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THE EFFECTIVENESS OF ONLINE AND MOBILE TECHNOLOGIES FOR CHANGING HEALTH BEHAVIOURS

Agencies for Nutrition Action
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Ngā Takawaenga Hāpai Kai Hauora

The Effectiveness of Online and Mobile Technologies for Changing Health Behaviours

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"Never before in history has innovation offered promise of so much to so many in so short a time." – Bill Gates (Former chief executive and current chairman of Microsoft).

Since the arrival of the personal computer in the 1970's, computing, information and communication technologies have changed dramatically. With the growing use of mobile phones and the Internet, new and innovative opportunities for the delivery of health promotion interventions have appeared. However, research has been slow to emerge on the effectiveness of these interventions for changing health behaviours.

This snapshot summarises the research to date on the effectiveness, cost-effectiveness and key success features of online and mobile-based interventions[1] aimed at encouraging healthy eating and physical activity. A literature review with a focus on the use of online and mobile technologies for the promotion of weight management, nutrition, physical activity and smoking cessation[2] underpins this snapshot[(1)]. The review also includes the findings of five interviews conducted with individuals involved in New Zealand health promotion programmes that use online and mobile-based interventions.

1. WHY A FOCUS ON ONLINE AND MOBILE-BASED INTERVENTIONS FOR CHANGING HEALTH BEHAVIOURS?

Interventions delivered online and via mobile devices offer a variety of benefits because they:

Can engage audiences anytime, anywhere...

Most New Zealanders (86%) now use the Internet and the number of people accessing the Internet from a mobile device (e.g. a smartphone or tablet) has quadrupled since 2001 (27% from 7%)[(2)]. Those who have a connection at home are predominantly connected to broadband (91%) while a smaller number use dial-up (9%)[(2)]. Most Internet users (98%) check their emails and many do so daily (77%)[(2)]. Over half (64%) belong to a social networking site with under-30s (87%) engaging more in social networking than over 60-year olds (34%)[(2)].

In 2011, New Zealand's mobile phone penetration was 109%, that's over one phone per person [(3)]. It is estimated that 48% of New Zealanders have a smartphone and the most commonly used smartphone apps were Facebook (76%), news and weather apps (70%), apps for gaming and entertainment (70%) and business/ banking apps (54%)[(4)].

These statistics confirm that more and more New Zealanders than ever are online and the increasing affordability of Internet-enabled mobile phones and devices means they can do so anywhere, anytime. This means that interventions, which utilise these technologies, have the potential to reach people regardless of where they live and the services available to them in their geographic/physical environment [(5 - 7)].

Can extend the reach of interventions...

Traditionally, priority groups have been less likely to use the Internet and mobile devices[(2)]. For example in 2007, 80% of NZ Europeans were Internet users, compared with 70% of Māori and Pasifika people[(2)]. However, since then this digital divide has decreased, largely due to a sharp rise in the proportion of Māori and Pasifika people using the Internet[(2)]. These increasing levels of Internet and mobile device use mean that interventions which use these technologies have the potential to reach large populations and, increasingly, priority groups[(6 - 11)]. They also have the potential to reach those who may not otherwise engage in traditional health promotion interventions for reasons such as concerns around stigmatisation[(5)].

1 For the purpose of this snapshot 'Online and mobile-based interventions' are those which utilise tools accessible via the Internet (websites, emails, online chat, online phone and videoconferencing, online gaming, blogs, social networking sites etc) and mobile phones/devices (voice calls, texting, sending photos and videos, sending data, multi-media playback, internet, email, apps, gaming, Bluetooth etc) for health promotion interventions.
2 Smoking cessation was included because online and mobile technologies have been used to promote smoking cessation for a number of years, potentially offering lessons for other health promotion areas.

Are scalable and offer relatively low costs per user...

Online and mobile-based interventions have the potential to be delivered at a relatively lower cost per user than face-to-face interventions[5, 12]. Their set up may be costly but their automated delivery tends to be very cheap[13]. They also have the ability to offer economies of scale as interventions to large populations cost little more than delivering to small groups[9, 13 - 15]. The reach of online and mobile technologies also gives interventions the potential to have a major public health impact[16]. Small changes at an individual level can mean large changes at the population level[6].

Can offer interactive features...

These features can be similar to those found in interpersonal counselling, e.g. motivational messaging, role modelling, tailoring of content and support[17]. Systems can be created which collect demographic information, as well as information on behavioural issues faced by users and this information can be used to generate personalised feedback. Online and mobile-based interventions also offer mechanisms to link users with other users for social support[10, 15].

