

Getting Our Active Lifestyles Started (GOALS)

Evaluation Report 2006 – 2009



Contents

Executive summary	3
Need (Why is there a need for a child weight management intervention in Liverpool?)	5
Development (How was the GOALS intervention developed?)	6
Intervention (What does the GOALS intervention involve?)	7
Data collection	9
Attendance and completion	11
Findings	12
Qualitative data	18
Summary and recommendations	19
Acknowledgements	25
References	26
Appendix 1 Table of intervention details for the 23 cohorts that ran June 2006-March 2009	28

GOALS (Getting Our Active Lifestyles Started! [1-3]) is a healthy lifestyle intervention for obese children aged 4-16 and their families, managed under Liverpool's Taste for Health Strategy by Liverpool John Moores University in partnership with Liverpool PCT, Liverpool City Council (Sportslinx), Alder Hey Hospital and the University of Salford. This report provides an evaluation of the feasibility work that took place between June 2006 and March 2009, following a year-long action research pilot in Speke [1]. Findings from this exploratory phase will be used to inform a proposal for an experimental trial of GOALS, aimed at establishing its practical and cost-effectiveness for implementation.

Need

Liverpool's commitment to action on childhood obesity was reflected in Liverpool's *Healthy Weight, Healthy Liverpool* strategy [5], which emphasized the importance of a multi-level approach if we are to make an impact on childhood obesity levels locally. Sitting under the Taste For Health Strategy, the GOALS project [1-3] provides a childhood obesity treatment model within a larger context of citywide initiatives contributing to the obesity prevention agenda.

Development

GOALS was developed in accordance with the Medical Research Council (MRC, [4]) framework for developing and evaluating complex interventions. The feasibility phase involved ongoing refinement of the intervention to reflect research findings, overcome pragmatic challenges, and develop a feasible management and delivery model.

Intervention

The GOALS intervention aims to support families in making gradual, sustainable changes to their physical activity and eating behaviours, with a view to reducing the child's level of overweight for their age and sex and improving the family's future health prospects. Unique to the intervention is the whole family approach, whereby the obese child, their parents and siblings take part in the change process together.

GOALS is for families with children aged 4-16 who are medically classified as obese (over the 98th %ile Body Mass Index (BMI) for age and sex).

The GOALS intervention began as 19 x 2-hour group sessions, and has since been refined to 18 x 2-hour group sessions over three 6-weekly modules (each spanning approximately half a school term). Sessions run during term-time only at local schools, mostly between 5.30pm and 7.30pm. Sessions are planned around three sections: Fun Foods (nutrition), Target Time (behaviour change and wellbeing) and Move It (physical activity).

On completion of GOALS, all families are invited to attend an individual follow up one year after they started (which equates to approximately six months after they finished). An additional follow-up three months after finishing was introduced in April 2007.

Data collection

Data was collected at baseline, post-GOALS and approximately one year post-baseline. Height, weight, and abdominal girth were collected from all participating family members. Self-report data on food intake and physical activity levels was collected via questionnaire from adults and children over 8, and children over 8 also completed four subscales from Harter's (1985, [6]) Self-Perception Profile for Children. Adults and children were invited to take part in focus groups to discuss their experiences of GOALS and help identify barriers and facilitators to success.

Height and weight were converted to BMI using the formula $\text{weight (kg)/height(m)}^2$. Children's measures were then converted to **BMI Standard Deviation Scores (BMI SDS)** based on the 1990 Growth Reference data [7], as recommended by the National Obesity Observatory Standard Evaluation Framework [8]. A BMI SDS (also referred to as BMI z-score) represents how many units of the standard deviation a child's BMI is from the mean for their age and sex, and thus accounts for changes in age from baseline.

Attendance and completion

163 families participated in the intervention, 80 of whom completed (49.1%). Mean attendance for those who completed was 83.4%.

Key research findings

Of the 163 families who participated in the intervention, 143 took part in the research study. 74 of these families completed, 71 of whom were included in the complete case analysis.

- The 76 children (excluding one outlier) who completed GOALS during the study period achieved a significant reduction of -0.06 BMI SDS from baseline to post-intervention, with those who attended during the most recent year achieving a change of -0.12 BMI SDS.
- When considering the data for all the 8-12 year old children who completed GOALS during the study period, mean reduction in BMI SDS from baseline to post-intervention was -0.08 ($p < 0.01$).
- There was a significant year on year increase in the proportion of children who decreased BMI-SDS ($p < 0.05$). 10 of the 23 children (43.5%) who completed GOALS during 2006-2007 showed a decrease in BMI SDS. This increased to 16 of 27 children (59.3%) who completed 2007-2008 and 21 of 27 children (77.8%) who completed 2008-2009.
- A reduction in BMI SDS from baseline was still apparent for the 44 children who were followed up at 12-16 month follow-up, though it lost significance due to the high variability amongst individual children.
- There was no significant change in adult BMI or abdominal girth. While absolute child abdominal girth did not change, the same children grew 2.7cm in height from baseline to post-intervention, therefore a stable abdominal measure could be indicative of an improved body composition.
- There was a small improvement in each of the four domains of child self-esteem, with the increase in perceived social acceptance being the only change to reach significance ($p < 0.05$).
- 38/40 adults rated their child's physical activity levels to have increased and 37/39 adults rated their family's diet to have improved. Adults rated themselves to be fitter after taking part in GOALS.

Conclusions

Development of new interventions requires patience, tenacity and belief. It is unrealistic to expect immediate success from inception, and evaluation methodologies should reflect and acknowledge the "bumpy ride" an intervention must overcome during the implementation phase. The learning that occurs during this period is vast and crucial for future success; it is only once these foundations are laid that the real impact will start to happen.

While the limitations of the current study must be acknowledged, this report demonstrates promising findings from 3 years of GOALS provision in Liverpool. Children who completed the GOALS intervention showed a significant improvement in BMI SDS from baseline to post-intervention. Furthermore, the proportion of children who reduced BMI SDS increased significantly year by year; highlighting the importance of the development process in refining new interventions to enhance their effect. An experimental trial is urgently required to substantiate these findings.

Need

Why is there a need for a child weight management intervention in Liverpool?

With annual obesity-related costs estimated at nearly £7 billion for England in 2002 [9], the recent rise in childhood obesity has serious long-term implications for public health. Data from the 2008-2009 National Child Measurement Programme [10] indicated 22.8% of children in England were already overweight or obese in their reception year, and 32.6% were overweight or obese by year 6. Liverpool's own data showed the situation to be even more alarming locally, with 37.1% of year 6 children charting as overweight or obese. Since obesity in childhood is associated with heightened cardiovascular risk factors [11, 12], and children who are obese are more likely to become obese adults [12], it is essential this problem is tackled early.

In 2008, the government published a national obesity strategy (*Healthy Weight, Healthy Lives* [13]) that outlined a commitment to "reverse the rising tide of obesity and overweight in the population", focussing initially on reducing the proportion of overweight and obese children to 2000 levels by 2020 (PSA 12, [14]). The *Healthy Weight, Healthy Lives* strategy is supported by a national social marketing campaign (www.nhs.uk/Change4Life) aimed at promoting behavioural change in families on a population level.

Liverpool's commitment to action on childhood obesity was reflected in Liverpool's *Healthy Weight, Healthy Liverpool* strategy [5], which emphasized the importance of a multi-level approach if we are to make an impact on childhood obesity levels locally. Focussing on both prevention and treatment, the obesity strategy links closely into Liverpool First for Health, which is a joint strategy between Liverpool City Council and Liverpool Primary Care Trust (PCT) aimed at improving the health and wellbeing of Liverpool residents.

Within the First for Health strategy are three sub-strategies, Taste for Health, Active City and Smoke Free Liverpool. Sitting under the Taste For Health Strategy, the Getting Our Active Lifestyles Started (GOALS) project [1-3] provides a childhood obesity treatment model within a larger context of citywide initiatives contributing to the obesity prevention agenda (eg. Sportslinx, Sport and Physical Activity Alliances, Healthy Schools, School Sports Partnerships, Extended Schools). The possible effects of this citywide strategy are indicated in recent Sportslinx data [15], which shows little change in obesity rates in year 5 children since the 2003-2004 school year, in comparison to a year on year increase in the five years leading up to this period.

The GOALS project was founded in 2003 in response to growing local concern regarding provision for children who were already overweight or obese. Sportslinx and school health teams were receiving referrals for obese children for whom there was no service available and community paediatricians were expressing concern about the volume of families seeking *medical* support for their child's obesity, which in the majority of cases required a *lifestyle* solution; something that paediatric teams had neither the capacity nor the context to provide.

