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Factors That Help and Hinder the Implementation of Community-Wide Behavior Change Programs

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Novel community-wide approaches that gamify physical activity through challenges and competition have become increasingly popular in recent years. However, little is known about the factors that help or hinder their implementation. This qualitative study aimed to address this gap in the literature by systematically investigating the facilitators (organizational and experiential) and barriers to successful implementation of a community-wide intervention delivered in Gloucester, the United Kingdom. A two-phased process evaluation was conducted. Phase 1 involved the thematical analysis of open question feedback from n = 289 adults. Phase 2 included three focus groups conducted with n = 12 participants. This research showed that promoting the initiative through primary education settings was fundamental to enhancing awareness and participation. Social elements of the intervention were identified as a motivating factor for, and a consequential outcome of, participation. A lack of promotion to wider-reaching proportions of the community was perceived to be a significant barrier to implementation, potentially limiting inclusivity and participation in the activity. Game dynamics, timing, and fears regarding sustainability represented further difficulties to implementation.

Keywords: physical activity; process evaluation; gamification; intervention; community

Physical activity levels across all sectors of the population are insufficient to benefit health (Guthold et al., 2018). The World Health Organization (WHO, 2018b) has identified physical inactivity as the fourth leading risk factor for global mortality, and the scale of the challenge worldwide is significant. In financial terms, the burden of physical inactivity on health is estimated to cost the National Health Service in the United Kingdom around £1 billion per year and an additional £7.4 billion per year including costs to the wider society (National Institute for Health and Care Excellence, 2018). Despite the plethora of biopsychosocial benefits associated with being active, the number of people insufficiently active in high-income western countries increased by over 5% between 2001 and 2016 (Guthold et al., 2018; World Health Organisation, 2018a).

Novel community-wide approaches that gamify physical activity through challenges and competition have become increasingly popular in recent years. Gamification refers to the use of game design elements in nongame contexts (Deterding et al., 2011). For example, providing rewards (i.e., points or streaks) to people motivates them toward a particular action, such as walking more or eating healthy. Some key gamification

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strategies (such as providing feedback to allow people to set goals and monitor progression, competing with others, and the use of incentives) are evidence-based behavior change techniques (Michie et al., 2013). The self-determination theory proposes that people become motivated when their needs for competence, relatedness, and autonomy are fulfilled. Competence is a term used to describe someone who has sufficient qualities to perform a given task. Relatedness is a sense of belonging or attachment to other people. Autonomy is the ability to feel in control of one's behavior and destiny. Research has begun to understand how gamification can be used to improve health and wellbeing. Studies have found that gamified health behaviors work through (1) competition, (2) incentives, and (3) the influence of friends (Corepal et al., 2018). Competition helps people feel competent in their ability to perform a certain behavior. Social groups build an attachment between new behaviors and the bond they share. Incentives provide autonomy and enable people to feel in control of their behaviors.

Two of the most established gamification-based programs, Pokémon Go and Beat the Street, demonstrate that this approach is able to engage substantial portions of the community (Clark & Clark, 2016; Harris & Bird, 2020). Pokémon Go has been downloaded over 800 million times and has an estimated 5 million daily users globally, whereas Beat the Street has engaged over 1 million people and reaches between 10% and 39% of each targeted community (Intelligent Health, 2019; Evans & Saker, 2018). Evidence for the effectiveness of gamified community-wide interventions is beginning to emerge. Although Pokémon Go was never designed to be a public health intervention, studies have shown that it may have been successful at increasing physical activity (McCartney, 2016) at least in the short term (Liu & Ligmann-Zielinska, 2017). Elsewhere, studies have shown that Beat the Street, which was designed to facilitate an increase in physical activity, may be successful in supporting people to become more active immediately after intervention and at 1- and 2-year follow-up (Harris, 2018, 2019).

This shows that gamification has the potential to improve the health and wellbeing of communities. Furthermore, qualitative research has identified elements of gamification-based programs which are key to engaging people and changing behavior (Harris & Crone, 2020; Lindqvist et al., 2018). At present, however, little is known about the factors and processes that help or hinder the implementation of gamification-based programs.

