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Combating child obesity: impact of HENRY on parenting and family lifestyle

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What is already known about this subject

- The rise in child obesity poses a serious public health challenge.
- It has been argued that efforts may be best targeted towards prevention, but there is a relative dearth of initiatives targeting infants.
- Earlier evaluation of the impact of HENRY (Health Exercise Nutrition for the Really Young) has shown an improvement in the way practitioners work with families and a positive impact upon their work setting and personal life.

What this study adds

- This study of the impact on families found that parents participating in HENRY groups report a healthier family lifestyle, which was sustained at follow-up.
- Participants reported increased parental self-efficacy around lifestyle change and parenting generally.
- They also reported increased consumption of fruit and vegetables; positive changes in mealtime behaviours and reduced screen time.

Summary

Background: One-quarter of children in England are overweight/obese at school entry. We investigated the impact of a programme designed to provide parents of infants and preschool children with the skills required for a healthier family lifestyle.

Method: A cohort of families was followed across the 8-week HENRY (Health Exercise Nutrition for the Really Young) parent course at nine locations in England. Seventy-seven parents enrolled on the course, of which 71 agreed to complete questionnaires addressing eating behaviours, dietary intake and parental self-efficacy. Pre- and post-course data was available from 60 (84.5%) parents (8-week follow-up data from 58 parents) and was analysed using repeated measures analyses.

Results: Significant changes were observed, with most sustained at follow-up. Parents reported increased self-efficacy and ability to encourage good behaviour ($P < 0.001$). Increased consumption of fruits and vegetables was reported in both children and adults, together with reduced consumption of sweets, cakes and fizzy drinks in adults (all $P < 0.01$). There were also positive changes in eating behaviours (e.g. frequency of family mealtimes and eating while watching television or in response to negative emotion [$P < 0.01$]) and reduced screen time in adults ($P < 0.001$).

Discussion: The results build upon earlier evaluation, indicating that the HENRY intervention has a beneficial impact upon the families of infants and preschool children. Furthermore, the findings suggest that positive changes inspired by the programme can be maintained beyond its completion. Such changes may serve to protect against later obesity.

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Keywords: Childhood obesity, obesity prevention, parental self-efficacy, preschool children.

Introduction

The rise in obesity poses a serious public health challenge: if current trends continue, over half of the UK adult population could be obese by 2050 (1). Approximately one in four children in England is overweight or obese by school entry, rising to a third by the end of primary school (2). Moreover, obese children are more likely to become obese adults (3,4) and may be at greater risk of cardiovascular problems (5,6). Consequently, it has been argued that efforts to combat obesity would be best directed to prevention and targeting preschool children.

In comparison with efforts aimed at school-aged children, initiatives targeting babies and younger children are in their infancy (7–13). A few randomized controlled trials are under way, largely in day care centres or through home visiting (14). However, their impact upon children's weight remains unclear, and evidence is yet to be produced for a successful, preventive obesity intervention for preschool children.

HENRY (Health Exercise Nutrition for the Really Young) (15,16) is an initiative that has been widely commissioned across the UK. It aims to tackle early childhood obesity through training community and health practitioners to work more effectively with the parents of young families. Initial evidence suggests that the programme is achieving its aim of improving the way practitioners work with families, and has a positive impact on their work settings and personal lives (17).

In addition to health professional training, HENRY offers an 8-week course for parents and carers of preschool children, and it is upon this that the present study focuses. The community-based course is designed to offer parents the skills and tools needed to provide a healthier lifestyle for their family and for themselves. It takes a broad approach to healthy living: healthy eating is covered, but equally important are parenting skills, physical activity and emotional well-being together with developing a positive attitude to change and enhancing self-esteem. Attention is paid to factors associated with later obesity, namely early feeding practices, eating behaviour, nutrition, play, parenting skills and emotional well-being (18). General objectives of the HENRY programme are presented in Box 1. In common with all aspects of the wider HENRY programme, the course is underpinned by the Family Partnership Model (19), an evidence-based approach that emphasizes the centrality of the parent–practitioner relationship.

Box 1 Key objectives of the HENRY programme

Parenting
- Increase in confidence to make changes to family lifestyle
- Development of an authoritative style of parenting
- Modelling of a healthy lifestyle

Eating patterns
- Establishment of regular family mealtimes
- Reduction in grazing behaviour

Healthy eating
- Providing appropriate child-sized portions
- Reduction in energy dense foods and sugar-sweetened beverages; increase in fruit & vegetable consumption

Physical activity
- Increase in active play
- Reduction in sedentary behaviour, especially television viewing

Emotional well-being
- Increase the emotional well-being of the child and all family members

A key component of HENRY is enhancement of parental self-efficacy, i.e. increasing parents' confidence in their ability to act successfully in the parental role, including managing behaviour and resolving problems (20). Parental self-efficacy is associated with better quality mother–toddler interactions (21), as well as greater maternal sensitivity and responsiveness (22), parenting characteristics that protect against later problem behaviour (23,24). This may be considered within the framework of social cognitive theory (25), which posits an integral role for personal efficacy: enhanced self-efficacy makes behavioural change more likely, and successful mastery of new behaviours brings a reciprocal impact upon one's self-efficacy. Thus, providing parents with a sense of empowerment and the ability to make desired changes in their family's lifestyles are core aspects of the HENRY intervention.

