# The development of a multilevel intervention to optimise participant engagement with an obesity prevention programme delivered in children's centres

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Wendy Burton
University of Leeds

✉ w.burton@leeds.ac.uk*Corresponding Author*
*ORCiD: https://orcid.org/0000-0001-7885-5971*

Pinki Sahota
Leeds Beckett University

Maureen Twiddy
Hull York Medical School

Julia Brown
University of Leeds

Maria Bryant
University of Leeds

## Abstract
### Background

Poor participant engagement threatens the potential impact and cost effectiveness of public health programmes preventing meaningful evaluation and wider application. Although barriers and levers to participant engagement with public health programmes are well documented, there is a lack of proven strategies in the literature addressing these in order to promote recruitment and retention. This paper details the development of a participant engagement intervention aimed at promoting enrolment and retention to a community based pre-school obesity prevention programme delivered in UK children's centres; HENRY (Health, Exercise, Nutrition for the Really Young).

### Methods

The behaviour change wheel framework was used to guide the development of the participant engagement intervention. The findings of a coinciding focused ethnography study identified barriers and levers to participant engagement with HENRY that informed which behaviours should be targeted within the intervention to promote recruitment and retention. A COM-B behavioural analysis was undertaken to identify whether capability, opportunity or motivation would need to be influenced in order for the target behaviours to occur. APEASE criteria was then used to agree on appropriate intervention function and behaviour change techniques.

### Results

A multi-level participant engagement intervention was developed that aimed to change behaviours across the children's centre context; including local authority commissioners, children's centre managers and staff. The intervention components included improved reporting of HENRY outcomes, centre manager training sessions, additional support provided to staff members involved in recruitment to the programme and refresher training for the facilitators of HENRY.

### Conclusions

This paper describes one of the first attempts to develop a theory based multi-level participant engagement intervention specifically designed to promote recruitment and retention to a community based obesity prevention programme. Given the challenges to implementing public health programmes with sufficient reach, the process used to develop the intervention serves as an example of how programmes that are already widely commissioned could be optimised to enable greater

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impact.

## Background

Local authorities in England are responsible for improving the health and well-being of people living in their communities. [1]. This includes providing equitable access to public health programmes that promote positive lifestyle behaviours. Populations living in the most deprived areas of England are more likely to have higher rates of smoking, poor mental health and obesity than those from more affluent areas [2].

Community based public health programmes that are adopted and implemented as planned by local authorities have the potential to promote health and reduce heath inequalities. However, a major barrier which hinders their effective implementation is poor participant engagement (enrolment and retention). Poor engagement reduces potential impact of public health programmes, with greater uptake and reach being associated with better outcomes for participants [3]. The cost effectiveness of programmes is also reduced; with literature showing an increased cost per person when classes do not run with the intended number of people, often resulting in programmes ending prematurely or being cancelled before they start [4]. Further, poor engagement hinders evaluation efforts, preventing wider application.

Engaging participants with public health programmes is known to be a challenge [5]. This is particularly pertinent to prevention interventions that are aimed at a general population rather than a targeted group [6] in which potential participants may perceive a lack of relevance, experience no clinical symptoms or be hesitant to receive unwanted lifestyle advice [7]. The literature describes many barriers to engagement with public health interventions such as lack of time, cost of public transport and social and cultural barriers [8] which suggests that programme deliverers should invest resources into the design, delivery and evaluation of engagement strategies aimed at addressing these barriers. Yet studies reporting on such efforts are few, and there is a particular lack of studies that have rigorously evaluated an engagement strategies. In contrast, there is a wealth of literature testing the effectiveness of interventions to promote uptake of clinical treatment interventions or appointments, for example postal and telephone reminders [9]. However, the evidence surrounding

these may not be applicable to programmes where participants are not seeking treatment or are expected to attend more than one session.

We developed a participant engagement intervention to support local authorities and children's centres to promote participant engagement with an obesity prevention programme that is currently delivered in 40 local authorities across the UK. HENRY is an eight week group parenting programme (2 hours per week) aimed at preventing the development of obesity in young children and includes components on parenting, diet and lifestyle and well-being [10]. Initial evaluation findings of the intervention are promising and show that it may have a positive impact on families and practitioners [11, 12]. However, implementation data indicate that some local authorities and children's centres fail to meet their enrolment and engagement targets of eight families per programme and completion of a minimum of five out of the eight sessions; threatening its potential impact and sustainability.

This paper describes the development of the participant engagement intervention. Although this intervention is focused on promoting participant engagement with HENRY, it has been developed with transferability in mind so that it has the potential to be adapted for other community-based interventions and contributes to the literature on developing interventions to optimise the impact of public health programmes.

## Methods

*Intervention development team*

A multi-disciplinary team was convened to develop the participant engagement intervention which included: experts in intervention development, obesity, applied health research and behaviour change; a local authority (local government) representative; a HENRY parent champion; and the chief executive of HENRY. The intervention development team met five times during the six month intervention development process (July to December 2015) with tasks completed between meetings.