When the GOALS project began, there was a paucity of academic evidence for treating childhood obesity and no evidence-based community intervention model existed in the UK. Therefore the project adopted a "bottom-up" approach to develop an intervention in accordance with the needs of local service-users, and to provide further evidence surrounding the feasibility and sustainability of family-based child weight management interventions. As this process has taken place, supporting evidence has begun to emerge in the academic literature for a multidisciplinary family-based lifestyle change approach to child weight management [16, 17].

*Childhood obesity treatment interventions need to take a long-term lifestyle change approach, with the ultimate aim being **prevention** of adult obesity and its related complications.*

How has the GOALS intervention been developed?

Child weight management interventions involve a complex interplay of factors, and the changes required of children to their eating and physical activity behaviours cannot happen in isolation of their family, peers, school and community. Hence we must find effective ways of instigating changes that are realistic, sustainable and informed by evidence. In recognition of the time and patience this requires, the Medical Research Council (MRC, [4]) advocated a staged process to the development, evaluation and implementation of complex interventions.

Figure 1 shows how the development and evaluation process of GOALS maps onto the key elements identified in the MRC model. This document reports on the process and outcomes of the **feasibility phase** of GOALS.

Aims of the feasibility phase included:

- To explore recruitment, retention and attendance rates
- To identify the most effective intervention components, and continue development of the intervention according to ongoing evaluation
- To identify solutions to pragmatic challenges and factors that must be taken into consideration for implementation
- To establish a feasible and sustainable management and delivery model
- To test potential outcome measures and different methods of data collection
- To measure change in child level of overweight, self-esteem, physical activity and eating behaviours, and any changes in parental weight status or behavior (including potential adverse effects)
- To explore the acceptability of the intervention to families and staff
- To provide information about effect and sample size to inform a proposal for an experimental trial, including the identification of key variables likely to affect outcomes

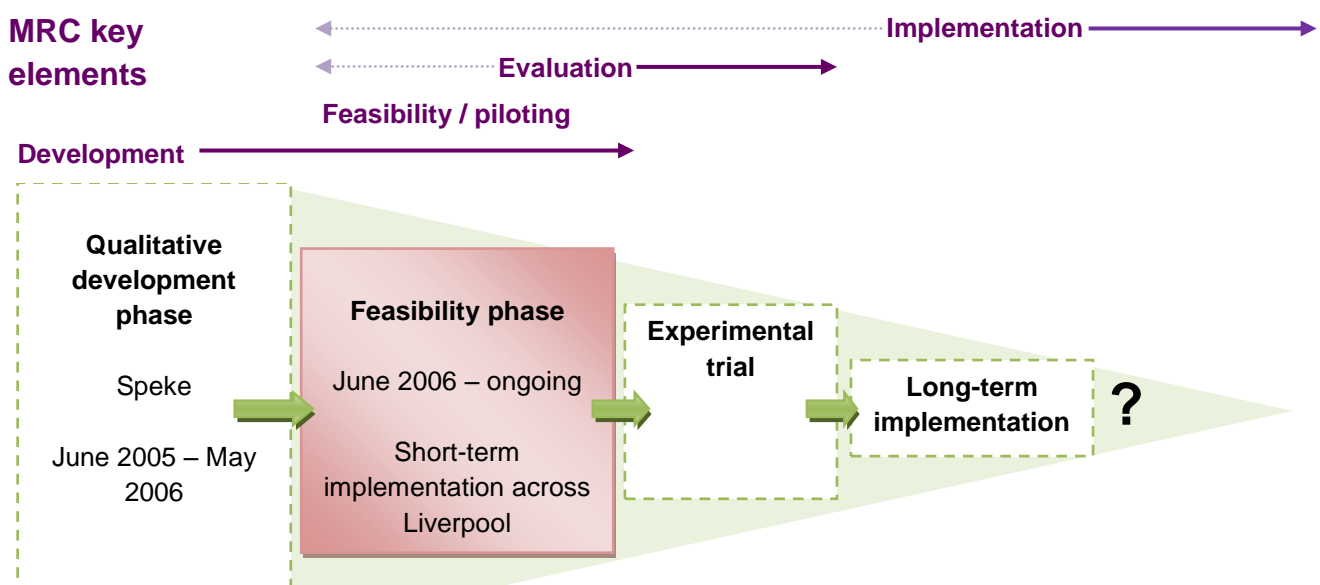


Figure 1. GOALS development process mapped against the Medical Research Council (MRC[4]) key elements for developing and evaluating complex interventions (p.8)

What does the GOALS intervention involve?

Due to the iterative nature of GOALS, some changes were made to the delivery of the intervention during the study period. Please see appendix 1 for a table of these changes.

Aims and ethos

The GOALS intervention aims to support families in making gradual, sustainable changes to their physical activity and eating behaviours, with a view to reducing the child's level of overweight for their age and sex and improving the family's future health prospects. Unique to the intervention is the whole family approach, whereby the obese child, their parents and siblings take part in the change process together, and – unlike many other interventions of this nature – all join in the practical physical activity session. Staff are trained to adopt a non-judgemental approach and to create an environment that is friendly, personalised and above all fun.

GOALS is not a weight loss intervention for the obese child, it is a healthy lifestyle intervention for the whole family

Theoretical basis

The GOALS intervention follows a social cognitive approach to behaviour change[2], acknowledging the many influences on a child's behaviour from their environment, their family and their own thoughts and behaviour. A number of behavioural change techniques are used throughout the intervention, among others self-monitoring, goalsetting, and reinforcement.

Participants

Families may take part if they have at least one child aged 4-16 who is medically classified as obese (over the 98th percentile BMI for age and sex). The minimal family unit is one child plus one adult guardian, but siblings and other family members are encouraged to join. In certain circumstances, a family who has not met the eligibility criteria (eg. if their child is

overweight rather than obese) may be permitted to join the intervention if they demonstrate a high need and motivation to change.

Recruitment

Participants are recruited to GOALS through multiple referral pathways. These include identification via Sportslinx, referral from health professionals and self-referral in response to promotional activities (eg. Press articles, posters, leaflets, health events etc.).

Structure

The GOALS intervention began as 19 x 2-hour group sessions, and has since been refined to 18 x 2-hour group sessions over three 6-weekly modules (each spanning approximately half a school term). Sessions run during term-time only at local schools, mostly between 5.30pm and 7.30pm. As some interventions run either side of the summer holiday period, the time it takes to run 18 sessions varies with season (April starts last approximately 7 months, September and November starts last approximately 5 months). Sessions are planned around three sections: Fun Foods (nutrition), Target Time (behaviour change and wellbeing) and Move It (physical activity).

Exit strategy

On completion of GOALS, all families are invited to attend an individual follow up one year after they started (which equates to approximately six months after they finished). An additional follow-up three months after finishing was introduced in April 2007. For some of the period covered by this report, ongoing support has been available through weekly physical activity sessions and, most recently, a graduate GOALS club.

Delivery staff

Each section of GOALS is designed and overseen by a qualified practitioner (Nutritionist, Physical Activity Specialist and Health Behaviour Specialist), with appropriately skilled staff employed to deliver the weekly sessions. During the early GOALS interventions, there was also input from a community dietician.

Content

Although the intervention content has operated within a clear framework, there has been variation over time and according to group need. Throughout the study period, attempts were made to group children of a similar age together and adapt the intervention accordingly.



Informed by the Eatwell Plate (www.eatwell.gov.uk), the nutrition section of GOALS aims to educate families with some clear, simple messages about healthy eating. A range of classroom-based and practical sessions include topics such as portion sizes, reading food labels and healthy snacking. Families are provided with practical opportunities to develop their cooking skills, and try out new recipes and foods.



Target Time focuses on behavioural change and wellbeing, supporting people to make their lifestyle changes easier. Topics include hunger and craving, self-esteem, bullying, and parental role-modelling. Each week families set themselves small, realistic goals to work on at home.



The practical Move It session provides opportunities to play active games, try new sports and enjoy adult versus children challenges. The sessions engage the whole family by making physical activity varied and fun, with a focus on personal achievement rather than competition.

Personal mentors

Prior to the first GOALS session, all families are invited to attend a lifestyle assessment, which involves a 40 minute chat to gain an insight into the family's current diet and physical activity patterns. Each family is then assigned a personal mentor at the outset of GOALS. The personal mentor has responsibility for setting weekly goals with the family, and tracking their progress throughout the intervention. Initially mentor sessions were conducted separately at the end of each module, but were later incorporated into the weekly sessions.

Family Lifestyles Counsellor

During February 2007, a qualified counsellor was recruited to support the intervention. The role of the counsellor has varied over time, starting with the delivery of therapeutic workshops, through a drop-in counselling role, and more recently a structured out-of-GOALS counselling service for families who need additional support.

