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Gambling Prevention Mobile Applications: Understanding the Inclusion and Use of Behaviour Change Techniques

Tom St Quinton[1] & Ben Morris[1]

[1] School of Social and Health Sciences, Leeds Trinity University, Leeds, UK

Abstract

Online gambling is emerging as a significant health behaviour of concern at a population level. Mobile applications (apps) are a popular tool to target change in health behaviour. Behaviour change techniques (BCTs) can be included within such apps to change relevant psychological mechanisms along established pathways, yet the content of apps targeting gambling problems specifically is not currently known. The purpose of the review was to identify the BCTs included in gambling prevention apps. Apps were downloaded from the Apple App Store and Google Play Store in October 2020. Apps were included if they related to gambling problems, were freely downloadable, and available in English. Once downloaded, two researchers independently coded the apps in November 2020 using the behaviour change technique taxonomy version 1 (Michie et al., 2013). The screening led to forty apps meeting the inclusion criteria (12 Apple App Store, 28 Google Play). The analyses identified 32 BCTs (20 Apple apps, 28 Google Play apps), with apps including between 0 and 9 BCTs (mean = 2.82, median = 2). The BCTs included most frequently were "3.1. Social support (unspecified)," "2.3. Self-monitoring of behaviour," and "7.4. Remove access to the reward." The review provides important information on the BCTs used in apps developed to reduce gambling-related problems. A limited number of BCTs were adopted within apps. Developers of apps seeking to develop effective gambling reduction products should draw upon a greater variety of BCTs.

Keywords: mobile apps, gambling problems, change techniques, mobile phone, behaviour change

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Introduction

Gambling-related behaviours, such as problem gambling and gambling disorders, can have significant negative consequences on health and well-being (Blank et al.,

2021; Cowlishaw & Kessler, 2016). Despite such harms, gambling-related problems remain an issue worldwide (Calado & Griffiths, 2016). The adoption of mobile health to change health-related behaviours has demonstrated recent popularity (Steinhubl et al., 2015). In 2020, it was estimated that 3.5 billion people owned a mobile phone (Statista, 2021). Among the many benefits of mobile health, mobile devices are easily portable (Klasnja & Pratt, 2012), can have significant reach (Milward et al., 2015), and are less reliant on face-to-face communication (Huang & Zhou, 2019). They therefore provide an ideal opportunity to change behaviours associated with health (Walsh & Groarke, 2019). There exist many ways that mobile phones can be used to change health behaviour including mobile applications (apps). Apps have potential in addressing many health behaviours (Han & Lee, 2018; Zhao et al., 2016) and have demonstrated considerable popularity (Ferrara et al., 2019). Indeed, Krebs and Duncan (2015) found that over half of mobile phone users had downloaded an app related to health.

Whether developed overtly or not, apps designed to modify health behaviour will include change strategies or behaviour change techniques (BCTs). These have been defined as the "observable, replicable, and irreducible component of an intervention designed to alter or redirect causal processes that regulate behavior" (Michie et al., 2013, p. 82). That is, BCTs are the specific components that change behaviour by altering psychological mechanisms (Michie & Johnston, 2012). For example, a person's attitude could be changed by the individual comparing the reasons for wanting and not wanting to change the behaviour ("Pros and cons"). Within the behaviour change technique taxonomy version 1 (BCTTv1; Michie et al., 2013), experts developed a list of 93 BCTs that could potentially alter psychological mechanisms. Each technique is labeled, clearly defined, and hierarchically clustered into a group based on similarity. For example, the label provided for the technique "Self-monitoring of behaviour" is defined ("Establish a method for the person to monitor and record their behaviour(s) as part of a behaviour change strategy") and provided a group ("2. Feedback and monitoring"). Organizing the BCTs in this way enables a consistent terminology of strategies and facilitates intervention development and evaluation.

Previous research has used the taxonomy, or a previous iteration, to identify the inclusion of BCTs in apps developed to change different health behaviours such as medication adherence (Morrissey et al., 2016), smoking cessation (Ubhi et al., 2016), alcohol consumption (Crane et al., 2015), and physical activity (Conroy et al., 2014; Yang et al., 2015). For example, Morrissey and colleagues (2016) found between zero and seven BCTs included in apps promoting medication adherence, with the techniques "1.4. Action planning" and "7.1. Prompt/Cues" used most frequently. Milne-Ives and colleagues (2020) recently conducted a systematic review related to apps targeting health behaviours including alcohol consumption, smoking cessation, physical activity, and dietary habits. They found 39 BCTs were included across all apps, with each app adopting an average of five BCTs. This work is important because to understand the usefulness of apps developed to change health behaviour it is important to identify the BCTs included within them (Milne-Ives et al., 2020).

