Evidence of effectiveness

Tool 13

This tool contains a summary of the evidence of effectiveness of interventions to prevent and manage obesity, adapted from the NICE guideline on obesity.[1] It contains information on:

Prevention (page 126)

- Evidence of effectiveness – Determinants of weight gain and weight maintenance among children and adults
- Evidence of effectiveness of prevention interventions targeted at the general population
- Evidence of effectiveness of prevention interventions targeted at children
- Evidence of effectiveness of prevention interventions targeted at adults
- Evidence of effectiveness of prevention interventions targeted at black, minority ethnic groups
- Evidence of effectiveness of prevention interventions targeted at vulnerable groups
- Evidence of effectiveness of prevention interventions targeted at vulnerable life stages

Management of obesity in non-clinical settings (page 134)

- Evidence of effectiveness of interventions in non-clinical settings targeted at children and adults

Management of obesity in clinical settings (page 136)

- Evidence of effectiveness of lifestyle interventions in weight management and other outcomes in children and adolescents
- Evidence of harm in children and adolescents who undergo weight management/maintenance programmes
- Evidence of effectiveness of diet interventions for weight loss in adults
- Evidence of effectiveness of behaviour therapy (with or without diet) interventions for weight loss in adults
- Evidence of effectiveness of physical activity (alone or in combination with diet or behaviour therapy) interventions for weight loss in adults

For additional information, see Mulvihill and Quigley (2003)[2] and Hillsdon, Foster et al (2005).[3]

Note: A lack of evidence of effectiveness does not necessarily mean evidence of ineffectiveness – it may simply mean that further evaluation is needed.

KEY TO GRADING EVIDENCE

Level of evidence	Type of evidence
1++	High quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias
1+	Well conducted meta-analyses, systematic reviews of RCTs, or RCTs with a low risk of bias
1-	Meta-analyses, systematic reviews of RCTs, or RCTs with a high risk of bias*
2++	High quality systematic reviews of non-RCT, case-control, cohort, CBA or ITS studies High quality non-RCT, case-control, cohort, CBA or ITS studies with a very low risk of confounding, bias or chance and a high probability that the relation is causal
2+	Well conducted, non-RCT, case-control, cohort, CBA or ITS studies with a very low risk of confounding, bias or chance and a moderate probability that the relation is causal
2-	Non-RCT, case-control, cohort, CBA or ITS studies with a high risk of confounding, bias or chance and a significant risk that the relationship is not causal
3	Non-analytic studies (eg case reports, case series)
4	Expert opinion, formal consensus

* Studies with a level of evidence (-) should not be used as a basis for making recommendations

RCT: Randomised controlled trial; CBA: controlled before and after; ITS: Interrupted time series

Source: National Institute for Health and Clinical Excellence, 2006 [1]

PREVENTION

Evidence of effectiveness – Determinants of weight gain and weight maintenance among children and adults

INTERVENTION	EVIDENCE
Children and young people	
General	There are limited data from cohort studies on the factors associated with weight gain in children **(N/A)**
Parental obesity	There is a body of evidence which suggests that the offspring of overweight and obese parent(s) are at increased risk of themselves becoming overweight or obese in childhood or adulthood **(2+)**
Dietary factors	Cohort studies suggest that children who increase calorie intake, increase fat intake, consume 'junk food', 'takeaways' and 'carbonated drinks' and/or do not eat breakfast, tend to gain weight **(2+)**
	The evidence on 'snacking' is limited and inconsistent **(2+)**
	There is limited evidence from prospective cohort studies over at least one year for the relationship between regular meals, portion size or snacking with weight in children **(2+)**
Physical activity	Cohort studies suggest that children who do not participate in sport outside school and who are the least active appear to gain more weight than their more active peers **(2+)**
	The evidence from cohort studies is inconsistent on the associations between television viewing and weight gain. Some but not all identified studies found a significant association between greater television viewing and weight gain **(2+)**

Adults	
General	Among adults, there is a body of evidence from cohort studies that pregnancy, menopause and smoking cessation are key stages in the life-course associated with weight gain. The evidence on the importance of other life stages, such as marriage, divorce and a change in work patterns (for example, shift working) remains unclear **(2+)**
Physical activity	There is limited evidence from cohort studies that increasing physical activity may minimise the weight gain associated with smoking cessation **(2+)**
	There is a body of evidence from cohort studies that adults are more likely to maintain a healthy weight if they maintain an active lifestyle and reduce sedentary behaviours such as television viewing **(2+)**
Dietary factors	There is a body of evidence from cohort studies that adults are more likely to maintain a healthy weight if they consume a low-fat diet containing less 'takeaway' foods, more fruit and vegetables, salad and fibre and little alcohol. Reducing consumption of confectionery and drinks high in sugar may also help to prevent weight gain **(2+)**

Evidence of effectiveness of prevention interventions targeted at the general population

