Parent-only interventions in the treatment of childhood obesity: a systematic review of randomized controlled trials

H. Ewald1,2, J. Kirby1, K. Rees1, W. Robertson1

1Division of Health Sciences, Warwick Medical School, University of Warwick, Coventry CV4 7AL, UK
2Present address: Basel Institute for Clinical Epidemiology and Biostatistics, University Hospital Basel, Hebelstrasse 10, 3rd Floor, Basel CH-4031, Switzerland
Address correspondence to Hannah Ewald, E-mail: hannah.ewald@usb.ch

ABSTRACT

Background An effective and cost-effective treatment is required for the treatment of childhood obesity. Comparing parent-only interventions with interventions including the child may help determine this.

Methods A systematic review of published and ongoing studies until 2013, using electronic database and manual searches. Inclusion criteria: randomized controlled trials, overweight/obese children aged 5–12 years, parent-only intervention compared with an intervention that included the child, 6 months or more follow-up. Outcomes included measures of overweight.

Results Ten papers from 6 completed studies, and 2 protocols for ongoing studies, were identified. Parent-only groups are either more effective than or similarly effective as child-only or parent–child interventions, in the change in degree of overweight. Most studies were at unclear risk of bias for randomization, allocation concealment and blinding of outcome assessors. Two trials were at high risk of bias for incomplete outcome data. Four studies showed higher dropout from parent-only interventions. One study examined programme costs and found parent-only interventions to be cheaper.

Conclusions Parent-only interventions appear to be as effective as parent–child interventions in the treatment of childhood overweight/obesity, and may be less expensive. Reasons for higher attrition rates in parent-only interventions need further investigation.

Keywords children, obesity

Introduction

The high prevalence of childhood obesity is a significant concern for public health. Childhood obesity is an established risk factor for cardiovascular disease, as well as type 2 diabetes, respiratory diseases, musculoskeletal and psychological disorders.1,2 In 1997, the World Health Organization (WHO) classified obesity as a global epidemic.3 In England, the prevalence of overweight and obesity rose by 60% between 1994 and 1998 and by 150% between 1984 and 1998.4 Although there has been a slight stabilization in recent years,5 there is still a strong need for tackling childhood obesity. In 2011, 14.8% of boys and 12.6% of girls aged 2–15 years in England were reported to be overweight, and a further 16.6 and 15.9% respectively, were obese.6

Obesity has significant effects on both healthcare and economic costs.7 The UK National Health Service currently spends 5–6% of its budget on overweight and obesity-related problems,8 equating to £5.1 billion per year. Interventions aimed at both preventing and treating obesity have been put into place.9,10 As public health seeks to translate evidence-based research into clinical practice with the most cost-effective outcome, establishing the most cost-effective format for an intervention is a key priority.

Family-based interventions have been shown to be effective and are considered as the current best practice in the treatment of childhood obesity.9 However, interventions that
involve the whole family can be costly, in particular when not running at full capacity, so increased attention is being paid to the possibility of parent-focused interventions. Parents play a large role in food choice and physical activity for their children and as such, targeting only parents could result in reduced intervention costs, if shown to be as effective. A recent review, published whilst we were nearing completion, identified a gap in evidence for child-only interventions in comparison to parent-only intervention for children aged 5–12 years. It includes searches up until June 2013 without any language limiters, thereby updating the Jull and Chen review (completed searches August 2012). Furthermore, we include additional databases in our search and identify papers relating to intervention costs and ongoing trials (protocols) matching the inclusion criteria. In doing so, we highlight where current evidence is lacking and ensure that future investigations in this area will also take into consideration the most up-to-date studies.

**Methods**

**Search methods**

The literature search was carried out in July 2012 and updated in March 2013. The Centre for Reviews and Dissemination’s guidance for undertaking reviews in healthcare guided the search. Searches were made in the following electronic databases: Cochrane Central Register of Controlled Trials, MEDLINE, EMBASE, CINAHL, PsychInfo and ASSIA. MeSH headings (or their equivalent) and text word terms were used, and key words were related to child, parent and overweight/obesity. The search strategy for Medline can be found in the Appendix. Reference lists of short-listed studies and systematic reviews were screened to identify further studies. Trial registers were searched to identify ongoing trials (metaRegister of controlled trials (www.controlled-trials.com/mrct), Clinicaltrials.gov (www.clinicaltrials.gov) and the WHO International Clinical Trials Registry Platform (http://apps.who.int/trialsearch/)).