The present study investigates the impact of the intervention by following a cohort of parents completing the course at several locations in England, and comparing data (including family dietary intake, eating behaviours and parental self-efficacy) from

Table 1 Baseline demographic characteristics of those completing the course and providing questionnaire data ($n = 60$)

Age	30.37 (5.30) years; range 18–40
Females (%)	58 (96.7%)
Ethnicity	
White British	52 (86.7%)
British Asian	5 (8.3%)
Other	3 (5.0%)
Employed	27 (45%)
Completed further education	50 (83.3%)
Number of children living at home	1.67 (.82), mode = 1, range = 1–4
Age of children at home	3.32 (4.04) years
Number aged under 12 months	22 (22.2%)
No other adults at home	15 (25.0%)

Mean (standard deviation) or frequency (%) unless otherwise indicated.

before and after the course, and at 8-week follow-up to assess if changes are sustained.

Method

Participants

Courses were delivered at nine locations in England between September 2010 and March 2011, involving 77 participants of which 71 agreed to complete questionnaires. Pre- and post-course questionnaires were available from 60 (84.5%) participants, of which 58 were women and 2 were men, with a mean age of 30.4 (±5.3) years (Table 1 contains sample characteristics). Eight-week follow-up data were available from 58 parents (96.7% of those completing the first questionnaire).

Intervention

The 8-week HENRY parent course is delivered by trained facilitator pairs to groups of 8–10 parents. Each session lasts for 2.5 h, consisting of 'Family Time' where parents and children enjoy a healthy snack and play an active game; and 'Parent Time' where group members explore the programme topics together while the children attend a crèche. Participants explore a new topic each week (e.g. parenting skills, portion sizes, physical activity and play) through activities that lead to shared understanding and ideas for strategies to support changes. At the end of each session, group members are encouraged to set individual goals for the week ahead. Each week, parents build a 'resource toolkit' of materials that promote the course's key messages, including a game, portion size guide and story books.

Procedures

Courses were delivered in Children's Centres, a UK government initiative designed to provide support for young families in disadvantaged areas of the country. Nine locations offering the HENRY programme were selected for study. Parents attending an introductory, 'taster' session were invited to participate and completed the first questionnaire at this time. The course was then delivered over eight weekly sessions, with the second questionnaire and course evaluation forms completed at the final session. At follow-up, parents were invited to a 'catch-up' session where they met to discuss progress and completed the final questionnaire. Parents unable to attend returned questionnaires by post. There were no incentives to attend the course, but £5-vouchers were offered for completion of each questionnaire (awarded at the end of the study). The study was approved by the University of Leeds Research Ethics Committee.

Measures

Stepping stones

During the first session, facilitators introduce a sequence of 'stepping stones' numbered from 1 (not very healthy) to 10 (perfectly healthy). Parents consider how healthy their family's lifestyle was and how healthy they would like it to be. In the final session they reflect and score this again. This non-validated tool is included in all HENRY parent courses.

Questionnaires

A questionnaire booklet (available from the authors upon request) was completed at the beginning and end of the course and the 8-week follow-up. Basic demographic information was also collected (age, gender, ethnicity, employment status, number of children at home).

Parental self-efficacy and ability to set limits

Parental self-efficacy was assessed using the 5-item Parenting Self-Agency Measure (20), which measures parents' overall confidence in their ability to act successfully in their parental role. Items relate to the individual's confidence, knowledge and willingness to expend effort in problem-solving with their child e.g. 'I feel sure of myself as a mother/father', and were completed using a Likert scale (1 = never to 5 = always). The validity of the measure has been

demonstrated (20). The scale's internal consistency in this sample was high (Cronbach's alpha > 0.80 at each timepoint).

Participants' ability to encourage good behaviour and set limits was assessed using five items developed for this study. The measure was headed: 'Being an effective parent means encouraging good behaviour and setting limits. How well do you think you do this?', and parents were asked to rate their ability in relation to mealtimes, television (TV) and computer games, active play, bedtime, and in general. They responded using a 5-point scale (1 = 'not well' to 5 = 'very well'). Good internal consistency was demonstrated (Cronbach's alpha = 0.67–0.85).

Food Frequency Questionnaire (FFQ)

Habitual family food intake was assessed using a modified FFQ (26). To ensure that the questionnaire was concise, some items were combined (e.g. individual items such as beef, pork, lamb, chicken, fish were included together as 'meat, chicken, fish'), and others were removed (e.g. soup). Respondents indicated how often (Never/once a month/once a fortnight/1–7 d a week) they consumed each of the 14 items or groups of foods (e.g. 'Fresh fruit', 'Sweets, chocolate', 'Water'), with space to report the number of times per day. Final scores were calculated to see how many times per week an item was consumed. The measure was completed twice – once in relation to the adults in the home and once for their child(ren).

