



BMJ Open Psychotherapy versus treatment as usual and other control interventions in children and adolescents with overweight and obesity: a protocol for systematic review with meta-analysis and Trial Sequential Analysis

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ABSTRACT

Introduction The prevalence of children with overweight and obesity is increasing worldwide. Multicomponent interventions incorporating diet, physical activity and behavioural change have shown limited improvement to body mass index (BMI). However, the impact of psychotherapy is poorly explored. This systematic review aims to assess the effects of psychotherapeutic approaches for children with all degrees of overweight.

Methods and analysis We will include randomised clinical trials involving children and adolescents between 0 and 18 years with overweight and obesity, irrespective of publication type, year, status or language up to April 2020. Psychotherapy will be compared with no intervention; wait list control; treatment as usual; sham psychotherapy or pharmaceutical placebo. The following databases will be searched: Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, MEDLINE, Embase, PsycINFO, PubMed, Web of Science, CINAHL and LILACS. Primary outcomes will be BMI z-score, quality of life measured by a validated scale and proportion of patients with serious adverse events. Secondary outcomes will be body weight, self-esteem, anxiety, depression and proportion of patients with non-serious adverse events. Exploratory outcomes will be body fat, muscle mass and serious adverse events. Study inclusion, data extraction and bias risk assessments will be conducted independently by at least two authors. We will assess risk of bias according to Cochrane guidelines and the Cochrane Effective Practice and Organisation of Care guidance. We will use meta-analysis and control risks of random errors with Trial Sequential Analysis. The quality of the evidence will be assessed using Grading of Recommendations Assessment, Development and Evaluation Tool. The systematic review will be reported according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses and Cochrane guidelines.

Ethics and dissemination As individual patient data will not be included, we do not require ethics approval. This review will be published in a peer review journal.

PROSPERO registration number CRD42018086458.

Strengths and limitations of the study

- This review will be the first systematic review of randomised controlled trials to investigate the benefits and harms of psychotherapy in children with overweight following Cochrane methodology.
- The review will perform meta-analysis, Trial Sequential Analysis and use Grading of Recommendations Assessment, Development and Evaluation Tool.
- This protocol has been registered on PROSPERO and aims to demonstrate a rigorous, methodical approach to our systematic review and thus reduce the risk of bias.
- We expect high heterogeneity across studies which may lead to challenges in performing a meta-analysis.
- It is anticipated that many papers will not provide sufficient details on all variables of interest and will lead to reliance on communication with corresponding authors for additional information.

INTRODUCTION

The prevalence of overweight is increasing worldwide both among children and adults irrespective of income.^{1–3} The rate of overweight in the paediatric population has risen worldwide over the last few decades⁴ despite significant resources being spent on reversing these trends. This widens health inequality, as the prevalence of children with overweight is higher in areas of social deprivation.⁵ Recent data from the WHO continues to show an increasing prevalence of children with obesity in Europe.^{6,7} The International Task Force of Obesity produced age-specific and sex-specific cut-off for the definition of overweight and obesity in children.⁸ Throughout

this paper, children and adolescents between 0 and 18 years will be referred to as children. Children with all degrees of overweight, including obese and morbidly obese, will be referred to as overweight in the remaining part of the paper.

Overweight has both short-term and long-term consequences on cardiovascular disease, type 2 diabetes, metabolic syndrome and cancer, resulting in a significant burden on health services across the world.⁹ The severity of these comorbidities typically increases with the severity of overweight.^{10–11} Mental health sequelae such as poor self-esteem, anxiety and depression may result in bullying, discrimination, long-term socioeconomic disadvantages and is often coupled with difficult family circumstances.^{12–16}

As such, psychological variables such as quality of life, self-esteem, life events, parental attitudes, eating disorders and anxiety need to be addressed in the long-term treatment of overweight and obesity. Psycho-education, cognitive behavioural therapy, solution-based therapy, including systemic therapy, and psychodynamic counselling are used.^{17–19}

Psychotherapeutic interventions

Psychotherapy is widely used in the management of children with overweight. It may support the child to change and maintain more weight-friendly habits while also potentially improving body image, self-esteem and social adaptation.²⁰ Several types of psychotherapy are used in the treatment of children with overweight. Solution-focused brief therapy might be an effective modality for weight management in children through helping them to use their inner resources.^{21–22} Motivational interviewing appears to be a beneficial communication tool for initiating and maintaining healthy habits and weight reduction through self-help or self-determination.^{23–27} Family therapy is a form of systemic therapy, widely used to treat children with overweight, often as part of multicomponent programmes.^{28–34} Cognitive-behavioural therapy is a very widely used form of psychotherapy that has been used to treat children with overweight.^{35–37} Group psychotherapy is an alternative to individual programmes for supporting weight loss in teenagers.^{36–38} Interpersonal therapy is most commonly used to treat low mood, depression and disordered eating with studies showing indications of its efficacy in decreasing the weight gain in teenage girls with overweight.^{39–41} Finally, psycho-dynamic therapy emphasises the systematic study of the psychological drivers that underlie human behaviour, feelings and emotions associated with weight gain.⁴² Psychotherapeutic approaches thus seek to support the child and their parents towards a healthier weight in the child.