Two authors independently screened the titles/abstracts from the database searching for potential relevance, retrieved the full text and then independently assessed short-listed studies for formal inclusion/exclusion. To be included, studies had to fulfil each of the following criteria: (i) target children aged 5–12 years who are overweight or obese; (ii), include an intervention targeting parents only, for the treatment of overweight/obese children; (iii) have a comparison intervention targeting children, with or without parents; (iv) include an outcome measure of adiposity of the child (e.g. BMI, waist circumference, percentage fat); (v) be a randomized controlled trial (RCT) with at least 6-month follow-up. No limiters on language have been applied.

**Risk of bias**

The quality of studies was evaluated by assessing the risk of bias using the Cochrane Collaboration’s tool. Two authors independently judged five domains (selection bias, detection bias, attrition bias, reporting bias and other bias) and ranked their judgement as low, high or unclear risk of bias. A sixth domain, performance bias (i.e. blinding of participants and personnel), was not assessed as it is impossible to blind either study participants or those delivering the intervention for behavioural interventions. For ‘other bias’, we looked at study power and the reported sample size calculations. Protocol papers were consulted where available. Disagreements were resolved by consensus and a third author was consulted where necessary.

**Results**

The electronic database search identified 523 titles and abstracts for screening, and those that were clearly irrelevant were excluded at this stage. Fifty-two short-listed papers were identified for retrieval of the full text. The search for ongoing trials on trial registry databases yielded 403 hits, resulting in the inclusion of a protocol for an additional ongoing trial from ClinicalTrials.gov. In total 8 studies (from 12 papers) met the inclusion criteria for the review, of which 6 were completed studies and 2 were protocols for ongoing trials. Reasons for excluding papers are presented in Fig. 1.

**Study characteristics of completed studies**

Table 1 presents the characteristics of the eight studies (in case of several publications on one study, the main paper is cited first). Of the six completed studies, two were carried out in Israel, two in USA, one in Switzerland and one in Australia. Parent-only interventions were compared with interventions targeting both parent and child in five studies, and with child-only interventions in two studies. All studies reported effectiveness, one study being an equivalence trial (testing if one treatment is more or less as effective as another, one a non-inferiority trial (testing if one...
treatment is therapeutically not worse than a reference treatment\textsuperscript{19,27} and the other four were superiority trials (testing superiority of one treatment over the other).\textsuperscript{27} One study also reported data on costs.\textsuperscript{25}

One study included children aged 8–14 years, and was included because of the overlap with the target age range of the 5–12 years. All child participants were overweight or obese defined as either $>20\%$ overweight or above the 85th BMI percentile. Extremely obese children (BMI Z-score > 4) were excluded in one study.\textsuperscript{22} Study sample sizes ranged from 37 to 165 participants, including a total of 466 children. All studies included male and female children and both parents, apart from one study, which was restricted to only mothers due to recruitment issues.\textsuperscript{21}