Eating behaviours, home environment and physical activity

Many of the items relating to eating behaviours and physical activity were based upon the Family Eating and Activity Habits Questionnaire (27). This identifies environmental and behavioural factors associated with childhood obesity, such as snacks in the home, allowing children to eat what and when they want and TV viewing. Some items were adapted to make them applicable to the UK (e.g. 'potato chips' became 'crisps', 'Chitos' were removed) while new items were included. Parents were asked to report the frequency with which their family sat together for meals, watched TV during mealtimes and consumed takeaway food (never/once a month/once every 2 weeks/one to two times a week/three to six times a week/once a day/more than once a day). 'Personal eating behaviours' included 'stop eating when you have had enough, even if food is left' and 'eat when you are angry, bored or feeling low'. These were rated on a Likert scale (Never/Hardly ever/Sometimes/Often/Always). Both family and personal eating behaviour items were analysed individually after Cronbach's alpha values suggested that their reliability as combined scales was poor (all <0.60). Participants were also asked to indicate which of a list of snacks were typically available at home. These were then grouped as 'healthy' (fruit, raw vegetables, nuts and raisins) and 'unhealthy' (crisps, sweets and chocolate).

Physical activity was also considered in terms of both family and individual behaviour. Family activity items included the frequency with which participants 'play with your children at home' and 'take your children to playground' (never/once a month/once every 2 weeks/one to two times a week/three to six times a week/once a day/more than once a day). Personal activity items asked for the amount of time spent per week engaged in various activities, e.g. cycling, walking and gardening (no activity/< 1 h a week/1–3 h a week/> 3 h a week). Screen time was assessed as time spent per day watching TV or digital video discs (DVDs), for both adults and children (none/< 1 h a day/1–2 h a day/2–3 h a day/3–4 h a day/4–5 h a day/> 5 h a day).

Additional measures

Estimated body mass index (BMI) was calculated using self-reported height and weight (adults only). Parents were not measured as it was felt that doing so would adversely affect the atmosphere of the group at the first meeting and would suggest a focus on parental weight reduction, which was not the purpose of the programme. Participants were asked to report their clothing size (women) or trouser waist size (men), as there is evidence that large clothing size may act as a simple indicator for heart disease, hypertension and diabetes risk (28). Also included were items concerning respondents' perceptions of their weight.

Analyses

Eating behaviour and physical activity items were recoded and scored in the same direction, i.e. higher scores reflect less appropriate behaviours (following [27]). Food frequency data were analysed using repeated measures analysis of variance, with Greenhouse–Geisser corrections where appropriate. *Post hoc* Bonferroni comparisons were used to identify whether significant results remained at follow-up. Child food frequency data were analysed initially using the whole sample and then repeated after excluding children aged <1 year at baseline (this was

only applied where there were no older children in the family in order to account for infants weaned during the course of the study who would naturally increase dietary intake). Changes in self-reported family healthy lifestyle score ('stepping stones') were analysed using a paired-samples *t*-test. Because of the level of data provided, parental self-efficacy, eating behaviour and physical activity items were analysed using the non-parametric Friedman's test, with significant results explored using Wilcoxon's signed-rank tests. As a result of the number of tests being conducted, a more stringent significance level of <0.01 was applied throughout.

Results

Attendance, acceptability of the course and stepping stones data

Seventy-seven parents enrolled on the courses, with 67 (87%) completing. The mean attendance rate of completers was 85% (standard deviation [SD] = 13.7; Mode = 7/8 sessions). Reasons for non-attendance were not routinely obtained, but where available, the most common were illness or work issues. Participant evaluation form responses ($n = 64$) showed that respondents felt positive about the course (M = 4.8/5, SD = 0.4) and would recommend it to others (M = 4.8/5, SD = 0.4). Self-rated family health data ('stepping stones') were available from 64 participants. Scores rose significantly between the start and end of the course (week 1 mean = 4.6 ± 1.7; week 8 mean = 7.8 ± 1.2; $t = 13.98$, degrees of freedom = 63, $P < 0.001$).

Parental self-efficacy and ability to set limits

Parental self-efficacy rose significantly over the duration of the course ($\chi^2[2] = 34.38$, $P < 0.001$; Table 2 & Fig. 1). *Post hoc* analysis revealed that this rise was maintained at follow-up, remaining significantly higher than baseline ($P < 0.001$). Similarly, ability to encourage good behaviour and set limits increased significantly and also remained significantly higher than baseline at follow-up ($\chi^2[2] = 14.68$, $P = 0.001$). This data were analysed as a single scale, but *post hoc* analyses revealed that parent-reported ability to set limits increased significantly for all five behaviours assessed.