2. WHAT LIFESTYLE CHANGES ARE MOBILE AND ONLINE-BASED INTERVENTIONS BEING USED TO PROMOTE?

Online and mobile-based interventions are increasingly being used to promote healthy lifestyles, encourage and support people to self-manage chronic conditions, facilitate communication between health care providers and patients and provide clinical management support[1]. Some examples of interventions using these technologies in New Zealand at the time of this review included:

- **Breakfast Eaters Have It Better:** A Health Promotion Agency campaign aimed at increasing the number of children and families eating breakfast every day. Delivery is via website, Facebook and electronic newsletters. See www.breakfast-eaters.org.nz
- **National Breastfeeding Campaign**: A Ministry of Health and GSL Network initiative aimed at increasing breastfeeding rates, especially amongst Māori and Pacific. Facebook and blogging are the predominant tools of delivery. See www.facebook.com/breastfeedingnz
- **Quitline**: A Quit Group service designed to increase smoking cessation. Delivery occurs via phone services, a website, emails, blogs, text messages and quit coaches. See www.quit.org.nz

Some examples of interventions showcased in the literature include the use of:

- Mobile devices or Internet-based interventions to increase physical activity efficacy and behaviours [6, 9 - 11, 18, 19].
- Mobile devices, interactive TV and web-based interventions for improving weight management [7, 16, 17, 19, 20 - 24].
- Computers, the Internet, mobile phones and interactive TV to facilitate improvements in dietary behaviours [9, 12, 19, 23].

3. WHAT FACTORS ENHANCE THE EFFECTIVENESS OF ONLINE AND MOBILE-BASED INTERVENTIONS?

There is limited evidence on which features of mobile device-based interventions are associated with enhanced effectiveness. This probably reflects the smaller body of research on mobile verses Internet-based interventions. In terms of Internet-based interventions, research has shown the following features tend to enhance their effectiveness:

- **Tailored content:** There has been a growing interest in interventions which customise content to users, with a number of reviews suggesting this intervention strategy holds considerable potential [5, 14, 21, 23 - 26]. Although studies using objective outcome measures suggest the difference in effectiveness of tailored verses generic content may be small [27].
- **Supplementary communication:** Online interventions can be more effective when supplemented by face-to-face approaches or additional communications such as texting [10, 26].
- **Theory based:** Theories (e.g. Social Cognitive Theory, the Transtheoretical Model and Theory of Planned Behaviour) can strengthen Internet-based interventions by assisting in identifying intervention targets (e.g. attitudes, self-efficacy), mechanisms underlying behaviour change techniques (e.g. observational learning) and selecting individuals most likely to benefit [10, 23, 26]. However many interventions to date have lacked a theoretical base and investment in testing and advancing more dynamic theories specifically for mobile and online intervention's has been suggested[28].
- **Influencing techniques:** The number of behaviour change techniques used in an Internet-based intervention has a significant positive impact on effect size; in general the more techniques used the larger the effect[8, 26]. Techniques include providing users with information on behavioural consequences, promoting self-monitoring of behaviour, identifying barriers and/or problems solving.

- **Investigator initiated contact**: Interventions where investigators deliver information to participants may be more effective because they don't rely on users planning to engage in the intervention[10].
- **Intervention exposure:** There is evidence in smoking cessation that increased intervention exposure is associated with increased intervention effectiveness [25]. However this observation was not supported by research on the promotion of healthy eating[23].
- **Time frames:** Shorter interventions tend to achieve larger impacts than longer-term interventions[8]. This may be a reflection of decreased motivation as the duration of an intervention increases.

In addition to the above features, evidence from New Zealand case studies suggest a clear intervention strategy, using online advertising to promote an intervention, having an intervention manager who understands social media/is up to date with technological developments and regular evaluation are also key success factors [1].

4. HOW EFFECTIVE ARE ONLINE AND MOBILE-BASED INTERVENTIONS?

Table one (see page 7) summarises the evidence to date from systematic reviews and meta-analyses on the effectiveness of online and mobile-based interventions. In short this research suggests:

That Internet and mobile-based interventions can have small but positive effects on a range of health behaviours in the short-term.

However it is unclear whether these interventions promote sustained behaviour change due to a lack of research conducted over longer periods and suggestive evidence that the effectiveness of interventions diminishes over time[7, 8, 16, 17].

Research on the effectiveness of these interventions by socioeconomic status and ethnicity is currently lacking, as is evidence to confirm the widely held view that using online and mobile technologies to change health behaviours is cost-effective[13, 20, 30]. This finding may reflect a lack of research incorporating economic endpoints[30].