Baker et al. (2015), in a systematic review of community-wide interventions at that time, reported a lack of evidence for current community-wide interventions, with no prospect of scalability and implementation complexity as major failure factors. There is also an additional risk associated with gamification-based interventions, where the use of technology could potentially further exclude sections of the population from health interventions and inadvertently widen health inequalities (Jahnel et al., 2022). Jahnel et al. (2022) argue that well-designed and well-implemented digital technologies can support interventions to promote more active and healthier lifestyles. However, the application of digital technology can lead to inequities in health if not targeted and received by the entirety of the population (Jahnel et al., 2022).

With the risks associated with implementing novel community-wide interventions, more research is needed which identifies success factors associated with these approaches and potential implementation weak spots that require additional focus and resource. Process evaluation is a vital instrument in complex interventions that allow researchers and practitioners to model causal mechanisms, identify salient contextual influences, and monitor fidelity and adaptations (Evans et al., 2015). Researchers and practitioners must understand the causal assumptions underpinning a complex intervention and how they work in practice to positively influence policy and practice (Craig et al., 2008). Moore et al. (2015) posit that an intervention may have limited or unexpected (positive or negative) effects because of design limitations or changes in the way it was implemented. Process evaluation allows researchers and practitioners to make confident conclusions about what works and what does not, in practice. In addition, process evaluation enables researchers and practitioners to investigate how an intervention was delivered, which provides essential information about how it could be replicated in different populations or overtime. Process evaluation can confirm if an intervention is reaching the right people or if key target groups are being excluded (Burke et al., 2013), and it shows if the design and delivery of an intervention is as anticipated or if there are unforeseen challenges (Burke et al., 2013). Burke et al. (2013) argue that without process evaluation, the suitability, delivery, or context of an intervention cannot be determined.

In light of the risks associated with the implementation of novel community-wide interventions that gamify physical activity through digital technology, a process evaluation was deemed necessary to advance knowledge in this field. This process evaluation aimed to address this gap in the literature by systematically investigating the facilitators (organizational and experiential) and barriers to implementation of a community-wide gamification-based intervention called "Beat the Street."

The process evaluation was underpinned by two core questions that Moore et al. (2015) propose: (1) How does context affect implementation and outcomes? and (2) How does the delivered intervention produce change?

MATERIALS AND METHODS

Intervention

Beat the Street is a technology-enabled initiative that converts a local area into a real-world game where people earn points as they walk, cycle, and run, by tapping radio frequency identification (RFID) points called "Beat boxes" with an RFID card. Beat the Street is a national program delivered by Intelligent Health, a health-technology company based in Reading, the United Kingdom. The program is delivered as a 12-month program that involves a 3-month anticipation period, followed by a 2-month game period, and is concluded with a 7-month "sustain" period that involves sign-posting game players into longer term physical activity provision. During the game period, players achieve 10 points on an online platform each time 2 "Beat Boxes" are touched within 1 hour, and at the end of the 6-week game period, the highest scoring schools, community groups, and individuals are rewarded with prizes (such as vouchers for school equipment, money for a local charity, or individual monetary prizes).

Participants and Procedure

A two-phased process evaluation was conducted on 1 of 10 interventions delivered throughout Europe in 2018, Beat the Street Gloucester. Beat the Street Gloucester was delivered between June 7, 2018, and July 19, 2018, and engaged 10,156 participants over the course of the 6-week game.

Phase 1. Before the intervention, participants were encouraged to register an RFID card via an online portal which allowed them to select a team to join. During registration, participants (n = 4,400) completed a self-report questionnaire which included a range of sociodemographic questions (including age, gender, ethnicity, and current health conditions) and a validated single-item physical activity measure (Milton et al., 2011). At the end of the 6-week game, registered participants who agreed to be contacted (n = 3,025) were sent a link to a follow-up survey via email. A £50 prize draw was offered to incentivize follow-up survey completion, and a total of five reminders were sent to participants. Following the methodological approach of Redmond et al. (2019), participants who completed a post-intervention follow-up survey were invited to provide open feedback to the question "Do you have any comments about Beat the Street or how we could do things better?." A total of n = 289 adults provided 6,348 words of qualitative feedback. Participants' age ranged from 19 to 79 years; however, most were aged between 30 and 49 years (75%). They were more likely to be female (67%) and of white ethnic background (91%). Of all participants, 22% reported having a long-term medical condition, and 2% reported having a disability.

