. Additionally, only four of the 28 included studies attempted to involve participants that had withdrawn from an intervention (35, 38, 42, 44). Therefore, this review may be over represented with the views of adolescents that had positive experiences of obesity interventions. Even when attempts were made to recruit withdrawers, those with negative experiences of an obesity intervention would have been less likely to engage.

### Implications for research

More research is needed to investigate the views of adolescents that have not engaged with, or withdrawn from, obesity interventions. Additionally, primary studies need to be clearer when reporting on intervention dose, to enable more research into the most appropriate dose of obesity intervention for adolescents.

### Implications for practice

Ensuring that an initial assessment opportunity is given to adolescents may reduce their prior fears of attending by managing expectations. Although widely recognised that a multi-component intervention is the most evidence-based approach (13, 14) for child obesity interventions, this review highlighted the importance of exercise. Allowing adolescents an opportunity to try new and varied activities in a non-forceful manner may help to improve uptake and attrition rates. Obesity interventions should involve the whole family in certain elements, whilst allowing adolescents to create bonds with peers, offering an alternative avenue of support. Professionals should be on hand to provide valuable tailored advice, both health and mental well-being, in a structured and non-judgmental way that also allows autonomy to develop post intervention. Interventions may benefit from focusing on psychosocial elements of weight loss to improve maintenance and attrition rates. Offering longer-term support is essential; incorporating an element of technology into interventions may aid this.

### Conclusion

This review gives a strong argument for ensuring adolescents views are listened to when planning obesity interventions. Incorporating the views of adolescents from many individual studies resulted in a comprehensive overview of potentially pertinent factors. Findings may inform local and national policy makers in the development of future interventions for adolescents with obesity. Developing interventions with adolescent views in mind may improve recruitment and attrition rates.

### Authors contributions:

HMJ designed the protocol, designed and ran the searches; HMJ, LA, OO and GJMT performed the initial screening and screening of full-text articles; HMJ, LA, OO extracted data and performed quality assessment; HMJ synthesised extracted data and performed CERQual, both were audited by GJMT. HMJ wrote the first draft of the manuscript; LA, OO and GJMT reviewed the manuscript.

### Supporting information:

Supporting Information: Table S1 – Example of search on MEDLINE

Supporting Information: Table S2 – Quality assessment of included studies using criteria developed by the EPPI-Centre

Supporting Information: Table S3 – CERQual Evidence Profile

Supporting Information: Table S4 – Representative quotes

Supporting Information: Figure S5 - Network diagram showing domains and analytical themes

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