Moreover, identifying the content used in apps in terms of BCTs can inform future app development (Dunn et al., 2018). For example, if apps utilize only a relatively small number of BCTs, developers could be encouraged to draw upon more strategies. Understanding the adoption of BCTs can help inform the development or modification of future apps targeting health behaviour.

Not only has the introduction of mobile phones and apps made gambling more accessible (James et al., 2017), but there now also exists many apps attending to gambling prevention. Recently, Ridley and colleagues (2020) reviewed the content of such apps. They specifically examined the presence of features and tools in apps designed to reduce problem gambling. The study found the most common tools were abstinence trackers and links with local services. Although useful, this study did not specifically align app content with BCTs. Given the importance of understanding the inclusion of BCTs in apps (Dunn et al., 2018; Milne-Ives et al., 2020), it is important to identify the specific strategies included in apps developed to change gambling behaviour. Although research has identified categories of techniques in gambling interventions (Rodda et al., 2018a), as far as we are aware no review is yet to identify the BCTs specifically within gambling prevention apps. As a consequence, we presently do not know the strategies adopted within such apps. The purpose of the investigation was to therefore conduct a content analysis to identify the BCTs included within apps developed to change gambling problems.

Method

Apps were sourced from the Apple App Store and the Google Play Store available in the United Kingdom in October 2020. These two stores were selected as they are the largest providers of apps and the most widely used. Searches were conducted using Boolean logic and included "gambling" AND "prevention," "help," "issues," "stop," "addiction," "problem." Apps were included in the analyses if they targeted gambling-related problems. Apps applicable to many problems, addictions and behaviours were also included as long as gambling was mentioned in the app description. Apps targeting general problems or addictions were excluded unless the app stated its applicability to gambling. Apps were also only included if they were freely downloadable and available in English. Free apps were selected because people may be reluctant to pay for the content of apps (Krebs & Duncan, 2015).

The apps meeting the inclusion criteria were downloaded and coded using the BCTTv1. Coding was conducted independently by two researchers in November 2020. The researchers downloaded the apps on either a mobile device or tablet and examined the content of each app individually and independently from one another. The researchers specifically examined the description, menu, and features of the app. The researchers both possessed prior knowledge of the BCTTv1, and noted when a BCT was used. Prior to the analyses, and for the purpose of standardization, definitions of each BCT were also read by the researchers. The presence of BCTs were coded with a "1" and the absence with a "0." After independent review had

taken place, Krippendorff's alpha showed strong inter-rater reliability ($\alpha = 0.81$). Minor discrepancies were resolved through discussions between the two researchers.

Results

The searches identified a total of 1,203 apps; 59 Apple App Store, 1,144 Google Play. Of these, 789 apps were unique. The screening led to 749 apps being excluded; 718 did not relate to addictions, 10 focused on general addictions, 17 focused on addictions or behaviours not associated with gambling (i.e., alcohol dependence, smoking), and 4 were not freely downloadable. Forty apps were therefore analyzed; 12 Apple App Store, 28 Google Play.

The analyses found 95% of gambling prevention apps included at least one BCT, with 32 BCTs present across all apps (see Table 1). Apps had between 0 and 9 BCTs (mean = 2.82, median = 2). Of the 40 apps analyzed, 35% had fewer than two BCTs and 30% had four or more. The most frequently used BCTs were: "3.1. Social support (unspecified)," "2.3. Self-monitoring of behaviour," and "7.4. Remove access to the reward." The most frequent combination of apps was "2.3. Self-monitoring of behaviour" and "2.4. Self-monitoring of outcome(s) of behaviour." These two BCTs were included in 17.5% of apps. The BCTs most likely to be found in combination were "1.1. Goal setting (behaviour)" and "1.3. Goal setting (outcome)," and "3.1. Social support (unspecified)" and "15.1. Verbal persuasion about capability." These combinations were identified in 10% of gambling prevention apps.