INTERVENTION	EVIDENCE
Raising awareness	
Weight outcomes	There is limited evidence to show that a multi-component intervention including a public health media campaign, can have a beneficial effect on weight management, particularly among individuals of higher social status **(2+)**
	The effectiveness of promotional campaigns focusing on education alone remains unclear **(1+)**
Diet outcomes	There is a body of evidence that promotional campaigns including media interventions can increase awareness of what constitutes a healthy diet and may subsequently improve dietary intakes **(2+)**
	There is a body of evidence that food promotion can have an effect on children's food preferences, purchase behaviour and consumption. The majority of food promotion focuses on foods high in fat, sugar and salt and therefore tends to have a negative effect. However, food promotion has the potential to influence children in a positive way **(2+)**
Physical activity outcomes	It remains unclear whether media interventions can influence participation in physical activity. There is some evidence that interventions may be more successful if they target motivated subgroups **(2++)**
	Promotional campaigns including media interventions can improve knowledge, attitudes and awareness of physical activity. Levels of awareness are likely to vary according to the type of medium used and the scale of the campaign **(2++)**
Generalisability	The majority of the identified interventions are generalisable to the UK **(2+)**
	There is a paucity of evidence on the effectiveness of interventions among lower socioeconomic groups and black and minority ethnic groups **(N/A)**
	There is a paucity of evidence in children and young people; the generalisability of evidence in adults to children and young people remains unclear **(N/A)**
	The effectiveness of interventions varies by age, gender, social status and ethnicity **(2+)**
Implementation	Parents are important role models for children and young people in terms of behaviours associated with the maintenance of a healthy weight **(3)**
	Books, magazines and television programmes are an important source of information and actively involving media providers may improve the effectiveness of interventions **(3)**
	A significant proportion of parents may not recognise that their child is overweight and may have a poor understanding of how to translate general advice into specific food choices **(3)**

For the Key to the levels of evidence (1++, 1+, 1 etc), see page 126.

Evidence of effectiveness of prevention interventions targeted at children

INTERVENTION	EVIDENCE
Home (pre-school children and family-based)	
Weight outcomes	There is limited evidence that interventions which focus on the prevention of obesity through improvements to diet and activity appear to have a small but important impact on body weight that may aid weight maintenance **(1+)**
	Improvements in the food service to pre-school children can result in reductions in dietary intakes of fat and improved weight outcomes **(1+)**
	No family studies were identified among children under 5 years of age **(N/A)**
	Family-based interventions that target improved weight maintenance in children and adults, focusing on diet and activity, can be effective, at least for the duration of the intervention **(1++)**
	The effectiveness of interventions tends to be positively associated with the number of behaviour change techniques taught to both parents and children **(1++)**
	It remains unclear whether the age of the child influences the effectiveness of family-based interventions compared with individual interventions **(N/A)**
Diet and activity outcomes	Interventions which do not identify favourable changes in weight outcomes may identify favourable changes in diet and/or activity outcomes (where recorded). The reasons for this are unclear **(1+)**
	There is some evidence that interventions which do not focus on preventing obesity, but aim to bring about modest changes in dietary and physical activity behaviour, are unlikely to demonstrate an impact on body weight. However, there is evidence from cohort studies that people who habitually eat healthy diets and are physically active are more likely to maintain their weight over the long term **(2+)**
	There is evidence for small but important beneficial effects of interventions that aim to improve dietary intake (such as videos, interactive demonstrations, and changing food provision at nursery school) so long as these interventions are not solely focused on nutrition education alone **(2+)**
	The provision of regular meals in a supportive environment free from distractions may improve dietary intakes **(4)**
	There is limited evidence that structured physical activity programmes within nurseries can increase physical activity levels **(grade pending)**
	Interventions which involve parents in a significant way may be particularly effective and can improve parental engagement in active play with children and a child's dietary intake **(2+)**
Generalisability	The majority of interventions identified were conducted in the USA. However the findings are likely to be generalisable to the UK population **(4)**
	Interventions should be tailored as appropriate for lower-income groups **(1+)**
	2–5 years is a key time to establish good nutritional habits especially when parents are involved **(1+)**
Implementation	Interventions require some involvement of parents or carers **(1+)**
	There is limited evidence that interventions to increase opportunities for children to be active can be incorporated into nurseries and implemented by nursery staff **(grade pending)**

For the Key to the levels of evidence (1++, 1+, 1 etc), see page 126.

Schools	
Weight outcomes	The evidence on the effectiveness of multi-component school-based interventions to prevent obesity (addressing the promotion of physical activity, modification of dietary intake and reduction of sedentary behaviours) is equivocal. Some identified interventions demonstrated a reduction in mean BMI and the prevalence of obesity while the intervention was in place, but this finding was not universal. UK-based evidence in particular is lacking **(2+)**
	School-based physical activity interventions (physical activity promotion and reduced television viewing) may help children maintain a healthy weight **(no grade assigned)**
	There is limited evidence from one UK-based study to suggest that interventions to reduce consumption of carbonated drinks containing sugar may have a role in reducing the prevalence of overweight and obesity **(1++)**
Diet and activity outcomes	There is a body of evidence that school-based multi-component interventions addressing various aspects of diet and/or activity in the school, including the school environment are effective in improving physical activity and dietary behaviour, at least while the intervention is in place. However, UK-based evidence to support multi-component interventions (the 'whole-school approach') is limited **(1+)**
	There is a body of evidence to suggest that short- and long-term school-based interventions to improve children's dietary intake may be effective, at least while the intervention is in place. This includes interventions aiming to increase fruit and (to a lesser extent) vegetable intake, improve school lunches and/or promote water consumption **(1+)**
	UK-based evidence suggests that school children with the lowest fruit and vegetable intakes at baseline may benefit more from the school-based interventions than their peers **(2+)**
	There is evidence from multi-component interventions to suggest that both short- and long-term physical activity focused interventions may be effective, at least while the intervention is in place **(1+)**
Other outcomes	No negative outcomes were reported in the identified studies. One multi-component study showed that measures of extreme dieting behaviour remained unchanged **(1+)**
Generalisability	Most of the evidence for school-based interventions is non-UK based. However, it is likely that the findings are generalisable to the UK **(4)**
Implementation	There is limited UK evidence to indicate that in terms of engaging schools it is important to enlist the support of key school staff **(2+)**
	There is a body of evidence to suggest that young people's views of barriers and facilitators to healthy eating indicated that effective interventions would (i) make healthy food choices accessible, convenient and cheap in schools, (ii) involve family and peers, and (iii) address personal barriers to healthy eating, such as preferences for fast food in terms of taste, and perceived lack of will-power **(1++)**
	There is a body of evidence to suggest that young people's views on barriers and facilitators suggest that interventions should (i) modify physical education lessons to suit their preferences, (ii) involve family and peers, and make physical activity a social activity, (iii) increase young people's confidence, knowledge and motivation relating to physical activity, and (iv) make physical activities more accessible, affordable and appealing to young people **(1++)**