Extras

Childcare: During the early GOALS interventions a free on-site crèche was offered to those families who needed it. Due to the low take-up of this service, this was replaced by an offer to provide a childminder service. Two families were interested but the arrangements fell through as one family failed to start and the other child refused to stay with a minder. Over the past year, younger siblings have joined in the intervention, with staff members taking them aside for more age-appropriate activities were necessary.

Parent awareness: Recently, a parent only awareness chat has been introduced prior to the initial lifestyle assessment. This is a group chat aimed at meeting other parents, sharing experiences, and learning more about GOALS, helping parents decide whether they would like to take part.

What data has been collected during the feasibility phase of GOALS?

The Medical Research Council [4] recommended several stages in the development and evaluation of complex interventions (see figure 1, p.5). The present phase of GOALS was exploratory in nature, allowing for refinement of the intervention and measurement protocols and extraction of factors to inform a future controlled trial. Ethical approval for the research was granted by Liverpool Paediatric Research Ethics Committee.

All adult participants joining the intervention were asked to sign informed consent a) for their family to participate in the intervention and b) for their family's data to be used for the research. Children over eight were asked to

provide written assent for the use of their own data. Table 1 outlines the measures taken during this phase, and the associated research questions.

Height and weight were converted to body mass index (BMI) using the formula **weight (kg)/height(m)²**. Children's measures were then converted to **BMI Standard Deviation Scores (BMI SDS)** based on the 1990 Growth Reference data [7], as recommended by the National Obesity Observatory Standard Evaluation Framework [8]. A BMI SDS (also referred to as BMI z-score) represents how many units of the standard deviation a child's BMI is from the mean for their age and sex, and thus accounts for changes in age from baseline.

Table 1. Data collected during the feasibility phase of GOALS

Research question/s	Measure	From who?	When?
<ul style="list-style-type: none"> Is there a change in BMI SDS of children who have completed GOALS? Are these changes sustained at one year? Do overweight and obese adults who have completed GOALS show an improved weight status compared to baseline? 	Height, weight and abdominal circumference*	Obese children Adults Siblings over 4 years old	pre, post, one-year post baseline
<ul style="list-style-type: none"> Are there any changes in self-esteem in children who have completed GOALS? 	4 subscales from Harter's (1985) Self-Perception Profile for Children [6] (<i>Social Acceptance, Athletic Competence, Physical Appearance, Global Self-Esteem</i>)	Obese children over 8 years old Siblings over 8 years old	pre, post, one-year post baseline
<ul style="list-style-type: none"> What changes do families make to their physical activity and eating habits during GOALS? 	Physical activity and food intake questionnaires	Obese children over 8 years old Adults Siblings over 8 years old	pre, post, one-year post baseline
<ul style="list-style-type: none"> How acceptable is GOALS to families taking part? What components of the intervention are key to success? 	Focus groups	Obese children and siblings Adults	<p>2006 - April 2007 cohorts Opt-in sessions outside intervention time</p> <p>Sep 2007 - 2009 cohorts Week 6 of intervention</p>

*During the three year period, it was necessary to make some changes to the measurement protocol to improve the reliability and validity of data collection. Abdominal circumference was initially taken at the waist, defined as the mid-point between the lowest rib and the iliac crest. It can be difficult to locate this point in obese children however and with effect from April 2007 the abdominal measurement was taken at the point of the umbilicus to improve the reliability of repeat measures.

Attendance and completion

Twenty-three GOALS cohorts completed between June 2006 and March 2009. Two of these (cohort 1 and cohort 23) were excluded from the current evaluation as the intervention structure differed significantly from the other cohorts.

163 families participated in the intervention, and 80 of these completed (49.1%).

Completion was defined as having attended sessions during all 3 modules plus attended either the final group session or the final mentor session.

Attendance for the families who completed ranged from 50-100%, with a mean of 83.4%. 64 families attended over 75% of sessions.

As it was possible for families to participate in the intervention but not the research, the research participation figures were slightly lower, with 143 families participating, 74 completing (51.7%) and 59 attending over 75% of sessions. Figure 2 provides a flow chart of participation for the intervention and the research.

Referral mechanisms

Referral to the intervention was via Sportslinx (48 families), promotional activities (43 families), secondary care referral (30 families), primary care/other referral (27 families), word of mouth/other (n=12) and unknown (n=3).

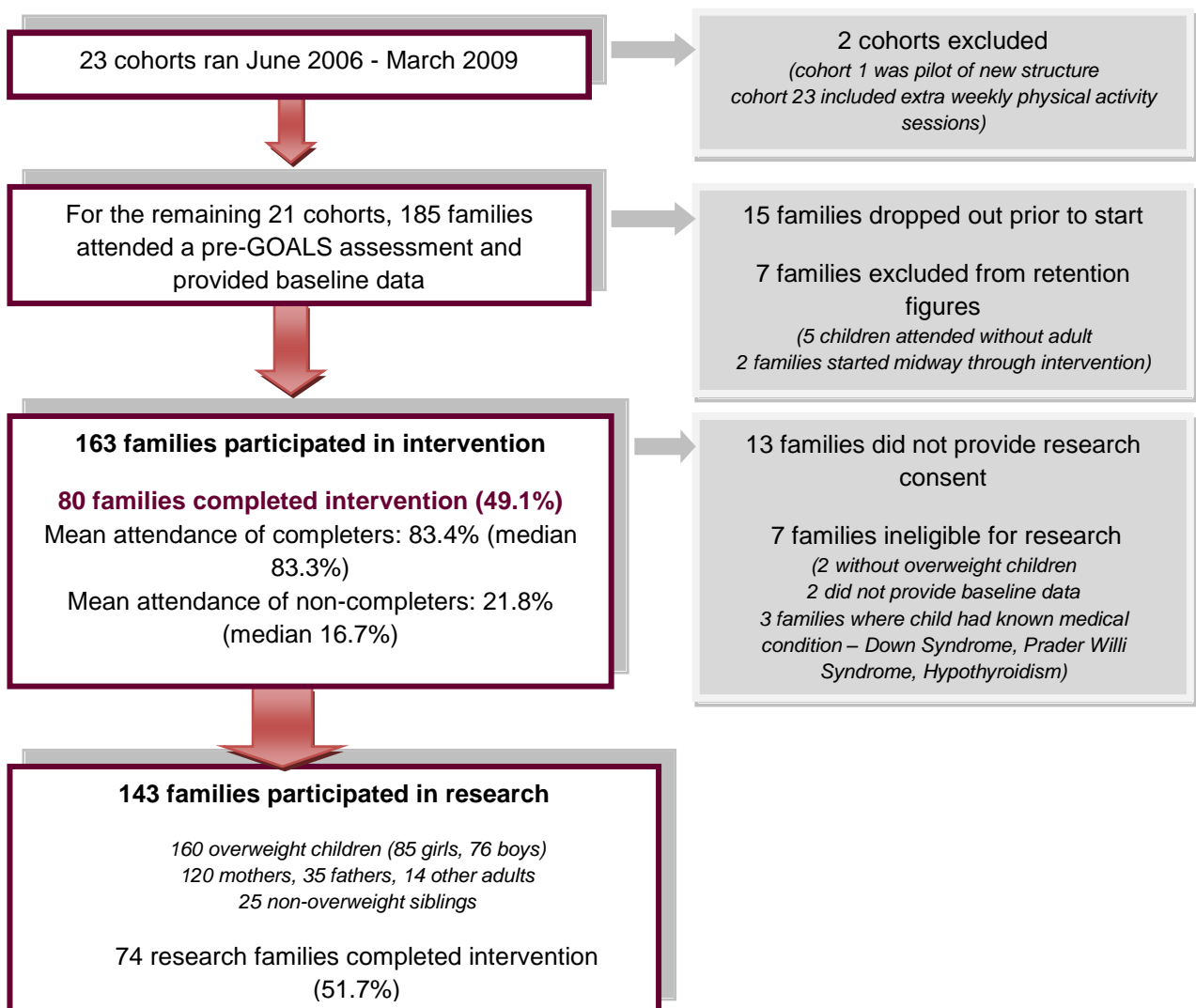


Figure 2. Flow chart of participation for the GOALS intervention and research

Seasonal considerations

During the period covered by this study, there were three possible start points for GOALS interventions (April, September and November). As qualitative research data from the earlier phase (2005-2006) had highlighted a difficulty in retaining families during school-holiday periods, the intervention ran term-time only. Therefore contact time for April interventions was up to 2 months longer than for September and November interventions. The retention rate for cohorts starting in April

was slightly lower than in September or November (40% compared with 52.5% and 54.4% respectively) but this difference failed to reach significance. As there were no significant differences in baseline measures (age, sex, parental obesity) or BMI SDS change for the three start points, it was deemed appropriate to pool the data together for analysis.