Phase 2. Participants who registered to take part in the game were sent a randomly allocated email, at the end of the 6-week intervention, inviting them to take part in a focus group. Three focus groups were subsequently conducted with n = 12 participants and focused on participant perspectives of the Beat the Street program in respect to processes (how the program was marketed, delivered, and managed; the application process; their perceived function of the game; opinions on the game setup; and community engagement) and perceived outcomes (for physical activity engagement for them, their families, the community, the game's role in the promotion of physical activity, and sustainability of the concept beyond the projects lifetime). Focus groups were digitally recorded, transcribed, and anonymized. The mean age of the participants was 36 years, which ranged from 18 to 54 years, they were all of white ethnic background, and 92% of them were female.

Informed consent was obtained via the online portal, and ethical approval was granted by the Psychology Research Ethics Committee, Cardiff Metropolitan University, (Ref. 8405) and University of Gloucestershire School of Health and Social Care research ethics panel (Ref: HSC 1801).

Method of Analysis

Data collected from phase 1 (text responses from the open-ended questions) and phase 2 (focus group transcripts) were analyzed using the thematic analysis process of Braun and Clarke (2006; Braun et al., 2014). A thematic analysis was undertaken on the text responses from the open-ended questions before being conducted on each of the focus group transcripts. Key themes and findings from both phases were subsequently combined and triangulated, forming the final themes presented in this article. The three authors coded the data individually before collaborating their findings to refine and verify the final themes. NVivo 12 software was used to manage the storage and data analysis processes. Quotations were selected for illustration of key themes and divergent findings. These are identified

with the participant's pseudonym (applied at the time of transcription), with the source identified either as "Questionnaire response" or focus group response ("FG response"). The 15-point checklist developed by Braun and Clarke (2006; Braun et al., 2016) was used to ensure quality in the analysis.

RESULTS

The findings from the two phases were combined, with two main themes emerging, "facilitating factors" and "barriers to implementation." Each of these themes had a number of subthemes. Facilitating factors included subthemes related to aspects of the intervention that assisted involvement and, therefore, activity: (1) connectivity to primary education settings and (2) opportunity for being more active and for more social interaction. Barriers to implementation included subthemes: (1) a lack of promotion and awareness, (2) inclusivity, (3) game dynamics, and (4) timing of the intervention and sustainability. These themes and subthemes, with supporting quotations, are presented below.

Facilitating Factors

Connectivity to Primary Education Settings. The promotion through primary schools was seen as a useful medium for the promotion of the program. Through this educational setting, it raised awareness of, and facilitated involvement in, the game. This was often led by the children themselves:

> I didn't know anything about it . . . the [children] had an assembly . . . it was only when [my son] came home with the card and said, "right, we're going out. We're going to the library to get cards." This is all on [my son's] say-so. I don't know anything about [Beat the Street]. (Lynette; FG response)

Opportunity for Being More Active and Social Interaction. Participation provided a range of opportunities associated with being active and the subsequent benefits and motives related to that. These included

- providing a purpose for being more active, "it gave me something to focus on, like a task to achieve, I suppose" (Janet; FG response);
- a reason to go outside, "the children were excited to go out . . . they wanted to go out and tap their cards" (Lynette; FG response);
- an incentive to take active transport, "it made me think twice about getting in the car" (Trisha; FG response);
- reducing the use of the car, "really motivated [me] to get out and about not using the car" (Questionnaire response);
- an opportunity for an adventure, "[my daughter] had just learned to ride her bike without stabilisers so for her it was just a huge adventure" (Darcey; FG response);
- an incentive for exploration, "I discovered new places within Gloucester . . . some places that I'd never been to before" and a challenge to achieve "it was good fun, trying to push for that last prize" (Katie; FG response).