Systematic reviews on interventions

The effects of interventions for children with overweight have been analysed recently in Cochrane reviews.^{43–45} Quality of life was included in only two of these reviews, showing no effects in children after the end of

intervention.^{44–45} A moderate improvement of health-related quality of life in the intervention groups was seen in older children ($p=0.01$), but the evidence was uncertain.^{44–45} In preschool children, multicomponent interventions showed reductions in body mass index (BMI) ($p<0.00001$) and improvements in some markers of quality of life.⁴³

Overall, systematic reviews have not shown that structured interventions in children with overweight are associated with an increased risk of depression or anxiety and may result in a mild reduction in symptoms.⁴⁶ Similarly, a very recent systematic review demonstrated that paediatric obesity treatment improves self-esteem and body image in the short and medium term. These findings may underpin improvements in other psychological outcomes.⁴⁷ However, a 5-year follow-up study in adolescents with morbid obesity who underwent bariatric surgery demonstrated no significant improvement in self-esteem.⁴⁸ Potentially, a small proportion of participants may be at risk of developing worsening pathology, which clinicians should monitor, while treatment of weight concerns should be considered within treatment plans for young people with depression and obesity.⁴⁶ Identification of these young people and provision of additional support may improve treatment outcomes while benefits to psychological well-being following treatment should be considered when assessing treatment success.

While previous reviews have commented upon the significant risk of bias in many studies, none of the earlier reviews have consistently assessed the risk of bias, the risk of random errors, or assessed the overall evidence certainty with Grading of Recommendations Assessment, Development and Evaluation (GRADE).^{49–58}

Objective

The objective of this systematic review will be to assess the benefits and harms of psychotherapy versus no intervention in children with all degrees of overweight (including all levels of obesity); wait list control; treatment as usual; sham psychotherapy or pharmaceutical placebo. Benefits will include a reduction of BMI z-score or body weight and quality of life while harms will include developing eating disorders.

METHODS AND ANALYSIS

This systematic review protocol has been developed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis Protocols (PRISMA-P) guidelines⁵⁹ (online supplemental additional file 1). We will assess the beneficial and harmful effects of psychotherapy for in children with overweight taking risks of bias (systematic errors), risks of play of chance (random errors), type of psychotherapy and control interventions and GRADE assessments into consideration.

Criteria for considering studies for this review

Types of studies

Randomised clinical trials irrespective of language, publication status, publication type or publication year will be searched for and include benefits and harms. We will follow Population, Intervention, Control and Outcomes (PICO) criteria as per the Cochrane Handbook for Systematic Reviews of Interventions for inclusion and exclusion criteria.⁶⁰ Eligible studies which are not published in English will be translated using Google translate. Authors will be contacted if necessary, for an English translation or for any clarification of their data. Data on harms from quasi-randomised studies, controlled clinical studies and other observational studies if retrieved from our searches for randomised clinical trials will be included. Such data will be described narratively as adverse events are rarely reported in randomised clinical trials while such observational studies may provide information on rare or late occurring adverse events.⁶¹

Types of participants

All children who are overweight (including all levels of obesity) up to 18 years of age. We will also include randomised clinical trials which include children and young adults below the age of 21 years. Children with associated co-morbidities, either physical or psychological secondary to overweight and obesity will be included.

Types of interventions

As the experimental intervention, we will include any type of solution-focused brief therapy, family therapy, cognitive behavioural therapy, interpersonal therapy or psycho-dynamic therapy as described in our introduction with the intention to treat children with overweight. The therapy can be delivered, face-to-face, either individually, delivered to parents only or in groups, in any setting. The control intervention can be no intervention; wait list control; treatment as usual; sham psychotherapy or pharmaceutical placebo.

There is no restriction as to who delivers the treatment or treatment duration. We will accept any co-intervention providing that they are planned to be delivered in similar fashion in both the experimental group and the control group.

Types of outcomes

We will assess all outcomes at baseline and then at two time points:

- ▶ End of intervention, as defined by trialist (our primary time point of interest).
- ▶ Maximum follow up.