Baseline characteristics of research participants

Of the 163 families who participated in the intervention, 13 did not provide consent for their data to be used in the research, and a further 7 were excluded from the analysis (2 did not provide baseline data, 2 did not have any overweight children, and 3 were excluded on medical grounds – see figure 2). This

resulted in 143 families participating in the research, made up of 161 overweight children (85 girls, 76 boys), 120 mothers, 35 fathers and 14 other adults. 25 non-overweight siblings also took part but their data is not reported here. Table 2 shows the baseline characteristics of the research participants.

Table 2. Baseline characteristics of research participants

Child age range	4.65 – 16.07 years (mean 10.41 years) 26 children aged between 4 and 7 years 114 children aged between 8 and 12 years 21 children aged between 13 and 16 years
Child BMI %centile for age and sex <i>(based on the British 1990 Growth Reference data [7])</i>	12 >91 st %ile (overweight) 34 >98 th %ile (obese) 115 >99.6 th %ile (superobese [7])
BMI SDS	1.43 - 4.73 (median 2.98)
Parent/guardian weight status	23 healthy (BMI 18.5-24.9) 51 overweight (BMI 25-25.9) 79 obese (BMI 30+) 16 unknown
Exclusions	Children diagnosed with a known medical condition that might affect intervention response (eg. hypothyroidism, Prader-Willi syndrome)
Children with ASD and learning difficulties were included	

Analysis of each outcome measure is based on full data sets only. Of the 74 families who completed the intervention, 3 families were excluded from the analysis (one family did not provide post measures, one child was put on a medically prescribed dairy-free diet mid-way through GOALS, and the other family were the only family left in their cohort yielding it no longer a “group intervention”). Therefore 71 families were included in the complete case analysis.

Year by year increase in proportion of children decreasing BMI SDS

BMI SDS decreased in 47 of the 77 overweight children who completed (61%). Figure 3 shows that the proportion of children reducing BMI SDS significantly increased each year ($p < 0.05$). **Only 10 of the 23 children (43.5%) who completed GOALS during 2006-2007 showed a decrease in BMI SDS. This increased to 16 of 27 children (59.3%) who**

completed 2007-2008 and 21 of 27 children (77.8%) who completed 2008-2009. Given that there were no baseline differences between year groups in terms of age, BMI SDS, sex or parental obesity, this result is a promising indicator of increasing success as the intervention became more refined.

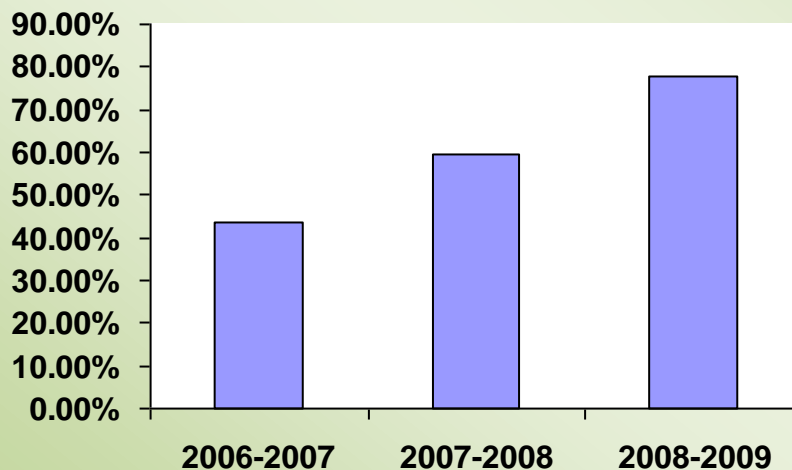


Figure 3. Percentage of children decreasing BMI SDS by year of participation

Pre- and post- BMI SDS data for the children who completed is shown in table 3. Mean BMI SDS change was -0.07 ($P < 0.01$) pre to post intervention. However, this figure was distorted by one male outlier whose BMI SDS change was -0.71 (range for the other 76 cases was -0.40 to 0.33). When excluding this case the change remained significant, though reduced to -0.06 ($P < 0.01$).

As this figure pools data over a 2.5 year period, it is possible it is contaminated by early data when the intervention was less refined. This is supported by the fact the mean BMI SDS reduction for the 27 complete cases who started after April 2008 was larger than when considering the population as a whole (-0.12 ($p < 0.01$)).

Table 3. BMI SDS data (mean, sd) based on *all complete cases*, and *with outlier removed* (*p<0.01)

	n	Pre BMI SDS	Post BMI SDS	BMI SDS change	95% confidence interval
All	77	2.90 (0.66)	2.83 (0.67)	-0.07* (0.18)	-0.03 to -0.11
With outlier removed	76	2.91 (0.66)	2.85 (0.67)	-0.06* (0.16)	-0.02 to -0.10

Age differences

Although the intervention was available to children aged 4-16 years, over 70% of baseline participants were aged between 8 and 12 years and much of the intervention development was focussed on this age group. Retention did not differ significantly between this age group and the 4-7 or 13-16 year olds, though a slightly lower retention rate was observed in the 4-7 age group (34.6%, compared to 54.4% in the 8-12 group, and 52.4% in the 13-16 group). Table 4 shows BMI and BMI SDS data for the children who completed according to their age at baseline. The male outlier (aged 12.56 years) discussed in the previous section has been excluded from these figures.

When considering the data for the 8-12 year old children only, mean reduction in BMI SDS was -0.08 (p<0.01). Although mean BMI SDS appeared to increase in the 4-7 age

group and remained the same in the 13-16 age group, there was great variability within these groups and there is insufficient data to draw conclusions (n=7 and n=9 respectively). For example, three of the seven 4-7 year olds decreased BMI SDS by -0.1 or more and three increased BMI SDS by 0.2 or more.

It is important to interpret any between group differences with caution, as there were differences in baseline characteristics between the age groups. Table 4 shows that, although baseline BMI increases with age as expected, baseline BMI SDS is lowest in the 8-12 age group; indicating these children were less overweight for their age and sex. There were also differences in the referral mechanisms for the age groups, with a large proportion (47/114) of 8-12 year olds being referred via the Sportslinx programme (Sportslinx collects data only from the 9-10 and 11-12 age groups).

Table 4. BMI data (mean, sd) by age group (*p<0.01)

Age group	n	Pre BMI	Post BMI	BMI change	Pre BMI SDS	Post BMI SDS	BMI SDS change
4-7 years	7 (3 girls, 4 boys)	23.52 (2.91)	24.26 (2.4)	0.74 (0.95)	3.1 (0.98)	3.15 (0.8)	0.05 (0.25)
8-12 years	60 (33 girls, 27 boys)	27.86 (4.1)	27.86 (4.12)	0.0 (0.91)	2.81 (0.6)	2.73 (0.61)	-0.08* (0.15)
13-16 years	9 (4 girls, 5 boys)	37.93 (6.49)	38.48 (7.03)	0.55 (1.35)	3.39 (0.63)	3.39 (0.67)	0.00 (0.13)

Are changes sustained after GOALS? (preliminary data)

GOALS takes a long-term approach to lifestyle change, and follow-up data is crucial in understanding the intervention's effects.

There is a paucity of such data in the childhood obesity treatment literature and calls have been made for well-designed studies with longitudinal follow-up [16].

At the time of writing follow-up data was available for 44 of the 77 children in this study (25 girls, 19 boys). Due to logistical difficulties follow ups were carried out between 12 and 16 months after baseline. Follow-ups were still underway (though nearing completion) for the 2008-2009 cohort so the data reported remains preliminary only.

Characteristics of follow up group (BMI SDS change and attendance)

Of the 44 children who attended follow-up, 27 (61.4%) had achieved a reduction in BMI SDS whilst at GOALS, which is a comparable proportion to the number reducing BMI SDS from the whole group who completed (47/77, 61%). However, the 44 children who attended follow-up had a significantly higher mean attendance than the 33 children who did not attend follow up (86.4% compared with 80.2%, $p < 0.05$). Therefore, the results presented must be interpreted with caution as they may not generalise to the less compliant cases.