*Parent advisory group*

During the development of the participant engagement intervention, we met with our parent advisory group (PAG) twice, to gain their views of barriers and facilitators to engagement with HENRY and their thoughts on planned intervention components. The PAG comprised six parents; three that had

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attended a HENRY programme and three that had not.

*Literature review*

Prior to the development of the intervention, a comprehensive review of the relevant literature was conducted to identify strategies used to promote engagement with a public health programme, using four databases (Embase, Scopus, PsychInfo and Web of Science) see Additional file 1 for search terms used. Additional papers were identified via reference lists.

*Focused Ethnography Study*

During the development of the engagement intervention, a focused ethnography study was undertaken to provide primary evidence about the factors influencing participant engagement with HENRY [13]. Key findings of the ethnography were used to inform the development of the intervention and refine subsequent ethnography observations. During the ethnography study five children's centres were visited that delivered HENRY across the UK, with one hundred and ninety hours of field observations, 22 staff interviews (commissioners, HENRY co-ordinators, managers and facilitators) and six parent focus groups (36 parents) [13].

*Behaviour Change Wheel framework*

The behaviour change wheel (BCW) [14] was used as a guide to develop the intervention. The BCW asks "what conditions within the social and physical environment need to change for behaviour change to occur?" and is underpinned by the COM-B model of behaviour (capability, opportunity and motivation) [15]. The COM-B model proposes that one or more of its behavioural components need to be influenced for behaviour change to occur. The BCW approach involves 3 stages of intervention development: Stage 1: specifying the target behaviours and identifying what needs to change; Stage 2: identifying intervention functions (the ways in which the intervention will operate); and Stage 3: identifying the content and implementation options. The intervention development process we adopted is summarised in Fig. 1.

Behaviour Change Wheel Stage 1: Specifying target behaviours and identifying what needs to change

*Defining the problems in behavioural terms*

To understand how to promote participant engagement with HENRY, the development team

considered data from the ethnography study [13], key literature surrounding engagement with parenting programmes (e.g. [16]), the implementation of public health programmes (e.g. [17]) and their own experience and expertise to identify the main barriers and levers to engagement. This was translated into a 'long list' of behaviour change objectives (target behaviours) that could potentially be addressed within the intervention.

*Selecting target behaviours*

Decision making guidance from the BCW was used to narrow the 'long list' of potential behaviours to a 'short list' of target behaviours that the intervention aimed to change within existing funds and timescales of the delivery period (March 2016 to September 2017). This process involved structured discussions where the team used the evidence to categorise each behaviour as: promising, very promising, unpromising but worth considering, and unacceptable. Categorisation was achieved by considering the expected impact of the behaviour change, the likelihood of changing the behaviour, anticipated wider impact ('spill over score') and the behaviour change measurability. A ranking exercise was then used with each development team member individually selecting their 'top ten' from the promising or very promising behaviours list, assigning each a score of 1 to10. The scores were then collated to produce an overall top ten shortlist. Where a team member felt strongly that additional behaviours should be added to the shortlist, further discussions were held until consensus was reached.

*Identifying what needed to change*

Once the target behaviours had been selected, a 'behavioural analysis' was undertaken utilising the COM-B model of behaviour. This exercise is central to the BCW approach and involved the team drawing upon their experience and expertise along with the ethnography study findings to consider whether an individual's capability, opportunity or motivation would need to be influenced for the target behaviours to occur.

Stage 2: Identifying intervention options

The next stage in the BCW process was to identify the most appropriate intervention functions to incorporate in the intervention that would have the best chance of influencing capability, opportunity

on motivation; based on the behavioural analysis described above, available resources, and

contextual factors. The BCW offers the following suggestions of potential intervention functions:

education, persuasion, incentivisation, coercion, training, restriction, or environmental restructuring

(Table 2). To assist with decision making around which intervention functions to include, the BCW

suggests the use of the APEASE criteria [18] as a decision-making tool: Affordability, Practicability,

Effectiveness, Acceptability, Side effects and Equity which the team used to structure group

discussions.

Table 2 Suggested intervention functions to influence capability, opportunity and motivation (Michie,

2011)

| COM-B | Intervention function |
|---|---|
| Physical capability | Training |
| Psychological capability | Education<br>Training<br>Environmental restructuring<br>Modelling<br>Enablement |
| Reflective motivation | Education<br>Persuasion<br>Modelling<br>Enablement<br>Incentivisation<br>Coercion |
| Automatic motivation | Training<br>Incentivisation<br>Coercion<br>Environmental restructuring<br>Persuasion<br>Modelling<br>Enablement |
| Physical opportunity | Training<br>Restriction<br>Environmental restructuring<br>Enablement |
| Social opportunity | Restriction<br>Environmental restructuring<br>Modelling<br>Enablement |

Stage 3: Identifying content and implementation options

The next stage was to decide on which behaviour change techniques to include [19]. The BCW

matches each potential intervention function selected in Stage 2 to a list of appropriate behaviour change techniques based on a consensus reached by experts in behaviour change [14]. The intervention development team considered the evidence within the context of children's centre/local authority setting and again drew upon APEASE criteria and their own experience of HENRY and children's centres to decide on the final behaviour change techniques to include.