Primary outcomes

1. BMI z-score (kg/m²).
2. Quality of life: as measured by a scale that has been validated for use in the target population.⁶²
3. Proportion of participants with one or more serious adverse events; that is, any untoward medical occurrence that results in death, is life-threatening, requires

hospitalisation or prolongation of existing hospitalisation, results in persistent or significant disability or incapacity.^{63 64}

Secondary outcomes

1. Body weight measured in kg.
2. Self-esteem.
3. Anxiety.
4. Depression.
5. Proportion of participants with at least one non-serious adverse event.^{63 64}

Exploratory outcomes

1. Body fat (%) measured by bioimpedance or dual energy X-ray absorptiometry.^{65 66}
2. Muscle mass (kg) via bioimpedance or dual energy X-ray absorptiometry.^{65 66}
3. Individual serious adverse events and individual adverse events not considered serious.

Search methods for identification of studies

Electronic searches

Searches will include literature up to April 2020. We will search the following databases: The Cochrane Library, MEDLINE, Excerpta Medica database (Embase), PsycINFO, Web of Science (SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCL, CCR-EXPANDED, IC), CINAHL and LILACS. Examples of keywords used in the search strategy will include: obesity, overweight, psychotherapy, BMI, weight gain, weight loss, hyperphagia and systematic review. Controlled descriptors will be included using MeSH. A preliminary search strategy for MEDLINE is enclosed as online supplemental additional file 2.

Searching other resources

We will search for trials or ongoing studies on the following resources:

- ▶ ClinicalTrials.gov (<http://www.clinicaltrials.gov>).
- ▶ Google Scholar (<https://scholar.google.com/>).
- ▶ European Medicine Agency (<http://www.ema.europa.eu/ema/>).
- ▶ United States Food and Drug Administration (<http://www.fda.gov>).
- ▶ Medicines and Healthcare Products Regulatory Agency (<https://www.gov.uk/government/organisations/medicines-and-healthcare-products-regulatory-agency>).
- ▶ The WHO International Clinical Trials Registry Platform (ICTRP) Search Portal (<http://www.who.int/>).
- ▶ Global Obesity Forum (previously International Association for the Study of Obesity) (<http://www.iaso.org>).
- ▶ European Association for the Study of Obesity (<http://easo.org>).

Keywords used in the search strategy

- ▶ Obesity.
- ▶ Overweight.
- ▶ Psychotherapy.

- ▶ BMI.
- ▶ Weight gain.
- ▶ Weight loss.
- ▶ Hyperphagia.
- ▶ Randomised clinical trial.

A preliminary search strategy for MEDLINE is enclosed as online supplemental additional file 2.

Data collection and analysis

Selection of studies

We will perform the review following the recommendations in the *Cochrane Handbook for Systematic Reviews of Interventions*.⁶⁰ The meta-analyses will be performed using Review Manager and Trial Sequential Analysis programme.^{67 68}

At least two authors will independently screen titles and abstracts using software Covidence,⁶⁹. They will retrieve all identified and relevant full-text publications after which two authors will independently screen the full text and identify and record reasons for exclusion of the ineligible studies. Disagreement will be resolved through discussion or by consulting a with a third author. Trial selection will be displayed in an adapted flow diagram as per the PRISMA statement. At least two authors will extract data. Disagreement will be resolved by discussing with a third author. We will assess duplicate publications and companion papers of a trial together.

Data extraction and management

Data extraction will be performed by at least two authors independently using software Covidence,⁶⁹ who will both compare the extracted data for primary, secondary and exploratory outcomes. Disagreements will be resolved by a third author. We will use Review Manager software to extract data.⁶⁴ For outcome data not reported in a usable manner, we will present this in a table outlining the characteristics of these studies using the following headings: Methods, Participants, Interventions, Outcomes and Notes described in chapter 4 (section 4.6.1) of the *Cochrane Handbook for Systematic Reviews of Interventions*.⁶⁰ Two review authors will independently transfer data into the Covidence. Disagreements will be resolved through discussion or by consulting a third author.

Assessment of risk of bias in included studies

The risk of bias of every included trial will be evaluated independently by at least two authors. In case of any disagreement, discrepancies will be discussed with a third author and resolved by consensus. Risk of bias will be assessed using Cochrane's 'Risk of bias' assessment tool and the Cochrane Effective Practice and Organisation of Care Group's guidance.^{70 71} We will evaluate the methodology in respect of:

- ▶ Random sequence generation.
- ▶ Allocation concealment.
- ▶ Blinding of participants and treatment providers.
- ▶ Blinding of outcome assessment.
- ▶ Incomplete outcome data.

- ▶ Selective outcome reporting.
- ▶ Other risks of bias.
- ▶ Overall risk of bias.

Classification of the trials will follow criteria defined in online supplemental additional file 3.

