BCD Cards: A Tool for Designing Theory-based Behavior Change Technologies

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Abstract. There is a wealth of theoretical knowledge around behavior change theories and strategies. However, due to the lack of accessibility of that knowledge to designers, designing theory-based behavior change technological interventions can be challenging. Card-based design tools can make academic knowledge accessible to designers, providing a structured and creative design process. In this study, we present the Behavior Change Design Cards (BCD Cards) - a card deck developed from two behavior change theoretical models, the Transtheoretical Model of Behavior Change and a Taxonomy of 93 Behavior Change Techniques. Through an empirical study, we aim at evaluating the impact of the tool on designers' creativity, their capacity to create theoretically-grounded designs, as well as the perceived usefulness and ease of use of the BCD cards as a supporting tool in the design of behavior change technologies.

Keywords: Behavior Change, Behavior Change Technologies, Design Cards, Design Tools.

1 Introduction

Applying behavior change theory on design practice can be challenging due to the vast amount of theories, models, and techniques. HCI researchers and designers increasingly engage in the design of technological interventions for behavior change; however, recent studies have revealed that only a limited number of behavior change technologies have used theory in their design process, have implemented behavior change techniques and undergone scientific research [1,2]. Thus a question arises: How can designers gain access to behavior change literature and therefore design theory-based technological interventions?

Design cards have been a popular design tool, supporting the translation of research findings from one discipline into another [7] through a simple and easy way. It has been argued that they can make the design process visible and less abstract, communicate knowledge between the members of a group and increase creativity and idea generation [3].

The goal of this work-in-progress is the development of a card deck named as Behavior Change Design Cards (BCD Cards) based on two behavior change theoretical

models, the Transtheoretical Model of Behavior Change (TTM) [4] and a Taxonomy of 93 Behavior Change Techniques (BCTs) [5] with the aim to teach designers the appropriate knowledge when it comes to designing behavior change technologies.

2 Background

According to the Transtheoretical Model (TTM), an individual moves through a series of stages and processes when modifying a behavior. The core of the model consists of five stages of behavior change: pre-contemplation, contemplation, preparation, action, and maintenance [4]. One can think of the five stages either as different times in the process, either as actions that a person takes or is willing to take at each stage; relapses to previous stages are possible to happen anytime.

An assumption of the TTM is that individuals can apply a set of processes of a specific behavior. Cognitive, affective and evaluative processes are more used in the early stages, while commitments, conditioning, contingencies, environmental controls and support for achieving maintenance, are more used in the later stages. For the BCD cards development, we focus on three out of ten processes of change that *involve the acquisition of new information and insights of the sort that might be obtained through Personal Informatics (PI)* [6]: consciousness raising, outcome expectancies and self-monitoring and contingency management; and the self-efficacy construct of the theory (i.e. the situation-specific confidence that the individual can cope with challenging situations).

Recent work by Michie et. al [5] has synthesized existing behavior change techniques into a hierarchically, cross-domain, organized taxonomy based on an international consensus process. The Behavior Change Techniques (BCTs) Taxonomy consists of 93 behavior change techniques, clustered in 16 categories, which can be used in multiple behavioral interventions.

Both, the TTM and the BCTs have been expanded, validated, applied and challenged by researchers all over the world and are considered of the most potentially useful models applied in multiple health risk behavior interventions.

3 Designing the BCD cards

From the 93 BCTs, we chose and combined into 23 groups those that are easy to implement in technological interventions; each group represents a technique card of the BCD deck (see Figure 1). Then, each of those 23 techniques was classified into the five stages of behavior change (see Table 1).

The BCD cards consist of 31 two-sided cardboard cards in total; including, among others, five *stages cards* describing the different stages of behavior change and 23 *techniques cards* describing each of the behavior change techniques. The cards contain definitions, possible design directions, hints, questions, and pictured examples for supporting the design process (see Figure 2 for an example).
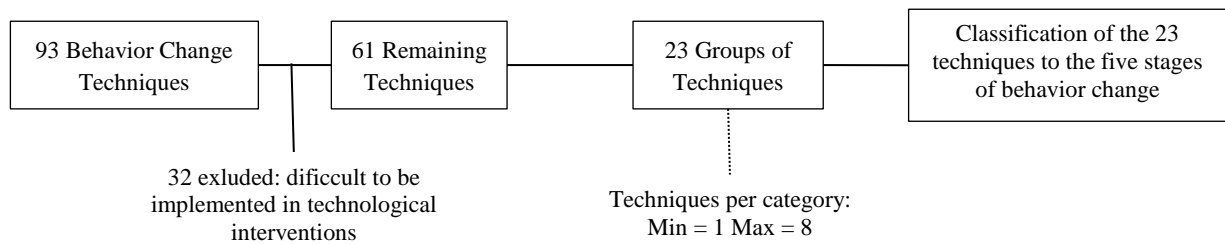
Fig. 1. The BCTs selection procedure

Table 1. Ten out of 23 BCTs classified to the five stages of the TTM.

TTM / BCTs	Pre-contemplation	Contemplation	Preparation	Action	Maintenance
Goal Setting			■	■	■
Problem Solving			■	■	■
Action Planning			■	■	
Review Goals				■	■
Commitment			■	■	■
Feedback on behavior				■	■
Self-monitoring				■	■
Social support				■	■
Information about consequences	■	■			
Prompts/ Cues				■	

Through an empirical study, we aim at evaluating the impact of the tool on designers' creativity, their capacity to create theoretically-grounded designs, as well as the perceived usefulness and ease of use of the BCD cards as a supporting tool in the design of behavior change technologies.

Fig. 2. Two sides of a *Stage card* (Top), Two sides of a *Technique Card* (Bottom)

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