Discussion

The purpose of the study was to identify the BCTs included in apps developed to target gambling problems. The BCTs identified in the study share similarities with previous work. For example, Ridley and colleagues (2020) identified tools including a "Sober time tracker" and "Link with local services" to be those most frequently adopted in gambling prevention apps. Similarly, "Social support" and "Self-monitoring" were identified by Rodda and colleagues (2018a), although these were not the most prevalent techniques. Moreover, some of these BCTs have demonstrated utility in previous interventions. Self-monitoring, which has shown success in health interventions more generally (Dombrowski et al., 2012; Michie et al., 2009; Van Rhoon et al., 2020), was recently identified by Humphreys and colleagues (2021) as a technique present in effective gambling interventions.

Despite this, the review found limited use of BCTs and even the most frequently adopted BCTs were not used consistently across the apps sourced. The BCTs used less frequently could mean apps potentially miss important opportunities for behaviour change. For example, the inclusion of planning, which can be beneficial in changing many health behaviours (Hagger & Luszczynska, 2014) including problem gambling (Rodda et al., 2018b), was only included sparingly in apps. Similarly, the use of normative feedback or social comparisons can reduce participation in

Table 1
The prevalence of behaviour change techniques (BCTs) in mobile applications targeting gambling problems

BCT	Definition of BCT	Number of apps adopting it (%)
3.1. Social support (unspecified)	Advise on, arrange or provide social support or noncontingent praise or reward for performance of the behaviour	12 (30.0)
2.3. Self-monitoring of behaviour	Establish a method for the person to monitor and record their behaviour(s) as part of a behaviour change strategy	10 (25.0)
7.4. Remove access to the reward	Advise or arrange for the person to be separated from situations in which unwanted behaviour can be rewarded in order to reduce the behaviour	8 (20.0)
2.2. Feedback on behaviour	Monitor and provide informative or evaluative feedback on performance of the behaviour	7 (17.5)
15.1. Verbal persuasion about capability	Tell the person that he or she can successfully perform the wanted behaviour, arguing against self-doubts and asserting that the person can and will succeed	7 (17.5)
1.1. Goal setting (behaviour)	Set or agree on a goal defined in terms of the behaviour to be achieved	5 (12.5)
2.7. Feedback on outcome(s) of behaviour	Monitor and provide feedback on the outcome of performance of the behaviour	5 (12.5)
5.4. Monitoring of emotional consequences	Prompt assessment of feelings after attempts at performing the behaviour	5 (12.5)
1.3. Goal setting (outcome)	Set or agree on a goal defined in terms of a positive outcome of wanted behaviour	4 (10.0)
9.2. Pros and cons	Advise the person to identify and compare reasons for wanting (pros) and not wanting to (cons) change the behaviour	4 (10.0)
1.7. Review outcome goal(s)	Review outcome goal(s) jointly with the person and consider modifying goal(s) in light of achievement. This may lead to resetting the same goal, a small change in that goal or setting a new goal instead of, or in addition to the first	3 (7.5)
6.2. Social comparison	Draw attention to others' performance to allow comparison with the person's own performance	3 (7.5)
10.9. Self-reward	Prompt self-praise or self-reward if and only if there has been effort and/or progress in performing the behaviour	3 (7.5)
11.2. Reduce negative emotions	Advise on ways of reducing negative emotions to facilitate performance of the behaviour	3 (7.5)
2.4. Self-monitoring of outcome(s) of behaviour	Establish a method for the person to monitor and record the outcome(s) of their behaviour as part of a behaviour change strategy	2 (5.0)

(Continued)

Table 1 Continued.

BCT	Definition of BCT	Number of apps adopting it (%)
4.1. Instruction on how to perform a behaviour	Advise or agree on how to perform the behaviour	2 (5.0)
4.2. Information about antecedents	Provide information about antecedents that reliably predict performance of the behaviour	2 (5.0)
5.3. Information about social and environmental consequences	Provide information about social and environmental consequences of performing the behaviour	2 (5.0)
10.6. Non-specific incentive	Inform that a reward will be delivered if and only if there has been effort and/or progress in performing the behaviour	2 (5.0)
12.4. Distraction	Advise or arrange to use an alternative focus for attention to avoid triggers for unwanted behaviour	2 (5.0)
13.4. Valued self-identity	Advise the person to write or complete rating scales about a cherished value or personal strength as a means of affirming the person's identity as part of a behaviour change strategy	2 (5.0)
1.4. Action planning	Prompt detailed planning of performance of the behaviour	1 (2.5)
1.9. Commitment	Ask the person to affirm or reaffirm statements indicating commitment to change the behaviour	1 (2.5)
5.1. Information about health consequences	Provide information about health consequences of performing the behaviour	1 (2.5)
5.2. Salience of consequences	Use methods specifically designed to emphasize the consequences of performing the behaviour with the aim of making them more memorable	1 (2.5)
5.6. Information about emotional consequences	Provide information about emotional consequences of performing the behaviour	1 (2.5)
7.1. Prompts/cues	Introduce or define environmental or social stimulus with the purpose of prompting or cueing the behaviour. The prompt or cue would normally occur at the time or place of performance	1 (2.5)
8.2. Behaviour substitution	Prompt substitution of the unwanted behaviour with a wanted or neutral behaviour	1 (2.5)
10.3. Non-specific reward	Arrange delivery of a reward if and only if there has been effort and/or progress in performing the behaviour	1 (2.5)
10.4. Social reward	Arrange verbal or non-verbal reward if and only if there has been effort and/or progress in performing the behaviour	1 (2.5)
12.3. Avoidance/reducing exposure to cues for the behaviour	Advise on how to avoid exposure to specific social and contextual/physical cues for the behaviour, including changing daily or weekly routines	1 (2.5)
15.4. Self-talk	Prompt positive self-talk before and during the behaviour	1 (2.5)