In respect to social interaction, the game was perceived to cultivate an enhanced sense of positivity and togetherness within the local community, for example, "you would see a lot more people out . . . and say hi at the beat boxes" (Katie; FG response). It was also deemed to enrich family bonds and parent-child interactions, for example,

> my husband's never around, he's always at work, but actually there was a few times he was, "right, going out with [my daughter] on the bikes [to] get some beat boxes," [be]cause he wanted to be a part of it as well. (Charlotte; FG response)

Barriers to Implementation

Lack of Promotion and Awareness. Despite the promotion of the game in primary education settings, there was, according to the respondents, a lack of visual information to publicize the game in mainstream public localities (i.e., posters in local supermarkets); "I just think there wasn't a lot of information about [Beat the Street]. Even if you walk around with your eyes open you still wouldn't have known anything about it" (Lynette; FG response); "a lot of people . . . weren't aware of [Beat the Street]" (Questionnaire response).

Furthermore, any information that was available was deemed to have been disseminated (or seen) too late to trigger engagement; "it was the day that it started that the children got the letters [about Beat the Street] sent home from school. So they didn't really know what it was or what was happening" (Natalie; FG response). This timing issue consequently limited people's awareness of, and potential engagement in, the game and identified the critical role for the game's promotion, in the school setting; "without [the school promotion] I probably wouldn't have even noticed Beat the Street existed . . . and obviously I wouldn't have signed up to it" (Jodie; FG response). There was also an opinion about the overreliance on social media, "[do not] limit communications

to social media [because it is] unused by some" (Janet; FG response), and there was a need for "more publicity beyond the schools" (Questionnaire response), to facilitate access and engagement to the game. As such, participants suggested that for the future, Beat the Street should (1) "advertise[d] more in local newsagent's noticeboards, shops, etc. so [that] each area in the city knows [about the game]" (Questionnaire response) and (2) improve the timing of that promotion, "increasing [the] lead in time to allow better promotion and engagement" (Questionnaire response), to encourage more engagement from the community.

Inclusivity. As a consequence of the limited advertising, participants reported that there was a substantial proportion of the community that did not participate in Beat the Street because they were not aware that it existed;

> I think the groups that mostly got involved were Cubs, Beavers, Brownies, schools and running clubs . . . I don't know if there was anything aimed at the elder generation? . . . they may not have been aware. (Catherine; FG response).

> I know a lot of people that weren't aware of [Beat the Street] . . . unless you came back . . . from school, or somebody in the running clubs . . . if you weren't in those circles . . . like people that don't normally go out very much, not of a school age, but other ages . . . you could [not] have [been aware]. (Jodie; FG response)

The consequence of this was that participants did not feel that Beat the Street was as inclusive as it could have been within their community.

Game Dynamics. The dynamics of the game were highlighted as influential to engagement. These included the location and positioning of the Beat Boxes and people cheating. Most Beat Boxes were within walking distance of people's homes and schools; this made it easy to participate in the game, as described by one participant below:

> It was nice to have three beat boxes in our area because it made it a lot easier to get the [children] involved, whereas if we had to go into the centre every day it would've been tricky. (Lynette; FG response)

However, despite this closeness, the specific location of some of the boxes was a cause for concern because of their proximity to main roads; "main issue was putting [beat boxes] right by main roads" (Catherine; FG response), which limited children's involvement because of concerns for their safety and distance. Furthermore, the distance between some of them was too far, and participants "were surprised just how spread out the [boxes] were" (Questionnaire response), which resulted in the game being perceived as tiring and often unattainable for some to participate in:

> For some with disabilities and pregnancy the boxes are quite a trek and it's hard work to get multiple [boxes] on limited mobility. (Questionnaire response)

> There were times when I'd gone out with [my children], but the younger one . . . "actually I'm tired, I wanna go home" . . . I know obviously the incentive is to cover ground for the exercise . . . but if you're walking for little ones that's not practical . . . so maybe just have a couple [more beat boxes] to fill the gaps a bit." (Jodie; FG response)

> For little legs the beat boxes were slightly too far apart so we couldn't participate as much as I'd like us to of. (Questionnaire response)

Thus, boxes "need to be closer together," distributed more evenly ("an even distribution of beat boxes"), and located in "more logical loops" and "in more pleasant places" (all Questionnaire responses).