Once the intervention function and behaviour change techniques had been selected, the most appropriate and realistic mode of delivery was agreed.

## Results

*Literature review*

The review identified eight papers of relevance (Table 3) which tested five engagement strategies: monetary incentives [20–23]; a prize draw [24]; professional testimonial [5]; text message reminders [25]; and smaller time commitment [26]. The majority tested interventions for parenting programmes [5, 21, 22, 25, 27], two were substance abuse prevention programmes [20, 26] and one smoking cessation programme [24]. None tested interventions in the UK. Two strategies demonstrated effectiveness; financial incentives [28] [23]; and text message reminders. Although Diaz et al. and Heinrichs et al. observed positive effects with a financial incentive, Dumas et al. and Gross et al. did not. This is consistent with the wider literature that suggests financial incentives are not always effective. Further, this approach is unlikely to be feasible at population level and so was not considered in the present study. Text message reminders were effective at promoting programme completion. This method is widely used to promote uptake of clinical interventions or appointments, and are a low cost and low resource strategy which indicated potential for this intervention [29–32]. The findings of this review were presented to the intervention development team to summarise the current literature.

Table 3 Studies that have tested a strategy to promote engagement with a public health programme

| Study | Public health programme | Sample | Evaluation design | Engagement intervention |
|---|---|---|---|---|
| Diaz et al. 2009 | Family drug use prevention programme delivered in secondary school setting in Spain | 197 families invited from three participating secondary schools in different localities with high risk factors of | Quasi-experimental design<br><br>One school randomly selected (n=3) to receive intervention | Financial incent<br>I= €10 shopping<br>voucher receive<br>each session at<br>(up to 7 session<br>C=no shopping |

| Study | Public health programme | Sample | Evaluation design | Engagement intervention |
|---|---|---|---|---|
| | | drug use | condition | voucher |
| Dumas et al. 2010 | Parenting programme delivered in day-care setting in US | 610 parents that completed a survey at participating daycare centre invited to enrol | Experimental design<br><br>Daycare centres (*n*=50) randomised to incentive intervention or control condition | Financial incent<br>I= up to $68 rec<br>depending on n<br>of sessions atte<br>C=no financial incentive |
| Emont and Cummings, 1992 | Worksite smoking cessation programme at car dealership in US | 56 smokers from car dealership work sites | Quasi-experimental design<br><br>Worksites (*n*=25) randomised to "prize draw" intervention or control condition | Prize draw ("dir<br>two")<br>I=participants c<br>a chance to win<br>dinner for two in<br>local restaurant<br>attended the fir<br>session<br>C=no prize draw<br>offered |
| Gross et al. 2011 | Parenting programme delivered in childcare setting in US | 174 parents using participating "low income" childcare centre | Experimental design<br><br>Childcare centres (n=8) randomised to discount condition or control condition | Financial incent<br>I=parents offere<br>discount on the<br>childcare bill<br>contingent with<br>weekly attenda<br>programme<br>C=no financial incentive |
| **Study** | **Public health programme** | **Sample** | **Evaluation design** | **Engagement intervention** |
| Heinrichs et al. 2006 | Parenting programme in preschool setting in Germany | 248 parents whose children attended participating preschools | Experimental design<br><br>Preschools (*n*=15) matched on size then randomly assigned to four incentive conditions | Financial incent<br>either group or<br>individual forma<br><br>15 preschools<br>randomise to fo<br>intervention<br>conditions<br><br>Incentive= up t<br>depending on h<br>many sessions<br>attended<br>Individual or gro<br>format….<br><br>$I_1$=Individual fo<br>no incentive<br>$I_2$=Group forma<br>incentive<br>$I_3$=Indvidual fo |

| | | | | |
|---|---|---|---|---|
| | | | | +incentive $I_4$=Group forma incentive - |
| Morawska et al. 2011 (Study 2) | Parenting programme delivered in Australia | 73 parents recruited from primary schools around Australia via email - - | Experimental design - Participants randomly assigned to one of three conditions | Professional testimonial - $I_1$=non-fear exp testimonial....... $I_2$=fear expert testimonial....... - |
| Murray et al. 2015 | Parenting programme delivered in community setting in US | 117 parents from area where children are at high-risk of malnutrition | Randomised controlled trial Participants randomised to receive SMS message reminder or no message | SMS reminder - I=text message reminders sent participants on day before each C=no text mess |
| Spoth et al. 1994 | Family substance abuse prevention programme delivered in school setting in the US | 208 families from six school districts in two rural counties that were eligible for state supported school lunch | Quasi-experimental design Participants randomised to intervention or control condition | Recruitment str (reduced time commitment) I=project overv with programm summary receiv participant invit in-home intervie only, at initial in interview partic invited to $2^{nd}$ in interview and fu programme participation C=full program brochure receiv participant invit participate in fu programme, participant invit commit to full programme |

**Stage 1**:

*Defining the problems in behavioural terms*

The findings of the ethnography were consistent with what has previously been reported in the

literature regarding participant level barriers to engagement with parenting programmes e.g.