For the Key to the levels of evidence (1++, 1+, 1 etc), see page 126.

Evidence of effectiveness of prevention interventions targeted at adults

INTERVENTION	EVIDENCE
Workplace	
Weight outcomes	Worksite behaviour modification programmes that include health screening with counselling/education can result in short-term weight loss. Weight loss may be regained post intervention **(1+)**
	Payroll incentive schemes (such as free gym membership) are either only effective in the short term (during the period of the intervention) or ineffective for weight control **(1+)**
	There is inconclusive evidence for the effectiveness of workplace-based physical activity interventions on weight outcomes **(N/A)**
	The effectiveness of healthier food provision in workplaces on weight outcomes remains unclear **(2++)**
	No studies were identified which considered the provision of water in the workplace, active travel schemes and stair use on weight outcomes **(N/A)**
Diet and activity outcomes	Worksite behaviour modification programmes, such as health screening followed by counselling and, sometimes, environmental changes, can lead to improvements in nutrition and physical activity while the intervention is in place **(1+)**
	There is a body of evidence that the provision of healthier food choices can encourage consumption of a healthier diet **(2++)**
	Workplace physical activity programmes can have a positive effect on physical activity **(1++)**
	Environmental improvements in stairwells, such as decoration, motivational signs and music may increase stair use. Posters alone may be ineffective or effective only while the posters are in place **(2+/++)**
	No studies were identified which considered the provision of water in the workplace on diet or activity outcomes **(N/A)**
	It is unknown whether incentive schemes improve dietary intakes or increase physical activity levels **(2+)**
Generalisability	It remains unclear whether the effectiveness of interventions varies by age, gender, socioeconomic or ethnic group **(N/A)**
Implementation	There is little evidence on the most effective strategies for attracting workplaces to invest in the health and activity of their staff, with the exception of weak evidence of reduced sick leave as a result of physical activity programmes **(N/A)**
	A body of UK-based case studies suggests that factors most likely to make a canteen-style five-a-day intervention work are: commitment from the top, enthusiastic catering management, a strong occupational health lead, links to other on-site health initiatives, free or subsidised produce and heavy promotion and advertisement at point of purchase **(3)**
	A body of UK-based case studies suggests that the more successful behaviour modification/education techniques include an interdisciplinary approach with broad representation including health and safety and human resources, and implementers from high grades and strategic positions; initiatives integrated into worksite objectives; staff involvement, communication and realistic objectives; activities that go beyond the superficial and address root causes **(3)**
	A UK-based survey of Heartbeat Award schemes recommended improved promotion and better integration with other health programmes **(3)**

For the Key to the levels of evidence (1++, 1+, 1 etc), see page 126.

Community interventions led by health professionals	
Weight outcomes	Sustained health-professional-led interventions in primary care or community settings, focusing on diet and physical activity or general health counselling can support maintenance of a healthy weight **(1+)**
	Interventions which provide support and advice on physical activity and diet are more likely to be effective for weight outcomes than interventions which focus on physical activity alone. There is no reliable evidence for diet alone **(1+)**
Diet and activity outcomes	Interventions which do not identify favourable changes in weight outcomes may identify favourable changes in diet and/or activity outcomes (where recorded) **(1+)**
	Behavioural/educational interventions to increase physical activity can be moderately effective, particularly for walking and non-facility-based activities, although increases may not be sustained over time **(1++)**
	Limited evidence suggests that using an incentive of free access to leisure facilities is likely to increase activity levels but only during the period of the intervention **(1+)**
	Moderate- or high-intensity dietary interventions most commonly report clinically significant reductions in fat intake and an increase in fruit and vegetable intake **(1++)**
	Briefer interventions, such as brief counselling/dietary advice by GPs or other health professionals, can be effective in improving dietary intake but tend to result in smaller changes than intensive interventions **(1++)**
	Interventions with a greater number of components are more likely to be effective **(1++)**
Generalisability	The majority of interventions identified were conducted in the USA. However, the findings are likely to be generalisable to the UK population **(N/A)**
	Although the majority of studies included predominantly white, higher social status and reasonably motivated individuals, there is some evidence that interventions can also be effective among lower social groups and effectiveness does not vary by age or gender **(1+)**
Implementation	Tailoring dietary advice to address potential barriers (taste, cost, availability, views of family members, time) is key to the effectiveness of interventions and may be more important than the setting **(3)**
	The type of health professional who provides the advice is not critical as long as they have the appropriate training and experience, are enthusiastic and able to motivate, and are able to provide long-term support **(3)**
	It remains unclear whether interventions are more effective when delivered by multidisciplinary teams **(N/A)**
	There is some evidence that primary care staff may hold negative views on the ability of patients to change behaviours, and their own ability to encourage change **(3)**
	There is a body of evidence from UK-based qualitative research that time, space, training, costs and concerns about damaging relationships with patients may be barriers to action by health professionals (GPs and pharmacists) **(3)**
	There is some evidence from the UK that patients are likely to welcome the provision of advice despite concerns by health professionals about interference or damaging the relationship with patients **(3)**
	Tailoring physical activity advice to address potential barriers (such as lack of time, access to leisure facilities, need for social support and lack of self-belief) is key to the effectiveness of interventions **(1++)**

For the Key to the levels of evidence (1++, 1+, 1 etc), see page 126.