For people to find where the boxes were located, Beat the Street produced a map that identifies where the beat boxes are located in the community. However, for some, this proved difficult to navigate; it was "hard to try and work out routes from the map" (Tim; FG response). In addition, there was a suggestion that this could be improved by "includ[ing] footpaths or walkways on the map" or by "having an app" (Questionnaire responses).

In respect to people cheating, this was viewed as "demoralizing," "not fair," and "annoying" (Questionnaire responses). Cheating included "driving between boxes" and "tapping multiple cards" (Questionnaire responses). For some, this affected their motivation to continue participating; "my children gave up when we saw one person with over a dozen cards scanning them at the same time" (Janet; FG response). Thus, many participants noted the need to "stop people cheating" by devising "better cheat prevention" strategies (Questionnaire responses).

Timing of the Intervention and Sustainability. A barrier to the successful implementation of Beat the Street was that it did not take place during the school summer

holidays, but 6 weeks before the start of them. For some, this limited their ability to engage because of existing commitments:

> I think coming home from school and then if they've got Brownies or a dance club, and then you've gotta get dinner, then you've gotta bath, you can't . . . fit [Beat the Street] in . . . you can't do it of an evening after school. (Catherine; FG response)

Furthermore, participants felt that "[Beat the Street] would have been better to run in [the] school holidays" as "people have more time to take part"; to act as a motivation for activity, "it would be a good incentive to do more walking and cycling outside of term time"; and "it [would] give the kids something to do for free [over the summer]." In addition, people wanted "to keep [the game] running for longer" because they acknowledged "that it takes longer than a couple of weeks to make lasting changes" (all Questionnaire responses).

On the issue regarding the length of intervention, many participants did not think that the 6-week time period was long enough for them to engage in the game as fully as they would have liked to:

> From my point of view, if it had been longer . . . it would have worked, we could have done lots, lots, lots more now than we were able to do at the time. (Jodie; FG response)

Finally, to ensure the longevity of the game and its benefits, participants would have liked a "follow up 6 months or a year later" to see if Beat the Street "ha[d] made a long-standing difference." One individual also noted that more could be done to encourage long-term maintenance of the program's outcomes such as "setting up other goals and games to keep the encouragement going" and by "publicising follow-up activities" (all Questionnaire responses).

DISCUSSION

This process evaluation investigated the facilitators (organizational and experiential) and barriers to implementation of a community-wide gamification-based intervention. Participants identified facilitating factors that assisted involvement in the game and, therefore, factors responsible for being physically active. These findings present a novel contribution to the evidence base by highlighting that connectivity to a primary education setting was viewed as fundamental to the successful implementation of, and engagement in, the intervention. Furthering this, and in support of previous research findings (i.e., Harris & Crone, 2020; Lindqvist et al., 2018), social elements of the intervention were identified as a motivating factor for, and a consequential outcome of, participation. These findings further emphasize the value of endorsing social interaction as a factor for community-wide engagement if initiatives are to be a success.

