Will the smartphone become a useful tool to promote physical activity?

In addition to a healthy diet, achievement of regular and sustained optimum levels of physical activity should be a top priority for everyone. The 2018 US Physical Activity Guidelines\(^1\) declare physical activity as a “best buy” for public health, reducing the risk of a large number of diseases and leading to improved sleep and quality of life, reducing depressive symptoms and anxiety, and improving overall physical and executive function. A major challenge for busy clinicians is the difficulty in both effectively encouraging and accurately measuring behavioural change associated with physical activity, since any such changes would occur during patient’s daily lives, and thus are difficult to assess using conventional medical evaluation.

The recent proliferation of digital technologies into modern life (eg, the internet and smartphones) has led to numerous efforts to apply these pervasive technologies to health applications, including enhancing physical activity. Digital health tools have been found to modestly improve physical activity.\(^2,3\) Notably, existing trials report fairly small sample sizes, short follow-up, and often rely on devices less ubiquitous and accessible than the common smartphone.

Despite embracing these digital health tools, most published studies have largely relied on conventional approaches to conducting research—ie, in-person enrolment and recruitment. Accordingly, some investigators have called for innovation in the fundamental methods used for research studies to better leverage the technology-based tools that are now available.\(^4\)

Applying digital tools that employ fully remote participation offers several potential advantages, including the ability to recruit larger sample sizes arising from more geographically diverse populations at lower costs. Potential limitations include poor generalisability, narrow scope of interventions, and decreased engagement that might translate into difficulties with participant retention.

In The Lancet Digital Health, Anna Shcherbina and colleagues\(^5\) report on a smartphone-based research platform used for a randomised crossover trial of several interventions aimed at increasing physical activity. A smartphone app was used to complete all aspects of the study, including delivery of the intervention. The smartphone also recorded daily step count, which was the primary outcome measure. Each participant underwent a week of baseline monitoring, followed by four smartphone-based interventions done for 1 week, delivered in a random order. The four interventions were a daily triggered prompt to achieve 10,000 steps a day, a tailored coaching prompt based on their individual baseline activity, a daily reminder to read the American Heart Association website guidelines, and triggered prompts directing users to stand after 60 min of inactivity. Daily step count increased significantly from baseline for all four interventions: mean step count increased by 319 steps (SE 75) for participants in the American Heart Association website prompt group (p<0·0001), 267 steps (74) for participants in the hourly stand prompt group (p=0·0003), 254 steps (74) for participants in the cluster-specific prompts group (p=0·0006), and by 226 steps (75) for participants in the 10,000 daily step prompt group (p=0·0026).

As the authors acknowledge, participant attrition in this fully digital research study was high: only 493 (17%) of 2783 participants completed all four planned interventions. Although the number of patients who completed all four interventions was higher than that reported in previous interventional digital health trials,\(^3\) this level of attrition decreases the generalisability of the findings. Previous trials using fully-remote methods have reported similar challenges with patient retention,\(^6,7\) often with higher losses to follow-up than is commonly observed in traditional randomised trials.\(^5\) In the absence of unique methods that can convincingly address the bias that might result from loss to follow-up, retention rates will need to improve before the results of fully remote trials gain broad acceptance. Power calculations might also need to account for high levels of attrition, whereby deliberate over-enrolment (acknowledging selection bias issues) is considered in the initial study design.

Although each intervention increased the daily mean step count, no differences between interventions were observed, which might have resulted from the study
having insufficient power to detect such differences. Alternatively, such findings might suggest that engagement with any type of smartphone app is more important than the nature of the intervention or the experience itself, or that relatively generic app-based experiences might not provide enough differentiation between the interventions. Thus, there is further opportunity for innovation with regard to the type of intervention that could be delivered. Although statistically significant, the increase in total number of steps was not large. The mean increase in daily step count for the four interventions ranged between 254 and 319 steps per day, which equates to around 5% of the mean daily step count for American adults (4700 steps per day).

In addition to limitations inherent to fully-remote approaches, sustained behavioural change remains an ongoing challenge for this area of research and ultimately in practice-based implementation. This study by Shcherbina and colleagues reported results after only 5 weeks of follow-up. The most meaningful application of these digital tools might be primarily associated with long-term effects. An important next step in this line of research will be to identify the types of interventions that best promote ongoing engagement and long-lasting behavioural change.

In summary, Shcherbina and colleagues demonstrate that it is feasible to use a smartphone-based research platform for a fully digital cross-over randomised trial, setting a precedent for similar future clinical trials for a range of diseases and interventions. Ultimately, behavioural change that effectively promotes physical activity must be robust, which will require cooperation between the research and technical communities to innovate the way in which physical activity is promoted and how potential interventions are evaluated.

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