Broader community	
Weight outcomes	There is no evidence on the effectiveness of broader environmental interventions on the maintenance of a healthy weight and prevention of obesity **(N/A)**
	There is little evidence of benefit from locally implementable multi-component city- and state-wide interventions to prevent cardiovascular disease on weight outcomes **(2+)**
Diet and activity outcomes	No interventions were identified which addressed both diet and activity **(N/A)**
	There is little evidence of benefit from locally implementable city- and state-wide interventions to prevent cardiovascular disease in relation to diet and/or physical activity outcomes **(2+)**
	Point of purchase schemes in shops, supermarkets, restaurants and cafés can be effective in improving dietary intakes at least in the short term, particularly if accompanied by supporting education, information and promotion. There is some evidence that longer-term, multi-component interventions may show greater effects **(2++)**
	There is a body of evidence that creation of, or enhanced access to space for physical activity (such as walking or cycling routes), combined with supportive information/promotion, is effective in increasing physical activity levels **(2++)**
	The general promotion of active travel (for example, publicity campaigns) does not appear to be effective in increasing physical activity levels **(1++)**
	Targeted behavioural change programmes with tailored advice appear to change travel behaviour of motivated groups. Associated actions such as subsidies for commuters may also be effective **(1++)**
	Point of decision prompts or educational materials such as posters and banners have a weak positive effect on stair walking **(2+)**
Generalisability	Barriers may vary by age, gender and social status **(3)**
Implementation	Auditing the needs of all local users can help engage all potential local partners and establish local ownership **(3)**
	Interventions may be ineffective unless fundamental issues are addressed, such as individual confidence to change behaviour; cost and availability; pre-existing concerns such as poorer taste of healthier foods and confusion over mixed messages; the perceived 'irrelevance' of healthier eating to young people; and the potential risks (including perception of risk) associated with walking and cycling **(3)**
	Addressing safety concerns in relation to walking and cycling may be particularly important for females and children and young people and their parents **(3)**
	Interventions which incorporate novel educational and promotional methods, such as videos and computer programmes, may improve dietary intake **(1++)**
	Changes to city-wide transport, which make it easier and safer to walk, cycle and use public transport – such as the congestion charging scheme in the City of London and Safe Routes to School schemes – have the potential to make active transport more appealing to local users **(3)**

Evidence of effectiveness of prevention interventions targeted at black, minority ethnic groups (BMEGs)

INTERVENTION	EVIDENCE
Weight outcomes	There is a dearth of evidence on the effectiveness of interventions among BMEGs in the UK. All identified RCTs were undertaken in the USA, the majority among African/black Americans **(N/A)**
	There is some evidence that interventions among African/black American women, which promote a low-fat diet and moderate activity, can result in modest decreases in BMI and waist circumference in the short to medium term **(1+)**

For the Key to the levels of evidence (1++, 1+, 1 etc), see page 126.

	The effectiveness of interventions among African/ black American children remains unclear. The majority of identified studies were not adequately powered to identify differences in BMI **(N/A)**
	There is evidence that school-based interventions are effective in preventing excess weight gain among black American children **(1+)**
	There is some evidence that ethnicity may be a risk factor for greater weight gain during childhood, pregnancy and smoking cessation **(3)**
Diet and activity outcomes	There is a dearth of evidence on the effectiveness of interventions among BMEGs in the UK. All identified RCTs were undertaken in the US, the majority among African/black Americans **(N/A)**
	There is a body of evidence that culturally specific interventions among black American adults can significantly improve fruit and vegetable intake, reduce percentage energy from total and saturated fat and reduce energy intake up to 2 years **(1+)**
	The effectiveness of tailored physical activity interventions targeted at BMEGs, compared with a non-targeted intervention programme, remains unclear **(N/A)**
	The effectiveness of interventions among children remains unclear **(N/A)**
Generalisability	The generalisability of specific interventions among black American populations to all UK BMEGs may be limited but general learning can be applied to the UK **(4)**
	Community settings, such as churches, have been shown to be an effective setting for engaging black/African Americans **(1++)**
	Additional barriers for BMEGs include cost, child care, cultural codes of conduct, language, racism and religious discrimination **(3+)**

Evidence of effectiveness of prevention interventions targeted at vulnerable groups

INTERVENTION	EVIDENCE
Weight outcomes	The effectiveness of interventions among lower-income and other vulnerable groups remains unclear **(N/A)**
	There is a dearth of evidence on the effectiveness of interventions among individuals with a disability. There is limited short-term evidence to suggest that intervention may prevent excessive weight gain in overweight adults with Down's syndrome **(N/A)**
	There is some evidence that interventions to prevent excess pregnancy weight gain may be effective among lower-income groups but the impact of baseline weight remains unclear **(1+)**
Diet and activity outcomes	There is a paucity of evidence on the effectiveness of interventions to manage weight, improve dietary intake and/or improve activity levels among vulnerable groups **(N/A)**
	The impact of interventions during pregnancy to lower income groups in relation to long-term diet and activity levels remains unclear **(N/A)**
Generalisability	Additional barriers for vulnerable groups include cost, child care, cultural codes of conduct, language, racism and religious discrimination **(3+)**

For the Key to the levels of evidence (1++, 1+, 1 etc), see page 126.