This study is one the first qualitative attempts to systematically explore the barriers to implementation of interventions of this kind, and its findings provide tangible areas of improvement for community-wide interventions. The identification of issues with promotion and awareness of the intervention understandably limited people from taking part, particularly those individuals that were not affiliated with a primary school. As such, simple recommendations are that the marketing for these programs should be increased to include wider areas of the community, that there is a greater lead-in time to ensure that people can adequately prepare for the start of the intervention, and to consider other broad mediums, in addition to social media, for promotion. Timing of the project, in school time, was also viewed as an issue. Thus, to increase participation, it is recommended that residents are involved in the preparation stages of delivery to ensure that the intervention most closely suits their requirements or indeed it is timed to overlap with the school term and subsequent school holiday. Finally, participants were skeptical about the sustainability of activity enhancement beyond the intervention. This concern is echoed in the Pokémon Go study of Lindqvist et al. (2018) in which it was suggested that "the sustainability of the new behaviours is inherently based on the elements of the game . . . and thus the increased physical activity evidenced in this study . . . is not likely sustainable" (p. 4). Nevertheless, this fits with our assertion that gamification-based approaches may be a useful contributor to promote physical activity within a broader, joined-up, systems-based approach.

IMPLICATIONS FOR PRACTICE

Physical inactivity is a complex multicausal issue that requires not only high levels of individual agency but also a facilitative society that, when aggregated, can drive change at the population level (Rutter et al., 2019). Thus, gaining this unique insight into the participants' motives for engaging, or not engaging, in Beat the Street may help to guide the application and adoption of strategic approaches to addressing physical inactivity at population level. This was one of the first studies to examine the delivery of a community-wide physical activity intervention implemented as a part of a wider system-based approach to creating population-level changes in physical

activity. Furthermore, this was one of the first attempts to systematically probe the procedural facilitators and barriers to implementation of a community-wide gamification-based physical activity intervention. Taken together, this study suggests imbedding physical activity interventions within a wider systems-based approach to addressing population levels of physical inactivity may be more effective than delivering interventions in silo. However, several potential barriers need to be addressed to maximize the potential of these approaches in engaging and supporting behavior change by large portions of the community. Specifically, the challenge of systems-based approaches is that they involve a complex plethora of organizations and, therefore, stakeholders. Engaging, lobbying where required, and securing their political and, if required, financial involvement take time and sustained effort to ensure sustainability. Local knowledge, understanding of the communities in which programs are being developed, and engagement in the coproduction of initiatives with the community are all critical factors for the long-term success of this approach. Furthermore, it is crucial to understand what the physical activity system looks like in a community, who the stakeholders are, and their reach and range within the system. These considerations are of paramount importance to future designers, funders, and coordinators of systems-based approaches if a full understanding of how to apply this approach is to be attained over time.

FUTURE DIRECTIONS

We must ensure that community-wide interventions offer equal access to different cohorts of the community. This is even more crucial as health and health interventions become more digitized. A recent study has highlighted how health interventions that use digital technology could lead to inequalities. Today, health inequities increasingly depend on digital determinants (Jahnel et al., 2022). Jahnel et al. (2022) argue that digital determinants of health are organized on multiple hierarchical levels starting from individual-level determinants (such as education and training) to higher-level determinants (such as cultural or policy norms). Health inequalities are the result of differential access to resources and barriers in these layers. Approaches that aim to improve health and wellbeing through digital technology need to be based on an understanding of the availability and choice restrictions of individuals in general and, more importantly, of individuals from disadvantaged backgrounds. As such, bottom-up participatory approaches are needed when developing digital interventions. Further longitudinal follow-up research is needed to capture the longer term impact of these programs in terms of both processes and the connections that a systems-based approach has the potential to develop. This is critical to understanding the sustainability issues for these contemporary approaches to population change. Furthermore, both individual and population-based follow-up are needed to understand the impact on individual behaviors and attitudes and, ultimately, public health outcomes.

CONCLUSION

This study is one of the first to explore procedural facilitators and barriers to implementation of a community-wide gamification-based physical activity intervention. Understanding the communities for whom these programs are developed is a critical factor to ensure their success. Future planning should include the voices of those for whom these interventions are targeted at, as this may be crucial for any long-term success of this approach. This study provides novel insights into the factors that help and hinder the implementation of community-wide behavior-change programs. Primary education settings could be paramount to the success of implementing community-wide programs; however, targeted efforts are also required to reach wider, often marginalized, portions of the community. Community-wide programs also need to be developed with, rather than for, local populations. This will ensure that they meet the needs, expectations, and requirements of those who seek to engage.

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