Interim Report on the Effectiveness of Dietary Interventions for Children and Adolescents with Overweight and Obesity

Prepared for the World Health Organization

Priority Research Centre in Physical Activity and Nutrition,
School of Health Sciences, Faculty of Health and Medicine,
University of Newcastle

4th December 2017

Authors

Duncanson K[1], Shrewsbury VA[1], Collins CE[1] on behalf of the DiET-CO Consortium[2]

[1] School of Health Sciences, Faculty of Health and Medicine, Priority Research Centre in Physical Activity and Nutrition, The University of Newcastle, Callaghan NSW 2308, Australia.

[2] Dietary Efficacy/effectiveness Trials in Childhood Obesity (DiET-CO) Consortium members (alphabetical order): Ashman A, Ashton L, Burrows T, Chai LK, Collins CE, Coyle D, Demaio AR, Duncanson K, Ells LJ, Garnett SP, Gow M, Ho H, Jensen M, Littlewood R, Nowicka P, Ong N, Shrewsbury VA, Stewart L, Walker JL.

Acknowledgements

We thank Senior Research Librarian Debbie Booth at the University of Newcastle for conducting the literature searches. This report was prepared with the support of a National Health and Medical Research Council Senior Research Fellowship (Collins C), a Gladys M Brawn Senior fellowship (Collins C) and a Gladys M Brawn fellowship support package (Duncanson K, Shrewsbury VA).

Contact

Professor Clare Collins
PhD, BSc, Dip Nutr&Diet, Dip Clin Epi, FDAA
Professor in Nutrition and Dietetics
Acting Director, Priority Research Centre in Physical Activity and Nutrition
School of Health Sciences
Faculty of Health and Medicine
The University of Newcastle
Callaghan NSW 2308
Ph: 02 49215646 Fax 02 49 217053
Email clare.collins@newcastle.edu.au

Suggested Citation

Duncanson K, Shrewsbury VA, Collins CE and The DiET-CO Consortium. Interim Report on the Effectiveness of Dietary Interventions for Children and Adolescents with Overweight and Obesity for the World Health Organization. December 2017.

ISBN 978-0-7259-0017-5

Disclaimer

BACKGROUND

The purpose of this report is to develop a greater understanding of the characteristics and effectiveness of contemporary dietary interventions that achieve dietary improvements and relative weight reduction in children and adolescents with overweight or obesity. Data collected for a systematic review (in preparation), by the international DiET-CO consortium, on the dietetic management of children and adolescents with overweight and obesity, was considered in developing the preliminary recommendations in this report. The systematic review[1,2] is an update of an existing series of reviews conducted by members of the consortium.

METHODS

Study selection criteria

We included dietary interventions targeting the reduction of excess body weight in children or adolescents under 20 years of age with overweight or obesity and published since the previous systematic review on the same topic was conducted in 2010[1]. Eligible studies included:

1. randomised controlled trials (RCTs) that compared alternative treatment arms, or treatment groups to untreated controls, published in peer-reviewed journals;

2. interventions directed at children or adolescents or directed exclusively at parents of children or adolescents;

3. nutrition or dietary interventions provided by a dietitian with or without other health professionals, by other health or education professionals, or via the internet, telephone or mail. The focus of the interventions included lifestyle modifications, either dietary intake alone, or combined with physical activity and/or sedentary behaviour modification, or combined with meal replacements or dietary supplements, or combined with behavioural therapy, or as an adjunct to pharmacotherapy or a surgical intervention;

4. an adiposity and/or dietary-related outcome. Dietary outcomes considered for this report were: energy-dense, nutrient-poor (EDNP) foods, sugar-sweetened beverage (SSB) consumption, fruit and/or vegetable (FV) intake, or total energy intake. EDNP foods included foods or groups of foods that were reported as high in fat, energy and/or sugar, and low in nutritional value, and included fried and fatty foods, savoury snacks, high sugar foods such as confectionery and sweet snack foods (but not beverages). SSB and FV intake were categorised as per the respective included studies, with the exception of fruit juice and fried potato products, which were removed if possible;

5. any duration of follow up with all time points included. This is due to the potential for dietary changes to occur immediately. Studies included in the primary analysis and presented in the main report[3] on the impact on BMI and/or BMI z-score, only included studies with a minimum of six months data from baseline.

Studies were excluded if they focused on obesity attributable to a secondary cause, with the exception of Type 2 Diabetes Mellitus.

Literature search strategy

In February 2017, the literature search strategy used in the previous review[1] was implemented by a senior medical librarian and retrieved 8,575 citations. Using Covidence software each citation abstract, or full-text article as required, was screened in duplicate by DiET-CO Consortium members using the selection criteria to identify articles eligible for inclusion in this report. Each Cochrane review referenced in this report[4-9] was screened by one member (AA) of DiET-CO to identify additional articles eligible for inclusion.

Data extraction and synthesis

Sixteen of the DiET-CO members were involved in completing the primary data extraction of included studies using a standardised template. Extracted data included information on key study characteristics and methodology, quality indicators, and dietary and adiposity outcomes. The primary extraction for each study was checked by a second DiET-CO member, with the exception of the quality indicators which were extracted independently. Any disagreements regarding these extracted data were resolved between the reviewers or by a third reviewer as needed. Authors KD and VAS tabulated the key study characteristics for studies with significant ($P<0.05$) dietary outcomes (Table 1) and prepared the in-text result summaries which also considered studies with non-significant dietary outcomes. Primarily, we examined differences in the dietary outcome between study groups from baseline to each follow up time point evaluated. However, we also examined dietary outcome changes reported within study arms, or within combined study arms. The internal validity of tools used to measure weight status and dietary intake, along with the risk of bias related to randomisation procedures, analysis methods and the blinding to group allocation of participants, intervention implementers and outcome assessors were assessed using standard criteria[10,11] by either KD or VAS and checked by the other author. Each study was assigned to a pre-determined category for each validity and bias domain that was documented in Table 1.

Development of evidence statements

The Australian National Health and Medical Research Council tools for rating the quality of the evidence were used to generate evidence statements. These are based on the GRADE (Grading of Recommendations, Assessment, Development and Evaluation) system.[10,11]

The body of evidence on each of the four selected dietary outcomes was evaluated using the National Health and Medical Research Council (NHMRC) grades on the evidence base including number, type and quality of studies; consistency in findings and clinical impact of the recommendations. These parameters were used to inform the resulting evidence statements, which were developed in accordance with the associated NHMRC framework guidelines.[11]

RESULTS

The systematic literature search identified 159 eligible RCTs that included dietary modification strategies. One hundred and one (63.5%) studies reported on at least one dietary-related outcome, with 71 (44.7%) studies including one of the four dietary outcomes considered for this report. Findings are summarised by dietary outcome category.

Energy-dense, nutrient-poor (EDNP) food outcomes

The change in EDNP food intake was reported in 26 studies and is summarised in Table 1 for the 18 studies with a statistically significant result (9 with a group x time effect; 9 with only a time effect in at least one arm). EDNP foods were defined as reported foods or groups of foods that are high in fat and/or sugar, with low nutritional value and included fried and fatty foods, savoury snacks, high sugar foods such as confectionery and sweet snack foods (but not beverages).

Twelve studies reported EDNP outcomes using intention-to-treat (ITT) principles (2776 participants in total, range 24 to 686 per study), and 6 reported results as completer only or non-ITT (CO-NITT) (1681 participants in total, range 21 to 165 per study). Eleven studies were assessed as low risk of randomisation bias,[11] 14 reported blinding of primary outcome assessor and one blinded participants to group allocation. All 18 studies used objective BMI measures, and four different dietary assessment methods were used (note: some studies used multiple diet assessment methods). Dietary assessment methods with a low risk of bias were food frequency questionnaires (n = 7 studies), weighed food records (n = 5 studies), and 24-hour recalls (n = 3 studies) with subjective, generic questionnaires used in five studies.

Of the 9 studies with a 'group x time' effect seven were ITT studies, two were CO-NITT studies and sample sizes ranged from 24 to 358 participants. Of the 13 studies with significant 'time only' EDNP outcomes, six were ITT studies and seven were CO-NITT studies and sample sizes ranged from 21 to 686 participants. The study characteristics, outcomes reported and significance of time and group effects for EDNP outcomes are outlined in detail in Table 1.

Evidence statement (Level A) – EDNP food intake

Moderate to high intensity interventions that lasted two to 12 months that targeted children/adolescents with overweight or obesity, or their families, and that included a dietary component can result in a reduction in consumption of energy-dense, nutrient-poor foods for periods of time from 6 months up to two years. These reductions included 0.5 serves/day of savoury or sweet snacks (or desserts), 0.4 to 1.0 serve/day high fat (fried or fatty) foods or six to 15 grams per day of refined sugar.

Sugar sweetened beverages (SSB) outcomes

The change in SSB intake was reported in 24 studies and is summarised in Table 1 for the 15 studies with a statistically significant result (7 with a group x time effect; 8 with only a time effect in at least one arm). SSBs were defined as all beverages described within studies as SSB, sweet drinks or soda/soft-drinks, but did not include 100% fruit juice or sugar added to beverages (such as tea/coffee).

Eleven studies reported SSB outcomes using ITT principles (2861 participants in total, range 22 to 716 per study), and 4 reported results as completer only or non-ITT (CO-NITT) (364 participants in total, range 58 to 160 per study). Twelve studies were assessed as low risk of randomisation bias,[11] 10 reported blinding of primary outcome assessor and two blinded participants to group allocation. All 15 studies used objective BMI measures, and four different dietary assessment methods were used. Dietary assessment methods with a low risk of bias were food frequency questionnaires (n = 5 studies), weighed food records (n = 2 studies), and 24-hour recalls (n = 3 studies) with subjective, generic questionnaires used in five studies.

Of the 7 studies with a 'group x time' effect six were ITT studies, one was a CO-NITT study and sample sizes ranged from 86 to 637 participants. Of the 8 studies with only significant 'time only' SSB outcomes, five were ITT studies, three were CO-NITT studies and sample sizes ranged from 22 to 716 participants. The study characteristics, outcomes reported and significance of time and group effects for SSB outcomes are outlined in detail in Table 1.

Evidence statement (Level A) – SSB consumption

Moderate to high intensity interventions that lasted between two months to 12 months and that targeted children/adolescents with overweight or obesity aged up to 20 years, or their families, and that included a dietary component, resulted in a reduction in sugar sweetened beverage consumption of approximately 0.5 servings per day.

