What is the most effective way to maintain weight loss in adults?

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Although weight loss is achievable for many adults, weight maintenance is elusive. After completing weight loss programmes, around a third of the weight lost is regained in the following year, with small differences between groups that received an intervention and control.1 Randomised controlled trials have suggested that maintenance interventions can improve longer term weight loss maintenance2 3 but it is unclear what form these interventions should take and how they should be delivered. NICE guidance4 currently recommends a low fat, fibre rich diet, increasing physical activity, minimising sedentary activities and regular self monitoring of weight or waist size.

What is the evidence of the uncertainty?

We searched PubMed, the Cochrane Library, and PsychInfo to identify clinical trials or systematic reviews using the search terms: “weight loss maintenance”, “maintain* weight loss” and “overweight”, “obes*”. We excluded trials targeting pregnant women and patients with an eating disorder. We included trials with a distinct focus on maintenance of weight already lost, as well as those that included long term weight loss with at least a year of follow-up. This approach was in line with US Institute of Medicine guidance,1 which defines successful long term weight loss as losing at least 5% of body weight for at least one year. After reviewing abstracts of 918 papers we identified 67 potentially relevant published trials and 12 systematic reviews or meta-analyses. Four additional systematic reviews were identified from reference list searches.

Lifestyle and behavioural interventions

Lifestyle and behavioural changes are key to weight loss maintenance. A systematic review and meta-analysis of 30 randomised controlled trials, most of which included behavioural plus other strategies (13 on diet alone, four on diet and exercise, four on exercise alone, seven on meal replacements, and two on very low energy diets) found that diet alone, diet and exercise, and meal replacements led to weight loss already lost, as well as those that included long term weight loss with at least a year of follow-up. This approach was in line with US Institute of Medicine guidance,1 which defines successful long term weight loss as losing at least 5% of body weight for at least one year. After reviewing abstracts of 918 papers we identified 67 potentially relevant published trials and 12 systematic reviews or meta-analyses. Four additional systematic reviews were identified from reference list searches.

Web based interventions

There is evidence that web based interventions may be useful in weight loss maintenance. A large, well designed, three arm randomised controlled trial comparing monthly personal contact, unlimited access to an interactive technology based intervention, or self directed control found that weight regain was significantly lower in the interactive technology group than in the self directed group at 18 and 24 months, but not at 30 months. Some weight loss maintenance benefit was obtained from monthly personal contact. Another well conducted trial found that the proportion of participants who regained 2.3 kg or more over 18 month follow-up was significantly higher in controls than in groups assigned to face-to-face support or internet support (72.6%; 45.7%; 54.8%, respectively).1

A systematic review of five studies (rated moderate quality) suggests that web based interventions are about as effective as face-to-face interventions and higher website use may be associated with weight loss maintenance,10 but further research is needed as the evidence is limited.

There is heterogeneity in the results of trials exploring type of diet. A meta-analysis of five trials found no differences between low carbohydrate and low fat diets at 12 months.8 A systematic review of 14 randomised controlled trials found that low fat, 600 kcal deficit, or low calorie diets were associated with weight loss at 12, 24, and 36 months.9

There is limited evidence about the type or amount of exercise required for weight loss maintenance. A systematic review including 11 randomised controlled trials and 35 prospective or non-randomised studies concluded that higher levels of physical activity may be associated with weight loss maintenance, but this is difficult to maintain in the longer term.10 Secondary analyses of one well designed trial found individuals reporting higher levels of physical activity (275 mins per week) were better able to maintain 10% weight loss at 24 months.11

Most trials included in these reviews, however, are of poor or moderate quality, often with high attrition, inadequate reporting of randomisation processes or blinding, and lack of intention to treat analyses.