Evidence of effectiveness of prevention interventions targeted at vulnerable life stages

INTERVENTION	EVIDENCE
Weight outcomes	On balance, smoking cessation interventions incorporating weight management may increase continuous abstinence rates but the long-term impact on weight, and the impact on diet and physical activity levels, remains unclear **(1+)**
	There is a body of evidence that exercise (walking, other aerobic training, resistance training, and strength training with weights machines or combinations) can improve body composition and result in a small loss of body weight and fat in postmenopausal women. This effect seemed to be optimal when combined with a weight-reducing diet **(1++)**
	There is limited evidence that a weight management programme addressing diet and activity during the menopause can prevent excess weight gain in women during the menopause **(1++)**
	There is limited evidence to suggest that continuing a regular exercise regimen and following an appropriate, healthy diet throughout pregnancy can result in significantly less total weight gain and significantly less increases in the sum of skinfolds **(2+)**

MANAGEMENT OF OBESITY IN NON-CLINICAL SETTINGS

Evidence of effectiveness of interventions in non-clinical settings targeted at children and adults

INTERVENTION	EVIDENCE
Weight outcomes	In both children and adults, there is a paucity of good-quality evidence on the effectiveness of interventions in non-clinical settings **(N/A)**
Adults	There is limited evidence on the effectiveness of interventions based in non-clinical settings to manage obesity in adults (particularly men) **(N/A)**
	There is moderate evidence that a multi-component commercial group programme may be more effective than a standard self-help programme. It remains unclear whether the branded commercial group programme for which there is evidence of effectiveness (WeightWatchers) is more or less effective than other branded commercial programmes **(1++)**
	There is no strong evidence to support the use of meal replacement products over a standard low-calorie diet **(N/A)**
	There is limited evidence that interventions to manage obesity based in workplace settings can be effective, though weight loss may be small in the long term **(1-)**
	There is some evidence that computer/email/internet-based programmes accompanied by greater ongoing support – in person, by post or email – may be more effective than those without **(1+)**
	The effectiveness of commercial and computer-based weight loss programmes in men remains unclear **(N/A)**
	There is limited evidence that a diverse range of novel, multi-component community-based interventions may be effective in the management of obesity, including a peer-led programme and a group-based and individual-based weight loss programme in a religious-based setting, a home-based exercise programme (accompanied by regular group sessions) and a programme providing information through interactive television **(1+)**

For the Key to the levels of evidence (1++, 1+, 1 etc), see page 126.

Children	There is a paucity of evidence on the effectiveness of interventions to manage obesity in children based in non-clinical settings; the evidence that was identified was generally for children aged 8-12 years of age and at the extreme end of obesity **(N/A)**
	There is no UK-based evidence available on the effectiveness of interventions to manage obesity in children and young people in non-clinical settings **(N/A)**
	There is limited evidence that interventions provided by school staff can aid the management of obesity in children and young people, at least in the short term, but this may be less effective than a more intensive intervention delivered in a clinical setting **(2-)**
	There is insufficient evidence to compare the effectiveness of interventions with or without family involvement in non-clinical settings **(N/A)**
	There is some evidence that home-based interventions may be more effective when accompanied by behaviour modification material and ongoing support. However, the replicability of this intervention on a wider scale remains unclear **(1+)**
	No evidence was identified which considered the effectiveness of exercise referral programmes to manage overweight or obesity in children and young people **(N/A)**
Diet and activity outcomes	Among both children and adults, interventions in non-clinical settings that are shown to be effective in terms of weight management, are likely to demonstrate significant improvements in participants' dietary intakes (most commonly fat and calorie intake) or physical activity levels **(1+)**
Other outcomes	No negative outcomes were reported in the identified studies for children or adults **(N/A)**
Generalisability	The majority of studies identified were undertaken in the USA but many of the principles may be generalisable to the UK **(N/A)**
	It remains unclear whether the effectiveness of programmes in children or adults varies by age, gender, ethnicity or social status **(N/A)**
	It remains unclear whether the effectiveness of programmes varies by whether participants have previously attempted to lose or maintain their weight **(N/A)**
	The impact of participant joining fees and participant costs on the long-term effectiveness in 'real life' commercial programmes remains unclear **(N/A)**
Implementation	There is insufficient evidence to identify strategies in non-clinical settings that are associated with the long-term maintenance of weight and continuation of improved behaviours among overweight and obese adults and children **(N/A)**
	It remains unclear whether the source of delivery (both the main intervention and ongoing support) had an influence on effectiveness **(N/A)**
	There is insufficient evidence to assess the importance of the source of delivery (for example, health professional versus volunteer worker) on the effectiveness of programmes for children or adults **(N/A)**
	None of the identified studies considered inter-agency or inter-professional partnerships **(N/A)**

For the Key to the levels of evidence (1++, 1+, 1 etc), see page 126.