Fruit and vegetables (FV) outcomes

The change in fruit and vegetable intake was reported in 34 studies and is summarised in Table 1 for the 15 studies with a statistically significant result (7 with a group x time effect; 8 with only a time effect in at least one arm). Fruit and vegetables were defined as per study methods of included papers, with fruit juice and fried potatoes products excluded where possible, and fruit juice with added sugar included under SSBs.

Ten studies reported FV outcomes using ITT principles (2537 participants in total, range 42 to 716 per study), and five reported results as completer only or non-ITT (CO-NITT) (430 participants in total, range 78 to 160 per study). Ten studies were assessed as low risk of randomisation bias,[11] nine reported blinding of primary outcome assessor and one blinded participants to group allocation.

All 15 studies used objective BMI measures, and four different dietary assessment methods were used. Dietary assessment methods with a low risk of bias were food frequency questionnaires (n = 6 studies), weighed food records (n = 2 studies), and 24-hour recalls (n = 1 study) with subjective, generic questionnaires used in seven studies.

Of the 7 studies with a 'group x time' effect six were ITT studies, one was a CO-NITT study and sample sizes ranged from 38 to 716 participants. Of the 8 studies with only significant 'time only' SSB outcomes, four were ITT studies, four were CO-NITT studies and sample sizes ranged from 60 to 372 participants. The study characteristics, outcomes reported and significance of time and group effects for EDNP outcomes are outlined in detail in Table 1.

Evidence statement (Level B) – fruit and vegetable intake

Moderate to high intensity interventions that lasted between two months to 12 months and that targeted children/adolescents with overweight or obesity aged up to 20 years, or their families, and that included a dietary component, resulted in increases in combined fruit and vegetable consumption of 0.25 to 0.50 servings per day.

Total energy intake outcomes

The change in total energy intake was reported in 50 studies and is summarised in Table 1 for the 26 studies with a statistically significant result (12 with a group x time effect; 14 with only a time effect in at least one arm). Total energy intake was reported as calories or joules per day in most of these studies, with some adjusting for the body weight of participants. It is important to note that in some studies (such as[12-17]) total energy intake appears to be reported as a process measure. For example, assessment of total energy intake could be used to establish that all arms received a reduced-energy isocaloric diet as intended, hence no significant changes between groups would be desired. In other studies the extent to which the intervention(s) including a diet component reduced total energy intake was an outcome measure. Ten studies reported change in total energy intake using ITT principles (1,015 participants in total, range 24 to 357 per study) and 16 reported results as CO-NITT (1,277 participants in total, range 21 to 160 per study). Eighteen studies were assessed as low risk of randomisation bias, 11 reported blinding of primary outcome assessor and five blinded participants to group allocation. All 26 studies used objective BMI measures, and five different dietary assessment methods were used. Dietary assessment methods included food frequency questionnaires (n = 4 studies), food records (n = 10 studies) and food diaries (n=4 studies), and 24-hour recalls (n = 7 studies) with a generic questionnaire used in one study.

Evidence statement (Level A) – total energy intake

Moderate to high intensity interventions that lasted between 1 and 12 months and that targeted children/adolescents with overweight or obesity aged up to 20 years, or their families, and that included a dietary component, typically resulted in a reduction of total energy intake between 200 to 600kcal/day.

CONCLUSIONS AND RECOMMENDATIONS

This report contains evidence statements and summary tables related to dietary outcomes derived from RCTs identified as part of an updated systematic review on best practice dietetic management of children and adolescents with overweight and obesity. Included RCTs were generally of relatively low risk of randomisation bias. However, the risk of bias in relation to blinding of participants and blinding of intervention staff was either not conducted or not reported in most studies. The interventions that reported dietary outcomes were commonly of relatively high intensity (predominantly face-to-face individual or group lifestyle interventions) requiring participation for at least three months, followed by a longer follow-up component of moderate intensity (less frequent face-to-face or periodic contact via phone, text messaging or newsletters, plus a home based transition component) for a period of time ranging from a further three to 18 months.

The included studies involved between one and four intervention arms which were compared either head-to-head or against a usual care or wait-list control group. The majority of studies involved best practice health education strategies, with health behaviour change theory

components that addressed one or more of the biological, psychological, environmental and societal determinants of obesity[18] commonly embedded into the intervention design. Interventions that were aimed at children over the age of ten years were appropriately directed towards the participating child. Interventions for children under 10 years were usually directed at a parent, or were parent and child focused. A strength of the current evaluation was a high proportion of studies that were analysed using intention to treat principles or well-described completer only analysis. Limitations of the current evaluation included that most studies were not powered to detect changes in dietary outcomes, as diet was usually a secondary outcome variable, and inadequate reporting of dietary assessment methods used was common.

The changes in consumption of SSBs, EDNP foods, FV, and total energy reported by parents or children/adolescents up to age 20 years with overweight or obesity and described in the evidence statements are modest relative to the intensity and duration of interventions. However, the reported improvements in dietary intake are clinically important when sustained in the long term.

Recommendations for practice

Families can achieve reductions in total energy, SSB and EDNP intake and increases in fruit and vegetables in children and adolescents by participating in weight management interventions that include a combination of intensive health education and lifestyle behaviour changes strategies. If sustained in the long term, these changes have the potential to improve energy balance and reduce BMI z-scores.

Replication of intervention duration and intensity may not be feasible in routine clinical practice, but some promising intervention trends that are replicable were identified. Monitoring of dietary intake at an individual level by the child, adolescent or parent appeared to be a useful strategy. This was particularly effective when guidance about appropriate dietary intake was provided to participants or their families to benchmark the child/adolescent's intake against. Examples included comparison with dietary guidelines and/or food and nutrient recommendations. It is possible that this finding relates to the accountability associated with either self-monitoring or covert monitoring by parents or the health professionals or the study team. This is consistent with the association between self-monitoring and greater weight loss in adults reported by Burke et al.[19]

The inclusion of supplementary strategies to increase exposure to health education information, such as access to websites and SMS, was expected to enhance health literacy and achieve a greater impact of dietary outcomes, but this was not demonstrated. It is possible that the effectiveness of these strategies could be increased if they are more tailored to specific dietary outcomes and are health behaviour (as well as, or rather than health education) focused.

Features of studies that reported significant improvements in components of diet post intervention included:

1. Monitoring of dietary intake by child, parent or adolescent using a dietary intake monitoring tool, such as a food diary or diet application.
2. Self or family-led self-evaluation using comparison of collected dietary intake with recommendations in dietary guidelines.
3. Strategies that targeted specific dietary components, e.g. strategies to decrease SSB or EDNP intake, rather than more general healthy eating advice.

4. Strategies that prioritise personalised behaviour change based on individual health education or behaviour needs.
5. Use of health coaching techniques by health professionals to assist individuals to identify, prioritise, implement and evaluate agreed, prioritised health behaviour changes.

Recommendations for policy

The evidence contained in this report highlights the need for policy makers to prioritise the treatment of children/adolescents with overweight or obesity aged up to 20 years, or within their families using interventions that contain evidence based dietary interventions. In order to inform and optimise treatment approaches, very large studies that are powered for particular dietary intake factors as the primary outcome are required. Alternately, an agreed minimum data set for inclusion in obesity interventions needs to be established, and/or methodological consistency between studies achieved so results can be pooled in meta-analyses or meta-syntheses either retrospectively or prospectively.

Policy makers can:

1. Ensure that allocation of grant funding for interventions for treatment of children/adolescents with overweight or obesity is conditional on collection of agreed minimum data set to allow for pooling of data.
2. Align resource allocation to ensure adequate health professional training to accommodate treatment of children/adolescents with overweight or obesity and their families.
3. Allocate funding for early intervention strategies aimed at optimising diet-related behaviours amongst children who have a BMI above the 75th percentile, or who are at risk of overweight, and their families.
4. Ensure that applications requirements include specific reference to and assessment of translational potential of the intervention into clinical practice.

Recommendations for future research

General

The findings reported here indicate that intervention of higher intensity and longer duration effect greater relative reductions in adiposity in children and adolescents with overweight and obesity. Future research should focus on:

1. Interventions that are adequately powered to detect changes in dietary intake as the primary outcome. This may include testing the effectiveness of group allocation and specific dietary intervention based on baseline dietary intake.
2. Interventions that target specific components of dietary intake and include these factors in inclusion criteria, group assignment or analysis.
3. Evaluation of interventions that are scalable for administration across the target population.
4. Use of minimum data set to facilitate meta-analysis and meta-synthesis.
5. Secondary quartile analysis of existing data for dietary outcomes (such as fruit, vegetables, SSB and EDNP foods) to determine if an intervention effect is achieved amongst those for whom intake is furthest from recommendations.

6. Development of some brief but explicit guidelines for researchers for study design, implementation, analysis and reporting to increase consistency between studies and thereby increase potential for meta-analysis and meta-synthesis.

Methods

1. Description of methods by which dietary intake is assessed using specific and clearly described dietary assessment tools, and appropriate details on the data analysis, including nutrient databases used and methods for handling measurement error.
2. Analysis and reporting of difference for both time and between-group outcomes in studies with no true control group.
3. Analysis and reporting of dietary outcomes using intention to treat principles, with any additional completer only analysis clearly indicated and presented separately.
4. Collection and analysis of fruit and vegetable intake separately from each other and with whole fruit and fruit juice, potato and fried potato (chips) analysed and reported separately.
5. Reporting of dietary outcomes using standard measures (kJ or kcal/day, millilitres, grams or ounces) to allow for potential meta-analysis or between-study comparison.

Dietary intake

1. Measurement of association between specific dietary intervention components and the related dietary outcome (e.g. SSB focused intervention and SSB consumption (volume per day).
2. Emerging areas of research into obesity treatment such as Nutrigenomics and gastrointestinal microbiota should be considered for the child and adolescent populations.
3. Explicit descriptions or definitions of dietary components included in reported dietary measures to allow for potential meta-analysis or between study comparisons.

Behaviour change/other components

1. Further strengthen health behaviour change components, relative to or in addition to health education intervention components.
2. Determine effectiveness of interventions targeting a reduction in obesity promoting behaviours of children and adolescents who are in the 75^{th} to 85^{th} BMI percentile range to determine effectiveness of early intervention strategies.