The majority of the trials in the reviews included elements of behaviour therapy as part of the intervention, alongside other elements like dietary change, but the effects of these elements are not teased out. Behavioural interventions that have been specifically assessed in high quality randomised controlled trials and shown to offer significant benefit for weight loss maintenance are peer or social support,2 frequent continued professional support,2 3 behavioural methods like goal setting,3 problem solving,3 2 relapse prevention,3 self monitoring,2 and daily self weighing.2

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Anti-obesity medication
A Cochrane review of 30 randomised controlled trials suggests that compared with placebo, orlistat, rimonabant, and sibutramine may be moderately effective for weight loss maintenance. However, sibutramine has been withdrawn from the world market and a study of rimonabant was halted because of psychiatric side effects. The only drug approved worldwide for treating obesity is orlistat. A meta-analysis of 12 randomised controlled trials indicates that orlistat conferred an advantage above diet alone of 3.1 kg weight loss (standard deviation 10.5) at 24 months. Another systematic review of 12 clinical trials found that orlistat plus dietary or lifestyle intervention resulted in 3-10 kg loss after 12 to 24 months and increased the odds of attaining 5% weight loss or greater at 24 months. However, studies suffer from high attrition rates—on average between 30-50%—highly selected patient populations, inadequate description of randomisation, and few use intention to treat analyses. There is a need for a better designed, longer term evaluation of orlistat, as well as other potentially useful medications.

Bariatric surgery
A systematic review of the clinical and cost effectiveness of bariatric surgery in obese adults concluded that bariatric surgery is more effective than non-surgical options for weight loss. Two of the trials reported that weight loss was significantly higher in the surgery group at two year follow-up (20% and 21% versus 1.4% and 5.5%). Surgery is, however, associated with adverse effects, including postoperative mortality. Most of the trials included in this review had an uncertain risk of bias, only five out of 23 reported adequate allocation concealment, and most did not report whether those assessing outcome were blinded. NICE guidance suggests that bariatric surgery should be first line for those with a body mass index over 50, and should be considered for adults with a BMI of over 40—and for those with a BMI between 35 and 40 if they have another disease that could be improved by weight loss (all other appropriate methods of weight loss should have been tried for at least six months).

Is ongoing research likely to provide relevant evidence?
We searched controlled-trials.com/mrct and identified 18 relevant ongoing trials. The evidence base is equivocal and many questions remain unanswered in relation to weight loss maintenance.

Current ongoing randomised controlled trials will attempt to answer some of these questions. These include an evaluation of the level of activity (www.controlled-trials.com/mrct/trial/427141/wyatt), a few trials of specific psychological interventions such as mindfulness based therapy (www.controlled-trials.com/mrct/trial/1051017/wolvere), and others of less intensive—and thus less costly—interventions such as telephone (www.controlled-trials.com/mrct/trial/452607/sherwood) or web based interventions. A combination of interventions appears most effective, and trials that are based on theories of behaviour change are more likely to be able to identify active components. The Weight Loss Maintenance in Adults trial (www.hta.ac.uk/project/2083.asp) is one such trial. This three arm trial (comparing intensive, less intensive, and control) is evaluating whether motivational interviewing with self monitoring and peer support is effective in maintaining weight at three year follow-up.

What should we do in the light of uncertainty?
Evidence from trials is often contradictory; they are heterogeneous in terms of setting, length of follow-up, and type and duration of intervention, and many have methodological flaws. This makes it difficult to draw conclusions about what works in weight loss maintenance. High levels of attrition are problematic in these long term trials, and this is likely to be associated with weight loss maintenance failure. The issue of translation of trial findings to clinical practice is also problematic, not least because trial recruits are likely to be highly selected and more motivated than the general population. However, current evidence indicates that these interventions are likely to be helpful:

Ongoing regular support/follow-up;
Behavioural techniques such as goal setting, relapse prevention, self monitoring of weight, as well as diet and physical activity;
Increase in physical activity levels, alongside a moderately calorie reduced diet;
A lower fat, higher protein diet;
A low energy diet (600 kcal deficit); orlistat in the short term; however, patients need to develop healthy lifestyles for successful weight loss maintenance;
Bariatric surgery for appropriate patients.

Obesity should be viewed as a chronic condition for which longer term support is needed. The development of healthy habits is crucial for weight loss maintenance and weight loss can be maintained only by behaviours that fit with individual lifestyles, motivations, and preferences.