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programme acceptability, group dynamics and the personal attributes of the group facilitator [33–38]. However, the study also revealed that engagement with HENRY was influenced by implementation factors that were present across multiple operational levels within the children's centre/local authority context. This was consistent with what is known about the effective implementation of public health programmes. In particular, a hierarchical spill-over affect was observed, whereby local authority 'buy-in' of HENRY cascaded down to children's centre implementation of the programme which subsequently influenced how participants perceived and experienced the programme. During each intervention development meeting, the findings of the ethnography study were discussed and the team considered whether the findings acted as a barrier or lever to engagement. For example, in one centre some staff members had poor understanding of what HENRY entailed which hindered their efforts to recruit to the programme and therefore was a barrier to engagement. In contrast, in a different centre, all centre staff had received training in the HENRY approach which gave them confidence when approaching parents to attend which was a facilitator to engagement. However, a further finding of the ethnography study revealed that, although stakeholders acknowledged that some behaviours were likely to facilitate participant engagement with HENRY (e.g. HENRY training for all staff), practical barriers such as funding availability and capacity limited their ability to adopt them. Therefore, the problem defined in behavioural terms as to why centres struggled to recruit and retain participants on the HENRY programmes was that Children's centre stakeholders (commissioners, managers and centre staff) did not (or were not able to) adopt behaviours that were likely to promote participant engagement.

*Selecting the target behaviour*

The intervention development team used the findings of the ethnography study, the literature and professional experience to develop a list of broad intervention targets that were proposed to promote participant engagement with HENRY if adopted by children's centre stakeholders (Table 4); for example, delivering a taster session prior to each session. They then narrowed these down by determining who would be able to deliver these interventions and whether this was dependent on the behaviours of other people within the children's centre/local authority setting. For example,

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establishing whether managers would have the autonomy to provide HENRY training for staff without

agreement from the local authority decision makers. With this in mind, the optimisation development

team specified a 'long list' of 33 target behaviours aimed at individuals from across the children's

centre hierarchy (local authority commissioners, centre managers, centre staff, HENRY facilitators and

parents that had attended the HENRY programme) that would facilitate the broader intervention

targets to be met. The long list of 33 behaviours was then narrowed down to 16 using the BCW

exercise of prioritising behaviours into very promising, quite promising, and worth considering and

team ranking of the behaviours.

*Identifying what needs to change*

The COM-B behavioural analysis determined the direction of the intervention at each level (Table 5).

Table 4 Recommended behaviours for promoting parent engagement with HENRY

| Broad intervention targets for promoting participant engagement with HENRY | Rationale based on ethnography study findings, literature and expertise of optimisation development team |
|---|---|
| 1. Hold taster sessions prior to each HENRY programme | The incorporation of a taster session prior to each programme was proposed to be a positive way of promoting enrolment and attendance. Anecdotal evidence from HENRY process data suggested that potential participants were more likely to attend if they had a greater understanding of what the programme entailed which was supported during the ethnography study and in the literature [39] |
| 2. Increase HENRY training provision for centre staff | The ethnography study revealed that children's centre staff lacked basic knowledge around what the HENRY programme was, which limited their confidence when describing the programme to potential participants. It is also well understood that stakeholders involved in the implementation of programmes benefit from relevant training to foster buy-in, confidence and enthusiasm [40-44] |
| 3. Hold HENRY programmes regularly and plan far in advance | Interviews with HENRY facilitators and staff revealed that some HENRY programmes were planned at short notice which hindered recruitment efforts. Members of the intervention development team also had first-hand experience of this whereby managers were reluctant to plan courses until an appropriate number of attendees had been secured. |
| 4. Promote HENRY widely within Centre using a range of methods | The ethnography study revealed a general lack of awareness around the HENRY programme among parent visiting the centres. This was ascertained during informal conversations with parents and focus group discussions. A lack of promotion was also observed e.g. no posters promoting the programme in some centres. |
| 5. Allow a mix of referred and self-referred parents to enrol | There was agreement amongst participants of the study and the intervention development team that group dynamics were stronger when programmes were delivered to groups that had a mix of referred or self-referred participants. Miixed groups were also thought to reduce barriers with the stigma surrounding parenting programmes [8] |
| 6. Encourage parents that have attended HENRY to recruit their peers | Previous participants of HENRY described how they were more likely to attend a programme if they knew someone that had attended before. This supported what is known around the influence of 'word of mouth' and testimonials |
| 7. Adopt a whole centre approach to HENRY; whereby HENRY is well supported in the centre and HENRY principles are adopted in other programmes. | Members of the optimisation development team had first-hand experience of the beneficial effects of a whole centre approach to HENRY. This was supported during centre observations. The literature also suggests that interventions which are fully implemented and supported may achieve better outcomes [45] |
| 8. Promote HENRY accurately to dispel myths about HENRY being a healthy eating programme | A significant finding of the ethnography study was a wide scale misconception that HENRY was a healthy eating programme which deterred some potential participants from attending, particularly if they did not perceive themselves as needing the intervention which is a known barrier to engagement with prevention interventions [7]. |
| 9. Ensure parents feel comfortable when attending the session e.g. adapting delivery of sessions to meet the needs of the group | During observation of HENRY sessions, the importance of session facilitation was clear in relation to participant engagement. This included the way in which information was presented and how much time was allocated to group discussion. The importance of the group facilitator and group experience has also previously been reported. |
| 10. Follow up on all parents that miss a session to encourage continued attendance | Previous participants of HENRY described how they felt valued when facilitators encouraged their continued attendance (e.g. enquiring after their wellbeing if sessions were missed). This was also supported by the personal experience of the intervention development team who reported that following up on people that missed a session led to reduced dropout rates. |