Table 1: Key study characteristics for studies with significant*dietary outcomes

Trial descriptors					Key quality items					Results				
Author, Country	N	Intervention	Population and other content-specific items[a]		Randomisation procedure	Blinding	Follow up	Outcome assessment		**Δ Total energy**[#]	**Δ Fruit and/or** vegetables[#]	**Δ sugar-**sweetened beverages[#]	**Δ EDNP foods**[#]	**Δ Adiposity** [#]
True ITT analysis or 100% participant follow up														
Berry, USA[20]	716	2 arms: School based intervention EG: 3mo HI + 9mo MI, CF C: Wait list	Mean 8.6 ± 1.0 year olds ITT analysis[b]		Random block (school) (stratified)[b]	Data collector (diet & adiposity)[b], Unclear (SP,lvl)[d]	58% at 18mo	Diet: Child and Adolescent Trial for Cardio-vascular Health Q'aire[d] BMI: Objective[b]			Group x time ↑er consumption F, V as snack, post phase 1 intervention*	Time only ↓er SSB (>1 s/d) 18mo EG (NS, p = 0.052) ↑er water/USB at 18mo EG parents*		BMI %ile NS between group BMI %ile NS 18mo (p = 0.47)
Broccoli, Italy[21]	372	2 arm: Lifestyle intervention using Motivational Interviewing (LBI) vs usual care (C) LBI: 12mo MI, FF C: 12 mo usual care	4 – 7 year olds ITT analysis[b]		Stata software (stratified, non-blinded)[c]	Non-blinded[c]	91% at 24mo	Diet: Italian dietary habits Q'aire[d] Consumption BMI: Objective[b]			Time only ↑Veg ass.↓ BMI lv 24mo*	Group x time (% of participants making positive change) ↓SSB frequency lv 12mo** (P<0.001) ↓SSB frequency lv 24mo**	Time only (%of participants making positive change)↓ fast food times/w LBI ↓sweet snacks 12mo *** ↓desserts 12mo* ↓fried food 12mo* ↓desserts 24mo*	Group x time ↓BMI z-score in FBI vs C* (1.17±1.06 to 1.00±1.01) 0 – 12mo lv vs. (1.27±1.12 to 1.55±1.36) 0 – 12mo UC*
Codoñer-Franch, Spain[22]	40	2 arms: Hypocaloric diet (HC) + 100% mandarin (M) juice daily vs HC only HC+M: 4 week MI, FF HC: 4 week MI FF	9-13 year olds 100% follow up		Pairwise allocation[d]	Not reported[d]	100% at 4 weeks	Diet: Mean of a 24-h diet recall and a prospective 3-d record[b] BMI: Standardised techniques[d]			Time only ↓ MJ/d HC+M (Baseline to follow up:10.0 ± 2.1 to 6.9 ± 1.4)***; HC (9.6 ± 1.4 to 7.1 ± 1.9)***				Time ↓BMI (kg/m^2) in HC+M (29.3 ± 3.5 to 28.7 ± 3.6)***, ↓BMI (kg/m^2) in HC (28.7 ± 4.2 to 28.2 ± 4.1)**
DeBar, USA[23]	203	2 arms: Lifestyle intervention (12	12 – 17 year old girls		Validated method,	Data collector	83% at 12mo	Diet: 3 x 24 hr recalls (0, 6,					Group x time	

Trial descriptors					Key quality items					Results				
Author, Country	N	Intervention	Population and other content-specific items[a]		Randomisation procedure	Blinding	Follow up	Outcome assessment		**Δ Total energy**[#]	**Δ Fruit and/or** vegetables[#]	**Δ sugar-**sweetened beverages[#]	**Δ EDNP foods**[#]	**Δ Adiposity** [#]
		weekly for 3mo, 4 fortnightly for 2mo) for adolescent, separate weekly first 3 months for parents Iv: 3mo HI, 3mo MI, AF and 3mo HI, PF C: 6mo LI	ITT analysis[b]		computer generated[b]	(diet & adiposity)[b], Unblinded (SP,Ivl)[d]		12mo)[b] plus Self-report questionnaires BMI: Objective[b]					Fast-food, (s/w) 1.17±1.06 vs.1.27±1.01 (0mo), 1.18±1.32 vs. 1.08±1.17 (6mo), 1.00± 1.01 vs. 1.55± 1.39 (12mo)*	BMI z-score 2.00 ±0.34 vs. 2.00 (0.33) 0mo, 1.88 ±0.41 vs.1.94± 0.38 (6mo), 1.85±0.46 vs 1.92±0.39 (12mo) (0, 6, 12mo)*
Ebbeling, USA[24]	224	2 arms: Lifestyle intervention with USB delivery and monthly motivational call Iv: 12mo MI plus 12mo LI, AF C: Vouchers for NCB at completion	Grade 9 or 10 Mean 15 years ITT analysis[b]		Random allocation[d]	Data collector (diet & adiposity)[b], Unclear (SP,Ivl)[d]	93% at 24mo	Diet: 3 x 24-hour telephone recall (trained interviewer)[b] BMI: Objective[b]		<u>Group x time</u> kcal/d Diff 12mo −278±69*** kcal/d diff. 24mo −183±76*	<u>Group x time</u> Fruit juice diff. 12mo −45±16**	<u>Group x time</u> ↓SSB (s/d) 12mo (−0.7±0.1)*** ↓SSB 24mo (−0.4±0.1)** ↑er USB at 12mo (0.8±0.2)*** ↑er USB at 24mo (0.6±0.2)**	<u>Group x time</u> Sugar difference (g/d)12mo −105±20*** 24mo −58±21**	<u>Group x time</u> ↓BMI 12 mo (-0.57± 0.28)* ↓BMI 24 mo (-0.30 ±0.40) NS
Elloumi, Tunisa[25]	28 males only	4 arms: energy restriction group (R), exercise training at maximum lipid-oxidation (LIPOXmax) group (E), or an energy restriction/training group (RE), control group (C) R: 2mo MI AF E: 2mo HI AF RE: 2mo HI AF	12-14 year olds 100% follow up		Random allocation[d]	Not reported[d]	100% at 2 months	Diet: Recorded (4 times/ week), in a specially designed diary, the quantity and time at which food was eaten[b] BMI: Objective[b]		<u>Time only</u> ↓kcal/day from baseline to 2 months in the energy restriction group 3239 ± 347 to 2724 ± 212**, ↓energy restriction/exercise training 3033 ± 378 to 2525 ± 228**				<u>Time</u> ↓BMI (kg/m^2) in RE (30.3 ± 4.5 to 27.7 ± 4.1)***, ↓BMI (kg/m^2) in E (30.3 ± 4.6 to 29.4 ± 4.5*)*, ↓BMI (kg/m^2) in R (30.3 ± 2.9 to 28.5 ± 2.6)**, NS in C

Trial descriptors					Key quality items					Results				
Author, Country	N	Intervention	Population and other content-specific items[a]		Randomisation procedure	Blinding	Follow up	Outcome assessment		**Δ Total energy**[#]	**Δ Fruit and/or** vegetables[#]	**Δ sugar-**sweetened beverages[#]	**Δ EDNP foods**[#]	**Δ Adiposity** [#]
		C: Not specified												
Epstein, USA[26]	24	2 arms: family-based treatment (FBT) + variety of high energy dense foods; FBT only FBT+V: 6mo HI, FF FBI only: 6mo HI, FF	8-12 year olds, ITT analysis (as per abstract)[b]		Not specified[d]	Adiposity data collector[b,] Unclear (Randomisation[d], diet data collector[d], SP & Ivl[d,e]	Unclear at 6 months	Diet:3 x 24 hr food recalls, multipass approach[b] BMI: Objective[b]		Group x time ↓kcal/day (2005 to 1513)6mo***		Beverage variety computed but not reported	Group x time Variety of RED foods showed a significant change by family (FBT+ V=20.2 to 12.6, FBT only=19.7 to 16.8)*	Group x time Greater reductions in child % owt.and parent BMI Change in variety of child and parent RED foods were related to changes in child % overweight*
Ferranti, USA[27]	27	2 arms: low-fat (LF) vs a low-glycemic-load (LGL) diet LF: 2mo HI FF, 4mo <LI LGL: 2mo HI FF, 4mo <LI 25% calorie deficit both arms.	8–21 year olds ITT analysis[b]		Computer-generated assignment[b]	Participants[b,] Unclear (Randomisation[d], diet and adiposity data collectors[d], Ivl[d,e])	96% at 6 months	Diet: Unannounced dietary recalls as a process measure[b] BMI: Objective[b]		Time only In the maintenance phase, energy intake declined in the group overall (−221.6 kcal ±63.4)**				Time ↓BMI z-score in LF (2mo:−0.16 ±0.03)**, LGL (−0.16 ±0.04)**
Kirk, USA[28]	102	3 arms: Low CHO (LC), limit high GI foods (RGL), portion control (PC) All arms: Individual parent-child sessions with dietitian and group exercise classes	7 – 12 year olds, ITT analysis[b]		Random permuted block (stratified)[b]	Data collector (diet & adiposity)[b] SP[b], Ivl not blinded[d]	83% at 12mo	Diet: 3-consecutive day food record[b] BMI: Objective[b]		Time only ↓kcal/day all arms (LCHO, PC, LGI) 3mo*** and 12mo*** RGL higher kcal/day than PC arm 3mo***				Time only ↓BMIz all 3 arms 3mo*** and 12mo