5. WHAT SHOULD YOU CONSIDER WHEN PLANNING ONLINE AND MOBILE-BASED INTERVENTIONS?

The key take home message from this snapshot is:

> There is evidence that online and mobile-based interventions can have small but positive effects on a range of health behaviours in the short term, however it remains unclear as to whether these interventions promote sustained behaviour change.

Important planning considerations for those developing online and mobile-based interventions include:

- That they should be used as part of a wider, integrated and theory-based intervention.
- They should be used alongside other behaviour change tools such as additional communication channels and availability of personal support.
- Know your target audiences and where they are present online.
- The objectives of online and mobile-based interventions should be clearly identified – distinguish between reach, awareness, engagement and action.
- Evaluate using a robust research design that incorporates a control group, ideally a randomised controlled trial.
- Include sufficient numbers of Māori, Pacific, Asian and low-income participants to facilitate analysis by priority groups.
- Plan to run interventions for long enough to establish and monitor long-term behaviour change.
- Conduct the same formative, process and outcome evaluation that would be conducted for traditional, mass media-based interventions:
  - Undertake target audience research and message testing.
  - Monitor reach and engagement.
  - Collect information on behaviour change in the target audience and, if possible, establish links between behaviour change and engagement with online and mobile channels.
- Collect cost and data on economic endpoints (e.g. improvements in quality adjusted life years, cost per participant).

6. OTHER USEFUL RESOURCES AVAILABLE FREE ONLINE:

NZ Government Web Tool Kit – Accessible At www.webtoolkit.govt.nz

The Health Communicators Social Media Tool Kit – by the Centers for Disease Control and Prevention

Social Media in Plain English – by Common Craft [An online YouTube video]

Top 10 Lessons Learned on mHealth – by Patty Mechael [A blog from the Earth Institute]

20 Ways to Improve mHealth Interventions in Low-Resource Settings – by THINK the Innovative Knowledge Foundation.

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Table One: Summary of evidence to date.

INTERNET-BASED INTERVENTIONS
Physical activity
Internet-based interventions have a smaller effect size than in-person interventions[6]. Tailored interventions can have positive, short to medium-term effects[11].
Weight management
Internet-based interventions can be as effective or more effective than no intervention or minimal intervention, but generally less effective than in-person interventions[7, 16, 22]. Interventions can be effective as a supplement to standard weight loss interventions but not as a substitute[7, 17]. Internet-based interventions tend to be more effective with enhanced features such as tailored feedback and self-monitoring[21, 22].
Smoking cessation
Interventions can be effective but results are inconsistent[5, 14, 25]. Internet-based interventions can be modestly effective for adults but evidence for adolescents is insufficient[25]. Interventions tend to be more effective with enhanced features such as tailored feedback and frequent, automated contact [5, 14]. Internet-based interventions that target multiple health behaviours tend to have slightly smaller effect sizes than those targeting single behaviours[26].
MOBILE-BASED INTERVENTIONS
Physical activity
There is suggestive evidence of short-term benefits of mobile-based interventions for physical activity[9, 18].
Weight management
There is mixed evidence for the use of mobile-based interventions targeting diet or diet and physical activity for weight management[9, 24].
Smoking cessation
There is strong evidence that automated, multi-faceted text messaging interventions can increase smoking cessation, including over the longer-term[9, 15, 29].
REVIEWS THAT COMBINED INTERNET AND MOBILE-BASED INTERVENTIONS
Physical activity
Internet and mobile-based interventions can have positive effects on physical activity behaviours among children and adolescents, especially when used alongside other delivery approaches such as in-person counselling[10]. There is consistent evidence for positive effects of Internet and mobile-based interventions on psychosocial variables relating to physical activity (e.g. intention, self-efficacy, stage of change) but less consistent evidence for positive effects on behavioural variables (energy expenditure, step-count, self-reported physical activity)[10].
Weight management
Tailored Internet and mobile-based interventions can have positive effects for weight management but the evidence is limited to a small number of heterogeneous studies, making it difficult to determine whether positive effects are generalisable and sustained[19].
Diet
Tailored Internet and mobile-based interventions can have significant, positive short to medium-term effects for dietary behaviour but, as for weight management, there is uncertainty regarding whether positive effects are generalisable and can be sustained long-term[23]. Tailored interventions do not produce clinically significant changes in dietary behaviour[12].
Smoking cessation
Internet and mobile-based interventions can be more effective than no intervention or general self-help materials, however, the effect size is small[13, 25].