Fig. 1 PRISMA flow diagram of study selection process.
**Table 1** Characteristics of included studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Study country/setting and study design</th>
<th>Participants baseline characteristics by treatment group (group differences)</th>
<th>Intervention (details, length, length of follow-up)</th>
<th>Comparison group (details)</th>
<th>Primary Outcome Measure Points</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Published papers</strong></td>
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<tr>
<td>Golan et al.</td>
<td>Israel</td>
<td>PO: n = 30 (18F; 12M), 8.9 ± 0.3 years</td>
<td>PO specific:</td>
<td>CO specific:</td>
<td>Month 0</td>
</tr>
<tr>
<td>Golan et al.</td>
<td>N/a</td>
<td>CO: n = 30 (19F; 11M), 9.2 ± 0.2 years</td>
<td>14 × 1 h group sessions; in last 7 months also 5 × 15 min individual sessions with the whole family</td>
<td>30 × 1 h group sessions; individual support available</td>
<td>Month 12</td>
</tr>
<tr>
<td>Golan and Croy</td>
<td>Arm 1) PO</td>
<td>Superiority trial</td>
<td>Sedentary lifestyle ↓; create opportunities for physical activity; fat content ↓; Exposure to food stimuli ↓; parenting skills, coping with resistance</td>
<td>Prescription of a 6.3 MJ/day (1500 kcal/d) diet</td>
<td>Month 24*</td>
</tr>
<tr>
<td></td>
<td>Arm 2) CO</td>
<td>PO: 39.6 ± 3.0 (20.1–95.5)</td>
<td>Sedentary lifestyle ↓; create opportunities for physical activity; fat content ↓; Exposure to food stimuli ↓; parenting skills, coping with resistance</td>
<td>Energy intake ↓; Exercise ↑; Control food stimuli; Self-monitoring; Use of social support</td>
<td>Month 36*</td>
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<td></td>
<td></td>
<td>CO: 39.1 ± 3.8 (20.3–102.2)</td>
<td>Overall intervention content: Nutrition education; Cognitive restructuring; eating behaviour modification; problem solving</td>
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<td>Month 96*</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>No significant between group differences at baseline.</td>
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<td>(7 years after termination)</td>
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<tr>
<td>Golan et al.</td>
<td>Israel</td>
<td>PO: 10F, 7M, 8.75 ± 1.9 years</td>
<td>PO intervention but changes intended for entire family</td>
<td>PC specific:</td>
<td>Month 0</td>
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<tr>
<td></td>
<td>N/a</td>
<td>PC: 10F, 10M, 8.7 ± 2 years</td>
<td></td>
<td>Child and parent attend group together—materials of PO group but child adapted</td>
<td>Month 6</td>
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<tr>
<td></td>
<td>Arm 1) PO</td>
<td>Superiority trial</td>
<td>Overall intervention duration: 16 × 1 h support and education group sessions over 6 months</td>
<td>PC group but child adapted</td>
<td>Month 18</td>
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<tr>
<td></td>
<td>Arm 2) PC</td>
<td>BMI PO: 24.2 (SD 3.0)</td>
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<td>BMI PC: 24.3 (SD 3.6)</td>
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<td>Mean % overweight as mean ± SD:</td>
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<td></td>
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<td>PO: 47.0 (SD 22.1)</td>
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<td>PC: 48.5 (SD 18.1)</td>
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<td>PO specific:</td>
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<td>PO intervention but changes intended for entire family</td>
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<td></td>
<td></td>
<td>Overall intervention content: Healthy eating patterns; daily physical activity ↑; sedentary behaviour ↑</td>
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<td>For parents: coping techniques (with regard to an authoritative feeding style (adults determine which foods are offered, children determine the amount eaten))</td>
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<tr>
<td>Munsch et al.</td>
<td>Switzerland</td>
<td>PO: 15F, 9M, 10.6 ± 1.5 years</td>
<td>PO specific:</td>
<td>PC specific:</td>
<td>Month 0</td>
</tr>
<tr>
<td></td>
<td>University and hospital/out-patient</td>
<td>PC: 17F, 12M, 10.3 ± 1.4</td>
<td>Cognitive behavioural therapy (CBT) for mother only</td>
<td>CBT for both mother and child</td>
<td>End of treatment (exact timing)</td>
</tr>
</tbody>
</table>
**Table 1** Continued

