

Beat the Street: A pilot evaluation of a community-wide gamification-based physical activity intervention.

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Abstract

There is a plethora of published research reporting the wealth and breadth of biopsychosocial benefits of physical activity, however a recent Cochrane systematic review concluded insufficient evidence for current population level physical activity interventions, citing scalability as a major contributory factor, with many of the interventions failing to reach a substantial proportion of the community. The current study aimed to conduct a pilot evaluation of a technology-enabled, gamification based intervention called Beat the Street and sought to examine the impact of the Beat the Street intervention on self-reported physical activity. In total, $n = 329$ people completed the International Physical Activity Questionnaire Short Form (I-PAQ-SF) in full at baseline (prior to the intervention) and follow-up (immediately following the 7-week intervention). Overall, participants increased their weekly walking by +180 mins per week ($p < 0.001$) and their weekly physical activity by +335 mins per week ($p < 0.0001$). Vigorous activity increased by +48 mins per week ($p = 0.004$) and moderate activity increased by +60 mins per week ($p < 0.001$). The findings provide preliminary evidence that the Beat the Street intervention may be a promising approach to increasing physical activity at a community-wide level and warrants further investigation.

Introduction

Physical inactivity is the fourth leading risk factor for global mortality, attributed to 6% of deaths globally.¹ Furthermore, global physical activity trends show rapid increases in levels of inactivity worldwide⁴ and indicate that individual level, targeted interventions are unlikely to reach and change behaviour on a large enough scale to stop the worldwide decline in physical activity before attempting to reverse the trend. Population level, multicomponent approaches are needed to change the alarming worldwide trend.⁵⁻⁶ There is a plethora of published research reporting the wealth and breadth of biopsychosocial benefits of physical activity², however a recent Cochrane systematic review concluded insufficient evidence for current community-wide physical activity interventions, citing scalability as a major contributory factor, with many of the interventions failing to reach a substantial proportion of the community due to the difficulties in implementing such programmes.³

In light of this key implementation issue, Intelligent Health developed a novel, technology enabled physical activity intervention called 'Beat the Street'. The aim of the current study was to conduct a pilot evaluation of the Beat the Street intervention and sought to examine the impact of Beat the Street on self-reported physical activity.

Methodology

Intervention:

Beat the Street turns a town or city into a game where players register their walking and cycling journeys by tapping a radio frequency identification card on radio frequency identification (RFID) readers called 'Beat Boxes' placed on lampposts around the locality. Beat the Street aims to get people more physically active by using gamification components whereby residents of a town/city receive 10 points each time 2 consecutive 'Beat Boxes' are touched within 1 hour. Residents compete to see which schools; community groups and individuals can achieve the greatest physical activity over the course of the game period and highest scorers are

rewarded with prizes (For instance, vouchers for sports equipment are provided to schools, community groups are rewarded with active lifestyle prizes (such as bicycles), 'lucky tap' cash prizes offer instant gratification and there is an overall prize for total miles travelled where money is donated to a local charity). A detailed overview of the intervention has been provided elsewhere.⁴ The current study focussed on 1 of 17 interventions implemented throughout the United Kingdom in 2017, Beat the Street Wolverhampton, which engaged 25,790 people over the course of the 7-week game period (10.33% of the population within the game boundary). Intervention characteristics are provided in Table 1.

Procedure:

To participate in the game adult residents were required to activate their RFID card via an online portal. Cards are distributed in 'parent packs' via schools which include RFID fobs for children, pre-registered to their school, cards for parents and extended family, a map showing where Beat Boxes are located throughout the area and instructions on how to play the game, via local points of interest, such as libraries, supermarkets, business parks and local businesses, and via a local engagement manager actively informing people about the game in public, such as city centres and shopping centres. During registration, participants were invited to complete a range of sociodemographic questions and the International Physical Activity Questionnaire Short Form (I-PAQ-SF) which formed the baseline measure of the current study. Immediately following the 7-week competition, all registered participants who agreed to be contacted (n=3315) were sent a link to a follow-up survey via email. A £50 prize draw was offered to incentivise follow-up survey completion and a total of 5 reminders were sent to participants. Informed consent was obtained via the online portal and ethical approval was granted by Cardiff Metropolitan University, Psychology Research Ethics Committee (Ref 8405). Participation in the intervention was entirely voluntary and participants could choose to partake in the intervention without providing data at baseline and/or follow-up.