Trial descriptors					Key quality items					Results				
Author, Country	N	Intervention	Population and other content-specific items[a]		Randomisation procedure	Blinding	Follow up	Outcome assessment		**Δ Total energy**[#]	**Δ Fruit and/or** vegetables[#]	**Δ sugar-**sweetened beverages[#]	**Δ EDNP foods**[#]	**Δ Adiposity** [#]
		All: 6mo HI, PF, CF								NS between group 6 and 12 months				
Looney, USA[29]	22	3 arms: Lifestyle 6 x monthly newsletters (N); (N) plus monthly face-to-face or phone contact (1 hour, 15 minutes total) (N+GM); (N) Plus monthly face-to-face or phone contact (2 hour, 60 minutes total) (N+GM+BC) N: 6mo LI, PF, FF N+GM: 6mo MI, PF N+GM+BC: 6mo HI, PF	4 – 10 year olds ITT analysis[b]		Random sealed envelope (block)[b]	Data collector (diet & adiposity)[b], Unclear (SP,IvI)[d]	91% at 6mo	Diet: Carer reported 3-day food record[b] BMI: Objective[b]				<u>Time only</u> ↓SSB (s/d) 6mo (1.6±0.9 vs.1.1±1.3)*		<u>Time only</u> ↓BMI z-score 6mo, F(1, 19) = 5.092*
Nguyen AUS[30,31]	151	2 arms: Group lifestyle intervention (G) plus additional therapeutic contact (G+ATC) G+ATC: 7w HI PF+AF, 22 mo LI, AF	13 – 17 year olds ITT analysis[b]		Computer generated (stratified)[b]	Data collector (diet & adiposity)[b], SP & IvI not blinded[e]	62% at 2yr	Diet: 15-item FFQ[b] BMI: Objective[b]				<u>Group x time</u> ↑er never/rare FJ 24mo, OR 2.5(1.6, 3.8)	<u>Time only</u> (combined groups) ↓er frequency high-fat meat products at 12 & 24 mo,* and ↓potato crisps at 12 mo*	NS BMI z-score Between groups Δ BMI z-score 24mo 0.13(0.20, 0.06)

Trial descriptors					Key quality items					Results				
Author, Country	N	Intervention	Population and other content-specific items[a]		Randomisation procedure	Blinding	Follow up	Outcome assessment		**Δ Total energy**[#]	**Δ Fruit and/or** vegetables[#]	**Δ sugar-**sweetened beverages[#]	**Δ EDNP foods**[#]	**Δ Adiposity** [#]
		G: 7w HI PF + AF only												
Pakpour Iran[32]	357	3 arms: Motivational Interviewing (MI), MI + parental involvement (MI+PI), Control (C) 2mo HI Lifestyle: AF, PI	13 – 18 year olds ITT analysis[b]		Computer generated[b]	Data collector (diet & adiposity)[b], SP not blinded[e], Unclear (IvI)[d]	97% at 1yr	Diet: 152-item FFQ[b] BMI: Objective[b]		<u>Group x time</u> ↓kcal/day MI+PI vs. C** <u>Time</u> ↓kcal/day MI+PI vs.MI* [MI= 3022±1443, MI+PI= 3001±1449, C = 2930±1343; FU MI= 2785± 1240, MI+PI= 2256± 1351, C = 2919.95±1472]	<u>Time only (s/d)</u> ↑F MI+PI vs. C* [MI=1.27±0.98, MI+PI= 1.27± 0.97, C = 1.21 ±0.97]; 12mo [MI= 1.31±0.96, MI+PI= 1.33± 0.93, C = 1.23± 0.97]	<u>Group x time</u> ↑er USB at 12mo [MI+PI vs. C]** <u>Time</u> MI+PI vs. MI* [MI= 0.87±0.66, MI+PI= 0.85 ± 0.53, C I= 0.89 ± 0.42]; FU [MI= 0.77± 0.38, MI+PI= 0.48± 0.35, C = 0.95 ± 0.33]	<u>Group x time</u> ↓Fried food (s/d) -0.3 MI+PI* <u>Time only</u> ↓Snack/dessert s/d. (MI+PI vs. MI)* Baseline [MI = 4.43 ± 1.5, MI+PI= 4.33 ± 1.82]; FU [MI= 4.12 ±1.43, MI+PI= 3.89± 1.65]	<u>Group x time</u> ↓ BMI z-score 12mo MI+PI* , (MI+PI vs. MI)*
Patrick USA[33]	101	4 arms: Lifestyle intervention web-delivered Website only (WO), Website plus monthly group with PI (WG), Website and SMS (WS) or Usual care (C) WO: 12mo LI AF WG: 12mo MI AF WS: 12mo LI AF C: Usual care	12 – 16 year olds ITT analysis[b]		Random allocation[d]	Data collector (diet & adiposity)[d], SP not blinded[e], IvI not blinded[e]	86% at 1yr	Diet: Validated FFQ[b] BMI: Objective[b]			<u>Time only</u> ↑FV change strategies score 12mo (WG only)*			NS by group or over time
Pbert, USA[34]	126	2 arms: school nurse inter-vention 1(SNI-1) plus exercise; SNI-2	Adolescents in grades 9-11, commenced 2008, 100% follow up		Schools were each assigned a random	Randomisation (n/a), Unclear (data	100% at 6 months	Diet: 24-hour dietary recall interview, plus 8-item						BMI z-score NS between arms.

Trial descriptors					Key quality items					Results				
Author, Country	N	Intervention	Population and other content-specific items[a]		Randomisation procedure	Blinding	Follow up	Outcome assessment		**Δ Total energy**[#]	**Δ Fruit and/or** vegetables[#]	**Δ sugar-**sweetened beverages[#]	**Δ EDNP foods**[#]	**Δ Adiposity** [#]
		SNI: HI, AF SNI 2: HI, AF	(but 15 excluded from analysis due to error in height)		number. The random allocation sequence was generated by the study biostatistician[d]	collectors[d],SP and IvI)[d,e]		instrument to assess dietary behaviours BMI: Objective[b]						Favorable change in BMI associated with reporting drinking soda fewer times in the last 7days than those with unfavorable changes in BMI, adjusted mean 0.83 times vs 1.53 times, respectively (adjusted mean difference −0.71 days; 95% CI −1.12 to −0.30).
Raynor USA[35]	101	Trial 1, 3 arm: Decrease diet + Growth monitoring (DDGM), Increase diet + GM (IDGM), GM only Trial 2, TRADITION and SUBSTITUTE delivered in small groups of biweekly 45min meetings for 2 months, then monthly meetings for 4 months (total 8 meetings).	4 – 9 year olds ITT analysis[b]		Random permuted block (stratified)[b]	Data collector (diet & adiposity)[b], Unclear (SP,IvI)[d]	89% at 1yr	Diet: Parent-reported 3-day food diary[b] BMI: Objective[b]		<u>Time only</u> Trial1: ↓kcal/day DDGM 6mo* and 12mo* Trial 2 - ↓kcal/day TRAD 6mo* and SUB 6mo* NS between arms	<u>Time only</u> ↑FV 6mo** ΔF (0.36 vs 0.01) [95%CI diff. 0.22–0.93] SNR ΔV (0.31 vs. –0.06) [95%CI -0.15–0.89]NS	<u>Time only</u> ↓ SSB (s/d) (DDGM) -0.6 6mo**	<u>Time only (within</u> all groups) (s/d) ↓ Snack food (all arms) -0.7 6mo** and -0.4 12mo*	<u>Time only</u> ↓ BMI(z) 6mo and12 mo ↓ BMI(z) 6mo and 12mo Trial 1: Mean ΔBMI z-score 0 to 12 mo: −0.12 ± 0.22 Trial 2: Mean ΔBMI z-score 0 to 12 mo: −0.16 ± 0.31.

Trial descriptors					Key quality items					Results				
Author, Country	N	Intervention	Population and other content-specific items[a]		Randomisation procedure	Blinding	Follow up	Outcome assessment		**Δ Total energy**[#]	**Δ Fruit and/or** vegetables[#]	**Δ sugar-**sweetened beverages[#]	**Δ EDNP foods**[#]	**Δ Adiposity** [#]
		All: 6mo MI, PF												
Serra-Paya, Spain[36]	113	i) 2 arms: Intensive, 8 month family-based multi-component, behavioural intervention in primary care (NP), or 8 x monthly, 10-min, structured, family meetings at paediatrics unit (CG) NP: 8mo HI, FF CG: 8mo MI, FF	6 – 12 year olds ITT analysis[b]		Random allocation (stratified by age group and locality)[d]	Data collector (diet & adiposity)[b], Unclear (SP,Ivl)[d]	79% at 8mo	Diet: FFQ including extrapolation to govt. recommended daily frequencies[b] BMI: Objective[b]			Group x time ↑FV (s/d) (0.62 vs.0.13) NP vs CG 8mo*	Group x time ↓ SSB (s/d) (-0.26 vs. -0.02) NP vs CG 8mo*		Time only ↓BMI SDS 8mo NP (-4.94%) CG (-0.09%)
Stark, USA[37]	42	3 arms: Lifestyle focused Clinic + home (Iv1), Clinic (Iv2), or Control (C) Iv1: HI PF, CF, FF Iv2: MI PF,CF C: Enhanced standard care	2 – 5 year olds, ITT analysis[b]		Random numbers table[b]	Data collector (diet & adiposity)[b], Unclear (SP,Ivl)[d]	67% at 1yr	Diet: Home food environment assessment tool[d] FV available (from 15 options) BMI: Objective[b]		Group x time ↓kcal/day Iv1 -566 (95%CI:-888,-244) 6mo** ↓kcal/day Iv1 -640(95%CI-932, -348) 12mo*** ↓kcal/day Iv2 –415 (95%CI:-734,-97) 12mo*	Group x time ↑FV in home 6mo (Iv1 group only)**	Time only ↓er EDB in home Iv only (-1.4) 6mo**	Time only ↓ High calorie foods in home 6mo (Iv1 group only)** ↓ High calorie foods in home 12mo (Iv1 group only) **	Time only BMI z-score 6mo Iv1** BMI z-score12mo Iv1***, Iv2*
Taylor, New Zealand[38]	206	2 arms: Single consultant session followed by regular, brief contact (usually mothers only) with a mentor (MINT), usual care Control (C)	4 – 8 year olds Modified ITT analysis[b]		Computer generated random block allocation (stratified)[b]	Data collector (diet & adiposity)[b] SP,Ivl Non-blinded[c]	88% at 24mo	Diet: Children's Dietary Q'airre, Home Food Inventory Comprehensive Feeding Practices Q'airre[d]			Group x time ↑FV score 24mo Mean diff (1.0, (95%C: 0.0,2.1)		Group x time ↓ non-core foods in home MINT vs. UC** ↓ non-core foods (–0.3, 95%CI: –0.5 to 0.0)	BMI z score (-0.12, 95% CI –0.20 to –0.04),