<table>
<thead>
<tr>
<th>Study</th>
<th>Study country/ setting and study design</th>
<th>Participants baseline characteristics by treatment group (group differences)</th>
<th>Intervention (details, length, length of follow-up)</th>
<th>Comparison group (details)</th>
<th>Primary Outcome Measure Points</th>
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<tbody>
<tr>
<td>clinic</td>
<td>Arm 1) PO Arm 2) PC</td>
<td>Equivalence trial</td>
<td>Children received PMR in parallel session (control condition for children—same frequency and duration as CBT for children in PC arm)</td>
<td>Overall intervention duration: 10 weekly 120-min sessions; 6-month aftercare sessions Overall intervention content: Nutrition and eating behaviour, physical activity, social competences, body concept, relapse prevention</td>
<td>unclear) 6-month follow-up (exact timing unclear)</td>
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<tr>
<td>Janicke et al.²⁰ Janicke et al.²⁵</td>
<td>USA (rural) Community (PO and PC over WLC)</td>
<td>(Numbers completing all 3 assessments) PO: 12F, 14M, 11.0 years PC: 15f, 9M, 11.4 years WLC: 16F, 5M, 11.0 years BMI-Z PO: 2.015 BMI-Z PC: 2.160 BMI-Z WLC: 2.133</td>
<td>PO specific: Behavioural PO intervention. Parents encouraged meeting with children outside of the intervention to set goals. Overall intervention duration: 8 weekly group sessions a 90 min Then biweekly group sessions for next 8 weeks a 90 min Overall theoretic basis: Modified version of stoplight diet Treatment manuals developed for this project. Pre-specified design and methods Overall intervention content: Dietary habits; food monitoring; physical activity †; Behavioural strategies: self-monitoring and goal setting</td>
<td>PC specific: Parent and Children participated in separate parallel groups. Parents’ content similar to PO group. Brought together at end of session to develop dietary goals for the week. WLC specific: Intervention only received after final follow-up assessment</td>
<td>Month 0 Month 4 Month 10</td>
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<tr>
<td>Okely et al.²² Collins et al.²⁶*</td>
<td>Australia University: ‘Community'</td>
<td></td>
<td>PO: n = 42 (26F; 16M), 8.2 ± 1.2 years CO: n = 63 (38F, 25M), 8.3 ± 1 years Arm 1) PO Arm 2) CO Arm 3) PC</td>
<td>PO specific: Parent-centred programme on changing family eating behaviours Overall intervention duration: 1 weekly 2 h face-to-face session for 10 weeks</td>
<td>CO specific: Child-centred programme on promotion of physical activity/reduction of sedentary behaviour PC specific: Combination of PO and CO</td>
</tr>
<tr>
<td>Study</td>
<td>Study country/setting and study design</td>
<td>Estimated recruitment</td>
<td>Intervention (details, length, length of follow-up)</td>
<td>Comparison group (details)</td>
<td>Primary outcome</td>
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<td><strong>Superiority trial (of PC over PO/CO)</strong></td>
<td>USA University Arm 1) PO Arm 2) PC</td>
<td>PO: 20F, 20M, 10.8 ± 1.3 years PC: 28F, 12M, 10.1 ± 1.2 years</td>
<td>Overall intervention content: Homework activities; 3-month relapse prevention programme</td>
<td>PC specific: Parent group (same materials as PO) and parallel child group (materials adapted to child)</td>
<td>Month 0 Month 5 Month 11</td>
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<tr>
<td><strong>Non-inferiority trial</strong></td>
<td>USA University Arm 1) PO Arm 2) PC</td>
<td>PO: 20F, 20M, 10.8 ± 1.3 years PC: 28F, 12M, 10.1 ± 1.2 years</td>
<td>Overall intervention duration: PO parallel to PC groups, 1 h each session, unsure of number of sessions</td>
<td>Parent–child dyads met with interventionist to set family goals</td>
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<tr>
<td><strong>BMI-Z PO:</strong> 2.8 (0.6) BMI-Z PC: 2.8 (0.7) BMI-Z CO: 2.8 (0.7) N/a</td>
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<td>BMI-Z PO: 2.9 (0.38) BMI-Z PC: 2.25 (0.34) BMI: PO: 30.48 (6.08) BMI: PC: 28.26 (4.64) Groups were ‘roughly equivalent’ at baseline (significance tests not done)</td>
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<td><strong>PO specific:</strong> Behavioural treatment delivered to parents only. Overall intervention duration: PO parallel to PC groups, 1 h each session, unsure of number of sessions Overall intervention content: Standardized manuals; traffic-light diet; physical activity; behaviour change skills; parenting skills</td>
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<tr>
<td><strong>PC specific:</strong> Parent group (same materials as PO) and parallel child group (materials adapted to child) Parent–child dyads met with interventionist to set family goals</td>
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<td><strong>Boutelle et al.</strong> 19</td>
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<td><strong>Ongoing trials</strong></td>
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<tr>
<td><strong>Janicke et al.</strong> 16</td>
<td>USA Rural (community) Arm 1) PO Arm 2) PC (behavioural intervention) Arm 3) PC (educational control) Superiority trial (PC and PO over PC educational control)</td>
<td>240 parent–child dyads June 2014</td>
<td>PO specific: Behavioural treatment delivered to parents only. Parents instructed to meet with their children at home and work together to set goals based on their previous progress Overall intervention duration: 8 weekly group meetings (90 min) Then 4 bi-weekly sessions across 16 weeks Then one group session per month (months 5–12), with exception of month 9, when participants will attend two group sessions Overall intervention content: Dietary habits; Modified version of stoplight diet; food monitoring; physical activity ↑; Behavioural strategies: self-monitoring and goal setting</td>
<td>PC specific (behavioural) Parallel parent and child groups. Parents’ content identical to PO group. Children start with review of achieving dietary and physical activity goals, then exercise or game component, then with group leaders prepare and sample healthy snack. Brought together with parents at the end of session to set lifestyle behaviour goals for the week. PC specific (educational control) 21 group meetings (each 90 min) addressing key aspects of nutrition, physical activity and health promotion. Children will participate in a group physical activity and sample healthy snacks. No behavioural elements included for either parent or child.</td>
<td>Month 0 Month 12 Month 24</td>
</tr>
<tr>
<td><strong>Boutelle and Cotton</strong> 15</td>
<td>USA Arm 1) PO</td>
<td>150 parent–child dyads March 2015</td>
<td>PO specific: Behavioural treatment delivered to parents</td>
<td>PC specific: Parallel parent and child groups. Treatment includes</td>
<td>Month 0 Month 6</td>
</tr>
</tbody>
</table>
The interventions were delivered over periods of 10 weeks to 7 months, with sessions ranging from 1 to 2 h (Table 1). The session content comprised nutrition, physical activity and behaviour modification or cognitive behavioural therapy. The parent-only arms received similar content and duration of intervention as the comparator arms. The overweight or obese children of the parents from the parent-only arm did not receive any direct intervention, apart from one study in which children received progressive muscle relaxation training (PMR) in order to deliver comparable attention to the children in the parent–child group.21

