

# MODULE 2: Effective behaviour change techniques in digital health interventions targeting non-communicable diseases

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## 1 Introduction

Non-communicable diseases (NCDs) such as cardiovascular diseases, cancers, respiratory diseases, and diabetes are the leading causes of death and disability worldwide<sup>1</sup>.

Despite an abundance of digital health interventions (DHIs) targeting the prevention and management of NCDs, it is unclear what specific components make an intervention effective in changing human behaviour.

The aim of this umbrella review was to identify the most effective behaviour change techniques (BCTs) in DHIs that address the most common NCDs.

## 2 Method

- Five electronic databases (OVID (Medline), CINAHL, Web of Science, PsychInfo, and Embase) were searched for articles published in English between 1st January 2007 and 24th January 2021.
- Studies were included if they were systematic reviews or meta-analyses of e- or mHealth interventions targeting the modification of one or more NCD-related risk factors in adults.
- Study quality was assessed using AMSTAR 2.
- BCTs were coded using the Behaviour Change Technique Taxonomy (BCTTv1)<sup>2</sup> where possible.

Table 1: Summary of health-related behaviour change techniques across health domains. "O" = mixed; "O +" = mixed but tending to be positive; "+" = mostly positive. BCT = behaviour change technique; CVD = cardiovascular disease. Evidence for promising BCTs/components based on subgroup or regression analyses. BCTs in **bold** coded using the Behaviour Change Technique Taxonomy V1<sup>2</sup>.

## 3 Results

Health Domain	Effect	Promising BCTs/components
CVDs	+	<ul style="list-style-type: none"> <li>• Tailored messages based on health status</li> <li>• Communication with physician</li> <li>• Multiple app features</li> </ul>
Diabetes	+	<ul style="list-style-type: none"> <li>• <b>Goal setting (unspecified)</b></li> <li>• <b>Feedback (unspecified)</b></li> <li>• <b>Self-monitoring outcomes of behaviour</b></li> <li>• <b>Prompts and cues</b></li> <li>• Communication with specialist</li> <li>• Educational materials</li> <li>• Data visualisation</li> </ul>
Multiple lifestyle behaviours	O+	<ul style="list-style-type: none"> <li>• Tailoring or personalisation based on user input</li> <li>• Access to a coach or mentor</li> <li>• Frequency of intervention messaging</li> </ul>
Weight management	O+	<ul style="list-style-type: none"> <li>• <b>Social support (cluster)</b></li> </ul>
Physical activity	O	<ul style="list-style-type: none"> <li>• <b>Goals and planning (cluster)</b></li> <li>• <b>Feedback on behaviour</b></li> <li>• <b>Graded tasks</b></li> <li>• Text-messaging</li> <li>• Personalisation</li> <li>• Education</li> </ul>
Alcohol	+	<ul style="list-style-type: none"> <li>• <b>Goal setting (unspecified)</b></li> <li>• <b>Problem solving</b></li> <li>• <b>Information about antecedents</b></li> <li>• <b>Behaviour substitution</b></li> <li>• <b>Credible source</b></li> </ul>
Tobacco	+	<ul style="list-style-type: none"> <li>• <b>Goal setting (behaviour)</b></li> <li>• <b>Problem solving</b></li> <li>• <b>Action planning</b></li> <li>• <b>Review behaviour goals</b></li> <li>• <b>Social support (unspecified)</b></li> <li>• <b>Information about antecedents</b></li> <li>• <b>Information about health consequences</b></li> <li>• <b>Pros and cons</b></li> <li>• <b>Pharmacological support</b></li> <li>• <b>Feedback and monitoring</b></li> <li>• <b>Reward and threat</b></li> <li>• Contingency management programmes</li> </ul>

Sixty-one articles, spanning 11 health domains and comprising over half a million individual participants, were included in the review.

DHIs are favorably associated with improved outcomes for patients with CVD, cancer, type 2 diabetes, and asthma when compared to control or usual care. Furthermore, DHIs are effective in improving health-related behaviours, including physical activity, sedentary behavior, diet, weight management, medication adherence, and abstinence from substance use in both general and clinical populations.

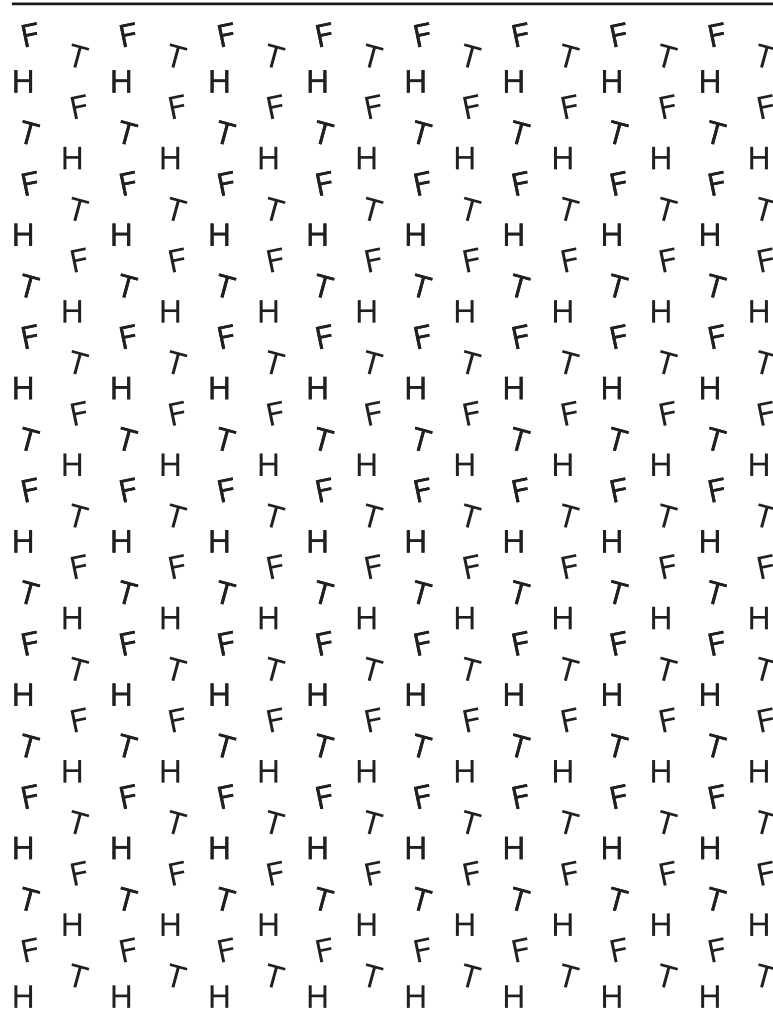
There is strong evidence that DHIs incorporating **education, communication with a specialist**, and intervention components from BCTTv1 clusters (1) **goals and planning** and (2) **feedback and monitoring** are associated with greater effectiveness. There was either no or inadequate evidence for effective BCTs in DHIs targeting cancer and asthma self-management. Reviews of nutritional and medication adherence interventions was unable to establish any association between specific BCTs and intervention effectiveness.

## 4 Conclusions

- There is convincing evidence to support the promotion of DHIs for the prevention and management of NCDs.
- Common BCTs across health domains, such as 'goals and planning', increase DHI effectiveness and should be prioritized for inclusion within future interventions.
- These findings are critical for future development and upscaling of DHIs and will help to establish best practice guidelines.

## 5 References

1. GBD 2017 Causes of Death Collaborators. The Lancet. 2018;392(10159):1736-1788
2. Michie S, Richardson M, Johnston M, et al. Ann Behav Med. 2013;46(1):81-95



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