

# Novel technologies and weight loss maintenance

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Novel technologies can help us to understand and change human behaviour. Alongside traditional behaviour change intervention delivery such as face-to-face interventions, recent technological advances can be used to support people in their change efforts. The advantages of novel technologies include wide reach, scalability to large population segments, and potential cost-effectiveness. Examples of novel technologies are web-based information and support platforms; phone or text messaging systems; mobile phone applications (i.e. apps); monitoring devices including weight tracking scales; activity monitors and sensors; and social media, such as Twitter and Facebook. Many novel technologies have been explored and systematically reviewed in the context of weight management; however the research on the use of technology to maintain weight loss is still limited.

## Novel technologies to change weight related behaviour

Behavioural weight management interventions have used a range of novel technologies and typically show positive but small effects. Web-based interventions can lead to significant small weight loss and engagement with website features is usually associated with greater weight loss (Neve, Morgan, Jones, & Collins, 2010). A systematic review of web-based interventions promoting health behaviours (including physical

activity and dietary behaviour) found that interventions that employ a greater number of behaviour change techniques (BCTs) and use additional methods of contact, especially text messages, tended to have larger effects (Webb, Joseph, Yardley, & Michie, 2010). Text messaging interventions for weight management are typically a well received and commonly accepted medium of communication within interventions, although their evidence for effectiveness is varied (Shaw & Bosworth, 2012). A meta-analysis examining behaviour change following text message interventions found small, positive, and significant effects (0.29) which were greater when multiple messages per day were sent (0.39) (Orr & King, 2015). The effectiveness of text messaging for weight loss maintenance is currently unknown.

Mobile phone apps to support weight management have shown promising effects (Årsand et al., 2012; Okorodudu, Bosworth, & Corsino, 2014). However, weight management apps often include only a limited number of behavioural strategies, delivering insufficient evidence-informed content (Breton, Fuemmeler, & Abrams, 2011; Pagoto, Schneider, Jovic, DeBiasse, & Mann, 2013). One review of 204 apps coded presence of 13 evidence-informed practices for weight control and only a small number of apps (15%) had five or more of the 13 practices (Breton et al., 2011). Another review of the top 20 paid and 20 unpaid physical activity and/or dietary behaviour apps found that these included 8 BCTs on average which was higher for paid versus unpaid apps (10 vs. 7 BCTs) (Direito et al., 2014). The most frequently included BCTs were providing instructions (16/20), setting a graded task (14/20), and prompting self-

monitoring (12/20). Several behavioural strategies that improve motivation, problem solving and help to reduce stress, were omitted from apps despite promising favourable evidence suggesting inclusion (Pagoto, Schneider, Jojic, et al., 2013).

Devices that can be used to support weight management include weight tracking scales, activity monitors and sensors. A wide variety of methods have been used to perform self-monitoring, mainly focusing on diet, exercise, and self-weighing (Burke, Wang, & Sevick, 2011). Weight tracking can be performed using digital scales that detect weight automatically and provide output to platforms such as websites or apps (Gilmore, Duhé, Frost, & Redman, 2014). Users can monitor their performance on a personal online platform which can be accessed via app. Devices usually synchronise with the platform via Bluetooth. The same principle works for activity trackers. Weight and activity trackers can be synchronised together and can also link to a food diary, which can be self-reported (e.g. taken from a food database) or imputed with QR code-scanning technology (Yusof & Iahad, 2012). Recent studies have shown that individuals want to use and control their personal sensor data, although only some of the commercially available devices provide this facility; and personal preferences varied across different devices (Barua, Kay, & Paris, 2013). Users of novel devices and sensors have joined a new era of weight management, often relying on technology to support weight loss and weight loss maintenance.