gambling (Grande-Gosende et al., 2020; Neighbors et al., 2015), yet was infrequently adopted.

The study identified 32 BCTs included across the apps. This meant that apps did not adopt 65% of the strategies available within the BCTTv1. Limited use of BCTs in apps designed to change health behaviours has been previously found (Conroy et al., 2014; Crane et al., 2015; Morrissey et al., 2016). Thus, similar to research examining other health behaviours, there exists a number of additional BCTs that could be included within apps targeting gambling-related problems. For example, research has shown that, closely aligning with the BCT "Information about others' approval," motivation to change gambling behaviour comes from individuals considering and appreciating the thoughts of significant others (Johansen et al., 2019). Gambling prevention apps therefore not only use BCTs inconsistently, but also only include a limited number of strategies. App developers may lack knowledge of health psychology and the strategies that can be included to change behaviour (Cowan et al., 2013). App developers and experts in behaviour change should therefore collaborate in app development (Kumar et al., 2013; Middelweerd et al., 2014). Health experts could advise on the theory underlying the app and developers could create the app factoring in user preferences (Cowan et al., 2013).

It is worth noting that, similar to Ridley and colleagues (2020), the number of apps promoting gambling outweighed the number of apps preventing it. This was apparent even when the gambling search included words such as "prevention" or "help." This is problematic for gamblers wanting to stop gambling and may, in fact, cause more harm. App platforms should therefore consider filtering the information presented when specific search terms are used.

Strengths of the study included the use of the BCTTv1 to identify BCTs (Michie et al., 2013). Adopting this taxonomy enabled contemporary techniques to be identified. Extensive search strategies of two large platforms were also used to extract relevant apps. Despite these strengths, the study was not without limitations, of which there were four. First, only freely downloadable apps were analyzed and many of the apps enabled more content to be available if a fee was paid. As has been found previously (Direito et al., 2014), it is possible that paid apps included a greater number of BCTs. Therefore, although there may be a preference for free apps (Krebs & Duncan, 2015), it nevertheless means that those either unwilling to purchase or unable to afford apps may be disadvantaged. Second, despite the comprehensive nature of identifying relevant BCTs, poor descriptions may have led to some techniques being missed for analyses. Third, given the frequent development and availability of mobile apps, the findings could become quickly outdated. Finally, the review reports the most frequently used BCTs and therefore provides no evidence towards the BCTs most effective in treating gambling problems. However, as was previously mentioned, some of the identified BCTs have demonstrated utility.

Conclusion

In summary, the study provides important information on the content of gambling prevention apps. The study specifically identified the use of BCTs in apps developed to reduce gambling participation. The study found a limited number of BCTs used in apps. Techniques related to social support, self-monitoring, and limiting access to gambling websites were used most frequently. However, these BCTs were still only adopted by a relatively small number of apps. The limited use of BCTs is problematic but provides an opportunity for future research. Research should develop apps drawing on a wider variety of available BCTs. More importantly, research should establish which BCTs and combination of BCTs work best to reduce gambling behaviour. Given the significant use of mobile apps, this work could be useful in gambling prevention.

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For correspondence: Tom St Quinton, Ph.D., School of Social and Health Sciences, Leeds Trinity University, Brownberrie Lane, Horsforth, Leeds, UK, LS18 5HD. E-mail: t.stquinton@leedstrinity.ac.uk

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