Eating behaviours (family)

Positive changes were found in a range of eating and mealtime behaviours (Table 2 and Fig. 2). Following the course, participants reported sitting down together for a meal significantly more often ($\chi^2[2] = 10.86$, $P = 0.004$), more regular consumption of home-cooked meals ($\chi^2[2] = 11.58$, $P = 0.003$) and having the TV on during mealtimes less often ($\chi^2[2] = 36.23$, $P < 0.001$). In addition, children ate with an adult more often at snack and mealtimes ($\chi^2[2] = 17.49$, $P < 0.001$). Each of these changes was sustained at follow-up. No changes were observed in the frequency of consuming takeaway food.

Eating behaviours (parental)

In terms of personal eating habits, participants reported a fall in the frequency with which they ate when angry, bored or felt low ($\chi^2[2] = 13.95$, $P = 0.001$) or while watching TV ($\chi^2[2] = 15.26$, $P < 0.001$). They reported choosing healthy meals more frequently ($\chi^2[2] = 21.43$, $P < 0.001$). Of these, eating while watching TV and choosing healthy meals remained significantly different at follow-up ($P < 0.005$). No changes were found in the frequency of eating standing up, eating straight from the bowl or stopping eating when full. Sitting to eat with others increased, but was not significant at the $P < 0.01$ level (Table 2).

Physical activity

No changes in family activity achieved significance, although the increased frequency of taking children to the playground was just outside the required significance level ($P = 0.03$). Increased participation was reported in gardening/DIY ($\chi^2[2] = 14.75$, $P = 0.001$), *post hoc* comparisons indicated that the change occurred only after the course was completed. There was a marginal significant increase in swimming/jogging/gym ($P = 0.019$).

Screen time

The amount of time spent watching TV/DVDs was reduced in adults, with a further reduction by follow-up (Friedman's test: $\chi^2[2] = 24.01$, $P < 0.001$; *post hoc* Wilcoxon tests T1vT2, $P = 0.003$; T2vT3, $P = 0.002$). No significant differences emerged in the child screen time data.

Family dietary intake – adults

Several significant changes in adult dietary intake were observed, with the majority enduring at follow-up (Table 3 & Fig. 3a). Frequency of consumption of salads/raw vegetables ($F_{2,108} = 8.75$, $P < 0.001$), fresh fruit ($F_{2,108} = 12.02$, $P < 0.001$),

Table 2 Self-reported questionnaire data at each timepoint (Mean [SD] scale values) and significance of repeated measures analysis

Item/scale	*N*	Baseline	Post-course	Follow-up	*P*‡
Parental self-efficacy	58	12.55 (4.26)	14.96 (2.70)¶	15.34 (2.72)¶	**<0.001**
Setting limits	56	13.26 (4.19)	15.67 (2.49)¶	15.12 (2.85)¶	**<0.001**
Family eating behaviours*					
Sat down together for a meal	54	1.91 (1.64)	1.33 (1.10)¶	1.28 (1.16)¶	**0.004**
Eating takeaway food	55	1.55 (0.96)	1.49 (0.90)	1.40 (0.76)	0.678
Had TV on at mealtimes	57	4.11 (2.19)	3.07 (2.09)¶	3.11 (1.89)¶	**<0.001**
Eating home-cooked meal	54	1.52 (1.09)	1.20 (1.04)¶	1.09 (0.98)¶	**0.003**
Frequency with which children eat with adult at home	54	7.21 (4.57)	5.20 (3.67)¶	5.19 (4.06)¶	**<0.001**
Children allowed to eat *when* they want	35§	2.11 (0.96)	1.71 (0.67)	1.69 (0.80)	0.057
Children allowed to eat *what* they want	34§	1.62 (0.95)	1.59 (0.78)	1.29 (0.76)	0.131
Children eat at set times	35§	0.97 (0.86)	0.77 (0.65)	0.69 (0.72)	0.129
Personal eating behaviours*					
Sit down to eat with others	51	1.41 (0.90)	1.08 (0.91)	1.25 (0.87)	0.027
Eat standing up	50	0.96 (0.95)	1.06 (0.94)	0.90 (0.86)	0.569
Eat straight from pan/bowl	50	0.54 (0.86)	0.58 (0.73)	0.42 (0.64)	0.161
Eat while watching TV	51	2.29 (1.32)	1.84 (1.22)¶	1.92 (1.04)¶	**<0.001**
Stop eating when had enough even if food is left	51	1.67 (1.23)	1.59 (0.96)	1.59 (0.94)	0.365
Eat when angry, bored or feeling low	51	2.27 (1.08)	1.82 (1.05)¶	2.04 (1.00)	**<0.001**
Choose to eat meals you know are healthy	51	1.51 (0.86)	1.02 (0.62)¶	1.14 (0.69)¶	**<0.001**
Family activity*					
Play with child at home	56	0.57 (1.11)	0.50 (0.95)	0.50 (0.85)	0.759
Take child to playground	48	3.33 (1.56)	2.81 (1.00)	2.90 (1.19)	0.03
Take child to organized activities	54	2.98 (1.56)	2.83 (1.26)	2.94 (1.31)	0.512
Involve child in domestic chores	50	2.94 (2.01)	2.64 (1.84)	2.72 (1.84)	0.215
Involve child in preparing meals	50	3.82 (2.05)	3.26 (2.00)	3.60 (1.92)	0.122
Personal physical activity*					
Swimming, jogging, aerobics, gym	54	2.37 (0.90)	2.06 (1.02)	2.11 (1.02)	0.019
Cycling	47	2.94 (0.25)	2.79 (0.55)	2.74 (0.61)	0.098
Walking	57	0.86 (0.85)	0.63 (0.82)	0.54 (0.76)	0.083
Housework	56	0.48 (0.69)	0.41 (0.60)	0.38 (0.59)	0.389
Childcare	47	0.57 (1.16)	0.36 (0.90)	0.11 (0.48)	0.036
Gardening/do-it-yourself	52	2.42 (0.89)	2.19 (0.99)	1.81 (1.12)¶	**0.001**
Screen time*					
Adults	51	7.12 (2.53)	6.27 (2.52)¶	5.73 (2.22)¶†	**<0.001**
Child	48	5.92 (3.22)	5.19 (2.46)	5.27 (2.66)	0.320