Table 5 Summary of behavioural analysis to identify which components of the COM-B model would need to be influenced in the Participant Engagement Intervention.

| Intervention level | Target behaviours | The COM-B construct that need to be influenced for target behaviours to occur. | | Would need to be influenced for behaviour change to occur | Potential intervention function suggested by BCW |
| --- | --- | --- | --- | --- | --- |
| Commissioner | Support/allow managers to implement recommended parent engagement strategies | Capability (psychological) | Commissioners need greater understanding of HENRY outcomes to facilitate decision making around level of support they are willing to provide | ✔ | Education, training or enablement |
| | | Opportunity (physical) | Strict budgets exist around how much money can be invested into participant engagement efforts. Therefore higher budgets would be required. | ✔ | *Higher budgets would not be possible to influence within the intervention* |
| | | Motivation (reflective) | Motivation of commissioners need to be increased before additional resources are invested into participant engagement efforts. | ✔ | Education, persuasion, incentivisation, coercion |
| Managers | Plan courses regularly and far in advance Provide further training for staff Allow self-referred parents to enrol Run taster sessions Promote HENRY using a variety of methods Implement peer to peer | Capability (psychological) | Managers are already capable of performing the behaviours | *X* | N/A |
| | | Opportunity (social) | Managers need support from commissioners before investing greater resources into parent engagement efforts | ✔ | Restriction, environmental restructuring, modelling, enablement |
| | | Motivation | Prior to | ✔ | *This would be* |

| | | | | | |
|---|---|---|---|---|---|
| recruitment | | (reflective) | investing greater resources into HENRY, manager's motivation would need to be increased due to restricted budgets and staff capacity. | | *influenced at the commissioner intervention level* |
| HENRY facilitators | Allow enough time in sessions to explore feelings Follow up on people that miss a session Consider characteristics of the group Put parents at ease during sessions Return outcome data promptly to allow prompt reporting Invite participants of HENRY to recruit their peers | Capability (psychological) | Some facilitators may lack the relevant capability to perform the behaviours e.g. due to lack of experience | ✔ | Education, training or enablement |
| | | Opportunity (physical) | A lack of time may present barriers to facilitators' performing the behaviours | ✔ | Training, restriction, environmental restructuring or enablement |
| | | Motivation (reflective) | The motivation of some facilitators could be increased to in order for them to invest additional time to HENRY planning. | ✔ | Education, persuasion, incentivisation, coercion |
| **Intervention level** | **Target behaviours** | **The COM-B construct that need to be influenced for target behaviours to occur.** | | **Would need to be influenced for behaviour change to occur** | **Potential intervention function suggested by BCW** |
| Children's Centre staff | Promote HENRY accurately to dispel myths Adopt whole centre approach to HENRY | Capability (psychological) | Children's centre staff often do not have the relevant capacity to perform the behaviours due to a lack of training. | ✔ | *This would be influenced at the manager level of the intervention* |
| | | Opportunity (Social) | Staff would require adequate social | ✔ | Restriction, environmental restructuring, |

| | | | | | |
|---|---|---|---|---|---|
| | | | support from managers and team members to perform the behaviours, along with physical resources to assist with promoting the programme. | | modelling, enablement |
| | | Motivation (reflective) | The motivation of some staff members would need to be increased in order for them to learn and implement new practices. | ✔ | Education, persuasion, incentivisation, coercion |
| HENRY parents | Volunteer to be a peer recruiter | Capability (psychological) | Previous participants of HENRY have the relevant capacity to be able to recruit their peers. | X | |
| | | Opportunity (physical) | The relevant physical resources would need to be provided in order for previous participants of HENRY to recruit their peers. In addition, social support from centre managers would also need to be influenced so that parents feel comfortable that their peers would be eligible and welcome to attend. | ✔ | Training, restriction, environmental restructuring or enablement |
| | | Motivation (reflective) | Previous participants of HENRY that have enjoyed | ✔ | Education, persuasion, incentivisation, coercion |

| | | the programme would be likely to be motivate do recruit their peers. However, some may also worry about causing offense by inferring that the family/child needed to attend an obesity prevention programme. | | |
|---|---|---|---|---|

**Stage 2: Identifying intervention options**

Based on the findings of the behavioural analysis, experience of the optimisation development team and the literature, the team utilised APEASE criteria to agree on the most appropriate intervention functions. For example, although some potential functions were likely to be effective such as 'enabling' commissioners to support manager to adopt the recommended engagement strategies by providing additional funding, this would not have been affordable within the realms of the project. Whereas 'education' was agreed to be affordable, acceptable practicable and likely to be effective. The outcome of this process is outlined in Table 5.