MANAGEMENT OF OBESITY IN CLINICAL SETTINGS

Evidence of effectiveness of lifestyle interventions in weight management and other outcomes in children and adolescents

INTERVENTION	EVIDENCE
Weight loss	The main requirement of a dietary approach to weight control is a reduction in total energy intake, with caloric expenditure exceeding caloric intake. Energy balance is critical to weight loss. Energy expenditure must exceed energy intake **(good practice point)**
	In specialist weight management programmes, physical activity and diet combined are more effective in weight management in children aged 4-16 years, than diet alone **(1++)**
	There is no evidence on the effectiveness of physical activity alone in the treatment of childhood obesity in a clinical setting **(N/A)**
	There is no clear evidence on which dietary intervention is the most effective in weight reduction and management in children and adolescents **(N/A)**
	Any recommended diet should be consistent with other healthy eating advice. Strict diets are not appropriate for children and adolescents except in rare occasions where combined with specialist supervision and intensive follow-up **(good practice point)**
	As part of a specialist weight management programme in the USA, targeting sedentary behaviour (watching television, playing computer games, imaginative play, talking on the telephone and playing board games) was shown to be as effective as promoting physical activity in managing weight in obese children aged 8-12 years **(1+)**
	As part of a specialist weight management programme in the USA, lifestyle exercise (e.g. walking or cycling to school, walking up and down the stairs, walking at lunch) was shown to be more effective than aerobic and calisthenics exercise (light exercises designed to promote general fitness) in maintaining weight loss in obese children aged 8-12 years **(1+)**
	In specialist weight management programmes, behavioural treatment combined with physical activity and/or diet is effective in the treatment of obese children and adolescents aged 3-18 years **(1++)**
	In specialist weight management programmes behavioural treatment can be more effective if parents, rather than children (aged 6 to 16 years), are given the main responsibility for behaviour change **(1++)**
	There is no evidence on which components of behavioural treatment are the most effective for childhood and adolescent obesity **(N/A)**
Outcomes other than weight loss (from trials that reported weight loss)	As part of specialist weight management programmes, physical activity can improve levels of fitness in obese children aged 8-12 years **(1+)**
	There is conflicting evidence on whether weight management programmes improve HDL and LDL cholesterol, and triglyceride levels in obese children **(1++)**
	There is conflicting evidence on whether weight management programmes improve diastolic and systolic blood pressure in obese children **(1-)**
	Specialist weight management programmes including diet and physical activity can improve the eating behaviour of 8-12-year-old obese children **(1++)**
	In specialist weight management programmes, behavioural treatment can have a positive effect on dietary quality **(1++)**
	In a specialist weight management programme targeting black adolescent girls aged 12-16 years, behavioural treatment improved self-esteem and feelings of depression **(1+)**
	In specialist weight management programmes, behavioural treatment can improve self-control in regard to weight-related behaviours in children aged 5-13 years **(1+)**

For the Key to the levels of evidence (1++, 1+, 1 etc), see page 126.

	In specialist weight control programmes, decrease in weight loss was associated with a decrease in consumption of 'red foods' in obese children aged 6-12 years **(1+)**
	Inpatient weight management programmes, with cognitive behaviour therapy, can improve quality of life over time in obese children and adolescents aged 9-19 years **(1+)**
Harms (from trials that reported weight loss)	Both a protein-sparing modified diet and a hypo-caloric balanced diet delivered in a school and outpatient programme setting can produce mild to moderate side effects such as: fatigue, weakness, muscle cramps, bad breath, headaches and abdominal pain in obese children aged 7-16 years **(2+)**

Evidence of harm in children and adolescents who undergo weight management/maintenance programmes

INTERVENTION	EVIDENCE
Harms (from trials that reported weight loss)	There is no evidence to suggest that professionally administered weight management programmes for children and adolescents increase the likelihood of developing eating disorders or cause psychological harm **(2+)**
	There is no evidence to suggest that professionally administered weight management programmes for children and adolescents have a negative impact on growth or lean mass loss **(2-)**
	There is no evidence to suggest that professionally administered weight management programmes for children and adolescents have a negative impact on psychosocial well-being **(2+)**
Generalisability (from trials that reported weight loss)	Generalisability of the findings remains unclear, as no study was conducted in the UK and the majority of the studies were based in highly specialised research settings **(N/A)**
	Generalisability of the findings is hindered by the methodological limitations of the retrieved studies **(N/A)**

Evidence of effectiveness of diet interventions for weight loss in adults

INTERVENTION	EVIDENCE	
General	Energy balance is critical to weight loss. Caloric expenditure must exceed caloric intake **(2++)**	
Weight loss	600 kcal deficit diet or low-fat diet	Overall, a 600kcal deficit diet is effective for weight loss: a change of approximately –5kg compared with usual care at 12 months **(1++)**
		Overall, a low-fat diet is as effective for weight loss as other diets (with the same calorie content): a change of approximately 0.5kg compared with other diets at 12 months **(1++)**
	Low-calorie diet (1000-1600 kcal/day)	Overall, a low-calorie diet is effective for weight loss: a change of approximately –6kg compared with usual care at 12 months **(1+)**
		Overall, a low-calorie diet is as effective for weight loss as a 600kcal deficit diet: a change of approximately +1kg (range +1.63kg to +0.20kg) compared with usual care at 12 months **(1+)**
		One study showed that a low-calorie diet resulted in a (non-significant) weight change of +0.30kg compared with a very-low-fat diet at 12 months **(1+)**

For the Key to the levels of evidence (1++, 1+, 1 etc), see page 126.