Values in bold significant at $P < 0.01$.
*Items coded so that high score = less appropriate behaviour.
¶Value significantly different from baseline.
†Value significantly different from post-course.
‡*P*-value refers to result from repeated measures test (Friedman test).
§Items only required for children aged >18 months, hence smaller *n*.
SD, standard deviation; TV, television.

cooked vegetables ($F_{2,110} = 5.09$, $P < 0.01$) all increased. The reported increased consumption of baked beans/lentils/chick peas was marginally outside the required significance level ($P = 0.012$). Significantly reduced intake frequencies were reported for cakes/biscuits/sweet pastries ($F_{2,106} = 5.92$, $P < 0.01$) and sweets/chocolate ($F_{2,108} = 9.61$, $P < 0.001$). The changes in consumption of salads/raw vegetables, fruit and energy-dense foods were sustained at follow-up. No significant changes were found for meat/fish, chips, milk/cheese/yogurt or crisps/savoury snacks.

Reduced consumption was reported for sweet drinks/squash ($F_{2,110} = 6.01$, $P < 0.005$) and low-

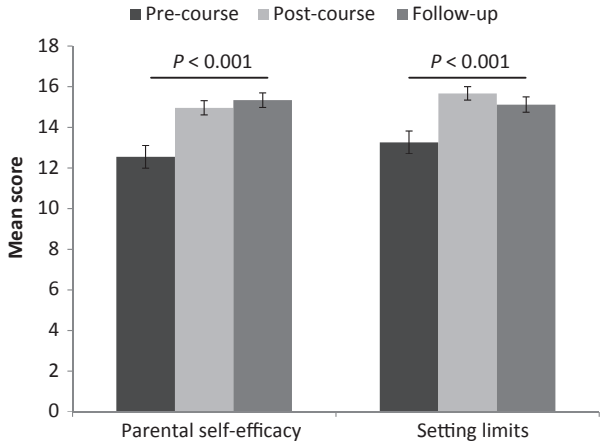

Figure 1 Parental self-efficacy (i.e. confidence in ability to act successfully in parental role) and confidence in setting limits (around mealtimes, screen time, active play, bedtime and generally) at pre-course, post-course and 8-week follow-up. *P*-values refer to repeated measures analysis.

calorie/diet drinks ($F_{2,98} = 5.53$, $P < 0.01$). Participants reported drinking water more frequently following the intervention, but this difference did not achieve the required level of significance ($P = 0.013$). No significant changes were observed for pure fruit juice.

Family dietary intake – children

The child food frequency data displayed a similar pattern (Table 3 & Fig. 3b). The frequency of consumption of cooked vegetables ($F_{2,96} = 5.79$, $P < 0.01$), fresh fruit ($F_{2,100} = 14.17$, $P < 0.001$) and baked beans/lentils/chick peas ($F_{2,98} = 7.73$, $P = 0.001$) all increased post-course. The increased intake of both baked beans etc. and fresh fruit remained significant at follow-up. The increase in salads/raw vegetable consumption did not reach the required significance level ($P = 0.011$). There was a marginal reduction in the intake of cakes/biscuits ($P = 0.028$); no significant changes were found for beverages.

To account for children who were weaned during the study, the data were re-analysed after exclusion of children <1 year old at baseline. The only difference that this made to the results was that the increase in fresh fruit consumption was no longer significant at follow-up.

Presence of snacks at home

The number of healthy snacks (nuts, raisins, raw vegetables, fruits) increased significantly ($F_{2,116} = 8.99$, $P < 0.001$). *Post hoc* analyses revealed that baseline figures were significantly lower than those at the end of the course and at follow-up. The same pattern was observed for unhealthy snacks (i.e. crisps, sweets, chocolate), which fell significantly ($F_{2,116} = 13.44$, $P < 0.001$), with the number at follow-up remaining at the significantly lower level.

Adult body mass index and attitude towards weight

Participants' BMI were calculated using self-reported height and weight. No changes were found in BMI or weight. An increase in happiness about their weight was found at follow-up, relative to baseline ($F_{2,112} = 3.85$, $P < 0.05$).