Meta-analysis

Data will be meta-analysed using RevMan V.5 statistical software.⁷² We will use STATA statistical software (STATA 2015) in case of zero event trials, where RevMan V.5 zero event handling is insufficient.^{73 74}

We will assess our intervention effects with random-effects model meta-analyses and fixed-effect model meta-analyses,^{75–77} using the more conservative point estimate of the two.⁷⁸ Three primary outcomes will be examined with $p \leq 0.025$ being statistically significant.⁷⁸ An eight-step procedure will be used to assess if the thresholds for significance are crossed.⁷⁸ Five secondary outcomes will be examined with $p \leq 0.017$ being statistically significant.⁷⁸ Analysis of the exploratory outcomes will be considered hypothesis generating only. We will measure effect size using standardised mean differences using CIs of 95%. Analysis of all included studies will be compared with a subgroup analysis comparing trials at low risk of bias to trials at high risk of bias. If the results do not differ, primary conclusions will be based on the overall analysis. If the results differ, primary conclusions will be based on trials at low risk of bias. A table describing the types of serious adverse events in each trial will be provided.

Trial Sequential Analysis

Traditional meta-analysis runs the risk of random errors due to sparse data and repetitive testing of accumulating data when updating reviews. In order to control the risks of type I errors and type II errors,^{57 58 79} Trial Sequential Analysis will be conducted on the outcomes. In order to do so, we will calculate the required information size (that is the number of participants needed in a meta-analysis to detect or reject a certain intervention effect).⁷⁹

For continuous outcomes, we will in the Trial Sequential Analysis use the observed SD, a mean difference of the observed SD/2, an alpha of 2.5% for our three primary outcomes and an alpha of 1.67% for our five secondary outcomes, and a beta of 10%.⁸⁰ For dichotomous outcomes, we will use the proportion of participants with an outcome in the control group, a relative risk reduction of 20%, and an alpha of 2.5% for our primary outcomes and an alpha of 1.67% for secondary outcomes, and a beta of 10%.⁸⁰ We will calculate risk ratios with 95% CI for dichotomous outcomes.

Subgroup analysis

In order to investigate and compare different trials and interventions subgroup analysis will be performed on the following:

- ▶ Trials at high risk of bias trials compared to trials at low risk of bias trials.

- ▶ Trial stratified according to experimental interventions.
- ▶ Trials stratified according to weight status: overweight, obese or morbidly obese at the point of entry into the trial.⁸
- ▶ Trials stratified according to the duration of intervention, the number of in person sessions and length of sessions in hours.⁸¹
- ▶ Trials stratified if treatment fidelity was assessed or not.⁸²
- ▶ Trials stratified according to the control interventions.
- ▶ Complexity: trials with participants with no co-morbidities compared to trials with participants pre-existing co-morbidities.
- ▶ Trials in which the experimental intervention was evaluated by either the parents or the child after the treatment sessions had been delivered compared to trials in which the experimental intervention was not evaluated by either the parents or the child after the treatment sessions had been delivered.

We will use the formal test for subgroup interactions in Review Manager.⁷²

Sensitivity analysis

To assess the potential impact of the missing data for dichotomous outcomes, we will perform the following sensitivity analyses.

- ▶ ‘Best–worst case’ scenario: we will assume that all participants lost to follow-up in the experimental group had no serious adverse events, including not developing any psychiatric disease such as an eating disorder.
- ▶ ‘Worst–best case’ scenario: we will assume that all participants lost to follow-up in the experimental group, had a serious adverse event, for instance, developing a psychiatric disease such as an eating disorder.⁴⁶

Statistical heterogeneity will be assessed by visual inspection of the forest plots and I^2 statistic values.⁷⁸ Underlying reasons behind statistical heterogeneity in meta-analyses will be investigated by assessing trial characteristics.

Summary of findings table

A summary of findings table using each of the prespecified primary outcomes will be presented using GRADE considerations for studies contributing data to the meta-analyses for the prespecified outcomes.^{78 83–96} Methods and recommendations described in chapter 8 (section 8.5) and chapter 12 of the *Cochrane Handbook for Systematic Reviews of Interventions*⁶⁰ using GRADEpro software will be used.

DISCUSSION

This protocol intends to outline a rigorous, methodical approach to developing a systematic review to provide evidence on the potential effects of psychotherapy as an intervention for children with overweight. The protocol

has been registered on PROSPERO and through peer review and publication aims to reduce the risk of bias in the future systematic review.

Currently, there is no comprehensive systematic review of psychotherapeutic interventions in the treatment of children with overweight to inform clinical practice. Previous systematic reviews in this population have considered behavioural interventions for lifestyle behaviour change as a mediating factor for weight loss initiation and maintenance.^{44 45} We will also be able to assess the different types of psychotherapeutic interventions as well as their individual comparison groups (no intervention; wait list control; treatment as usual; sham psychotherapy; or pharmaceutical placebo). This review will also highlight any gaps in the evidence base of such interventions which will help to shape the development and optimisation of future interventions.