Weight loss continued	Very low calorie diet (<1000 kcal/day)	One study showed that a very low calorie diet (420kcal per day), for a limited period of 12 weeks, resulted in a (non-significant) weight change of –4.70kg compared with a 600 kcal deficit diet or low-fat diet at 24 months **(1+)**
		Overall, a 800kcal/day very low calorie diet (used for 4 days a week, in conjunction with a 1200kcal/day low-calorie diet) is as effective for weight loss as a continuous low-calorie diet: a change of approximately 0kg (range +3.52kg to –3.56kg) compared with a low-calorie diet at 12 months
		Overall, a 750kcal/day maximum very low calorie diet (used for 2 days a week, in conjunction with an individualised low-calorie diet of weight in lbs x 12 – 1000kcal) is as effective for weight loss as a continuous low-calorie diet: a change of approximately 0kg (range +2.11kg to –2.33kg) compared with a low-calorie diet at 12 months
		Overall, a very low calorie diet (800kcal/day for 8 weeks) is as effective for weight loss as a continuous low-calorie diet for 8 weeks: a change of approximately 1.13kg (range +3.06kg to –5.32kg) compared with a low-calorie diet at 18 months **(1++)**
	Protein sparing modified fast (PSMF) (carbohydrate content of 40g or less)	Overall, a PSMF (food-based, with a calorie content in the range of 1400-1900kcal/day) is as effective for weight loss as a 600kcal deficit diet or low-fat diet: a change of approximately –0.5kg compared with a 600kcal deficit diet or low-fat diet at 12 months **(1++)**
		Overall, a PSMF (based on food or very low calorie diet) is as effective for weight loss as low-calorie diet: a change of approximately –0.6kg compared with low-calorie diet at 12 months **(1++)**
		Overall, an 8-week PSMF (based on food with a calorie content of 1000kcal/day) is as effective for weight loss as an 8-week very low calorie diet (420kcal/day) PSMF: a change of approximately +1.5kg (range +3.76kg to –0.20 kg) compared with low-calorie diet at 18 months **(1++)**
		One study showed that a PSMF (based on food, calorie content 1700–1800kcal/day), resulted in a weight change of +1.20kg compared with a very-low-fat diet at 12 months **(1+)**
	High protein diet	One study showed that a high-protein diet (25% of energy from protein, low glycaemic index), resulted in a (non-significant) weight change of –1.90kg compared with a standard/medium-protein diet (12% of energy from protein, high glycaemic index) at 12 months **(1+)**
	There is not enough evidence to compare the use of diets in populations with specific co-morbidities **(N/A)**	
	The effectiveness of all diets appears to change over time, with a trend for greater weight loss in the short term (up to 12 months), with a reduction in overall weight loss in the longer term (up to 60 months) **(1++)**	
Generalisability	Only two studies were conducted solely in the UK, with the majority of studies done in the USA. It is difficult to know how generalisable the results of the included studies are to the UK population, particularly in primary care **(1++)**	
	From the included studies, the duration of intervention varied considerably and the rate of follow-up varied **(1++)**	
	Dietary advice and support were provided most often by a dietitian. Other personnel who delivered interventions were physicians, research nurses, health educators, graduate students, diet group leaders, experts in nutritional counselling and behavioural therapists **(1++)**	
	One assumption could be that the effect size achieved in the included studies may be smaller, in practice, in a less motivated, non-volunteer population and less intensive follow-up delivered by generalists **(N/A)**	

For the Key to the levels of evidence (1++, 1+, 1 etc), see page 126.

Evidence of effectiveness of behaviour therapy (with or without diet) interventions for weight loss in adults

INTERVENTION	EVIDENCE
Weight loss	Overall, a combination of active support for diet (very low calorie diet or low-calorie diet) and behaviour therapy (problem solving, relapse prevention, stimulus control, dealing with problem situations, assertion, behaviour chain analysis) is effective for weight loss: a change of approximately –4kg compared with a passive approach (advice or self-help) at 12 months **(1++)**
	One study showed a combination of active support for a very low calorie diet and behaviour therapy resulted in weight change of –5.20kg compared with a passive approach (advice or self-help) at 12 months **(1+)**
	One study showed a combination of diet and behaviour therapy (self-monitoring, goal setting, cognitive restructuring, problem solving, and environmental management) resulted in weight change of –3.51kg compared to a healthy lifestyle information at 18 months **(1+)**
	Overall, a combination of diet (low-calorie diet and PSMF 400-500kcal/day food based) and behaviour therapy (cue avoidance, self-monitoring, stimulus control, slowing rate of eating, social support, planning, problem solving, assertiveness, cognitive restructuring, modifying thoughts, reinforcement of changes, relapse prevention, strategies for dealing with weight gain) is effective for weight loss: a change of approximately –7.6kg compared with diet alone at 12 months **(1+)**
	One study showed a combination of a PSMF diet (400–500 kcal/day based on food) and behaviour therapy resulted in weight change of –8.19kg compared with diet alone at 12 months **(1+)**
	One study showed a combination of intensive behaviour therapy and very low calorie diet (combination of 200 or 800kcal/day and 600kcal/day deficit) resulted in weight change of –1.18kg compared with a less intensive approach at 12 months **(1+)**
	One study showed a combination of 20 weeks' behaviour therapy (self-monitoring, goal setting, stimulus control) with a low-calorie diet and physical activity followed by 12 months of relapse prevention training was less effective compared with a combination of the 20 weeks' programme followed by 12 months of group problem solving **(1+)**
	Involving family members (usually spouses) in behavioural treatment programmes can be more effective for weight loss than targeting the overweight individual only. Overall, involving family members (in the same sessions as the individual) is effective for weight loss: a change of approximately –2.96kg compared with the individual alone at 12 months **(1++)**
	Group behavioural programmes do not result in a greater weight loss than behavioural programmes aimed at individuals at 12 months. At 24 months, one study showed that group intervention resulted in a significant weight difference of +8.10kg compared to the individual alone. Absolute weight changes were –4.20kg for the group compared with –12.30kg for individual intervention. This difference was not maintained at 60 months **(1++)**
	The effectiveness of all interventions appears to change over time, with a trend for greater weight loss in the short term (up to 12 months), with a reduction in overall weight loss in the longer term (up to 60 months) **(1++)**
Generalisability	Only two studies were conducted solely in the UK, with the majority of studies done in the US. It is difficult to know how generalisable the results of the included studies are to the UK population, particularly in primary care **(1++)**
	From the included studies, the duration of intervention varied considerably and the rate of follow-up varied **(1++)**

For the Key to the levels of evidence (1++, 1+, 1 etc), see page 126.