Trial descriptors					Key quality items					Results				
Author, Country	N	Intervention	Population and other content-specific items[a]		Randomisation procedure	Blinding	Follow up	Outcome assessment		**Δ Total energy**[#]	**Δ Fruit and/or** vegetables[#]	**Δ sugar-**sweetened beverages[#]	**Δ EDNP foods**[#]	**Δ Adiposity** [#]
		MINT: 24mo MI, PF C: 24mo <LI, PF						BMI: Objective[b]						
Van Grieken, Netherlands[39,40]	637	2 arms; Structured lifestyle counselling sessions on overweight-preventing behaviours at 3, 6, 12 months. Mot, Int (optional) inc. i) having breakfast daily, ii) drinking < 2 s/d SSB (Iv) usual care (C) Iv: MI, PF C: <LI, PF	Approximately 5 year olds ITT analysis[b]		Computer-generated random permuted blocks (4 – 6, specified allocation ratio 1:1)	SP[b] & Data collector (diet & adiposity)[b]Unclear (Ivl)[d]	78% at 24mo	Diet: Home environment, parenting practices, health behaviours survey tool[d] BMI: Objective[b]				<u>Group x time</u> NS OR ≤ 2 SSB (s/d) between groups <u>Time only</u> ≤ 2SSB (s/d) Iv: 23.1%*** C: 14.6%*		<u>Time only</u> NS Δ BMI Iv: 1.37 ± 1.53 C: 1.44 ± 1.71
Visuthranukul, Thailand[41]	70	2 arms: Low GI (L-GI) vs Low fat (LF) L-GI: HI, 1,400–1,500 kcal/d LF: HI, 1,200–1,300 kcal/d	9–16 year olds, ITT principles applied[b]		Computer-generated randomization[b]	Not reported[d]	74% at 6mo follow up	Diet: 3-d dietary records[d] BMI: Objective[b]		<u>Group x time</u> ↓kcal/day −612 ± 50 intervention vs−271 ± 701 control* <u>Time only</u> −612 kcal/d ± 50 intervention***. NS control				BMI z-score was NS between groups
Waling, Sweden[42,43]	105	2 arm: MI Lifestyle: FF	8 – 12 year olds ITT analysis[b]		Consecutive randomisation 1:1 (stratified)[c]	Data collector (diet)[b], SP	55% at 1yr	Diet: Diet history,					<u>Group x time</u> Higher % meeting refined sugar	<u>Time only</u>

Trial descriptors					Key quality items					Results				
Author, Country	N	Intervention	Population and other content-specific items[a]		Randomisation procedure	Blinding	Follow up	Outcome assessment		**Δ Total energy**[#]	**Δ Fruit and/or** vegetables[#]	**Δ sugar-**sweetened beverages[#]	**Δ EDNP foods**[#]	**Δ Adiposity** [#]
		Intervention vs Control Iv: 12mo MI C: Usual care				and Ivl not blinded[e]		3 x 2-day food records over 12mo, 1 x 4-day food record at12mo[b] BMI: Objective[b]					(sucrose) target 12mo*	↓ BMI z-score 12mo Iv -0.22**, C -0.23**
Warsch-burger, Germany[44]	686	2 arms; child inpatient program (CIP) + PF CBT, CIP +PF written information. CIP: very HI PF CBT: LI Written information: very LI	8-12 year olds, RCT commenced 2007, ITT analysis – but some non-intended cross over of participants		Random number table[b]	Adiposity data collector[b,] parent self completed FFQ[e], Unclear (SP & Ivl)[d,e]	75% at 12 months	Diet: FFQ including problematic food items (e.g. sweets, salty snacks). Reliability for these items was low (α=0.53) BMI: Objective[b]					Time only ↓problematic food score Iv 12mo*	↓NS BMI-SDS 0.24 (95%CI: 0.18 to 0.30) baseline to 12mo post study both groups (F (2, 1034) 0 33.74)**
Wright, USA[45]	305	2 arms ii) 6-week, family-centered, lifestyle after-school program (6 x 90 min sessions on physical activity, nutrition education (dietary guidelines) and a parental support group (KNF), school and community-level environmental (GE) KNF: 1.5mo HI, FF GE: 12mo <LI	8 – 12 year olds ITT analysis[b]		Non-randomised	Adiposity data collector[b], parent self completed FFQe, Unclear (SP & Ivl)[d]	80% at 12mo	Child Adolescent Trial for Cardiovascular Health After-School Student Questionnaire (ASSQ)[d] BMI: Objective[b]			Group x time (12mo) ↑V (1.51)* ↑F (2.00)**		Time only ↑French fries 0.09 (0.02, 0.96) GE 12mo	Time only ↓ BMI z-score 0.48 12mo*

Completer analysis or non-true ITT analysis or unclear ITT analysis status														
Bean, USA[46,47]	96	2 arms: NOURISH 6 session group intervention; vs 1 session group intervention + handouts (minimal care) NOURISH: 3 mo HI PF Minimal care:3 mo MI PF	6-11 year olds Modified ITT approach		Random number generator[b]	Not reported[d] except minimal care interventionist was blinded[b]	6 months	Diet: 24-Hour Food Record and Block Food Screener[b] BMI: Objective[b]		<u>Time only</u> NOURISH: NS Minimal care: 1897.2 kcal (522.7) baseline, 1633.9 kcal (575.3) post-test,* 1521.9 kcal (503.8) 6 months*				<u>Group x time</u> Baseline to post-test mean (SD) BMI%ile: 98.47 (2.24) to 98.19 (2.73) in NOURISH; 97.86 (2.67) to 97.86 (2.61) in Minimal care**
Boutelle, USA[48]	44	2 arms: Regulation of Cues (ROC) program; Control (C) ROC: 4mo HI PF CF C: 4mo non-treatment	8-12 year olds, Unclear if ITT analysis used		Computer-generated randomization[b]	Not reported[b]	89% follow up at 8 months	Diet: Three 24-hr dietary recalls[b] BMI: Objective[b]		<u>Time</u> ROC participants had improvements from baseline to 4-month follow-up on mean calories consumed per day*				<u>Time</u> ROC group showed improvements at posttreatment (4mo) and follow-up (8mo) on BMI-Z*
Burrows, Australia[49,50]	160	3 arms: Lifestyle group sessions, diet (D), activity (A) or diet and activity (DA) and monthly follow-up telephone calls to 2 years from baseline. All arms: 2.5mo HI, 4mo LI	5 – 9 year olds, RCT but completers only analysis[d]		Computer-based random number-producing algorithm[b]	Blinding Data collectors and SP[b] lvl not blinded[d]	54% at 24mo	Diet: 135 item FFQ[b] BMI: Objective[b]		<u>Time only</u> ↓kJ/kg/day lv 6mo*, ↓kJ/kg/day lv 12mo*	<u>Time only</u> (24mo DA) ↑V %total energy) 12mo	<u>Time only</u> ↓SSB %E (5.0±0.4 vs. 2.9±0.3%) 0 to 12mo*** (all groups)	<u>Time only</u> ↓ EDNP %E 42%(1%) vs. 34.8%(1.0%) 24mo***	<u>Group x time</u> (D) and (DA) vs. (A) 24mo* <u>Time</u> BMI z-scores 12mo all arms,(D)-0.39(-0.51 to 0.27), (DA -0.32,(-0.36,-0.23, (A) -0.17(-0.28,-0.06)**

															BMI z-score at 24 mo***
Coppins UK[51]	65	2 arms: Lifestyle + physical activity (I/C) vs Control (C/I) I/C: 12mo HI FF C/I: Non-intervention first 12 months then cross-over	6-14 year olds, Unclear if ITT		Random allocation[d]	Not reported[d]	71% at 24 mo	Diet: 7-day food and activity diary BMI: Objective[b]					Time Potato crisps C/I 24mo (mean= 25.0 g/week, 95% CI, 1.2 to 51.2) I/C group (mean-87.0 g/week, 95% CI 41.2–132.8)..	Time ↓BMI z-score in I/C at 12 mo -0.13 (-0.26 to -0.008)* and 24 mo -0.41 (-0.71 to -0.11))*
Davis, USA[52]	58	2 arms: Behavioural intervention via telemedicine (TM); structured physician visits (PV). TM: initially HI, CF, PF PV: LI, FF	Mean 8.5 (SD 1.74) years, RCT commenced 2007, completer analysis		Random number table (stratified)[b]	Not reported[d]	72% at 8 mo	Diet: 24hr recall, standardised three-pass method[b] BMI: Objective[b]				Time only ↓ SSB (s/d) TM: 0.99 ± 1.01 to 0.78 ± 0.97 NS SSB PV (s/d): 0.92 ± 1.07 to 0.92 ± 0.98	Time only (s/d both groups) ↓ Servings of "red" foods (>12g sugar and/or 7g fat) [7.25 ± 3.09 vs. 6.01 ± 2.98 TM, 7.76 ± 2.75 vs 6.27 ± 2.68 PV]*	Time only TM: BMI (z)-0.12 by time 8mo** PV: ΔBMI -0.15 by time 8mo*
Esfarjani Iran[53]	156	2 arms: FBT, Non-intervention Control (appears to have received some intervention post-follow up) FBT: HI, PF Control: Nil intensity	7 year olds, commenced 2011, completer analysis		Code number[d]	Unclear for randomis-ation[d], data collectors[d], SP and IVI[d,e]	75% at 6 months	Diet: 168-item vaildated FFQ[b] BMI: Objective[b]			Time only ↑FV by time**		Time only (g/d) Sugar/jam (21.5 ± 18.9 vs 7.5 ± 8.01) 24mo* Improved types fats and oil*	Time only ↑BMI (kg/m^2)*** BMI z-score or SDS not presented.
Foster, USA[54]	60	2 arms: Lifestyle delivered by parent mentor (PM); alternative lifestyle delivered by community health worker (CHW)	2-5 year olds, RCT commenced 2015, Unclear if true ITT[d]		Random allocation table[b]	IvI were not blinded[e], not reported (SP & data collectors)[d]	68% at 12 months	Diet: Block kids food screener. BMI: Objective[b]		Time only ↓kcal/day 6mo (0-6 mo, entire cohort)*, NS 0-12 mo, entire cohort)	Time only ↓Fruit/ fruit juice cups (0 to 12 entire cohort)* NS vegetables	Time only ↓ SSB (s/d) 0-6mo (entire cohort)*, 0-12mo (entire cohort)*	Time only ↓ added sugar tsp/d -1.22 (95%CI: -2.12, -0.32) 12mo (entire cohort)*	Time only ↓BMIz: 0-6mo (entire cohort)*, 0-12mo (entire cohort)*