**Stage 3: Identifying content and implementation options**

Once it was agreed what the various functions of the interventions would be, APEASE criteria again facilitated structured group discussions around which behaviour change techniques had the potential to demonstrate effectiveness, balanced with which would be affordable, practicable, acceptable, equitable and present no side effects. Once agreed, the team considered how the behaviour change techniques could be incorporated into the intervention. The outcome of this stage is detailed in Table 6.

**Intervention and delivery**

The participant engagement intervention comprises the following components. The aim is to change behaviours of individuals across five levels of the local authority/children's centre hierarchy: local

authority commissioners, children's centre managers, children's centre staff, HENRY facilitators and previous participants of HENRY (summarised in Table 6)

1. HENRY outcome report and leaflet: This is aimed at increasing local authority (or equivalent) commissioner support for HENRY implementation. The report outlines programme outcomes such as pre and post fruit and vegetable intake. The report will be produced and distributed by the central HENRY team. A HENRY overview leaflet will also be distributed to local authority commissioners which describes recommended strategies to promote recruitment and retention to HENRY, as well as describing the expected benefits of adopting the strategies.

2. Dashboard report: A one page report summary will be circulated to children's centre managers after each HENRY programme summarising the main participant and implementations outcomes (e.g. changes in dietary behaviour, parenting efficacy and recruitment and retention rates).The report aims to increase manager engagement with HENRY to encourage increased resource into promotion of the programme.

3. Manager Information Days: Managers from of children's centres delivering HENRY will be invited to attend a one day manager information workshop. During the workshop, strategies to promote participant engagement with HENRY will be recommended along with a discussion on the expected benefits of adopting them.

4. Facilitator refresher training: Facilitators of HENRY will be invited to attend a one day refresher training session. Sessions will highlight and provide training on how to optimise the participant experience. The training session will also introduce the concept of peer recruitment.

5. Revised promotional material will be utilised buy all centres recruiting to HENRY programmes which includes a new strapline for the HENRY programme; 'Healthy family, happy home' rather than Health, Exercise, Nutrition for the Really Young.

See additional file 1 for the logic model of how the intervention hoped to promote participant

engagement with HENRY.

Table 6.  Participant engagement intervention behaviour change technique and intervention component linked to intervention function

| Intervention level | Intervention function | Behaviour change technique | Operationalised by | Intervention component |
|---|---|---|---|---|
| Commissioner | Enablement | 12.5 Adding objects to the environment | Information about how HENRY supports families and the benefits of investing appropriate resources into participant engagement efforts | Commissioner report |
|  | Education | 5.6 Information about social and environmental consequences | Regular outcome reports to enable decision making around HENRY | Commissioner leaflet |
| Managers | Persuasion | 5.6 Information about social and environmental consequences | Information on how local families have benefited from attending HENRY and why it is beneficial to adopt target behaviours | Manager information day and dashboard report |
| HENRY facilitators | Training | 4.1 Instruction on how to perform the behaviour | Instruction on how to incorporate target behaviours into HENRY session delivery | Facilitator refresher training |
|  | Persuasion | 5.6 Information about social and environmental consequences | Information on why it is beneficial to adopt target behaviours | Facilitator refresher training |
| Children's Centre staff | Environmental restructuring | 12.5 Adding objects to the environment | Provision of promotional material which accurately depicts HENRY programme | Promotional material |
|  | Persuasion | 5.6 Information about social and environmental consequences | Information on how HENRY supports families and how local families have benefitted from attending. | Dashboard report and promotional material |
| HENRY parents | Enablement | 12.5 Adding objects to the environment | Resources to assist with peer recruitment such | Facilitator refresher training |

| | | | as promotional material and information on future course dates | |
|---|---|---|---|---|
| | Education | 5.6 Information on social consequences | Information on why peer recruitment is effective for recruiting friends and families to the HENRY programme and therefore more people can benefit from the support it provides. | Promotional material Facilitator refresher training |

## Discussion

This paper describes the development of a theory-based participant engagement intervention aimed at supporting local authorities to promote engagement with a community delivered obesity prevention programme. Participant engagement with preventative public health programmes is central to achieving meaningful impact, yet there is a lack of studies rigorously evaluating the effect of strategies aimed at promoting engagement, and from those that have, few found a positive effect ( e.g. [20, 23, 26]).