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Competing interests: All authors have completed the ICMJE uniform disclosure form at www.icmje.org/coi_disclosure.pdf (available on request from the corresponding author) and declare: no support from any organisation for the submitted work; no financial relationships with any organisations that might have an interest in the submitted work in the previous three years; no other relationships or activities that could appear to have influenced the submitted work other than SaS is the Chief Investigator of the Weight Loss Maintenance in Adults trial, CS is a Co-Investigator and RMCh is the Trial Manager.

Provenance and peer review: Commissioned; externally peer reviewed.


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This man struggled with a gambling addiction for some years before eventually seeking help. He describes how his condition seriously affected his relationship with his partner and talks about the treatment that finally helped him to stop gambling.

I graduated from King’s College, London with a BSc in human biology so I’m not a stupid man, and I’m aware of some of the psychobiological science behind addiction. Despite this, I am evidently capable of stupid acts; illogical, irrational, and emotional acts that undermined my future, my relationship, my family.

I’m 32. I am a financial services head hunter—a well paid job if it goes well but risky too as deals that would generate big fees often fail at the last minute, beyond my control.

I have a love-hate relationship with this type of stress as it’s 24 hour but also exciting and full of possibilities. The clients and candidates I mix with often run global franchises and earn millions, and this rarefied environment became the norm I aspired to. I undervalued what I had in my life (for example, health, family, relationships, job) and became the norm I aspired to. I undervalued what I had in my life (for example, health, family, relationships, job) and

I was happy to have us in the game. Sometimes we’d have a financial party where you could win all the money you invested in the stock market. My brother and I started to play on the fruit machines. My brother had a system relating to the sound the coins made and how his condition seriously affected his family. He describes addiction for some years before eventually seeking help. He describes how his condition seriously affected his relationship with his partner and talks about the treatment that finally helped him to stop gambling.

A PATIENT’S JOURNEY

Gambling addiction

Anonymous, Henrietta Bowden-Jones, Sanju George

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My earliest memory of gambling is playing the children’s card game “top trumps” at primary school, in which the winner takes all. As a child I spent a lot of time at a working men’s club where my alcoholic father took my brother and me. In a large smoky room, we’d play 20p stake dominos with Frank, “Doughnut” (the baker), and their old cronies. They were happy to have us in the game. Sometimes we’d win and they’d complain that kids shouldn’t be gambling. It was all light-hearted and is a fond memory. Later, my brother and I started to play on the fruit machines. My brother had a system relating to the sound the coins made in the tubes that signalled a “payout window,” and a specific route of pubs he’d visit with the same type of machine.
A DOCTOR’S PERSPECTIVE

Gambling
Gambling can be described as putting something, usually money, at risk, in the hope of gaining something of greater value. It is a pastime engaged in by 73% of British adults. For a small minority (0.9%) it can develop into a problem, known as problem gambling (box 1). Gambling behaviours, like alcohol use, exist on a scale of escalating severity and adverse consequences, ranging from social and recreational gambling, through “at risk” gambling and problem gambling, to gambling addiction. Gambling addiction can negatively affect the individual (physical problems such as stress related symptoms or conditions, and psychiatric problems such as depression, anxiety spectrum disorders, and substance misuse), their family (for example, relationship problems, domestic violence, neglect of children), and wider society (crime, absenteeism from work, and so on).

Detecting the problem
Problem gamblers are very reluctant to seek help because of a fear of stigma or because of guilt and shame about the gambling behaviour and its consequences. In requesting help, they present more often to non-specialists than specialists and they do so with “non-direct” presentations such as physical symptoms, psychiatric complaints, financial difficulties, legal problems or domestic violence. This, coupled with healthcare professionals’ lack of awareness and knowledge of the disorder, often leads to gamblers going undetected, and their problems remaining unaddressed. It has been described as the “hidden addiction” for these reasons. We suggest a consistent screening of these “high risk” patient groups: those presenting with non-specific physical complaints and stress related symptoms; those with psychiatric conditions such as depression, anxiety, and alcohol misuse; those who commit domestic violence; and those with financial difficulties. Various questionnaires are available to screen for gambling but we suggest the Lie/Bet screening tool because of its brevity. The Lie/Bet screen is a two question screening instrument; the questions are “Have you ever felt the need to bet more and more money?” and “Have you ever had to lie to people important to you about how much you gamble?” A positive response to either question identifies a person who is likely to be a problem gambler.