Some studies used several outcome measures for change in children's overweight: three measured excessive body fat in percent overweight, three studies used BMI and one BMI-percentile. Among all groups, the children's average baseline percent overweight ranged from 39.1 to 62.4%, BMI Z-score from 2.015 to 2.8 and BMI from 28.26 to 30.48 kg/m². For parents, four studies measured BMI19–21,28; one study measured ‘percentage overweight’17 and one study did not measure parental weight.22 Baseline parental BMI or percentage overweight was not statistically different between groups in four studies,17,20,21,28 and deemed to be ‘roughly equivalent’ in the study by Boutelle et al.19. The mean parental BMI at baseline was in the overweight category (BMI ≥ 25) in the study by Munsch et al.,21 and in the obese category (BMI ≥ 30) in the other three studies.19,20,28

**Assessment of bias**

The assessment of bias in the six completed studies is shown in Fig. 2. Overall, the studies were at unclear risk of bias due to non- or underreporting. One study was regarded as being at high risk of bias for allocation concealment as families were notified of their group assignment at the pre-treatment assessment.20 Two studies were regarded as at high risk of bias for incomplete outcome data as there was high and differential loss to follow-up between the comparison groups, with higher losses in the parent-only interventions.17,21

Other potential biases examined as part of the review process included sample size and the possibility of small study effects.29–31 The sample sizes at baseline were small and ranged from 12 to 72 participants per allocated group. Three studies reported sample size calculations,18,21,22 in 2 of these the target recruitment was not met.21,22 Measures to minimize contamination bias were not reported in any of the included studies.

**Change in child BMI**

**Between-group analysis**

We performed a narrative synthesis of the data from the six completed studies as there was substantial heterogeneity
regarding the comparison groups and outcome measures reported which precluded meta-analysis. For each study ‘between group’ changes in measures of overweight, which compare parent-only interventions with either child-only or parent–child interventions, are presented in Table 2. The two superiority trials by Golan et al. have shown significantly greater reductions in the degree of overweight from the parent-only groups in comparison with the child-only and parent–child groups. The two other superiority trials showed mixed results: in Okely et al.’s study the BMI Z-score showed a significantly greater reduction at 12 months for the parent-only group compared with the child-only (mean difference 0.22; 95% CI 0.38 to 0.06) but no difference in comparison with the parent–child group (mean difference 0.07; 95% CI −0.08 to 0.23). The difference in BMI Z-score between the parent-only and child-only groups was not statistically significant by Month 24 (mean difference 0.17; 95% CI −0.34 to 0.01). The other superiority trial, by Janicke et al., showed no significant difference between the parent-only and the parent–child groups at 4 and 10 months (mean difference in BMI Z-score at Month 4: 0.061; 95% CI −0.039 to 0.162, P = 0.23). Neither Munsch et al., examining equivalence, nor Boutelle et al., conducting a non-inferiority trial, found any difference between the parent-only and parent–child groups in the reduction of percentage overweight or BMI percentile, respectively (Table 2).

Dropout rates from the interventions varied widely between 3 and 72% (Table 2). Four studies had a greater proportion of dropouts in the parent-only group compared with control. Each study reports of at least one participant-stated reason for dropout. Most frequent reasons are health issues (in four studies), time commitment (in four studies), refusal of the allocated group (in 3 studies) and lack of motivation (in two studies). Munsch et al., who experienced the highest dropout rate, observed that mothers missing after 6 months were significantly younger (P = 0.008) and they also commented that their choice to use PMR training with control children from the parent-only arm ‘might have disappointed and discouraged children’ indicating that study design may have been an issue in the high dropout.