		PM: 6mo LI, PF CHW: 6 mo LI, PF												
Gerards, Netherlands[55]	86	2 arms: Lifestyle intervention of 10 x 90-minute parental group sessions (5 with nutrition topics) and four individual 15–30 minute telephone sessions (3P): provision of brochures to control group (C) 3P: 4mo HI, 8mo NI C: 4mo <LI, 8mo NI	4 – 8 year olds RCT with completers only analysis[d]		Random sealed envelope (blocks of 4, 1:1 allocation)[b]	Unclear Data collector (diet & adiposity)[d] SP and Ivl not blinded[d]	78% at 12mo	Diet: Selected components from validated FFQ (accurately assesses energy intake of Dutch children aged 2–12 years) BMI: Objective[b]				Group x time ↓ SSB (s/d) 4mo 3P (-1.58 ± 2.00)***		NS BMI z-score group or time
Gunnars-dorrit, Iceland[56]	16	2 arm: 11x60 min group and 11x30 min individual sessions Iv: 3mo HI C: Usual care (then offered IV)	8 – 12 year olds, RCT, not ITT analysis[d]		Not reported	Unclear for Data collector (diet & adiposity)[d] and SP[d] Ivl not blinded[d]	81% at 12 mo	Diet: Fruit and vegetable self-monitoring[d] BMI: Objective[b]			Time only (both groups combined) ↑daily fruit & vegetable Servings from 1.3 (0.4) before treatment to 3.6 (1.3) after treatment***.			Group x time ↓BMI SDS [3.26±0.51 vs. 2.94±0.58] 4mo***
Hasson, USA[57,58]	126	3 arms: Nutrition with MI (N) or Strength training (S) ~90 min per week vs control N: 4mo HI, AF S: 4mo HI, Af C: Wait list control	9th to 12th grade RCT with completers only analysis[d]		Ramdonised 1:1:1 in blocks (stratified by ethnicity)[b]	Blinding for Data collector (diet & adiposity)[b] and SP[b] Ivl not blinded[d]	79% at 4mo	Diet:3-day diet record[b] BMI: Objective[b]		Group x time ↓kcal/day 4mo N (-9.2%) and N+ST (-13.7%) vs. (+15.7%) C**				NS BMI z-score

Hystad, Norway[59]	99	2 arms: therapist-led groups (TLG), self-help groups (SHG). TLG: HI, CF, FF, PF SHG:HI, CF, FF, PF	7-12 year olds, referral from 2005, completers only		Computer-generated list of random numbers[b]	Data collection not blinded[c], Unclear (randomis-ation[d], SP & Ivl[d,e])	81% at 24 months	Diet: 4-day food record completed by child and parent. BMI: Objective[b]		Time only ↓EI/kg 12mo TLG*** SHG** ↓EI/kg 24mo TLG*** SHG***			Time only ↓added sugar(g) TLG (47.5 ± 27.8 vs 33.7 ± 20.8) 6mo* and (47.5 ± 27.8 vs. 38.0 ± 24.1) 24mo*	Time only ↓BMI z-score TLG 0·22 to 6mo and 0.18 24mo SHG 0·19 to 6 mo and 0·17 to 24mo
Kong, China [60]	104	2 arms: Dietary intervention using Mot. Int individual dietitian sessions (L-GI) vs. High GI diet, usual care (H-GI) L-GI: 6mo AF, HI H-GI: 6mo AF, HI	15 – 18 year olds, RCT but completers only analysis[d]		Computer-generated random numbers, blocks of 6 stratified by gender [b]	Unclear: Data collector (diet & adiposity), SP,Ivl[d]	59% at 6mo	Diet: 3-day diet records (baseline and 6 months). GI and GL estimated by FFQ at baseline and 6 mo BMI: Objective[b]		Group x time ↓kcal/day L-GI vs. H-GI 6mo (1565kcal ± 545 vs. 1982kcal ±654)**				Group x time ↓BMI (kg/m2) (95% CI) -0.98 (-1.84,-0.14)* at 6 mo L-GI vs. H-GI
Lee, Hong Kong[61]	165	2 arms: phase. Intervention: 10 x 75-minute afterschool sessions (5 nutrition) education) and 3 hours weekend session. Parents seminar plus 2 x 1-hr follow-up Iv: 4mo HI CF, PF C: 4mo Wait list control	8 to 12 year olds, Completers presented in table		Random numbers[d]	Blinding for Data collector (diet & adiposity)[b] SP and Ivl not blinded[d]	58% at 8mo	Diet: 20-item non-validated questionnaire BMI: Objective[b]					Group x time ↓proportion that consumed unhealthy food* Fast-food, times/w [1.17±1.06 vs.1.27±1.01] 0mo, [1.18±1.32 vs. 1.08±1.17] 6mo, [1.00±1.01, 1.55±1.39] 12mo*	Group x time BMI z-score (−0.21, 95% CI −0.34 to −0.07)**
Leidy USA[62]	67	i) 3 arms: High-Protein breakfast (HP), Normal-Protein breakfast (NP), breakfast skipping (C) HP: 3mo,HI, AF	13-20 year olds, RCT but completers only analysis[d]		Randomized block allocation (2:2:1)[b]	Data collector (diet & adiposity)[b] SP[b], Ivl not blinded[d]	81% at 3mo	Diet: 3x 24-h dietary recalls using Automated Self-administered 24-hour Recall[b] BMI: Objective[b]		Group x time ↓kJ/day HP vs. control (Mean diff. -413.4± 228.8)*, NS for NP vs. control				Group x time ↓fat mass (kg) gain HP 3mo (-0.4±0.5)* NP 3mo (0.3±0.5kg) NS BMI (kg/m2)

		NP: 3mo,HI, AF C: 3mo LI, AF												
Liber, Poland[63]	97	2 arms: Oligofructose) + normoenergetic diet and physical activity (O), Placebo (same except oligiofructose substituted with maltodextrin) (P) O: 3mo HI CF PI P: 3mo HI CF PI	7-12 year olds, Completer analysis		Computer-generated number[b]	Blinded for randomisation[b], study participants[b], unclear for Ivl[d] outcome assessors[d,e]	81% at 12 weeks	Diet: 3d food record[b] BMI: Objective[b]		<u>Time only</u> ↓baseline to 3mo in median kJ/day in O group 7339 to 6431*, P group 6519 to 5430**				<u>Group x time</u> ↓ BMI z-score at 24 weeks -0·37±0·28 in O group, -0·29±0·32 in P group*
Luna-Pech, Mexico[64]	58	2 arms: Normo-calorie (ND) and free diet (FD) completed daily 24-hour dietary recall at home, intervention of 12 primary care clinic visits over 5mo with 24hr diet recall review Iv: 5mo, MI, CF, PF, FF C: Wait list control	8 – 12 year olds, Completers only analysis[d]		Random allocation[d]	Data collector (diet & adiposity)[b], SP not blinded[e], Unclear (Ivl)[d]	88% at 6mo	Diet: 3x 24-h dietary recalls verified by child and parent in visits[b] BMI: Objective[b]		<u>Group x time</u> ↓kcal/day (2231 vs. 3243 kcal)**				<u>Group x time</u> ↓ BMIz over time (2.18±0.3 vs. 1.66±0.2) 6mo* ND vs. FD (1.66±0.2 and 2.12±0.3)**
Mackniin, USA[65]	30	2 arms: plant-based no added fat diet (PB) vs the American Heart Association Diet (AHA). PB: 4w MI FF AHA: MI FF	9-18 year olds, Completer analysis		SAS computer program[b]	Blinding not reported[d]	93% at 4 weeks	DietL: 3-day dietary histories[b] BMI: Objective[b]		<u>Time only</u> ↓baseline to 4 weeks kcal/d PB −478.30 ± 496.93** −522.26±289.68 AHA**				<u>Group x time</u> PB - AHA Adjusted Mean Difference (95% CI) at Week 4 −0.13 (−0.24, −0.03)* <u>Time</u>

														↓ BMI Z-score in PB (−0.14)*
Mendes, Brazil[66]	66	i) 2 arms; Group A received a fixed diet plan (A): Group B calorie counting diet (B) Both arms:-500 calorie deficit daily (A) 6mo MI, AF 6mo MI, AF	10 – 17 year olds, RCT but completers only analysis[d]		Random allocation[d]	Unclear: Data collector (diet & adiposity), SP,Ivl[d]	67% at 6mo	Diet: Three-day food records baseline and 2mo[b] BMI: Objective[b]		<u>Group x time</u> ↓kcal/day both Iv groups*** but higher in (A)*				<u>Time only</u> ↓BMI z-score 0 – 6mo (A) (3.2±0.4 vs. 3.0± 0.5)*** (B) (3.0±0.4 vs. 2.7±0.5)*** (P<0.0001),
Ptomey, USA[67]	21	2 arms: Lifestyle and meal replacement (eSLD) or a conventional diet (CD) eSLD: 2mo HI CD: 2mo MI	11 – 18 year olds, RCT but completers only analysis[d]		Randomized[d]	Data collector (diet & adiposity) (unclear)SP and Ivl (not blinded)	95% at 2mo	Diet: 3-day photo assisted food record[b] BMI: Objective[b]		<u>Group x time</u> ↓kcal/day eSL 2mo (845±641)** ↓kcal/day Conv. 2mo (675±769)**			<u>Time only</u> ↓in 'empty calories' eSL *	<u>Time only</u> Weight(kg) eSLD -3.89± 2.66*** CD 2.22±1.37*** BMI (-1.6±0.9) vs -1.0± 0.4) NS
Silva, Brazil[68,69]	43	2 arms: High intensity training (HIT) compared to low intensity training (LIT) of equal energy expenditure HIT: 3mo HI, AF LIT: 3mo HI, AF	13 to 18 year olds, RCT but completers only analysis[d]		Randomized (coin-flip method)[b]	Data collector (diet & adiposity)[b], SP not blinded[e], Unclear (Ivl)[d]	44% at 6mo	Diet: 24 hr food diary Frequency not stated[d] BMI: Objective[b]		<u>Time only</u> ↓kcal/day HIT group 3mo (-595kcal/day)*				<u>Time only</u> ↓BMI 3mo HIT -0.9*** LIT -0.8*** ↓BMI 6mo HIT -1.5** LIT - 0.6**
Wang, China[70]	156	2 arms: egg breakfast vs steamed bread breakfast (isoenergetic) Egg: 12 w MI CF Bread: 12 w MI CF	13-16 year olds, ITT status not reported[d]		List gener-ated from JMP-11 (SAS Institute)[b]	Blinding not reported[d]	? at 3 months	Diet: Recorded food intake and calories, at calorie-labeled buffet lunch[b] Weight: Objective[b]		<u>Group x time</u> ↓kcal/lunch egg breakfast group 3mo (-451.1 ± 8.7 kcal/lunch)***				<u>Group x time</u> ↓weight loss 3mo egg breakfast -3.9%*** <u>Correlation</u> The subsequent lunchtime food intake was negatively correlated to