Interventions
Very effective, evidence based brief interventions for problem gambling, similar to those used in alcohol misuse, can easily be delivered in 5 to 10 minutes by non-specialists. Where resources or expertise do not permit this, refer patients to specialist gambling treatment services (box 2); patients can also self refer to these agencies. Psychological treatments (one to one or in groups) are the cornerstone of treating gambling problems, with cognitive behavioural therapy being the most commonly and effectively used. Gamblers Anonymous, a self help group modelled on Alcoholics Anonymous, is another widely available source of psychological treatment. Pharmacotherapy still has only a small role in the treatment of this condition: although selective serotonin reuptake inhibitors, mood stabilisers, and naltrexone have all been tried with some success, no drug is licensed yet for the treatment of pathological gamblers in the UK. However, the National Problem Gambling Clinic will begin prescribing naltrexone from 2012 as part of its evidence based practice.

The Responsible Gambling Fund (www.rgfund.org.uk), the major commissioning body for gambling research, education, harm prevention, and treatment in Britain has recently funded the Royal College of General Practitioners to train general practitioners to support patients with gambling problems; for further information contact the royal college (rcgp.org.uk). The Responsible Gambling Fund also funds both the National Problem Gambling Clinic, the first NHS multidisciplinary treatment service specifically set up to treat pathological gamblers, and Gamcare, the charity that delivers counselling to problem gamblers across the UK.

Henrietta Bowden-Jones, consultant psychiatrist

As an adult and as part of my job I would sometimes go to casinos with colleagues and clients. I enjoyed those times. Casinos have an attractive air of wealth and success. A mix of decadent relaxation and stress relief, they are also exciting and full of possibilities. I started gambling more and more. My gambling cycle was as follows:

Lose, chase a loss, lose again—then I’d feel awful, angry, disappointed; I’d lie and deceive to cover up the loss, which led to damaged self esteem and ego, depression, hopelessness, chronic anxiety, lack of focus on anything other than the issues around gambling losses, fear, loss of enjoyment in other things and so on.

Win some— but never as much as the total loss, so although I may have felt a very swift uplift in mood, it didn’t really feel good as I knew there was still a debt to service. What’s more, those wins would be either pocketed and returned another day or simply bet again there and then and lost.

Return to the casino—to repeat the same cycle of warped logic that I could “win” back the losses. Gambling quickly became no longer a bit of fun but a means to an end—the only way to get back to zero. I didn’t feel special anymore. I wanted only sanitary transactions—sit, bet, win, leave. There was no interaction with the croupier, no stories with fellow gamblers, just the job of winning it back. My bets would start small and increase without a discernible strategy. Most of the time I felt numb, emotionless, and robotic. At other times I felt depressed and “doomed to lose” but irrationally felt that it was the only way out of this mess and so continued on to the inevitable outcome.

I risked as much as I could. I lied to myself and my partner and spent our money as though it was my own. I unilaterally made decisions that materially affected our lives and led my partner to make painful decisions, like canceling our wedding. I knew what she didn’t know: that I’d spent our money and owed large sums on credit cards. I could think of nothing else. I woke up and the first thing I thought about was the debts and the lies. Daily conversations inevitably revolve around money, either directly or through its requirement to do things: visiting family, shopping for food, drinking with friends, travelling to work, and so on. I desperately tried to avoid conversations with any connection to money. I longed for each day to end so I could go to sleep and just get through it.
I became utterly deceitful. I changed our joint account to online banking so nothing was sent to our home address. I made my partner feel bad about opening anything addressed to me in case she accidentally found one of the statements that was sent to me at home. When we went shopping I’d send her off to get something so I could pay for the shopping on a credit card while she was away as I knew my bank card would be rejected.