	Behaviour therapy and additional support was provided most often by a dietitian and/or people with behavioural treatment or psychological expertise. Other personnel who delivered interventions were physicians, physiotherapists, health educators, graduate students, occupational therapist, and specially trained GPs **(1++)**
	One assumption could be that the effect size achieved in the included studies may be smaller, in practice, in a less motivated, non-volunteer population and less intensive follow-up, delivered by generalists **(N/A)**

Evidence of effectiveness of physical activity (alone or in combination with diet or behaviour therapy) interventions for weight loss in adults

INTERVENTION	EVIDENCE
Weight loss	Overall, physical activity (minimum of 30 minutes three times a week) is effective for weight loss: a change of approximately –3kg compared to no treatment at 12 months **(1++)**
	One study showed physical activity (60 minutes three times a week) resulted in a weight change of –2.36kg compared with information at 18 months **(1+)**
	Overall, physical activity alone (minimum of 30 minutes three times a week) was less effective for weight loss than diet alone at 12 months: a change of +3kg **(1++)**
	Overall, physical activity (minimum of 45 minutes three times a week) and diet (600kcal/deficit or low fat) is effective for weight loss: a change of approximately –7kg compared with no treatment at 12 months **(1++)**
	One study showed a combination of physical activity (30 minutes of moderate exercise daily plus supervised resistance training twice a week) and diet (classified as calorie deficit) resulted in weight change of –3.50kg compared with information at 12 months **(1+)**
	Overall, physical activity (minimum of 45 minutes three times a week) and diet (600kcal/deficit or low fat) is effective for weight loss: a change of approximately –1.95kg compared to diet alone at 12 months **(1++)**
	Overall, a combination of physical activity (varying in level from three to four sessions over 12 months to 30-45 minutes four to five times week), behaviour therapy (situational control, including cue avoidance, self-monitoring of calorie intake, eating behaviours and pulse rate, management of eating behaviours, relapse prevention, goal setting, cognitive reframing and coping imagery, stimulus control, social assertion, reinforcement techniques for enhancing motivation, cognitive strategies for replacing negative thinking with more positive statements and constructive self-statements), and diet (either calorie deficit or a low-calorie diet) is effective for weight loss: a change of –4.22kg compared with control (no treatment) at 12 months **(1++)**
	Overall, a combination of physical activity (minimum 150 minutes per week), behaviour therapy (behaviour change goals and problem solving, goal setting, menu planning, self-efficacy, consideration of body image, social support, social eating, removing road blocks, positive thinking, dealing with high-risk situations and slips, cue elimination, stress management and relapse prevention, self-monitoring, problem solving, managing cues, stimulus control, positive assertion, positive thinking, holiday eating, social support, motivation, role playing, modelling food tasting and grocery store tours) and diet (either calorie deficit or a very low calorie diet) is effective for weight loss: a change of –3.82kg compared with information alone **(1++)**
	One study showed a combination of physical activity (individualised level), behaviour therapy (self-monitoring, stimulus control, reinforcement, cognitive change), and diet (calorie deficit) was associated with a summary estimate of weight change of –5.80kg compared with behaviour therapy (enhancing body acceptance, disentangling self-worth from weight, barriers transformation, increased support and assertion, self-monitoring) alone **(1+)**

For the Key to the levels of evidence (1++, 1+, 1 etc), see page 126.

	One study showed a combination of physical activity (approximately 45 minutes five times a week maximum), behaviour therapy (stimulus control, problem solving, reducing barriers, exercising in different weather conditions), and diet (very low calorie diet 800-1000kcal/day and 1200-1500kcal for maintenance) was associated with a summary estimate of weight change of –7.00kg compared with physical activity and behaviour therapy **(1+)**
	Other benefits of physical activity (alone or in combination) include delay of onset of diabetes in people with impaired glucose tolerance; increased motility in older people with arthritis; reduction in the risk of developing hypertension and other cardiovascular events; reduction in medication use for comorbidities and improved quality of life **(1++)**
Generalisability	No studies were conducted in the UK, and 26 of the 33 unique studies were based in the USA. It is difficult to know how generalisable the results of the included studies are to the UK population, particularly in primary care **(1++)**
	From the included studies, the duration of intervention varied considerably and the rate of follow-up varied **(1++)**
	A wide variety of personnel delivered the different components of the interventions; this included physicians, researchers, health educators, graduate students, exercise coaches, trained interventionists, dietitians, commercial services (physical activity), and psychologists **(1++)**
	One assumption could be that the effect size achieved in the included studies may be smaller, in practice, in a less motivated, non-volunteer population and less intensive follow-up, delivered by generalists **(N/A)**
	The intensity and duration of exercise required to impact on long-term weight loss may be much higher than recommended in most behavioural treatment programmes **(1++)**

References

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For the Key to the levels of evidence (1++, 1+, 1 etc), see page 126.