**Within-group analysis for the parent-only arm**

Table 2 also shows the within-group differences. In all studies, children of the parent-only groups have experienced a reduction in the degree of overweight, albeit the response over time varied by study. Studies showing that the reduction increased over time were from Golan et al., which showed a significant decrease in percent overweight of 14.6% over 12 months, which dropped further 1, 2 and 7 years later, reaching a change of 29%. In another trial, Golan et al. have found a significant reduction in percent overweight and BMI Z-score over an 18-month period. Following up children over 11 months, Boutelle et al. also detected a continuous drop in BMI percentile, although significance was not tested. The promising drop of BMI Z-score in Janicke et al.’s study after 4 months was however opposed by a rebound at Month 10. No within-group statistical significance was reported. One year after baseline, Okely et al. measured a mean change of BMI Z-score of −0.39 (95% CI −0.51, −0.27), which was maintained at the 2-year follow-up at −0.35 (95% CI −0.48, −0.22).

**Secondary outcomes**

Change in parental BMI, or other weight-related measures, was reported by five studies. The study by Golan et al. reported a significant decrease in the percentage overweight of fathers at 12-months following the parent-only
<table>
<thead>
<tr>
<th>Study; measures of overweight</th>
<th>Within group, parent only</th>
<th>Within group, child only</th>
<th>Within group, parent and child</th>
<th>Between groups</th>
<th>Overall ‘between-group’ results</th>
<th>Lost-to-follow-up/ dropout (%) from intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Golan et al.17</td>
<td>Month 12: – 14.6%; P &lt; 0.001</td>
<td>Month 12: – 8.1%; P &lt; 0.01</td>
<td>n/a</td>
<td>F&lt;sub&gt;1,47&lt;/sub&gt; = 5.0, P &lt; 0.05 (greater reduction in PO)</td>
<td>Significantly greater weight loss in children of PO group compared with CO group</td>
<td>Randomization—month 12: PO: 1/30 (3%) CO: 9/30 (30%)</td>
</tr>
<tr>
<td>Golan et al.23</td>
<td>Month 24*: – 10.6%</td>
<td>Month 24*: – 0%</td>
<td>P &lt; 0.05</td>
<td>Month 96*: F = 64.5, P &lt; 0.000</td>
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<tr>
<td>Golan and Crow24*</td>
<td>Month 36*: – 13.6%</td>
<td>Month 36*: – 0%</td>
<td>P &lt; 0.05</td>
<td>Time x group interaction*: F = 6.9; P &lt; 0.000</td>
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<tr>
<td>Munsch et al.21</td>
<td>Month 6: – 9.5%; P &lt; 0.05</td>
<td>Month 6: – 2.4%, n.s.</td>
<td>n/a</td>
<td>F&lt;sub&gt;1,26&lt;/sub&gt; = 11.3, P = 0.02</td>
<td>PO intervention showed significantly better change in overweight than PC intervention</td>
<td>Randomization—month 6: PO: 4/14 (29%) PC: 1/18 (6%)</td>
</tr>
<tr>
<td>BMI Z</td>
<td>Month 6: – 0.4; P = 0.003</td>
<td>Month 6: – 0.1, n.s.</td>
<td>n/a</td>
<td>F&lt;sub&gt;1,28&lt;/sub&gt; = 5.7, P = 0.024</td>
<td>Overall change over time (0,6,18 months): F&lt;sub&gt;2,50&lt;/sub&gt; = 7.5, P = 0.001</td>
<td></td>
</tr>
<tr>
<td>Janicke et al.20</td>
<td>Month 4: – 0.139 (0.19)</td>
<td>Month 4: – 0.078 (0.16)</td>
<td>n/a</td>
<td>Interaction linear trend x treatment: P = 0.43</td>
<td>Both PO and PC effective at reducing overweight.</td>
<td></td>
</tr>
<tr>
<td>Munsch et al.21</td>
<td>6-month follow-up: – 4.52%; P &lt; 0.001</td>
<td>6-month follow-up: – 1.91%; P &lt; 0.001</td>
<td>n/a</td>
<td>Quadratic trend x treatment: P = 0.83</td>
<td>No difference between the groups (equivalent)</td>
<td></td>
</tr>
<tr>
<td>Janicke et al.20</td>
<td>Mean (SD) Month 4: – 0.091 (0.20)</td>
<td>Mean (SD) Month 4: – 0.078 (0.16)</td>
<td>n/a</td>
<td>Mean difference (95% CI) Month 4: PO-WLC: 0.127 (0.027, 0.226); PC = WLC: 0.065 (= 0.027, 0.158); P &lt; 0.05</td>
<td>PO and PC are statistically both better than WLC at 10 months follow-up.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(no within-group statistical significance presented)</td>
<td>(no within-group statistical significance presented)</td>
<td></td>
<td>PO-PC: 0.061 (= 0.039, 0.162); P = 0.23</td>
<td>Similar change for PO and PC conditions.</td>
<td></td>
</tr>
</tbody>
</table>