Discussion

The HENRY parent course, a component of the wider HENRY programme (15), is a community-delivered intervention designed to equip the parents/carers of preschool children with the skills to provide a healthier family lifestyle and so prevent obesity. Data were collected from a cohort of families before and after the 8-week course and at 8-week follow-up. The findings show considerable promise of a positive impact upon both parental self-efficacy and family lifestyle necessary to achieve obesity prevention. Encouraging changes were observed in dietary intake, family eating behaviours and environment, all of which are associated with the development of obesity (18). The significant increase in parental self-efficacy was important as this variable was considered a requirement for the achievement of family change and was associated with better-quality parent–child interactions (21).

These findings are particularly important given the dearth of evidence-based interventions in young children; the most promising interventions to date being two Australian programmes for infants (14,29). Other interventions focus principally on nutrition with less emphasis on the acquisition of parental skills needed to ensure family behavioural change in the long term (7–13).

The results were analysed using the stringent criteria of significance at the 0.01 level. Several important changes in the dietary intake of both children and adults were found, including significant increases in the frequency of consumption of vegetables and fresh fruit. Adults' consumption of sweets/chocolate, cakes/biscuits and sweetened drinks was reduced. Most importantly, several of these changes were sustained beyond the end of the course. Interestingly, the reduction found in high-energy foods was significant for parents, but not their

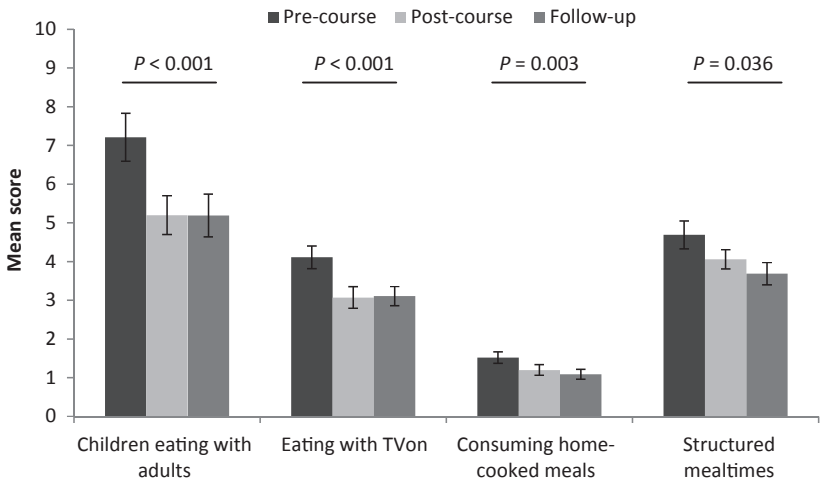

Figure 2 Family eating behaviours at pre-course, post-course and 8-week follow-up. 'Structured mealtimes' comprises three items: allowing children to eat whatever they want, whenever they want and how often they eat at set times. *P*-values refer to repeated measures analysis. Items scored such that high scores signify less appropriate behaviours.

children. Given that children's food preferences and intake are strongly influenced by their parents' eating behaviours, this could nonetheless result in the desired effect on their children over time (30,31). Modelling, which is strongly emphasized in the HENRY programme, has been shown to have a powerful influence on what children eat (32), and recent qualitative work has demonstrated this (33). Moreover, the importance of a whole-family approach to obesity prevention has been highlighted by a recent review of early risk factors for later obesity (34). Parental obesity has been identified as a key predictor, emphasizing the need to incorporate efforts to promote healthy weight in parents. Our earlier research suggested that intentions to change behaviour were induced through participation in the intervention (e.g. to increase physical activity, consume more fruit and vegetables; Willis TA *et al.*, unpublished data). The present results would suggest that these intentions are fulfilled, and, importantly, maintained beyond the intervention period.

The changes in children's diet may have been influenced by the increased availability of healthy snacks in the home; consumption of vegetables is known to be greater when children are frequently exposed to and offered them (35). Other observed changes in the home eating environment may be equally important. For example, family mealtimes were reported to occur more frequently, and these are known to be associated with higher children's vegetable and vitamin intake (36,37) and fewer soft drinks (38). Shared mealtimes also increase preschoolers' intake of basic food groups (39).

A significant increase in participants' confidence and ability to successfully function in the parental role was also found. Increasing parenting-specific and more general levels of self-efficacy is a vital component of the programme and underpins the observed changes in lifestyle and behaviour. Self-efficacy has been repeatedly demonstrated to be an important predictor of a range of behaviours; low levels of self-efficacy are associated with the adoption of fewer health-promoting behaviours, including eating healthily (40,41). The changes can be self-sustaining as higher parental self-efficacy may increase motivation to participate in interventions and to apply the skills taught (42). Moreover, according to social cognitive theory (25), the most potent contributor to parental self-efficacy is likely to be the individual's experiences of mastery and any accompanying changes in child behaviour.