ETHICS AND DISSEMINATION

No ethical approval required. Dissemination of results will be published in peer reviewed journals.

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REFERENCES

- 1 Wang Y, Lobstein T. Worldwide trends in childhood overweight and obesity. *Int J Pediatr Obes* 2006;1:11–25.
- 2 Lobstein T. The prevention of obesity in children. *Pediatr Endocrinol Rev* 2004;1 Suppl 3:471–5.

- 3 de Onis M, Blössner M, Borghi E. Global prevalence and trends of overweight and obesity among preschool children. *Am J Clin Nutr* 2010;92:1257–64.
- 4 Jebb SA, Rennie KL, Cole TJ. Prevalence of overweight and obesity among young people in Great Britain. *Public Health Nutr* 2004;7:461–5.
- 5 Olstad DL, Ancilotto R, Teychenne M, et al. Can targeted policies reduce obesity and improve obesity-related behaviours in socioeconomically disadvantaged populations? A systematic review. *Obes Rev* 2017;18:791–807.
- 6 WHO Europe. COSI Factsheet. Childhood Obesity Surveillance Initiative Highlights 2015–17. Preliminary Data 2018.
- 7 World Health Organization. Growing up unequal: gender and socioeconomic differences in young people's health and well-being. Health Behavior in school-aged children (HBSC) study. International report from the 2013/2014 survey; 2016.
- 8 Cole TJ, Bellizzi MC, Flegal KM, et al. Establishing a standard definition for child overweight and obesity worldwide: international survey. *BMJ* 2000;320:1240–3.
- 9 Kumar S, Kelly AS. Review of childhood obesity: from epidemiology, etiology, and comorbidities to clinical assessment and treatment. *Mayo Clin Proc* 2017;92:251–65.
- 10 Skinner AC, Perrin EM, Moss LA, et al. Cardiometabolic risks and severity of obesity in children and young adults. *N Engl J Med* 2015;373:1307–17.
- 11 Kopelman P. Health risks associated with overweight and obesity. *Obes Rev* 2007;8 Suppl 1:13–17.
- 12 Sawyer MG, Harchak T, Wake M, et al. Four-Year prospective study of BMI and mental health problems in young children. *Pediatrics* 2011;128:677–84.
- 13 Griffiths LJ, Wolke D, Page AS, et al. Obesity and bullying: different effects for boys and girls. *Arch Dis Child* 2006;91:121–5.
- 14 Gortmaker SL, Must A, Perrin JM, et al. Social and economic consequences of overweight in adolescence and young adulthood. *N Engl J Med* 1993;329:1008–12.
- 15 Lissau I, Sørensen TIA. Parental neglect during childhood and increased risk of obesity in young adulthood. *The Lancet* 1994;343:324–7.
- 16 Lissau I, Breum L, Sørensen TI. Maternal attitude to sweet eating habits and risk of overweight in offspring: a ten-year prospective population study. *Int J Obes Relat Metab Disord* 1993;17:125–9.
- 17 Swencionis C, Rendell SL. The psychology of obesity. *Abdom Radiol* 2012;37:733–7.
- 18 RR Wing. Behavioral weight control. In: Wadden TA SA, ed. *Handbook of obesity treatment*. New York: The Guilford Press, 2002: 301–16.
- 19 Wilfley DE, Tibbs TL, Van Buren D, et al. Lifestyle interventions in the treatment of childhood overweight: a meta-analytic review of randomized controlled trials. *Health Psychol* 2007;26:521–32.
- 20 Goldschmidt AB, Best JR, Stein RI, et al. Predictors of child weight loss and maintenance among family-based treatment completers. *J Consult Clin Psychol* 2014;82:1140–50.
- 21 Nowicka P, Flodmark CE. Family therapy as a model for treating childhood obesity: useful tools for clinicians. *Clin Child Psychol Psychiatry* 2011;16:129–45.
- 22 Flodmark CE, Ohlsson T, Rydén O, et al. Prevention of progression to severe obesity in a group of obese schoolchildren treated with family therapy. *Pediatrics* 1993;91:880–4.
- 23 Flattum C, Friend S, Story M, et al. Evaluation of an individualized counseling approach as part of a multicomponent school-based program to prevent weight-related problems among adolescent girls. *J Am Diet Assoc* 2011;111:1218–23.
- 24 André N, Béguier S. Using motivational interviewing as a supplement to physical activity program in obese adolescents: a RCT study. *Eat Weight Disord* 2015;20:519–23.
- 25 Bean MK, Powell P, Quinoy A, et al. Motivational interviewing targeting diet and physical activity improves adherence to paediatric obesity treatment: results from the *MI Values* randomized controlled trial. *Pediatr Obes* 2015;10:118–25.
- 26 Warschburger P, Kroeller K, Haerting J, et al. Empowering parents of obese children (EPOC): a randomized controlled trial on additional long-term weight effects of parent training. *Appetite* 2016;103:148–56.
- 27 Resnicow K, McMaster F. Motivational interviewing: moving from why to how with autonomy support. *Int J Behav Nutr Phys Act* 2012;9:19.
- 28 Moens E, Braet C, Van Winckel M. An 8-year follow-up of treated obese children: children's, process and parental predictors of successful outcome. *Behav Res Ther* 2010;48:626–33.