Outcome Measures and Analyses:

Participant's physical activity levels were measured using the International Physical Activity Questionnaire Short Form (I-PAQ-SF). The IPAQ-SF is a 7-item questionnaire frequently used to measure physical activity in large population-based studies.⁵ Physical activity data from IPAQ-SF was cleaned in accordance with the IPAQ protocol⁶. The data did not follow a Normal distribution therefore Wilcoxon signed-rank and Chi-Squared tests were used and medians and interquartile ranges are presented.

Results

In total, N = 8,345 registered a RFID card via the online portal, of which n = 607 people provided follow-up data. A final sample of n = 329 was available for people who completed the primary outcome measure (IPAQ-SF) in full at baseline (during registration) and follow-up (post-game) and following the removal of outliers (n = 7). Sample characteristics are provided in table 2. Figure 1A shows that, overall, participants increased their weekly walking from a median value of 240 mins at baseline to 420 mins at follow-up, which represents an increase of +180 mins per week and was statistically significant ($p < 0.001$). Figure 1B shows that, on average, participants increased their MET (metabolic equivalent) from a median of 2772 METS at baseline to 4266 METS at follow-up. Furthermore, Figure 1C shows that, overall, participants increased their weekly physical activity by a median of +335 mins per week, which was statistically significant ($p < 0.0001$). When physical activity was separated into different intensities, changes in all outcomes were in the expected direction and were statistically significant, with median vigorous activity increasing by +48 mins per week ($p = 0.004$, Figure 1D), median moderate activity increasing by +60 mins per week ($p < 0.001$, Figure 1E). There was no change in time spent sitting between baseline and follow-up, with the median value reported at both time points being 2100 minutes (35 hours) per week.

Discussion

The findings presented above provide promising evidence that the Beat the Street intervention may have increased physical activity. The findings from the data were consistent and statistically significant for most of the outcomes considered. However, there was no change between baseline and follow-up in time spent sitting, with the median value reported at both time points being 2100 minutes (35 hours) per week. This finding suggests the impact of Beat the Street may be in the time participants are already likely to be active rather than during timetabled sedentary periods, such as classroom time at school or periods spent in an office at work, or that sleeping time may have been displaced into activity, specifically the additional time spent during the morning school/work commute through active travel. However, such explanations are speculative, particularly given the issues well-established limitations of self-reported sitting time⁸, and warrant further exploration.

Global physical activity trends show substantial increases in levels of inactivity worldwide⁴. Furthermore, a recent Cochrane systematic review concluded insufficient evidence for current community-wide physical activity interventions, citing scalability as a major contributory factor, with many of the interventions failing to reach a substantial proportion of the community due to the difficulties in implementing such programmes³. The current pilot evaluation demonstrates that the Beat the Street is able to address previously cited issues with scalability by engaging 25,790 people into a physical activity intervention. Furthermore, the findings presented above provide preliminary evidence that the intervention increased levels of physical activity, at least for those who remained in this study.

A limitation of the current research is that all outcomes were based on self-report, therefore, there is the potential for desirability bias, however administering the survey via an online platform may have functioned to mitigate this. A further limitation is the exclusion of a

control group, consequently, it is not possible to determine with certainty if any changes observed were due to the intervention, or may be associated with other unrelated factors not considered in the research. Furthermore, the final sample used in the current study were self-selecting and may have represented a unique group of intervention participants. Notwithstanding the above limitations, this study provides promising evidence for the impact of Beat the Street on self-reported physical activity, at least for the participants who remained in this study.

This pilot evaluation provides evidence that the Beat the Street intervention warrants further investigation, however such efforts require the use of a control population, the measurement of a wider set of outcomes and processes, and the objective measurement of physical activity, to establish if the current findings are generalisable to the wider sample of intervention participants.

Author Disclosure Statement

At the time of writing this manuscript, the author was employed by 'Intelligent Health' who delivered the intervention. However, the author was not involved in data collection, which was carried out electronically, or data analysis, which was carried out by the University of East Anglia.

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