

What do we know about mHealth interventions and just-in-time adaptive interventions (JITAs) to promote physical activity?

Headline findings

- Physical activity interventions delivered through mobile devices such as smartphones or tablets (using text messages or smartphone apps) are called *mHealth interventions*. Studies have shown that mHealth interventions are more effective than usual care at reducing sedentary behaviours, and equally effective as usual care at helping people become more physically active. We know little about their effectiveness and cost-effectiveness in the long term, or how they can be integrated in health and care settings.
- *Just-in-time adaptive interventions (JITAs)* are a new technology, usually delivered through mobile phone apps, which provide behaviour change support in real time. Research into JITAs for physical activity promotion is in its infancy.
- We recommend that decision makers commission mHealth interventions for physical activity promotion when research evidence shows that they increase physical activity or reduce sedentary behaviour, and if such evidence is not available, that they incorporate evaluation in the commissioning process. We also recommend that decision makers are cautious in commissioning JITAs for use in the NHS until more is known about their effectiveness and cost-effectiveness.
- Health professionals can signpost patients to mHealth interventions for physical activity promotion which have been commissioned or are available on the NHS Digital Apps Library, such as the “Active 10 walking tracker”.

The problem

- Health professionals are expected to give physical activity advice, but often lack time and skills for supporting behaviour change.
- Behaviour change support delivered through mobile devices such as smartphones (text messages and apps) and tablets, so-called mHealth interventions, may reduce pressures on the NHS and health professionals. They are interactive and can help people become more active as they go about their daily lives.

What did we do?

- We did a broad review of the literature (‘scoping review’) to find out what is known about mHealth interventions which aim to promote physical activity. mHealth interventions are delivered through mobile devices such as mobile phones, smartphones and tablets. They include smartphone apps and text messages. mHealth interventions can be downloaded from non-commercial sites, such as the NHS Digital Apps Library, and commercial platforms such as Google Play or the Apple App store. They can be free of charge or downloadable for a fee. We focused on systematic reviews published since 2013 as mobile technology changes fast.

Furthermore, many early interventions included face-to-face sessions, so it is difficult to disentangle the effect of mHealth support.

- We also did a systematic review of the literature into a new technology called ‘just-in-time adaptive interventions (JITAs)’. The box below explains what JITAs are.

What is a just-in-time adaptive intervention (JITAI)?

A JITAI is a smartphone app which provides support ‘just-in-time’: the right type (or amount) of support, at the right time, whilst eliminating support that is not beneficial (1). For instance, people receive an alert to take a break when they have been sitting for 30 minutes, or are encouraged to go for a walk when the weather is nice and it is lunchtime. JITAIs use data from built-in sensors or apps such as accelerometers, GPS, electronic diary, or weather app to work out when to send support. They use technology (e.g., machine learning) to learn and improve over time what support a person likes and dislikes, what they find helpful and unhelpful, and when and where they are most and least receptive to support.



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What did the evidence tell us?

Literature review of mHealth interventions for physical activity promotion

- We found six relevant systematic reviews published since 2013.
- Compared to usual care, traditional interventions or intensive counselling, mHealth interventions (including SMS and smartphone apps) were equally effective at increasing physical activity and walking (2-4) and more effective at reducing sedentary behaviour (2, 5). This evidence comes from high-quality studies (randomised controlled trials).
- Common behaviour change techniques included in mHealth interventions were goal setting, self-monitoring of behaviour, social support, feedback on behaviour, instruction on how to perform the behaviour, adding objects to the environment (e.g., a pedometer or wearable), information about health consequences of being active, and prompts and cues (2, 5).
- mHealth interventions rarely included techniques which are known to help people make initial increases in physical activity, such as problem solving, action planning, review of goals, and setting easy-to-perform tasks and making them increasingly difficult (graded tasks) (2).

Systematic review of JITAIs for physical activity promotion

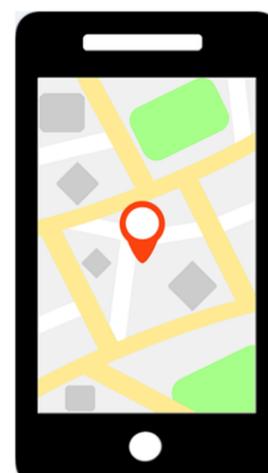
- We searched ten electronic databases, checked 1,416 titles, 608 abstracts and the full text of 132 papers.
- We included 17 papers which reported 13 unique JITAIs. Eight JITAIs came from the US and none were from the UK. Nine studies were done among colleagues and students. Most studies were small and had less than 100 participants.

- Five JITAI prompts prompted participants to take a break when their phone did not detect any activity for a specified time (e.g., 30 minutes), three suggested physical activities when participants had an opportunity to be active (e.g., lunchtime and fine weather), and another five targeted both sedentary behaviour and physical activity.
- Typically participants were asked to use the JITAI for three to four weeks. For six JITAI participants attended a face-to-face meeting where use of the smartphone and the app (JITAI) was explained.
- Five JITAI were informed by behaviour change theory. Common behaviour change techniques included in the JITAI were goal setting, prompts and cues, and feedback on behaviour.
- The evidence about their effects on physical activity is mixed, but most studies were not designed to look at behaviour change. Some studies suggested that the JITAI increased activity or reduced sedentary behaviour, but others did not. No study was large enough to detect effects on behaviour.
- Participants found the JITAI acceptable. Sometimes the support was not just-in-time due to unreliable sensors. Some messages were perceived as irrelevant, and the use of multiple sensors by the JITAI can drain the phone battery quickly.

What remains unknown in the research literature?

Mobile health interventions for physical activity promotion

- We don't know the long-term effectiveness and cost-effectiveness of mHealth interventions among representative populations (2, 4-7), their effects on physical activity when measured objectively (2, 5), and whether more engagement with these interventions results in more behaviour change (2).
- We don't know how mHealth interventions can best be adopted by health care organisations, implemented in routine care and sustained over time (7).
- We don't know the active ingredients of mHealth interventions (2, 5), how they increase physical activity (4), and how we can improve people's engagement with them (5).



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JITAI for physical activity promotion

- We don't know whether JITAI are effective or cost-effective, how many people would take them up and continue to use them over time, and their influence on health inequalities. We also don't know how JITAI increase physical activity and what their effective components are.
- We need research into the development of theory- and evidence-based JITAI in real-world settings in co-production with users and stakeholders. Studies need to assess engagement, feasibility, acceptability, and particularly their effectiveness, cost-effectiveness and integration into health and care systems.

What should decision makers and health professionals do?

- We recommend that decision makers commission mHealth interventions for physical activity promotion in addition to traditional interventions (face-to-face or written). Ideally research evidence should demonstrate that the commissioned interventions increase physical activity or reduce sedentary behaviour. If such evidence is not available, we recommend that decision makers incorporate evaluation in the commissioning process. Unlike apps which support clinical management, such as type 2 diabetes, apps which promote walking are unlikely to cause serious adverse effects provided people are encouraged to seek medical advice about safe levels of physical activity as appropriate. Despite the low risk of harm, we recommend that decision makers are cautious in commissioning JITAs for use in the NHS until more is known about their effectiveness and cost-effectiveness in representative populations and in real-world settings.
- Health professionals can signpost patients to mHealth interventions for physical activity promotion which have been commissioned or are available on the NHS Digital Apps Library. An example is an app called the “Active 10 walking tracker”.

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- Conference presentation about our JITAI review: www.ucl.ac.uk/behaviour-change/events/conf-18/presentations/7.A.1.pdf. A publication is in preparation, please email Wendy Hardeman if you want a copy.
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