*PO intervention showed significantly better change in overweight than PC intervention. **Both PO and PC effective at reducing overweight.
Okely et al.\textsuperscript{22} & Month 12: & −0.39 (−0.51, −0.27) & Month 12: & −0.32 (−0.42, −0.22) & Mean reduction (95% CI) & All groups show significant reduction in BMI Z-score at 12 and 24 months. PO (diet) and PC (diet and physical activity) groups better than CO (physical activity) at 12 and 24 months (double the reduction in BMI-Z score). PC and PO not statistically different between groups & Randomization—baseline: PO: 21/63 (33%) PC: 10/70 (14%) CO: 10/73 (14%) Baseline—month 24*: PO: 20/42 (48%) PC: 24/60 (40%) CO: 28/63 (44%) (only participants who completed baseline were included in analysis) \\
Collins et al.\textsuperscript{26*} & Month 24*: & −0.35 (−0.48, −0.22) & Month 24*: & −0.24 (−0.35, −0.13) & PO–WLC: 0.115 (0.003, 0.220); \( P = 0.04 \) PC–WLC: 0.136 (0.018, 0.254); \( P = 0.03 \) PO–PC: \( P = 0.68 \) & & \\
BMI Z mean (95% CI) & & & & & & \\
Waist circumference & & & & & & \\
Boutelle et al.\textsuperscript{19} & Month 0: & 98.37 (1.85), \( n = 40 \) & Month 0: & 98.34 (1.37), \( n = 40 \) & Mean reduction (s.e.) 90% CI & Non-inferiority of PO to PC on child weight changes & Randomization—month 6: PO: 16/40 (40%) PC: 12/40 (30%) \\
BMI Percentile & Month 5: & 96.82 (5.49), \( n = 24 \) & Month 5: & 97.21 (2.75), \( n = 28 \) & & & \\
& Month 11: & 95.08 (11.18), \( n = 24 \) & Month 11: & 97.23 (3.01), \( n = 28 \) & & & \\
& (no tests of significance) & & & & & &
intervention (baseline: 30.1% versus 12 months: 25.7%, \( t = 2.42, P < 0.05 \)), but no significant change in the child-only intervention. There was a significant difference between groups in favour of the parent-only intervention (\( F = 3.62, P < 0.05 \)). However, no other studies showed within-group or between-group changes.

Change in children's energy intake was reported by four studies, reporting equivocal findings.\(^{17,19,20,26}\) Between-group differences were reported by Golan \( et\ al.\)\(^ {17}\) in favour of a greater reduction of calories in the parent-only group (versus child-only); Boutelle et al.\(^ {19}\) found in favour of parent–child (versus parent-only) who could not support non-inferiority, whereas Collins et al.\(^ {26}\) and Janicke et al.\(^ {20}\) both reported no significant between-group differences.

Family eating habits were shown to be better in the parent-only group compared with the child-only group with regard to the presence of unhealthy foods in the home, the child taking and buying snacks without permission and the eating style.\(^ {17}\) However, when a parent-only intervention was compared with a parent–child intervention, the difference between groups for the presence of unhealthy foods in the home remained the only significant difference between groups, in favour of the parent-only intervention.\(^ {18}\) Change in children's physical activity levels was not different between parent-only and parent–child groups\(^ {18,19,26}\) and between parent-only and child-only groups.\(^ {17,26}\)

Only one paper reported mental health outcomes, which showed no group differences in behaviour, depressive feelings and anxiety in children between parent-only and parent–child interventions, whereas depressive feeling in mothers was significantly reduced in the parent-only group compared with parent–child group.\(^ {21}\) One study reported metabolic outcomes in children, which were broadly similar for parent-only, child-only and parent–child groups.\(^ {22}\)

**Study characteristics of ongoing RCTs**

Two protocols (Table 1) for ongoing RCTs were identified, both of which are from the USA and are definitive studies following the results from two RCTs already reported in this review.\(^ {19,20}\) now with larger sample sizes, longer follow-up periods and cost-effectiveness analyses. The first by Janicke et al.\(^ {16}\) is a protocol for an RCT entitled ‘Extension Family Lifestyle Intervention Project (E-FLIP for Kids)’. This study has three arms, aiming to compare a family-based with a parent-only intervention and an education control condition in 240 overweight or obese children aged 8–12 years, measuring BMI Z-score as well as cost-effectiveness up to 24-months follow-up. The second protocol\(^ {15}\) presents a study entitled ‘Parents as the Agents of Change for Childhood Obesity (PAAC)’ with 150 overweight 8–12 year-old children, aimed at evaluating the effectiveness and cost-effectiveness of parent-only versus parent–child behavioural treatment on the child's BMI Z-score, up to 18-months follow-up. Results are expected in 2015.