- 29 Best JR, Goldschmidt AB, Mockus-Valenzuela DS, et al. Shared weight and dietary changes in parent-child dyads following family-based obesity treatment. *Health Psychol* 2016;35:92–5.
- 30 Van Allen J, Borner KB, Gayes LA, et al. Weighing physical activity: the impact of a family-based group lifestyle intervention for pediatric obesity on participants' physical activity. *J Pediatr Psychol* 2015;40:193–202.
- 31 Jiang JX et al. A two year family based behaviour treatment for obese children. *Arch Dis Child* 2005;90:1235–8.
- 32 Savoye M, Shaw M, Dziura J, et al. Effects of a weight management program on body composition and metabolic parameters in overweight children. *JAMA* 2007;297:2697–704.
- 33 Berkowitz RI, Wadden TA, Terhakovec AM, et al. Behavior therapy and sibutramine for the treatment of adolescent obesity: a randomized controlled trial. *JAMA* 2003;289:1805–12.
- 34 Bronfenbrenner U. Ecology of the family as a context for human development: research perspectives. *Dev Psychol* 1986;22:723–42.
- 35 Braet C et al. Inpatient treatment for children with obesity: weight loss, psychological well-being, and eating behavior. *J Pediatr Psychol* 2004;29:519–29.
- 36 Luzier J, Berlin K, Weeks J. Behavioral treatment of pediatric obesity: review and future directions. *Children's Health Care* 2010;39:312–34.
- 37 Herrera EA, Johnston CA, Steele RG. A comparison of cognitive and behavioral treatments for pediatric obesity. *Children's Health Care* 2004;33:151–67.
- 38 Nowicka P, Höglund P, Pietrobello A, et al. Family weight school treatment: 1-year results in obese adolescents. *Int J Pediatr Obes* 2008;3:141–7.
- 39 Tanofsky-Kraff M, Wilfley DE, Young JF, et al. A pilot study of interpersonal psychotherapy for preventing excess weight gain in adolescent girls at-risk for obesity. *Int J Eat Disord* 2010;43:701–6.
- 40 Fenner AA, Howie EK, Davis MC, et al. Relationships between psychosocial outcomes in adolescents who are obese and their parents during a multi-disciplinary family-based healthy lifestyle intervention: one-year follow-up of a waitlist controlled trial (Curtin University's Activity, Food and Attitudes Program). *Health Qual Life Outcomes* 2016;14:100.
- 41 Tanofsky-Kraff M, Shomaker LB, Wilfley DE, et al. Targeted prevention of excess weight gain and eating disorders in high-risk adolescent girls: a randomized controlled trial. *Am J Clin Nutr* 2014;100:1010–8.
- 42 Bruch H. *Eating disorders: obesity, anorexia nervosa and the person within*. New York: Basic Books, 1973.
- 43 Colquitt JL, Loveman E, O'Malley C, et al. Diet, physical activity, and behavioural interventions for the treatment of overweight or obesity in preschool children up to the age of 6 years. *Cochrane Database Syst Rev* 2016;166:CD012105.
- 44 Al-Khudairy L, Loveman E, Colquitt JL, et al. Diet, physical activity and behavioural interventions for the treatment of overweight or obese adolescents aged 12 to 17 years. *Cochrane Database Syst Rev* 2017;6:CD012691.
- 45 Mead E, Brown T, Rees K, et al. Diet, physical activity and behavioural interventions for the treatment of overweight or obese children from the age of 6 to 11 years. *Cochrane Database Syst Rev* 2017;24(Suppl 2):CD012651.
- 46 Jebbelle H, Gow ML, Baur LA, et al. Association of pediatric obesity treatment, including a dietary component, with change in depression and anxiety. *JAMA Pediatr* 2019;173:e192841.
- 47 Gow ML, Tee MSY, Garnett SP, et al. Pediatric obesity treatment, self-esteem, and body image: a systematic review with meta-analysis. *Pediatr Obes* 2020;15:e12600.
- 48 Järholm K, Bruze G, Peltonen M, et al. 5-Year mental health and eating pattern outcomes following bariatric surgery in adolescents: a prospective cohort study. *Lancet Child Adolesc Health* 2020;4:210–9.
- 49 Kjaergard LL, Villumsen J, Gluud C. Reported methodologic quality and discrepancies between large and small randomized trials in meta-analyses. *Ann Intern Med* 2001;135:982–9.
- 50 Schünemann HJ, Wiercioch W, Brozek J, et al. Grade evidence to decision (ETD) frameworks for adoption, adaptation, and de novo development of trustworthy recommendations: GRADE-ADOLOPMENT. *J Clin Epidemiol* 2017;81:101–10.
- 51 Savović J, Jones H, Altman D, et al. Influence of reported study design characteristics on intervention effect estimates from randomised controlled trials: combined analysis of meta-epidemiological studies. *Health Technol Assess* 2012;16:1–82.
- 52 Savović J, Jones HE, Altman DG, et al. Influence of reported study design characteristics on intervention effect estimates from randomized, controlled trials. *Ann Intern Med* 2012;157:429.
- 53 Schulz KF, Chalmers I, Hayes RJ, et al. Empirical evidence of bias. dimensions of methodological quality associated with estimates of treatment effects in controlled trials. *JAMA* 1995;273:408–12.
- 54 Wood L, Egger M, Gluud LL, et al. Empirical evidence of bias in treatment effect estimates in controlled trials with different