Table 5. Pre, post and 12-16month follow up data (mean, sd) for complete cases (* $p < 0.05$, ** $p < 0.01$)

	n	Pre BMI SDS	Post BMI SDS	12-16months BMI SDS	Pre-post SDS change	Pre-(12-16m) SDS change
All	44	2.83 (0.64)	2.74 (0.63)	2.74 (0.68)	-0.09** (0.2)	-0.08 (0.28)
With outlier removed	43	2.83 (0.64)	2.76 (0.62)	2.76 (0.67)	-0.07* (0.18)	-0.07 (0.27)

It can be seen from table 5 that a **reduction in BMI SDS from baseline was still apparent at 12-16 month follow-up**, though it lost significance due to the high variability amongst individual children (range -0.65 to 0.59). This is nevertheless a promising finding. Of the 27 children who originally decreased BMI SDS, 14 showed a further decrease at follow-up, 9 showed an increase since finishing GOALS but BMI SDS remained lower than baseline

and 4 increased BMI SDS to higher than baseline. Of the 17 who had not decreased BMI SDS whilst at GOALS, 11 had increased further, 1 had decreased since GOALS but BMI SDS remained higher than baseline and 5 had decreased BMI SDS to a level below baseline. Further research is underway to explore possible factors contributing to these differences.

Abdominal girth

Abdominal girth was measured at the waist (defined as the mid-point between the lowest rib and the iliac crest) for the first 9 cohorts and at the umbilicus for the most recent 11 cohorts. The change was made due to the difficulty in locating the same waist point for individuals who are obese, which affected the reliability of repeat measurements. By taking the measurement at the point of the umbilicus, the presence of a stable marker reduced the room for error.

Unfortunately some measurements were excluded due to unreliable data (due either to being taken by different observers or using different equipment), yielding small sample sizes with poor statistical power. The available measurements showed no significant changes, though a small decrease in waist

circumference (mean -1.9cm, median -0.8cm, n=18) and a small decrease in umbilical circumference (mean -1.5cm, median -0.5cm, n=31) was observed for adults from earlier and more recent cohorts respectively. Given the small sample sizes, it is encouraging that both observations were approaching significance.

There was no change in children's abdominal girth (waist mean change -0.9cm, median -1.0cm, n=24; umbilicus mean change 0.4cm, median 0.6cm, n=41) but when taking into consideration mean height increased 2.7cm over the same period a stable abdominal measurement may be indicative of an improved body composition.

Adult BMI

Of the 71 families included in the complete case analysis, 57 adults were weighed and had their height measured at both baseline and post intervention. Other adults either did not wish to be measured, or were only present at either the baseline or post measurement session – for example, if two adults were

attending from one family, they might have attended different sessions. Of the 57 adults measured, 51 were either overweight or obese (BMI 25 or over). Average BMI for these 51 adults showed no change from baseline (median BMI 30.41) to post intervention (median BMI 30.55).

Child self-esteem

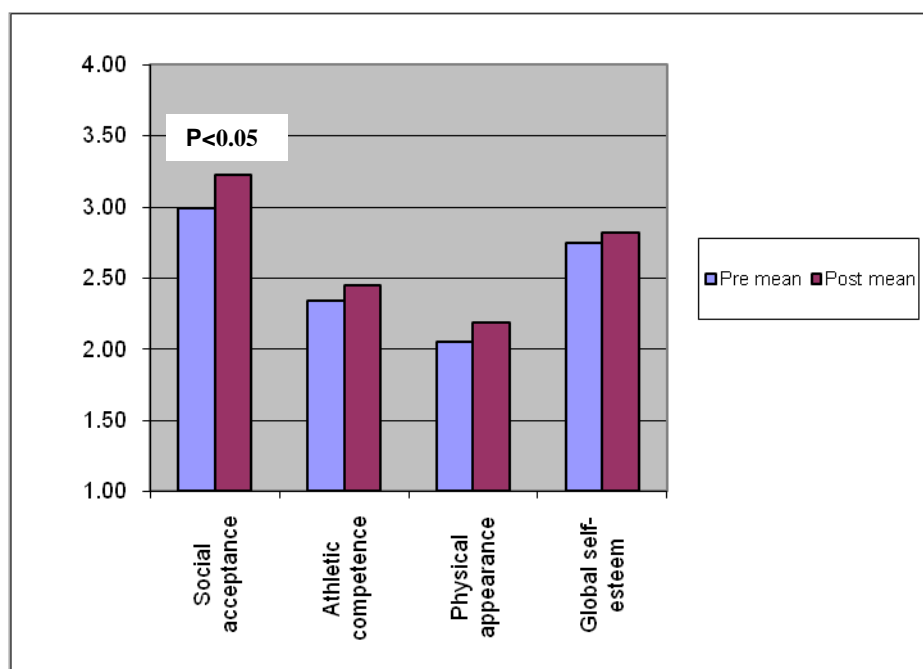


Figure 4. Harter's (1985) Self-Perception Profile for Children, mean scores before and after GOALS (n=48, *p<0.05)

Of the 77 completing children, 48 completed a questionnaire comprising four subscales of Harter's (1985) Self-Perception Profile for Children (SPPC,[6]) at both baseline and post-intervention. Of the remaining children, 7 were under 8 years old and therefore too young to complete the questionnaire, 15 provided incomplete data, and a further 7 did not provide any data (mostly due to non-attendance at either/both the group sessions during which the questionnaires were completed). The 48 children who completed questionnaires did not differ on baseline characteristics (eg. age, BMI SDS, parental obesity) from the 21 children who did not, and therefore can be considered a representative estimate of the study population.

Figure 4 shows the mean scores at baseline and post GOALS for the social acceptance, athletic competence, physical appearance and

global self-esteem subscales of the SPPC [6]. A score of 2.5 (minimum 1, maximum 4) can be deemed "neutral" as it indicates the child has given as many positive perceptions of themselves as they have negative. A score above 2.5 has more positives than negatives, and a score below 2.5 has more negatives than positives. It can be seen from the graph that children rated themselves positively in terms of their social acceptance and their global self-esteem, and negatively in terms of their athletic competence and physical appearance. While this did not change from baseline to post measures, there was a small improvement in each of the four domains, with the increase in perceived social acceptance being the only change to reach significance ($p<0.05$).

Physical activity and eating habits

As there is a paucity of accessible and appropriately validated tools for measuring physical activity and eating habits available in the literature [8], a lifestyle questionnaire was designed based on the Sportslinx questionnaire administered to year 5 and year 7 children in Liverpool. The questionnaire asked children and parents to report on physical activity behaviours over a “typical” week and food intake over the previous 24 hours. The questionnaire underwent some modification throughout the study period to improve ease of completion and validity of data collected. Although the food intake portion of the questionnaire proved useful in gaining a picture of the family’s baseline eating habits, there was some concern about its appropriateness as an outcome measure. The questions focused on 24-hour recall and thus lacked generalisability to other days of the

week. Day of administration was not controlled for in this study, and it was therefore decided not to report data from the food intake questionnaire.

The general questions asked in the most recent version of the adult’s questionnaire (administered to 2007-2009 cohorts only) provided a self-report measure of the changes that had taken place during GOALS. The feedback on these questionnaires was overwhelmingly positive, with 38/40 adults rating their child’s physical activity levels to have increased and 37/39 adults rating their family’s diet to have improved. 2/40 and 2/39 reported no change and indicated they already felt their physical activity/ diet were ok (the two who felt their physical activity levels had not changed were different participants from those who felt their diet had not changed).

Perceptions of fitness

52 adults rated their fitness before and after GOALS. As can be seen from figure 5, after attending GOALS participants were more likely

to rate themselves as fit or fairly fit, and less likely to rate themselves as unfit or very unfit than at baseline.

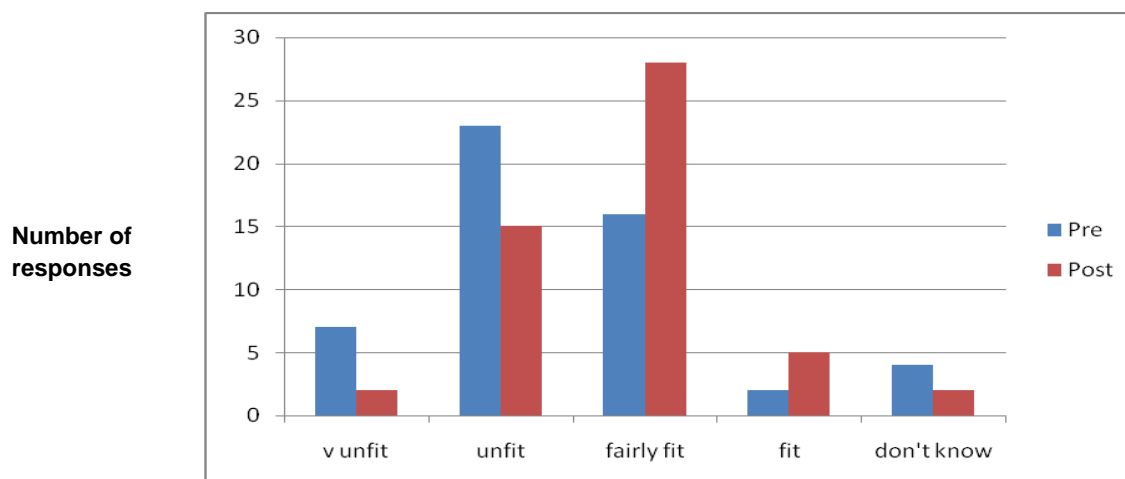


Figure 5. Adult self-reported fitness before and after GOALS (n=52)

Qualitative data

Approximately 30 focus groups (16 adult, 14 child) were carried out with GOALS participants during the study period, seeking their views on the acceptability of GOALS, and ideas for improving the intervention. Data from these focus groups was used to continuously refine the intervention and is currently being analysed for publication. Below are a few comments families have made about their experiences, which highlight the holistic nature of the support provided by GOALS.