The relationship between an enhanced sense of control and better health is particularly strong in low-income groups (43,44), suggesting that efforts to boost self-efficacy in such populations may be of added benefit. Our research was located in children centres with the explicit intention of reaching disadvantaged families. While we do not have detailed socioeconomic data on the participants, the finding that so many of the samples had completed further education suggests that we were only partially successful in this aim. Even greater efforts may be required to recruit those in greatest need of support.

The results were encouraging overall, although some findings were disappointing. While adult screen time was reduced, there was no corresponding reduction in children's TV viewing. Similarly, only minor changes were reported in family and individual physical activity. The measure(s) used may have lacked sufficient sensitivity to detect changes and were adapted from an existing measure (27) (so may also have lacked validity). Ways to increase the emphasis on physical activity/screen time in the programme need to be considered.

Consideration is also needed regarding other potential limitations. First, the data were collected via

Table 3 Food Frequency Questionnaire data for adults and children

Item	Adults					Children				
	n	T1	T2	T3	*P**	*n*	T1	T2	T3	*P**
Meat, chicken, fish	56	7.46 (3.89)	8.03 (4.22)	7.54 (4.26)	0.464	50	6.82 (4.14)	8.43 (4.38)	8.52 (5.76)	0.049
Baked beans, lentils, chick peas, soy mince etc.	54	2.56 (2.32)	3.67 (2.97)†	3.47 (3.46)	0.012	50	2.62 (2.91)	4.22 (3.47)	4.68 (4.30)†	**0.001**
Cooked vegetables	56	6.09 (4.16)	8.41 (5.40)†	7.32 (4.63)	**0.008**	49	6.06 (3.80)	8.59 (5.19)†	8.10 (5.36)	**0.004**
Chips, fried or roast potatoes	54	2.40 (1.86)	2.47 (1.79)	2.44 (1.87)	0.956	51	2.59 (3.55)	2.19 (2.34)	2.13 (1.88)	0.390
Salads/raw vegetables	55	3.51 (3.33)	6.24 (5.73)†	6.42 (5.25)†	**<0.001**	48	3.18 (3.38)	5.53 (5.08)†	5.07 (5.07)	0.011
Milk, cheese, yogurt	57	13.53 (6.92)	15.02 (7.89)	13.14 (6.82)	0.258	51	15.59 (8.08)	18.96 (8.94)	17.63 (9.64)	0.092
Fresh fruit	55	10.53 (7.99)	15.45 (8.76)†	13.18 (7.48)	**<0.001**	51	11.31 (8.14)	17.76 (9.02)†	15.32 (8.38)†	**<0.001**
Cakes, biscuits, scones, sweet pastries etc.	54	6.95 (6.79)	4.86 (5.78)†	4.25 (3.06)	**0.007**	50	5.21 (4.86)	4.44 (4.97)	3.48 (2.69)	0.028
Crisps or other savoury snacks	53	5.39 (5.81)	5.03 (6.54)	3.90 (3.01)	0.165	49	4.83 (5.07)	4.52 (5.64)	3.71 (2.80)	0.307
Sweets, chocolate	55	5.60 (6.09)	3.66 (5.49)†	2.69 (2.03)†	**<0.001**	49	3.00 (3.06)	3.84 (6.00)	2.55 (2.12)	0.170
Sweet drinks, squash, fizzy drinks	56	11.27 (9.80)	10.40 (10.02)	6.64 (8.10)†	**0.003**	48	7.11 (8.58)	5.65 (7.30)	6.03 (8.68)	0.477
Low calorie / diet drinks	50	6.77 (10.06)	3.85 (7.01)	3.84 (7.30)	**0.005**	45	2.54 (6.59)	2.47 (6.02)	1.32 (4.25)	0.263
Pure fruit juice	53	4.97 (5.39)	5.93 (6.90)	5.55 (6.16)	0.531	45	4.49 (7.42)	5.69 (8.89)	5.01 (7.36)	0.578
Water	57	18.53 (12.37)	23.03 (11.44)	22.44 (11.21)	0.013	50	18.68 (12.27)	20.46 (11.72)	20.68 (12.32)	0.405

Mean (standard deviation) number of times items consumed per week. Values in bold significant at $P < 0.01$.
**P*-value refers to result from repeated measures test (RM analysis of variance).
†Value significantly different from baseline.