- interventions and outcomes: meta-epidemiological study. *BMJ* 2008;336:601–5.
- 55 Lundh A, Sismondo S, Lexchin J, *et al.* Industry sponsorship and research outcome. *Cochrane Database Syst Rev* 2012;12:Mr000033.
 - 56 Moher D, Pham Ba', Jones A, *et al.* Does quality of reports of randomised trials affect estimates of intervention efficacy reported in meta-analyses? *The Lancet* 1998;352:609–13.
 - 57 Wetterslev J, Thorlund K, Brok J, *et al.* Estimating required information size by quantifying diversity in random-effects model meta-analyses. *BMC Med Res Methodol* 2009;9:86.
 - 58 Wetterslev J, Jakobsen JC, Gluud C. Trial sequential analysis in systematic reviews with meta-analysis. *BMC Med Res Methodol* 2017;17:39.
 - 59 Moher D, Shamseer L, Clarke M, *et al.* Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Syst Rev* 2015;4:1.
 - 60 Collaboration TC. *Cochrane Handbook for Systematic Reviews of Interventions*. Wiley-Blackwell, 2008.
 - 61 Storebø OJ, Pedersen N, Ramstad E, *et al.* Methylphenidate for attention deficit hyperactivity disorder (ADHD) in children and adolescents - assessment of adverse events in non-randomised studies. *Cochrane Database Syst Rev* 2018;5:Cd012069.
 - 62 Ahuja B, Klassen AF, Satz R, *et al.* A review of patient-reported outcomes for children and adolescents with obesity. *Qual Life Res* 2014;23:759–70.
 - 63 International Conference on Harmonisation - Good Clinical Practice (ICH-GCP). ICH harmonised tripartite guideline. Clinical safety data management: definitions and standards for expedited reporting E2A. *International Conference on Harmonisation of Technical Requirements for Registration of Pharmaceuticals for Human Use*, 1994.
 - 64 International Conference on Harmonisation - Good Clinical Practice (ICH-GCP). ICH harmonised guideline. Integrated Addendum to ICH E6(R1): Guideline for good clinical practice E6(R2). *International Council on Harmonisation of Technical Requirements for Pharmaceuticals for Human Use*, 2016.
 - 65 Pietrobelli A, Rubiano F, St-Onge M-P, *et al.* New bioimpedance analysis system: improved phenotyping with whole-body analysis. *Eur J Clin Nutr* 2004;58:1479–84.
 - 66 Kabiri LS, Hernandez DC, Mitchell K. Reliability, validity, and diagnostic value of a pediatric bioelectrical impedance analysis scale. *Child Obes* 2015;11:650–5.
 - 67 Review Manager 5 (RevMan 5). In: Centre NC, editor. In: *The Cochrane collaboration*. 5.3 ed. Copenhagen: The Cochrane Collaboration, 2014.
 - 68 Thorlund K, Engstrom J, Wetterslev J, *et al.* User manual for trial sequential analysis (TSA) 2011.
 - 69 Covidence systematic review software. Melbourne, Australia: Veritas Health Innovation.
 - 70 Higgins JPT, Altman DG, Gotzsche PC, *et al.* The cochrane collaboration's tool for assessing risk of bias in randomised trials. *BMJ* 2011;343:d5928.
 - 71 Sethi NJ, Safi S, Nielsen EE, *et al.* The effects of rhythm control strategies versus rate control strategies for atrial fibrillation and atrial flutter: a protocol for a systematic review with meta-analysis and trial sequential analysis. *Syst Rev* 2017;6:47.
 - 72 Collaboration C. *Review manager*. Copenhagen: Nordic Cochrane Centre, 2014.
 - 73 StataCorp. *StataCorp statistical software*. Release 14 ed. College Station: StataCorp LP, 2014.
 - 74 Sweeting MJ, Sutton AJ, Lambert PC. What to add to nothing? Use and avoidance of continuity corrections in meta-analysis of sparse data. *Stat Med* 2004;23:1351–75.