Adults

“One point that I would like to make and I think it’s a really important point...when you first come to GOALS you don’t feel like it’s your fault that your children aren’t eating healthily, are overweight. ‘Cos that’s the problem you get when you go to [other health professionals] - they always make out it’s the parents fault.”

“My children absolutely loved it [Move It!]. At last they were in someone’s team and not “the fat kid never picked”. All the children were the same. This was the essence of success. Fat children do not dislike exercise. They fear ridicule; as do we all.”

“The other day he was in the back kitchen and he got stuff out of the fridge to make a sandwich and he went “hang on” and then he stopped and then he actually went and had a glass of water and he put the food back.”

Children

“It’s easier to talk to people because they don’t tell you to go away or “you’re not fit to be with us because so and so and how you look” but they actually go “oh hi, how are you today?” and “do you want to come and join us?” and things like that”

“I feel a bit better because you’re not always concentrating on how you look and how your weight and your size and everything, and I like the privacy because nobody really finds out how much you weigh and things like that”

“I feel more confident in joining in stuff in school. I never wanted to do sport (play football) but now I’ve been playing every afternoon - I’ve been more confident in stepping up my game and asking people if I can play with them”

Summary and recommendations

This report described the process through which the GOALS intervention has been piloted across Liverpool, in accordance with the recommendations of the Medical Research Council [4] for the development and evaluation of complex interventions. Throughout this time the intervention has aimed to support families in making gradual, sustainable changes to their physical activity and eating behaviours, with a view to reducing the child's level of overweight and improving the family's future health prospects.

The 76 children (excluding one outlier) who completed GOALS during the study period achieved a significant reduction of -0.06 BMI SDS from baseline to post-intervention, with those who attended during the most recent year achieving a change of -0.12 BMI SDS.

Furthermore, the proportion of children who reduced BMI SDS increased significantly year by year; highlighting the importance of the development process in refining new interventions to enhance their effect.

There is debate in the literature about what constitutes a clinically significant change in BMI SDS in children. The -0.06 BMI SDS change we observed is comparable with that reported in the Watch-It community intervention in Leeds (-0.07, [18]), which

shares similarities with GOALS in terms of its community-base and non-clinical delivery teams. However, without a comparator group it is impossible to know whether a -0.06 change is a change we might have observed without intervention. A change of -0.06 BMI SDS will indicate a different drop in absolute BMI depending on the age and sex of the child, indicating that change might be easier to achieve for certain populations. For example, a 6-year old in our cohort achieved a drop in BMI SDS of -0.11 with an accompanying *increase* in BMI of 0.24. A 12-year old achieved the same drop in BMI SDS (-0.11), but their BMI *decreased* by 0.63. Therefore characteristics of the target population must be taken into account when making comparisons between studies. The inclusion criteria for the current study was very broad, and a number of children had a known diagnosis of autism spectrum disorder (ASD), which might have impacted on their intervention response.

A larger reduction in BMI SDS was observed when considering only the children in the 8-12 age group (-0.08, $p < 0.01$), though further research is required to explore the extent to which differing referral mechanisms and a lower baseline BMI SDS played a role in this. Due to the dominance of the 8-12 age group (who made up over 70% of participants), the intervention became most refined for this population. Further pilot work is required to adapt the intervention to the needs of the 4-7 and 13-16 age groups respectively.

A meaningful outcome?

In an attempt to provide a consensus on what is a clinically meaningful outcome in terms of BMI SDS reduction, a statement put together by 65 representatives from 9 countries in 2004 [19] suggested:

“Obese children should be encouraged by any reduction in BMI z-score [SDS]. The long-term objectives of treatment of childhood obesity are to reduce BMI z-score to less than 2 and reverse and prevent short- and long-term comorbidities”

(Speiser et al., 2005, p.1880[19])

If a 10 year old child with a BMI SDS of 2.9 decreased at a rate of -0.06 every 6 months they could achieve a BMI SDS of less than 2 by their 18th birthday. Although our preliminary follow up data suggested a reduction in BMI SDS was maintained 12-16 months post baseline, the change lost significance and did not increase in magnitude. This may be in part due to the large individual variability observed. Some children did continue to decrease BMI SDS beyond the intensive period of GOALS and 21 of 44 children (47.7%) who attended follow up showed a reduction of at least -0.12 BMI SDS at 12-16 months post baseline, which is in line with the rate of change identified above. Research is planned to follow families up 24-36 months from baseline and explore what differentiates the

families who demonstrate continued change from those for whom the intervention does not promote lasting change. Qualitative methodology will be used to explore the process of change for the “successful” families, which could be vital in helping us understand the key factors for a behavioural change intervention.

One of the most challenging aspects of delivering a behavioural change intervention continues to be the exit strategy, and the fact there is much individual variability in the level of support needed and the length of time for which families need support. Several means of continued support beyond the intensive period of GOALS were tried out during the development phase, but each has involved a rather swift transition from intensive formal weekly support to less formal or irregular contact with the delivery team. Feedback from some families has suggested this has led to relapse and it is possible a more gradual transition would enhance the sustainability of changes. It is therefore planned to extend the formal GOALS contact period to one year, consisting of 18 weekly sessions over 6 months, followed by 6 monthly sessions, after which time families may continue attending monthly as part of an “open graduate group”. Ongoing research will continue to explore ways in which long-term maintenance of changes can be enhanced.

When patience pays

“Before undertaking a substantial evaluation you should first develop the intervention to the point where it can reasonably be expected to have a worthwhile effect.”

(Medical Research Council, 2008, [4])

This research highlighted an important point for the development of complex interventions. **It might take several years before an intervention reaches a point where it is having the desired effect, and the early years are crucial in developing a sustainable model for implementation and learning what are the key components to include.** Therefore a traditional evaluation carried out too early could write off a potentially efficacious intervention. Our research showed a significant year by year increase in the proportion of completing children who decreased BMI SDS. Whilst it is possible the cohorts during the final year were by chance a more highly motivated group, this likelihood is reduced firstly by the fact the year groups did not differ on baseline characteristics (eg. Age, BMI SDS, parental obesity), and secondly by the fact the most recent year contained 7 different cohorts, highly unlikely to be a homogenously-motivated group.

Some of the pragmatic changes to the intervention are detailed in appendix 1. It is potentially the *less-measurable* changes that are of more interest however. Staff experience, for example. Nine of the staff who delivered the 2008-2009 interventions also delivered during the first year of implementation (2006-2007). During this time, much was learned about working with families, motivating others and organising sessions. Communication during weighing and measuring sessions became less “sugar-coated” and measurers are now trained to give a clear, direct message to parents about the extent of their child’s obesity and the associated risks, yet without losing the empathy that is so crucial to the GOALS environment. This staff experience has been used to develop a training package for other

PCTs who have piloted GOALS as a model of best practice (Sandwell PCT, Walsall PCT).

As learning has occurred over time, the intervention has become more clearly mapped to behavioural change theory. In brief, GOALS focuses on the formation of new positive habits and the disruption of embedded negative habits, within a social-cognitive model [20] that recognises the environmental, social and cognitive influences on an individual. A habitual behaviour is one that happens frequently in a stable context [21]. It is usually triggered by daily cues that the individual may not even be conscious of (eg. A certain time of day, walking past a certain shop etc.). Therefore if a behaviour becomes habitual it requires less conscious thought and is more likely to be sustained as long as the context in which it is performed remains stable. At GOALS, we work with families to identify and remove the current triggers for their bad habits, whilst at the same time using behavioural change techniques (goalsetting, positive reinforcement etc.) to help them practice new behaviours, with the aim that in time these behaviours might become habitual. The rate at which change occurs, and the amount of changes feasible by the end of the GOALS intensive period, will vary between individuals. Recent research into habit formation [22] suggested it can take anything from 18 to 254 days to develop a simple health behaviour habit, and such evidence backs up the planned extension to the period of GOALS support. Follow up research with GOALS families aims to help us further understand the role of habit in the change process.