Social media is becoming increasingly popular and could play a role in aiding weight loss, shaping public opinions and promoting healthy behaviours, but evidence on the full potential still needs to be established. A recent study showed that the brief exercise #PlankADay can spread via social networks and can be tracked and reinforced online (Pagoto, Schneider, Oleski, Smith, & Bauman, 2013). However, social media can also have a negative impact, mainly due to the anonymity of users

(Christopherson, 2007). A study conducted to describe social media interactions regarding excess weight, collecting two months data and gathering 2.2 million posts, showed that Twitter represented the most common channel to talk about excess weight (Chou, Prestin, & Kunath, 2014). Both Twitter and Facebook were dominated by negative messages stigmatising people in relation to their body weight; blogs and forums contained more restrained comments (Chou et al., 2014). Social media are yet to be explored through research on weight loss maintenance.

## The possibilities of novel technologies to change behaviour

The use of novel technology in weight management programmes can lead to improved long-term results, and in most cases improved cost-effectiveness (Gilmore et al., 2014). In a review of technology-based weight management interventions, the following key components were identified: self-monitoring; feedback and contact with an expert; social support; and structured, individually tailored programmes (Khaylis, Yiaslas, Bergstrom, & Gore-Felton, 2010). Short-term results from weight-loss interventions using these components and employing technology have been promising. However, long-term results are more mixed and still need further investigation (Khaylis et al., 2010). Although increasingly popular, weight maintenance technologies may lack comprehensive evidence-informed recommendations and rigorous evaluations for healthy weight management (Breton et al., 2011). Currently there are no industry standards for technology developers who provide support for health behaviour change and maintenance. An evidence-based framework for technology developers and programme providers combining up-to-date evidence from health psychology, public health and digital science could

substantially improve weight outcomes at the population level. Evidence clearly suggests that modern technology can be used to change weight-related behaviour so rather than blaming technology for recent population weight increases, technology and recent innovations can be used as part of the solution to combat the obesity epidemic.

## Practical examples

Novel technologies provide researchers with new possibilities to understand and change behaviour. Health psychologists are now able to gain access to data that can be gathered unobtrusively and frequently, e.g. through ecological momentary assessment. Pen-and-paper questionnaires are often being replaced by information gathered through devices and sensors and by assessment delivered directly to the mobile phone, computer or tablet. Instant delivery of BCTs such as prompting and feeding back in relevant contexts is now possible due to novel technologies.

An example of using novel technology to understand weight loss maintenance is a recent N-of-1 study which followed participants for half a year, asking daily questions about cognitions such as motivation, confidence, habits, and providing participants with wireless activity monitors and scales gathering daily data on objectively measured outcomes. Each participant was provided with a personal report on the most important predictors of weight loss maintenance, which formed the basis of a discussion about people's views on their weight management efforts (Kwasnicka, Dombrowski, White, & Sniehotta, 2015). Another example of using technology to change and support people to maintain weight loss is the NULevel trial which provided participants with wireless scales and then used pre-defined algorithms to recognise when participants regain their weight and to support them at the times when the support is most needed

(Evans et al., 2015).

## Future research possibilities and challenges

The use of novel technologies to understand and change behaviour in research is just starting and early evidence is promising. The potential of these innovations to support and shape healthy lifestyle is tremendous with new innovations being developed at a rapid pace. However, with this change come practical and ethical challenges that need to be addressed. Health psychologists will need to collaborate within interdisciplinary teams as the technical skills required are beyond our discipline. Moreover, the design and testing of evidence- and theory-based interventions is typically slow and rigorous process, often taking years. In the context of a rapidly changing field such as novel technologies these approaches might lead to interventions which are outdated before they have been fully developed and tested. Further, the collection of vast amounts of data requires skills to analyse and summarise findings in line with research, which in itself can be a time consuming and complex process. Finally, much of the data we can now collect is sensitive and personal in nature so researchers need to do their utmost to protect participants and their privacy at all times.

In summary, novel technologies have already revolutionised the way we conduct behaviour change research and will continue to do so in the future. Health Psychology should be at the forefront of ensuring that these possibilities are used in a way to help us test and develop our theories and apply our science to impact long-term behaviour change to combat the large public health challenges such as weight management.

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