 - 75 DerSimonian R, Laird N. Meta-Analysis in clinical trials. *Control Clin Trials* 1986;7:177–88.
 - 76 DerSimonian R, Laird N. Meta-Analysis in clinical trials revisited. *Contemp Clin Trials* 2015;45:139–45.
 - 77 Demets DL. Methods for combining randomized clinical trials: strengths and limitations. *Stat Med* 1987;6:341–8.
 - 78 Jakobsen JC, Wetterslev J, Winkel P, *et al.* Thresholds for statistical and clinical significance in systematic reviews with meta-analytic methods. *BMC Med Res Methodol* 2014;14:120.
 - 79 Wetterslev J, Thorlund K, Brok J, *et al.* Trial sequential analysis may establish when firm evidence is reached in cumulative meta-analysis. *J Clin Epidemiol* 2008;61:64–75.
 - 80 Castellini G, Nielsen EE, Gluud C. Comment on: "Cell therapy for heart disease: Trial sequential analyses of two cochrane reviews". *Clin Pharmacol Ther* 2017;102:21–4.
 - 81 Heerman WJ, JaKa MM, Berge JM, *et al.* The dose of behavioral interventions to prevent and treat childhood obesity: a systematic review and meta-regression. *Int J Behav Nutr Phys Act* 2017;14:157.
 - 82 JaKa MM, Haapala JL, Trapl ES, *et al.* Reporting of treatment fidelity in behavioural paediatric obesity intervention trials: a systematic review. *Obes Rev* 2016;17:1287–300.
 - 83 Guyatt GH, Oxman AD, Vist GE, *et al.* GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. *BMJ* 2008;336:924–6.
 - 84 Schünemann HJ, Best D, Vist G, *et al.* Letters, numbers, symbols and words: how to communicate grades of evidence and recommendations. *Can Med Assoc J* 2003;169:677–80.
 - 85 Guyatt GH, Oxman AD, Schünemann HJ, *et al.* Grade guidelines: a new series of articles in the Journal of clinical epidemiology. *J Clin Epidemiol* 2011;64:380–2.
 - 86 Garattini S, Jakobsen JC, Wetterslev J, *et al.* Evidence-Based clinical practice: overview of threats to the validity of evidence and how to minimise them. *Eur J Intern Med* 2016;32:13–21.
 - 87 Atkins D, Best D, Briss PA, *et al.* Grading quality of evidence and strength of recommendations. *BMJ* 2004;328:1490.
 - 88 Guyatt G, Oxman AD, Akl EA, *et al.* Grade guidelines: 1. Introduction- GRADE evidence profiles and summary of findings tables. *J Clin Epidemiol* 2011;64:383–94.
 - 89 Guyatt GH, Oxman AD, Kunz R, *et al.* Grade guidelines: 2. framing the question and deciding on important outcomes. *J Clin Epidemiol* 2011;64:395–400.
 - 90 Guyatt GH, Oxman AD, Vist G, *et al.* GRADE guidelines: 4. Rating the quality of evidence--study limitations (risk of bias). *J Clin Epidemiol* 2011;64:407–15.
 - 91 Guyatt GH, Oxman AD, Montori V, *et al.* GRADE guidelines: 5. Rating the quality of evidence--publication bias. *J Clin Epidemiol* 2011;64:1277–82.
 - 92 Guyatt GH, Oxman AD, Kunz R, *et al.* GRADE guidelines: 7. Rating the quality of evidence--inconsistency. *J Clin Epidemiol* 2011;64:1294–302.
 - 93 Guyatt GH, Oxman AD, Kunz R, *et al.* GRADE guidelines: 8. Rating the quality of evidence--indirectness. *J Clin Epidemiol* 2011;64:1303–10.
 - 94 Guyatt GH, Oxman AD, Sultan S, *et al.* Grade guidelines: 9. rating up the quality of evidence. *J Clin Epidemiol* 2011;64:1311–6.
 - 95 Guyatt G, Oxman AD, Sultan S, *et al.* Grade guidelines: 11. making an overall rating of confidence in effect estimates for a single outcome and for all outcomes. *J Clin Epidemiol* 2013;66:151–7.
 - 96 Guyatt GH, Oxman AD, Santesso N, *et al.* Grade guidelines: 12. preparing summary of findings tables-binary outcomes. *J Clin Epidemiol* 2013;66:158–72.