Future challenges

A limitation of the current study was the low retention rate (49.1%). Mean attendance for the families who dropped out was 21.8%, indicating that they attended an average of 3.9 sessions out of 18. This may be in part due to the wide inclusion criteria and lack of screening employed. During the period of study, GOALS was the only community service available for children who are obese in Liverpool, and an inclusive approach was essential. We hope through ongoing research to learn more about who GOALS is most effective for, to enable us to develop effective screening processes and alternative care pathways for those for whom GOALS is not the optimum treatment model.

It proved challenging obtaining reasons for drop-out since few families formally told staff they were leaving the intervention. When families had missed one or two sessions they were called by staff to ask if everything was going ok. It was not uncommon for families to say they were coming back the following week, then failing to turn up. An attempt was made during 2007-2008 to contact families for interview who had dropped out, but of 50 families we were able to make contact with only 3. Anecdotally, reasons provided for drop-out suggested it was not the “right time” due to other commitments or priorities (eg. Family illness, difficulty getting to sessions etc.). The make-up of the group also appeared to play a role – for example, one child left because he was the only boy left in the cohort. We know very little about the effects of attending the intervention 3 or 4 times, and it is vital that any future research follows up families who drop out – to find out who they are, why they leave and whether attending only a few GOALS sessions is sufficient to instigate change.

It is acknowledged there was a difference in the length of “contact time” for the April,

September and November interventions, and some interventions spanned the summer or Christmas holiday periods. This was a practicality based on the yearly short-term funding, and it is noteworthy that retention was lower (though did not reach significance) for cohorts who broke over the summer holidays. Interestingly however, for families that did complete the intervention the summer break did not appear to be detrimental as there was no difference in BMI SDS change between cohorts starting in April and cohorts starting in September or November. It could be that the longer duration of the programme (7 months as opposed to 5 months) offset any weight that was gained during the summer holiday (summer holiday weight gain has been observed elsewhere in overweight youth [23]). Further analysis of the mid-intervention BMI SDS data may provide an insight into these patterns.

A unique feature of GOALS is the focus on whole family lifestyle change, through personal goalsetting, regular weighing of all family members and family physical activity sessions. One possible reason for the lack of change in BMI of the overweight and obese adults taking part could be the lack of direct focus on the adult’s weight. Although adults were regularly weighed, the decision as to whether they tried to lose weight was left with them, and weight targets were not used as they would be at an adult weight management intervention. Future research might investigate the potential approaches to enhance adult weight loss, without removing the focus on healthy lifestyles.

Unfortunately, we only had self-report data to rely on to gain a picture of changes made to family’s physical activity and dietary habits. The difficulty of measuring physical activity and dietary behaviours in a field setting has been acknowledged [8] as there is a paucity of

well-validated tools relevant for this population. Self-report data from GOALS families (through questionnaires and focus groups) did suggest the intervention was effective in equipping them to make healthy choices, and in helping them change their behaviours. Common areas of reported change were reducing portion sizes, eating breakfast, healthier snacking, reading food labels, cooking more from fresh, increased walking and increased confidence in physical activity. There is an urgent need to develop and validate a simple,

relevant tool to measure physical activity and dietary change in families.

Although a breakdown of ethnicity and socioeconomic status was not available for this report, the majority of families were from White-British backgrounds and resided in Liverpool postcodes. Further research is underway to explore and improve the cultural relevance of the intervention for families from different cultural backgrounds.

While the limitations of the current study must be acknowledged, this report demonstrates promising findings from 3 years of GOALS provision in Liverpool. Children who completed the GOALS intervention showed a significant improvement in BMI SDS from baseline to post-intervention.

Furthermore, the proportion of children who reduced BMI SDS increased significantly year by year; highlighting the importance of the development process in refining new interventions to enhance their effect.

An experimental trial is urgently required to substantiate these findings.

Research recommendations

- An experimental trial of GOALS (8-12 age group) is urgently needed to substantiate the evidence in this report. It is important that an appropriate comparator group is identified, the intervention is standardised so all cohorts receive support over the same number of months and participants are followed up for a minimum of one year post-intervention. Any future research should include a cost-effectiveness analysis.
- Appropriate outcome measures need to be identified to demonstrate changes related to physical activity and dietary behaviours, and feasible measures of abdominal girth for this population. It would be of interest also to investigate the impact of the intervention on other parameters of health in both the children and adults taking part (eg. blood pressure).
- We need to learn more about the families who drop-out of the intervention – who they are, why they drop-out and whether they gain any benefit from attending.
- Family-based lifestyle intervention is not a one size fits all approach, and research is needed to explore the characteristics of the families for whom GOALS is most successful , and the key triggers associated with success. A deeper understanding of these factors will allow practitioners to tailor and target the intervention more effectively, and commissioners to develop a care pathway to meet the needs of families for whom group-based healthy lifestyle intervention may not be appropriate.
- Future research might aim to identify the key factors that are leading to change, and explore alternative structures for the intervention, with the aim of enhancing cost-effectiveness and long-term sustainability.

Practice recommendations

- Expand GOALS formal contact time to 12 months, with an 18-session intensive phase followed by six monthly sessions and the option of continuing on a monthly basis beyond that. This can be done within current capacity by changing the structure through which the GOALS graduate club is run.
- Explore strategies to improve retention.
- Seek longer-term funding to allow for a restructure of the intervention schedule to prevent interventions straddling the 6-week summer holiday period (and possibly improve retention).
- Refine intervention in line with 4-7, 8-12 and 13-16 age groups.
- Enhance focus on whole family through more directed weight loss support for overweight and obese adults.

GOALS is part of Liverpool's Taste For Health Strategy and is managed in partnership between Liverpool John Moores University (LJMU), Liverpool PCT, Liverpool City Council (Sportslinx), Alder Hey Children's Hospital, and the University of Salford.

GOALS management

Paula Watson, Project Manager and Principal Researcher, LJMU
Professor Tim Cable, LJMU
Liz Lamb, Liverpool City Council
Dr Lindsey Dugdill, University of Salford
Dr Ruwan De Soysa, Alder Hey Children's Hospital
Dr Jamuna Acharya, Alder Hey Children's Hospital
Julie Curren and Annette James, Liverpool PCT

GOALS staff (all LJMU)

Katie Pickering, Service Co-ordinator and Physical Activity Specialist
Stephanie Bostock, Nutritionist
Leanne Staniford, Health Behaviour Specialist
Eve Fineberg, Administrative Assistant
Joanne Trigwell, MerseyBEAT-funded Research Assistant
Supported by a team of Nutrition Mentors, Physical Activity Coaches, Health Behaviour Mentors, Volunteers and a Family Lifestyles Counsellor

GOALS venues

Alsop High School	Parklands High School
Broadgreen International School	Sacred Heart Catholic Primary School
Childwall Sports College	Shorefields Technology College
Fazakerley Primary School	Windsor Community Primary School
Gwladys Street Primary and Nursery School	Belvedere Community Activity Centre
Holy Trinity Catholic Primary School	Everton Active Families Centre

Medical support

School Health Team

Additional acknowledgements

We would also like to thank Dr Nicola Manson, Shirley Judd, Dr Lisa Newson, Jackie Hepples, Hazel Cheung and Phil Casey for their contribution to the early development of GOALS.