**Programme costs**

One of the six completed studies also considered the costs of delivering the interventions.\(^ {25}\) They compared the programme costs that arose for the parent-only intervention with the costs for the parent–child intervention, for personnel, materials, incentives, food and travel for staff and families. While the effectiveness of the parent-only intervention did not differ significantly from that of the parent–child intervention, the parent-only intervention was cheaper. The costs per child were 63% higher in the parent–child group compared with the parent-only group (parent only $521 versus parent–child $872), and 31% higher per unit change in weight status (0.1 decrease in BMI Z-score) (parent only $579 versus parent–child $758).

**Discussion**

**Main findings of this study**

This study set out to determine whether parent-only interventions are effective in the treatment of obesity in children aged 5–12 years compared with child-only or parent and child interventions. In total, 8 studies (from 12 papers) met the inclusion criteria for the review, of which 6 were completed studies and 2 were protocols for ongoing trials.

While two studies showed an increased reduction in the degree of overweight in the parent-only groups compared with parent–child and child-only interventions, the other four studies’ results suggest that parent-only interventions are at least as good as parent–child interventions with regard to their effectiveness in the treatment of childhood obesity. None of the studies showed that parent-only interventions were less effective in weight management in children.

High dropout rates are common in weight management programmes and can vary widely depending on the definition.\(^ {32,33}\) Parent-only interventions could be expected to show lower dropout rates as it may be easier for parents to plan attendance. However, we found that the overall trend was for parent-only interventions to experience higher dropouts from the intervention. In addition to participants’ reasons for dropping out, it could be argued that taking up the responsibility for their child’s healthy weight may be overwhelming and lead to higher dropouts in the parent-only groups.\(^ {21,24}\) Thus, parents who participate in parent-only programmes need strong motivation for...
but also the support of extended family that should not undermine the efforts of the lead parent. Furthermore, parents may prefer their child to be involved, perhaps preferring another adult to teach weight management skills to their child and their child to have the support from other overweight children. Previously identified influencing factors on childhood obesity intervention dropout, e.g. ethnicity, socio-economic status, child age and baseline BMI, were not assessed as predictors for dropout in our included studies.

Having established that parent-only interventions appear to be as good as parent–child (family-based) interventions, the assumption must be explored that parent-only interventions are likely to be more cost-effective. Only one of the six published studies in this review also considered programme costs and showed that parent-only interventions are cheaper to run than interventions including both parents and children—with lower costs per unit change in BMI Z-score. However, the authors did not perform a full economic evaluation. Costs to run a family-based programme will depend on whether parents and children attend together or in separate groups. For example, in the study examining costs by Janicke et al., the parent–child intervention was delivered to separate parallel groups for children and parents. This design would likely be more costly to deliver on rooms and facilitators than if the parents and children had attended a single group. Further studies are needed to examine both intervention costs and costs from a healthcare and societal perspective.

**Limitations of this study**

A limitation of the study is that due to the heterogeneity of the outcome data, a meta-analysis was not conducted. A meta-analysis would have added to the validity and overall statistical significance of the findings. While Jull and Chen included a meta-analysis in their review, only one study published enough data for inclusion, with unpublished data being provided by the study authors. Our identification of ongoing studies suggests that this is still an important area under investigation, and as such future results will add to the evidence base, allowing potential for updated meta-analyses. Other limitations of the review are that the studies included in this review were generally small and at some risk, or unclear risk of bias, which was mostly associated with non-reporting or under-reporting of risk of bias domains. The results should be interpreted with this in mind.

**References**


Appendix: Search strategy MEDLINE

Medline Search for PO versus PC SR, 3 March 2013

# Search terms
1 (childhood or children).mp. [mp = title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept, rare disease supplementary concept, unique identifier]
2 Child.mp. or Child/
3 1 or 2
4 adiposity.mp. or Adiposity/
5 (overweight or obese).mp. [mp = title, abstract, original title, name of substance word, subject heading word, keyword]
6 exp Obesity/ or obesity.mp.
7 4 or 5 or 6
8 Limit 3 to (‘child (6–12 years)’ or ‘adolescent (13–18 years)’)
9 parent.mp. or Parents/
10 parenting.mp. or Parenting/
11 9 or 10
12 7 and 8 and 11
13 Limit 12 to (clinical trial, all or randomized controlled trial)
14 Limit 13 to yr = ‘1990 -Current’