The majority of reported participant engagement interventions in the literature comprise of a single strategies directed only at anticipated beneficiaries which are largely ineffective (e.g. [21]).Moreover, although reported strategies are mostly theoretically based, they are often not tailored to address particular barriers identified within a programme's context. Participant engagement is likely influenced by multiple contextual factors such as organisational strategies, local implementation practices, intervention characteristics and the characteristics of individuals involved in a programme's delivery [13, 46]. Thus, in theory, interventions aimed at multiple organisational levels have greater potential for promoting participant engagement with public health programmes.

This participant engagement intervention addresses the multiple levels of influence that hinder effective programme implementation of HENRY [47] [17]. To our knowledge, this is the first study that has adopted this approach with the primary aim of optimising participant engagement with a public health programme. Participant engagement efforts directed only at the participant facing level may be more widely adopted in the literature due to a lack of resources, restricting interventions to be single rather than multi-level. However, based on our learning [13], it could be argued that single

level interventions would be better directed towards changing behaviours at the organisational level, such as local authorities, rather than at the potential participant level, where appropriate changes to practice could be set in motion that would cascade down to potential participants; for example, providing adequate training opportunities for people involved in promoting the programme. The BCW provided a useful guide to develop this participant engagement intervention, offering valuable decision making tools such as APEASE criteria. However, the focus on individual behaviour change directed by the COM-B model of behaviour was difficult to apply to a whole setting approach where hierarchical structures influence whether behaviour change is possible. In future, combining the BCW with another theoretical model may be beneficial. For example, Band et al. [48] successfully utilised both the COM-B model of behaviour and Normalisation Process Theory [49] to develop an intervention which considered both individual level and organisation level factors in its design that was most relevant to the user population and setting.

The participant engagement intervention was designed using a rigorous and transparent process. Consulting with a parent advisory group was invaluable in learning how the wider impact of the intervention could ultimately influence participant engagement with HENRY. Incorporating an ethnography study also provided a thorough understanding of the setting in which HENRY is delivered which enabled a tailored intervention to be developed that addressed specific implementation barriers to participant engagement. The methods and insight gained through the development of the participant engagement intervention could be applied to other public health programmes delivered within a community setting. A limitation of the intervention development process was that stakeholders from the children's centres were not involved in decision making about the final intervention functions and components. However, they were important in identifying where intervention was needed through their ongoing involvement in the ethnographical research. Further, clear parameters were not agreed prior to the development of the intervention on what funds were available for the design and delivery of the intervention, and therefore how to judge which target behaviours were potentially feasible or not. Implementation of the participant engagement intervention did not include a piloting phase. Ideally, any intervention should be piloted prior to full

implementation, but due to timeline and resources, this was not done here which is a recognised limitation.

The participant engagement intervention is currently being tested in a multi-site, cluster randomised controlled trial [50], the results of which will be reported elsewhere when available. A comprehensive process evaluation will also report on the implementation of the intervention and explore the change mechanisms around each component of the intervention. It will also help understand the findings in relation to contextual factors surrounding the children's centre and local authority environment. Throughout the development of the participant engagement intervention, the development team have been mindful of the severe upheaval that has occurred throughout local authorities and children's centre services in England in recent years which has led to substantial re-structuring and job losses [51]. The influence of these contextual factors on the implementation of programmes such as HENRY is yet unknown. Further, until the results of this intervention are established, we do not know whether local authority level intervention is high enough to achieve change at the population level, or rather, if central Government need to act so that local authority budgets can be adjusted accordingly to support implementation of public health programmes.

## Conclusions

This paper describes an example of one of the first attempts to develop a multi-level participant engagement intervention designed to promote participant engagement with an obesity prevention programme, using HENRY as an example. Highlighted within the development process was the importance of identifying the barriers and levels within the implementation setting that promoted or hindered participant engagement. The use of the BCW framework served as a useful guide to consider which behavioural components needed to be influenced for behaviour change to occur before providing a transparent and systematic decision-making tool. Given the challenges to implementing public health programmes with sufficient reach, the process used to develop the participant engagement optimisation intervention serves as an example of how programmes that are already widely commissioned and have the potential to improve the health of the population could be optimised to enable greater impact.

## Abbreviations

APEASE       Affordability, Practicability, Effectiveness, Acceptability, Side effects and Equity

BCW         Behaviour Change Wheel

COM-B      Capability, Opportunity, Motivation, Behaviour

HENRY      Health Exercise Nutrition for the Really Young

PAG         Parent Advisory Group

## Declarations

**Ethics approval and consent to participate**

The research was approved by University of Leeds School of Medicine Research Ethics Committee.

**Consent for publication**

Not applicable

**Availability of data and material**

Not applicable

**Competing interests**

All authors declare that they have no competing interests.

**Authors' contributions**

WB led the development of the intervention under the supervision of PS, MT, JB and MB. WB, PS, MT and MB were members of the intervention development team. All authors contributed to the writing of the manuscript. All authors read and approved the final manuscript.

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## Note Regarding Table 1

Table 1 was omitted by the authors in this version of the paper.