														weight loss in all subjects (r = –0.96).***
Wengle, Canada[71]	38	2 arms: Lifestyle + mentoring (LM), Lifestyle (L only) LM=HI, AF & FF C=LI, AF & FF	12-16 year olds, RCT commenced 2006, Completer analysis		Random number generator (stratified and blocked)[b]	Not reported[d]	84% at 6 months	Diet: 4-day food record and FFQ for additional information about frequency of snack and fast food consumption[b]. BMI: Objective[b]			Group x time NS between groups Time only Each ↑ s/d FV associated with ↓ LDL cholesterol (0.32±0.11 mmol/L)**		Group x time ↓ in high fat/sugar (s/w) (Baseline: 3.6+/-0.8; 6mo: 2.2+/-0.9) in L only group compared with NS ↓ in LM group (Baseline: 4.2+/2.7; 6mo: 3.7+/-1.5).** Time only (entire cohort) ↓ in high fat/sugar servings, snack foods and fast food.**	NS BMI z-score
Wright, USA[72]	50	2 arms: interactive voice technology (IVR) education and behaviour calls vs a wait-list control (WLC) group IVR: 12w HI CF PF WLC: 12w	9-12 year olds, Per protocol analysis – but same results for ITT (data not presented)		Randomized in blocks of six[d]	Randomisation was blinded[b], SP and IvI were not blinded[e], blinding was unclear for outcome assessors	86% at 12 weeks	Diet: Block Dietary Data Systems Kids Food Screener version 2. BMI: Objective[b]		Time only ↓kcal/day -202 (397.0) IVR group. NS WLC.				Time only ↓BMI z-score -0.06 (0.1) in IVR group*

Table modified from[10, 11] for dietary outcomes and childhood adiposity

[a] Information relevant to particular study (e.g. information on participants, methods, outcomes) [b] Low-risk of bias [c] High-risk of bias [d] Inadequate data provided to perform risk of bias assessment, [e] Not blinded, it could be argued that it is not possible to blind study participants for this type of intervention.

[#] Compared with control unless stated

Abbreviations

↓ = decreased/lower, ↑ increased/higher, BMI – body mass index, C= Control, diff. = difference, E = energy, EDNP = energy-dense, nutrient-poor, FU = follow up, F = fruit, Kcal = kilocalorie, Iv = Intervention group, IvI= Intervention implementer, kg = kilogram, m = metre, mo = month/s, Mot. Int = Motivational Interviewing, NS = not significant, s/d = servings per day, SP= Study participant, SSB = sugar sweetened beverage, TE = total energy, tsp = teaspoon, USB = unsweetened beverage, V = vegetables, w = week

Intervention target group: PF = parent focused (child not present); PI = parental involvement; AF = adolescent focused (parent not present); CF = child focused (parent not present); FF = family focused (parent and child present)

Significance notations: NS = Non-significant; *p <0.05; **p< 0.01; *** p<0.001, 'Group x time' = a significant difference between intervention group and control or between two different intervention methods over the stated intervention period, 'time only' = a significant difference within at least one group over the stated intervention period.

Intervention intensity classification

HI = High intensity (at least 6 face-to-face lifestyle education with a nutrition/dietary component of at least three month duration

MI = Moderate intensity (regular face-to-face lifestyle education, but not delivered by health professional or not ≥6 sessions or less frequent than HI)

LI = Low intensity (maintenance focused or not face-to-face, or information only or intervention follow initial intensive intervention)

CO = Significant outcome also reported in 'completers only' analysis of a RCT

Notes:

We did not extract data from[73] as it appears to be a preliminary study (n=18) related to Stark et al (2014)[37].

We did not extract from Pbert[74] as a latter study by Pbert[34] using a similar intervention was included.

REFERENCES

1. Ho M, Jensen ME, Burrows T, et al. Best practice dietetic management of overweight and obese children and adolescents: a 2010 update of a systematic review. *JBI Database of Systematic Reviews and Implementation Reports* 2013; 11(10): 190-293.
2. Collins CE, Warren JM, Neve M, McCoy P, Stokes B. Systematic review of interventions in the management of overweight and obese children which include a dietary component. *JBI Libr Syst Rev* 2007; 5(1): 1-70.
3. World Health Organization. Achieving and maintaining healthy weight in children and adolescents with overweight and obesity: An evidence summary. 2017 Geneva: World Health Organization.
4. 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.
5. Loveman E, Al-Khudairy L, Johnson RE, et al. Parent-only interventions for childhood overweight or obesity in children aged 5 to 11 years. *Cochrane Database Syst Rev* 2015; (12): CD012008.
6. 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; 3: CD012105.
7. Ells LJ, Mead E, Atkinson G, et al. Surgery for the treatment of obesity in children and adolescents. *Cochrane Database Syst Rev* 2015; (6): CD011740.
8. Mead E, Atkinson G, Richter B, et al. Drug interventions for the treatment of obesity in children and adolescents. *Cochrane Database Syst Rev* 2016; 11: CD012436.
9. 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; 6: CD012651.
10. Coleman K, Norris S, Weston A, et al. NHMRC additional levels of evidence and grades for recommendations for developers of guidelines. 2009 Canberra: National Health and Medical Research Council (NHMRC).
11. NHMRC. How to review the evidence: Systematic identification and review of the scientific literature Handbook series on preparing clinical practice guidelines. 1999 Canberra: National Health and Medical Research Council (NHMRC).
12. Garnett S, Gow M, Ho M, et al. Improved insulin sensitivity and body composition, irrespective of macronutrient intake, after a 12 month intervention in adolescents with pre-diabetes; RESIST a randomised control trial. *BMC Pediatrics* 2014; 14: 289.
13. McCormack S, McCarthy M, Harrington S, et al. Effects of exercise and lifestyle modification on fitness, insulin resistance, skeletal muscle oxidative phosphorylation and intramyocellular lipid content in obese children and adolescents. *Pediatric Obesity* 2014; 9(4): 281-91.

14. Parillo M, Licenziati M, Vacca M, Marco D, Iannuzzi A. Metabolic changes after a hypocaloric, low-glycemic-index diet in obese children. *Journal of Endocrinological Investigation* 2012; 35(7): 629-33.

15. Wong JMW, Ebbeling CB, Robinson L, Feldman HA, Ludwig DS. Effects of Advice to Drink 8 Cups of Water per Day in Adolescents With Overweight or Obesity: A Randomized Clinical Trial. *JAMA Pediatr* 2017; 171(5): e170012.

16. Sigal R, Alberga A, Goldfield G, et al. Effects of aerobic training, resistance training, or both on percentage body fat and cardiometabolic risk markers in obese adolescents: the healthy eating aerobic and resistance training in youth randomized clinical trial. *JAMA Pediatrics* 2014; 168(11): 1006-14.

17. Saelens B, Grow H, Stark L, Seeley R, Roehrig H. Efficacy of increasing physical activity to reduce children's visceral fat: a pilot randomized controlled trial. *International journal of pediatric obesity : IJPO : an official journal of the International Association for the Study of Obesity* 2011; 6(2): 102-12.

18. Butland B, Jebb S, Kopelman P, et al. Foresight Tackling Obesities: Future Choices – Project report 2nd Edition. United Kingdom, 2007.

19. Burke LE, Wang J, Sevick MA. Self-monitoring in weight loss: a systematic review of the literature. *J Am Diet Assoc* 2011; 111(1): 92-102.

20. Berry DC, Schwartz TA, McMurray RG, et al. The family partners for health study: a cluster randomized controlled trial for child and parent weight management. *Nutr Diabetes* 2014; 4: e101.

21. Broccoli S, Davoli AM, Bonvicini L, et al. Motivational interviewing to treat overweight children: 24-month follow-up of a randomized controlled trial. *Pediatrics* 2016; 137 (1) (no pagination)(e20151979).

22. Codoñer-Franch P, López-Jaén A, Mano-Hernández A, Sentandreu E, Simó-Jordá R, Valls-Bellés V. Oxidative markers in children with severe obesity following low-calorie diets supplemented with mandarin juice. *Acta paediatrica (Oslo, Norway : 1992)* 2010; 99(12): 1841-6.

23. DeBar LL, Stevens VJ, Perrin N, et al. A primary care-based, multicomponent lifestyle intervention for overweight adolescent females. *Pediatrics* 2012; 129(3): e611-20.

24. Ebbeling CB, Feldman HA, Chomitz VR, et al. A randomized trial of sugar-sweetened beverages and adolescent body weight. *New England Journal of Medicine* 2012; 367(15): 1407-16.

25. Elloumi M, Makni E, Ounis OB, et al. Six-minute walking test and the assessment of cardiorespiratory responses during weight-loss programmes in obese children. *Physiotherapy Research International* 2011; 16(1): 32-42.

26. Epstein L, Kilanowski C, Paluch R, Raynor H, Daniel T. Reducing variety enhances effectiveness of family-based treatment for pediatric obesity. *Eating Behaviors* 2015; 17: 140-3.

27. Ferranti S, Milliren C, Denhoff E, et al. Providing food to treat adolescents at risk for cardiovascular disease. *Obesity* 2015; 23(10): 2109-17.

28. Kirk S, Brehm B, Saelens BE, et al. Role of carbohydrate modification in weight management among obese children: a randomized clinical trial. *Journal of Pediatrics* 2012; 161(2): 320-7.e1.

29. Looney S, Raynor H. Examining the effect of three low-intensity pediatric obesity interventions: a pilot randomized controlled trial. *Clinical Pediatrics* 2014; 53(14): 1367-74.

30. Nguyen B, Shrewsbury V, O'Connor J, et al. Twelve-month outcomes of the loozit randomized controlled trial: a community-based healthy lifestyle program for overweight and obese adolescents. *Archives of Pediatrics & Adolescent Medicine* 2012; 166(2): 170-7.