Within a few years I ended up with £28 000 of debts. That doesn’t include interest paid on credit card balances, overdraft fees and breach charges, 0% credit card transfer fees, and so on. So the number is probably closer to double that. I reached the point where I couldn’t afford to gamble anymore. I was forced to disclose the depth of the situation and my lies to my partner.

Once I’d told her of the debts, I felt a sense of relief. Needless to say there was a whole panoply of emotions. Good days. Bad days. Sometimes tears, sometimes shouting, sometimes nothing—and everything in between. She didn’t leave me. She came very close to doing so and still questions if she should fear for becoming an enabler of a problem, but we’re together for now.

I wanted to do everything I could to rectify the situation for the benefit of my relationship and myself. I went online and found Gamblers Anonymous. It was encouraging to read comments on forums describing similar experiences and familiar thoughts and feelings. I booked a date to attend one of their meetings. Sadly, that wasn’t a wholly positive experience for me. I met a large number of people (60 or so), but it felt a bit religious/cultish. There was definitely unspoken peer pressure to conform to their way, which is a little too attractive to people addicted to that kind of rehabilitation environment, I believe. However, I met a couple of people who left a real impression on me, and I learnt a couple of key points that stick in my mind as proving useful in my own journey. One of those is, “I cannot win if I cannot stop,” a thoroughly rational, objective view, of which I’m always mindful. The other was the Gamblers Anonymous motto, which is essentially “Change the things you can, ignore the things you can’t, and understand the difference.” This has implications in life generally aside from just gambling rehabilitation, and it strikes a chord in me. It makes me feel powerful and potent enough to make significant changes for the better but rational enough to focus only on those things I can change.

Still searching the internet for ways to understand and approach a gambling problem, I found a self referral link to the eight session cognitive behavioural therapy (CBT) group at the gambling clinic in London. As I have a basic understanding of CBT and neurolinguistic programming this appealed to me and I approached the clinic. Following an interview I was accepted on to the course, learnt strategies, and built a toolkit to understand stimuli, impulse control, defining positive alternatives to gambling, and so on.

This pragmatic and forward looking “what now?” approach has proved to be wholly complementary to the retrospective “why?” approach that psychotherapy has offered so far. Now I’ve gone 10 weeks without gambling and, for me, the clinic defines the “change the things you can” part of the motto. This clearly illustrates that things can be changed by the individual, but the clinic also offers practical advice on what the key things to change may be and what techniques can be used to break old patterns and create new, positive ones. The rest, the hard work, as always, is up to me.

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ANSWERS TO ENDGAMES, p 50 For long answers go to the Education channel on bmj.com

STATISTICAL QUESTION
The Hawthorne effect
Answer a is the correct answer.

PICTURE QUIZ
An incidental finding in a preoperative chest radiograph

1 The Eastern Co-operative Oncology Group/World Health Organization performance status is used widely in patients with cancer to measure their general wellbeing and ability to perform (or otherwise) daily living activities.
2 Subcarinal lymphadenopathy and a soft tissue mass in the left lower lobe abutting the visceral pleura.
3 The main differential diagnoses of mediastinal lymphadenopathy in a patient with a peripheral lung lesion are primary lung cancer, metastasis from another primary site, lymphoma, and tuberculosis. In this patient, primary lung cancer and metastatic colon cancer were the two main conditions to consider.
4 Transbronchial needle aspiration of the subcarinal lymph node—possibly aided by endobronchial ultrasound—permits both tissue diagnosis and staging during one procedure.

CASE REPORT
A man with deteriorating ability to live independently

1 Huntington’s disease.
2 Autosomal dominant inheritance (of an expanded CAG repeat in the Huntington gene on chromosome 4).
3 This patient displays both behavioural and motor features of Huntington’s disease. These include obsessive-compulsive symptoms, lack of motivation (seen in his tendency to sit on the sofa all day), cognitive impairment (seen in the impaired mini-mental state examination), and involuntary arm movements (which could be either chorea or dystonia). The lack of motivation could be caused by depression or apathy, both of which are common in Huntington’s disease.
4 Atrophy of the striatum (caudate and putamen) bilaterally.