Sources of funding

2006-2008 Neighbourhood Renewal Fund (Liverpool City Council)
2008-2009 Working Neighbourhood Fund (Liverpool City Council)
2009-Present Area Based Grant (Liverpool City Council and Liverpool First)

References

1. Dugdill, L., G.S. Stratton, and P.M. Watson, *Developing the evidence base for physical activity interventions*, in *Physical Activity and Health Promotion: Evidence-based Approaches to Practice*, L. Dugdill, D. Crone, and R. Murphy, Editors. 2009, Wiley-Blackwell: Oxford. p. 60-81.
2. Stratton, G.S. and P.M. Watson, *Young people and physical activity*, in *Physical Activity and Health Promotion: Evidence-based Approaches to Practice*, L. Dugdill, D. Crone, and R. Murphy, Editors. 2009, Wiley-Blackwell: Oxford. p. 150-169.
3. Getting Our Active Lifestyles Started (GOALS), *Summary Report*. 2007, Liverpool John Moores University.
4. Medical Research Council, *Developing and evaluating complex interventions: new guidance*. 2008: Available to download at www.mrc.ac.uk/complexinterventionsguidance. Accessed 1 October 2009.
5. Liverpool Primary Care Trust and Liverpool City Council, *Healthy Weight, Healthy Liverpool: Healthy weight strategy for Liverpool 2008-2011*. Available from www.liverpoolpct.nhs.uk.
6. Harter, S., *Manual for the Self-Perception Profile for Children*. 1985, Denver, CO: University of Denver.
7. Cole, T.J., J.V. Freeman, and M.A. Preece, *Body mass index reference curves for the UK, 1990*. Archives of Disease in Childhood, 1995. **73**: p. 25-29.
8. National Obesity Observatory, *Standard Evaluation Framework for Weight Management Interventions*. 2009: Available from www.noo.org.uk
9. Foresight, *Tackling Obesities: Future Choices - Project Report*. 2007, Government Office for Science.
10. The NHS Information Centre, *National Child Measurement Programme: England, 2008/2009 school year*. 2009.
11. Freedman, D.S., et al., *Relation of body mass index and skinfold thicknesses to cardiovascular disease risk factors in children: the Bogalusa Heart Study*. American Journal of Clinical Nutrition, 2009. **90**: p. 210-216.
12. Reilly, J.J., et al., *Health consequences of obesity*. Archives of Disease in Childhood, 2003. **88**: p. 748-752.
13. Cross-Government Obesity Unit, *Healthy Weight, Healthy Lives: A Cross-Government Strategy for England*. 2008: Department of Health and Department of Children, Schools and Families.
14. HM Treasury, *PSA Delivery Agreement 12: Improve the health and wellbeing of children and young people*. 2008.
15. Boddy, L.M., *Obesity in Liverpool: Liverpool Sportslinx Project*. Childhood Obesity Breakfast Seminar 8 October 2009, Liverpool John Moores University.
16. National Institute for Health and Clinical Excellence, *Obesity: guidance on the prevention, identification, assessment and management of overweight and obesity in adults and children. NICE clinical guideline 43*. 2006, NICE: London.
17. Oude Luttikhuis, H., et al., *Interventions for treating obesity in children (Review)*. 2009: The Cochrane Collaboration: Wiley.

18. Rudolf, M., et al., *WATCH IT: a community based programme for obese children and adolescents*. Archives of Disease in Childhood, 2006. **91**: p. 736-739.
19. Speiser, P.W., et al., *CONSENSUS STATEMENT: Childhood Obesity*. Journal of Clinical Endocrinology and Metabolism, 2005. **90**: p. 1871-1887.
20. Bandura, A., *Social Foundations of Thought and Action: A Social-Cognitive Theory*. 1986, New Jersey: Prentice Hall.
21. Wood, W., J.M. Quinn, and D.A. Kashy, *Habits in everyday life: thought, emotion and action*. Journal of Personality and Social Psychology, 2002. **83**(6): p. 1281-1297.
22. Lally, P., et al., *How are habits formed: modelling habit formation in the real world*. European Journal of Social Psychology, In press.
23. Gillis, L., M. McDowell, and O. Bar-Or, *Relationship between summer vacation weight gain and lack of success in a pediatric weight control program*. Eating Behaviors, 2005. **6**: p. 137-143.

Appendix 1 – table of intervention details for the 23 GOALS cohorts that ran between June 2006 and March 2009

	Dates	Age	Venue	No. of sessions	Extras ¹	Medical ²	Mentor session	Delivery – Fun Foods	Delivery – Target Time	Delivery – Move It	FLC	Follow up
1	Jun 06 -Dec 06	6-13	Primary	19	C	P/N	Separate	Diet / CFW	HBS	PAS	No	1YPB ³
2	Sep 06- Feb 07	6-10	Secondary	19	C,T	P/N	Separate	Diet / CFW	HB mentor	PA coach	No	1YPB
3	Sep 06- Feb 07	6-11	Primary	19	C	P/N	Separate	Diet / CFW	HB mentor	PA coach	No	1YPB
4	Nov 06-Mar 07	7-12	Primary	18	-	P/N	Separate	Diet / CFW	HB mentor	PA coach	No	1YPB
5	Nov 06-Mar 07	4-9	Primary	17	-	P/N	Separate	Diet / CFW	HB mentor	PA coach	No	1YPB
6	Nov 06-Mar 07	11-14	Secondary	17	C	P/N	Separate	Diet / CFW	HBS	PA coach	Workshop	1YPB
7	Nov 06-Mar 07	5-12	Primary	19	C	P/N	Separate	Diet / CFW	HB mentor	PA coach	No	1YPB
8	Nov 06-Mar 07	10-14	Secondary	18	-	P/N	Separate	Diet / CFW	HB mentor	PAS	Workshop	1YPB
9	Apr 07-Oct 07	9-13	Secondary	18	C,T	N/P	Separate	Mod1&2-Diet1 / FW Mod 3 – Nut / FW	HB mentor	PA coach	Drop-ins	3m, 1YPB
10	Apr 07-Oct 07	7-10	Secondary	18	C	N/P	Separate	Mod1&2-Diet1 / FW Mod 3 – Nut / FW	HBS	PA coach	Drop-ins	3m, 1YPB
11	Apr 07-Oct 07	10-15	Secondary	18	-	N/P	Separate	Mod1&2-Diet1 / FW Mod3 – Nut / FW	HBS	PA coach	Drop-ins	3m, 1YPB
12	Sep 07-Feb 08	10-14	Secondary	18	C	N/P	In prog	Nut / FW	HB mentor	PAS	Drop-ins	3m, 1YPB
13	Nov 07-March 08	5-10	Secondary	18	T	N/P	In prog	Nut / FW	HB mentor	PA coach	Drop-ins	3m, 1YPB
14	Nov 07-March 08	10-16	Secondary	18	C,T	N/P	In prog	Nut / FW	HBS	PA coach	Drop-ins	3m, 1YPB
15	Nov 07-March 08	5-14	Secondary	18	-	N/P	In prog	Nut / FW	HBS	PA coach	Drop-ins	3m, 1YPB
16	Apr 08-Oct 08	9-12	Secondary	18	CM	N/P	In prog	Nut / FW	PAS/HBS	PA coach	Drop-ins	3m, 1YPB
17	Apr 08-Oct 08	5-9	Secondary	18	-	N/P	In prog	Nut / FW	HB mentor	PA coach	Drop-ins	3m, 1YPB
18	Apr 08-Oct 08	9-15	Secondary	18	-	N/P	In prog	Nut / FW	PM	PA coach	Drop-ins	3m, 1YPB
19	Sep 08-Feb 09	9-13	Secondary	18	T	N/P	In prog	Nut	HB mentor	PA coach	Drop-ins	3m, 1YPB
20	Sep 08-Feb 09	8-13 ⁴	Secondary	18	T	Form	In prog	Nut mentor	HBS	PAS	Drop-ins	3m, 1YPB
21	Nov 08-Mar 09	4-8	Secondary	18	PA,T	Form	In prog	Nut mentor	HB mentor	PA coach	Appts ⁵	3m, 1YPB
22	Nov 08-Mar 09	10-12 ⁶	Secondary	18	T	Form	In prog	Nut mentor	HBS	PA coach	Appts	3m, 1YPB
23	Nov 08-Mar 09	11-16	Secondary	18+MI ⁷	PA,T	Form	In prog	Nut mentor	FLC	PA coach/PAS	Appts	3m, 1YPB

Ongoing Support



Weekly family physical activity May 07 – July 08



Weekly Graduate Club started April 09

¹ Extras: C = free crèche on site; CM = child minder arranged but family opted out at last minute;

PA = parent awareness session preceded lifestyle assessments, T = taxis provided for families without transport

² Medical: P/N = mostly paediatrician, some nurse; N/P = nurse, referrals to paediatrician if required; Form = medical form

³ 1YPB = one year post-baseline

⁴ Cohort included one 3-4 year old sibling during module 1

⁵ Started trialling more structured appointments with FLC in and out of sessions. April 09 – introduced home visits

⁶ Cohort included six siblings aged 2-8

⁷ Extra weekly exercise session provided for young people only at Everton Active Families Centre

Key to abbreviations (delivery staff)

CFW = Community Food Workers (PCT employed)

Diet = Community Dietician (PCT employed)

Diet1 = Sessional dietician employed by LJMU

FLC = Family Lifestyles Counsellor

FW = Food Workers employed by LJMU

HBS = Health Behaviour Specialist

Nut = Nutritionist

Nut mentor = Nutrition Mentor

PAS = Physical Activity Specialist

PM = Project Manager