31. Nguyen B, Shrewsbury VA, O'Connor J, et al. Two-year outcomes of an adjunctive telephone coaching and electronic contact intervention for adolescent weight-loss maintenance: the Loozit randomized controlled trial. *International journal of obesity (2005)* 2013; 37(3): 468-72.

32. Pakpour AH, Gellert P, Dombrowski SU, Fridlund B. Motivational interviewing with parents for obesity: an RCT. *Pediatrics* 2015; 135(3): e644-52.

33. Patrick K, Norman GJ, Davila EP, et al. Outcomes of a 12-month technology-based intervention to promote weight loss in adolescents at risk for type 2 diabetes. *J Diabetes Sci Technol* 2013; 7(3): 759-70.

34. Pbert L, Druker S, Barton B, et al. A School-Based Program for Overweight and Obese Adolescents: A Randomized Controlled Trial. *Journal of School Health* 2016; 86(10): 699-708.

35. Raynor HA, Osterholt KM, Hart CN, Jelalian E, Vivier P, Wing RR. Efficacy of US paediatric obesity primary care guidelines: two randomized trials. *Pediatric Obesity* 2012; 7(1): 28-38.

36. Serra-Paya N, Ensenyat A, Castro-Viñuales I, et al. Effectiveness of a Multi-Component Intervention for Overweight and Obese Children (Nereu Program): A Randomized Controlled Trial. *PLoS ONE* 2015; 10(12): e0144502.

37. Stark L, Clifford L, Towner E, et al. A pilot randomized controlled trial of a behavioral family-based intervention with and without home visits to decrease obesity in preschoolers. *Journal of Pediatric Psychology* 2014; 39(9): 1001-12.

38. Taylor R, Cox A, Knight L, et al. A Tailored Family-Based Obesity Intervention: A Randomized Trial. *Pediatrics* 2015; 136(2): 281-9.

39. van Grieken A, Renders CM, Veldhuis L, Looman CW, Hirasing RA, Raat H. Promotion of a healthy lifestyle among 5-year-old overweight children: health behavior outcomes of the 'Be active, eat right' study. *BMC Public Health* 2014; 14: 59.

40. van Grieken A, Veldhuis L, Renders CM, et al. Population-based childhood overweight prevention: outcomes of the 'Be active, eat right' study. *PLoS One* 2013; 8(5): e65376.

41. Visuthranukul C, Sirimongkol P, Prachansuwan A, Pruksananonda C, Chomtho S. Low-glycemic index diet may improve insulin sensitivity in obese children. *Pediatric Research* 2015; 78(5): 567-73.

42. Waling M, Bäcklund C, Lind T, Larsson C. Effects on metabolic health after a 1-year-lifestyle intervention in overweight and obese children: A randomized controlled trial. *Journal of Nutrition and Metabolism* 2012; 2012.

43. Waling M, Lind T, Hernell O, Larsson C. A one-year intervention has modest effects on energy and macronutrient intakes of overweight and obese Swedish children. *Journal of Nutrition* 2010; 140(10): 1793-8.

44. Warschburger P, Kroeller K, Haerting J, Unverzagt S, van Egmond-Fröhlich A. Empowering Parents of Obese Children (EPOC): A randomized controlled trial on additional long-term weight effects of parent training. *Appetite* 2016; 103: 148-56.

45. Wright K, Norris K, Newman GJ, Suro Z. Improving healthy dietary behaviors, nutrition knowledge, and self-efficacy among underserved school children with parent and community involvement. *Childhood obesity (Print)* 2012; 8(4): 347-56.

46. Bean MK, Wilson DB, Thornton LM, et al. Dietary intake in a randomized-controlled pilot of NOURISH: a parent intervention for overweight children. *Preventive Medicine* 2012; 55(3): 224-7.

47. Mazzeo SE, Kelly NR, Stern M, et al. Parent skills training to enhance weight loss in overweight children: evaluation of NOURISH. *Eating Behaviors* 2014; 15(2): 225-9.

48. Boutelle KN, Zucker N, Peterson CB, Rydell S, Carlson J, Harnack LJ. An intervention based on Schachter's externality theory for overweight children: the regulation of cues pilot. *Journal of Pediatric Psychology* 2014; 39(4): 405-17.

49. Burrows T, Janet WM, Collins CE. Long-term Changes in Food Consumption Trends in Overweight Children in the HIKCUPS Intervention. *Journal of Pediatric Gastroenterology & Nutrition* 2011; 53(5): 543-7.

50. Collins C, Okely A, Morgan P, et al. Parent diet modification, child activity, or both in obese children: an RCT. *Pediatrics* 2011; 127(4): 619-27.

51. Coppins D, Margetts B, Fa J, Brown M, Garrett F, Huelin S. Effectiveness of a multi-disciplinary family-based programme for treating childhood obesity (the Family Project). *European Journal of Clinical Nutrition* 2011; 65(8): 903-9.

52. Davis AM, Sampilo M, Gallagher KS, Landrum Y, Malone B. Treating rural pediatric obesity through telemedicine: outcomes from a small randomized controlled trial. *Journal of Pediatric Psychology* 2013; 38(9): 932-43.

53. Esfarjani F, Khalafi M, Mohammadi F, et al. Family-based intervention for controlling childhood obesity: An experience among iranian children. *International Journal of Preventive Medicine* 2013; 4(3): 358-65.

54. Foster BA, Aquino CA, Gil M, Gelfond JAL, Hale DE. A Pilot Study of Parent Mentors for Early Childhood Obesity. *Journal of Obesity* 2016; 2016.

55. Gerards SMPL, Dagnelie PC, Gubbels JS, et al. The effectiveness of lifestyle triple P in the Netherlands: A randomized controlled trial. *PLoS ONE [Electronic Resource]* 2015; 10 (4) (no pagination)(e122240).

56. Gunnarsdottir T, Sigurdardottir ZG, Njardvik U, Olafsdottir AS, Bjarnason R. A randomized-controlled pilot study of Epstein's family-based behavioural treatment for childhood obesity in a clinical setting in Iceland. *Nordic Psychology* 2011; 63(1): 6-19.

57. Davis JN, Ventura EE, Tung A, et al. Effects of a randomized maintenance intervention on adiposity and metabolic risk factors in overweight minority adolescents. *Pediatric Obesity* 2012; 7(1): 16-27.

58. Hasson RE, Adam TC, Davis JN, et al. Randomized controlled trial to improve adiposity, inflammation, and insulin resistance in obese African-American and Latino youth. *Obesity* 2012; 20(4): 811-8.

59. Hystad HT, Steinsbekk S, Odegård R, Wichstrom L, Gudbrandsen OA. A randomised study on the effectiveness of therapist-led v. self-help parental intervention for treating childhood obesity. *British Journal of Nutrition* 2013; 110(6): 1143-50.

60. Kong A, Choi K, Chan R, et al. A randomized controlled trial to investigate the impact of a low glycemic index (GI) diet on body mass index in obese adolescents. *BMC Public Health* 2014; 14: 180.

61. Lee A, Ho M, Keung V, Kwong A. Childhood obesity management shifting from health care system to school system: intervention study of school-based weight management programme. *BMC Public Health* 2014; 14: 1128.

62. Leidy HJ, Hoertel HA, Douglas SM, Higgins KA, Shafer RS. A high-protein breakfast prevents body fat gain, through reductions in daily intake and hunger, in "Breakfast skipping" adolescents. *Obesity* 2015; 23(9): 1761-4.

63. Liber A, Szajewska H. Effect of oligofructose supplementation on body weight in overweight and obese children: a randomised, double-blind, placebo-controlled trial. *British Journal of Nutrition* 2014; 112(12): 2068-74.

64. Luna-Pech J, Torres-Mendoza B, Luna-Pech J, Garcia-Cobas C, Navarrete-Navarro S, Elizalde-Lozano A. Normocaloric diet improves asthma-related quality of life in obese pubertal adolescents. *International archives of allergy and immunology* 2014; 163(4): 252-8.

65. Macknin M, Kong T, Weier A, et al. Plant-based, no-added-fat or American Heart Association diets: impact on cardiovascular risk in obese children with hypercholesterolemia and their parents. *Journal of Pediatrics* 2015; 166(4): 953-9.e1.

66. Mendes MDSD, de Melo ME, Fernandes AE, et al. Effects of two diet techniques and delivery mode on weight loss, metabolic profile and food intake of obese adolescents: a fixed diet plan and a calorie-counting diet. *European Journal of Clinical Nutrition* 2016.

67. Ptomey L, Sullivan D, Lee J, Goetz, Jr., Gibson C, Donnelly J. The use of technology for delivering a weight loss program for adolescents with intellectual and developmental disabilities. *Journal of the Academy of Nutrition and Dietetics* 2015; 115(1): 112-8.

68. Silva HJ, Andersen LB, Lofrano-Prado MC, et al. Improvements on Cardiovascular Diseases Risk Factors in Obese Adolescents: A Randomized Exercise Intervention Study. *Journal of Physical Activity & Health* 2015; 12(4): 553-60.

69. Prado WL, Lofrano-Prado MC, Oyama LM, et al. Effect of a 12-week low vs. high intensity aerobic exercise training on appetite-regulating hormones in obese adolescents: A randomized exercise intervention study. *Pediatric Exercise Science* 2015; 27(4): 510-7.

70. Wang S, Yang L, Lu J, Mu Y. High-protein breakfast promotes weight loss by suppressing subsequent food intake and regulating appetite hormones in obese Chinese adolescents. *Hormone Research in Paediatrics* 2015; 83(1): 19-25.

71. Wengle JG, Hamilton JK, Manlhiot C, et al. The 'Golden Keys' to health - A healthy lifestyle intervention with randomized individual mentorship for overweight and obesity in adolescents. *Paediatrics and Child Health* 2011; 16(8): 473-8.

72. Wright J, Phillips B, Watson B, Newby P, Norman G, Adams W. Randomized trial of a family-based, automated, conversational obesity treatment program for underserved populations. *Obesity* 2013; 21(9): E369-78.

73. Stark LJ, Spear S, Boles R, et al. A pilot randomized controlled trial of a clinic and home-based behavioral intervention to decrease obesity in preschoolers. *Obesity* 2011; 19(1): 134-41.

74. Pbert L, Druker S, Gapinski M, et al. A school nurse-delivered intervention for overweight and obese adolescents. *Journal of School Health* 2013; 83(3): 182-93.

ISBN 978-0-7259-0017-5