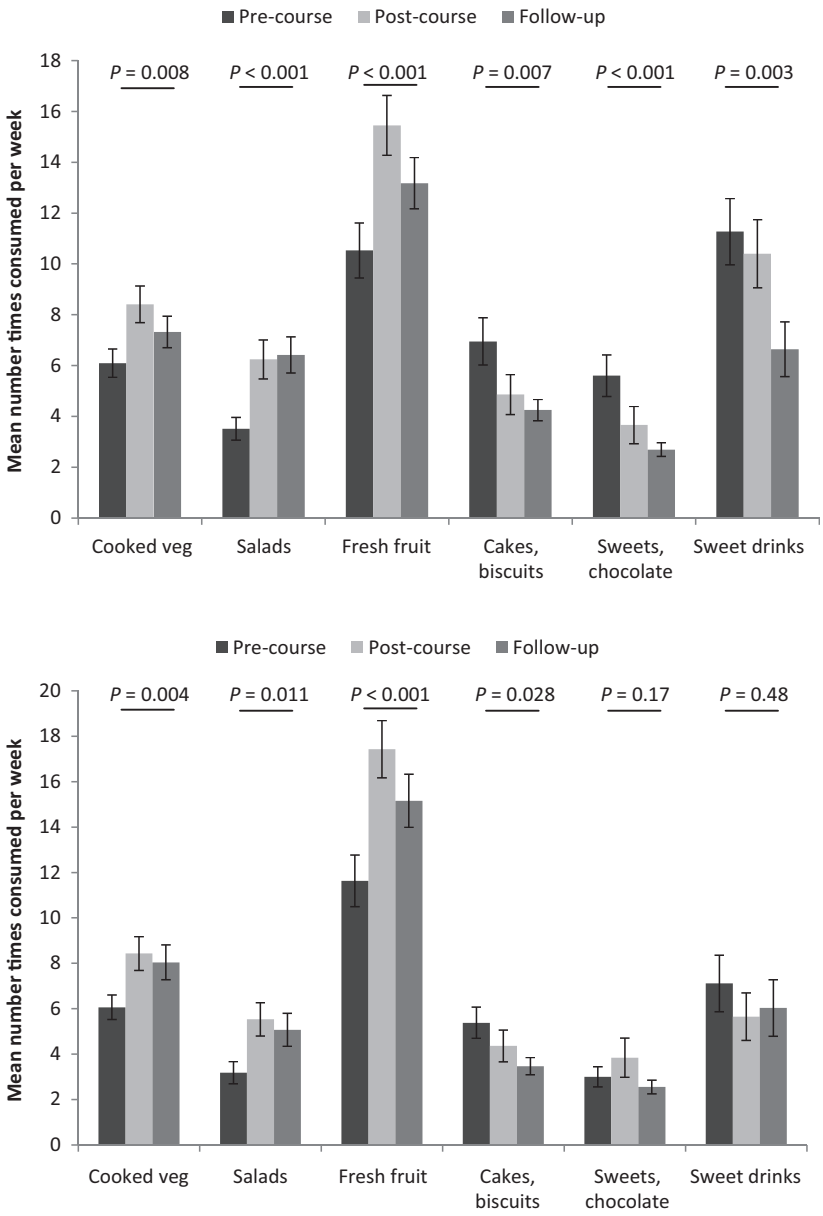

Figure 3 Frequency of consumption of selected Food Frequency Questionnaire items by adults (upper panel) and children (lower panel). *P*-values refer to repeated measures analysis.

self-report and is thus liable to response bias. Self-report questionnaires are used widely, with the advantage of collecting a range of data in a simple and cost-effective manner. While this methodology does not measure actual behavioural change, it does at least indicate that healthy lifestyle messages were being absorbed. More rigorous measures, such as detailed food intake measures, weighing of portions and measuring parental weight, would not have been practical and might well have been off-putting, potentially reduced participation, and, most seriously, affected the intervention itself, which is based on a non-prescriptive approach and encourages self-determination of goals.

Second, a number of the measures used were modified versions of existing scales and could be open to question regarding validity. The adaptations were made to ensure that measures were closely tailored to the objectives of the intervention and were reduced in length to minimize questionnaire fatigue. The FFQ was shortened and simplified, leaving it sensitive to change, but meaning that certain measures, such as reduced fat options, would not be detected. Parents were also asked to report what their children had eaten (rather than selecting a reference child) as broader impact on the family was sought. This did not seem to present a problem in completing the questionnaire, but may need to be

borne in mind when considering the results. Overall, we believe that the measures were effective in terms of the study's aims – to investigate whether a short, non-prescriptive, community-delivered intervention, covering more than simply nutritional advice – could produce a detectable move towards a healthier family lifestyle.

The study was not powered to demonstrate change, however significant results were obtained. A strength of the study is that the courses included were from a range of locations and communities across England. Our findings indicate that the sample is broadly representative of those attending the course elsewhere, and the results are consistent with previous qualitative evidence on the impact of the wider HENRY programme (17). The promising findings from this pilot indicate that the programme, with some adaptation, should move to the next stage of demonstrating its effectiveness by randomized and controlled trial.

Conclusion

The study found evidence that a community-delivered intervention for parents/carers of preschool children was associated with several positive changes, which, if maintained, promote a healthy lifestyle and reduce the likelihood of later obesity. These included changes in dietary intake for both adults and children, changes in family eating behaviour and increase in parental self-efficacy. Furthermore, many of the changes were sustained at follow-up, suggesting that the course may have an impact that endures beyond its delivery. Taken alongside previous evidence, the study adds further support to the view that the HENRY programme can have a beneficial impact upon families and help to prevent childhood obesity.

Conflict of interest statement

HENRY was established by CH and MR; JG is Programme Manager at HENRY and KR is Director of HENRY.

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