## Figures

**Development of participant engagement intervention**

Multi-disciplinary intervention development team convened

Focused ethnography study conducted to understand barriers and levers to participant engagement with HENRY

Literature review undertaken to identify strategies that have already been tried and tested to promote engagement with a public health programme

**Behaviour Change Wheel Stage 1:**
**Specifying target behaviours and identifying what needs to change**

Key findings of ethnography study and literature review presented to the intervention development team

Structured discussions held to develop long list of potential target behaviours

Shortlist of target behaviours agreed using decision making guidance from BCW (considering impact, likelihood of change and measurability) and ranking exercise

COM-B behavioural analysis undertaken to determine what needs to change (capability, opportunity or motivation)

**Behaviour Change Wheel Stage 2:**
**Identifying intervention options**

BCW suggests appropriate intervention functions. APEASE (Affordability, Practicability, Effectiveness, Acceptability, Side effects and Equity) criteria used to reach agreement on which to adopt.

**Behaviour Change Wheel Stage 3:**
**Identifying content and implementation options**

BCW suggests behaviour change techniques to use. APEASE criteria used to reach agreement on which to include

Participant engagement intervention components designed

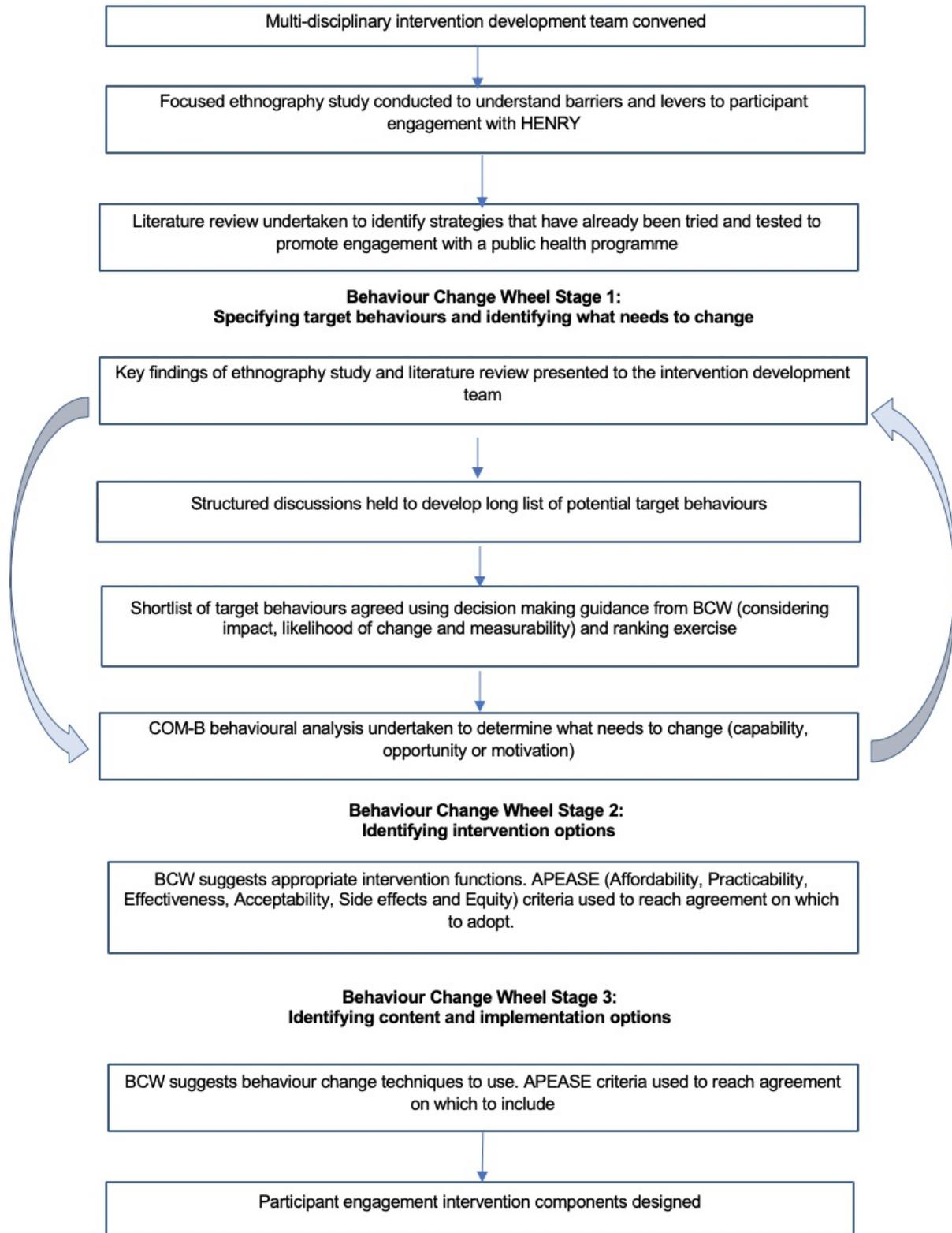Figure 1

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