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ARTICLE

Sustainable Change Sequence: a framework for developing behavior change interventions for patients with long-term conditions

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Abstract

Objective: Interactive interventions are increasingly advocated to support behavior change for patients who have long-term conditions. Such interventions are most likely to achieve behavior change when they are based on appropriate theoretical frameworks. Developers of interventions are faced with a diverse set of behavioral theories that do not specifically address intervention development. The aim of our work was to develop a framework to guide the developers of interactive healthcare interventions that was derived from relevant theory and which guided developers towards appropriate behavior change techniques within a person-centered approach.

Methods: We reviewed theories that inform behavior change interventions, where relevant to the management of long-term conditions. Theoretical constructs and behavior change techniques were grouped according to similarity in aims.

Results: We developed a logic model that operationalizes behavior change theories and techniques into 5 steps likely to lead to sustained behavior change. The steps are: 1) create awareness of need; 2) facilitate learning; 3) enhance motivation; 4) prompt behaviour change & 5) ensure sustainability of behaviour change.

Conclusion and practice implications: A framework that sequences behavioural change techniques along a sustainability model provides a practical template for the developers of interactive healthcare applications and interventions and can be integrally applied within individualized care strategies.

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Introduction

Individuals with long-term conditions are encouraged to self-manage their conditions [1]. However, the knowledge base and skills required for optimal self-management often require lifestyle modifications that almost always demand multiple and therefore difficult changes in behavior. To meet this challenge, an increasing number of interactive self-management interventions or applications are being developed [2,3]. Despite guidance that these interventions should be based on sound theoretical frameworks, intervention developers are challenged by the large number of behavioural theories that have been proposed, not knowing where to begin, or which theory best fits their needs [4-6]. The goal of this article is to propose a logic model, based on the main relevant theories of behavioural change that provides a practical way forward for developers who are keen to follow best practice, but who are not necessarily able to keep easily abreast of theoretical developments.

Interventions that draw on behavior change theory are hypothesized to be more effective because they target causal determinants of behavior and are more likely to facilitate an understanding of what works across different contexts and populations, for example, UK Medical

Research Council guidance [5]. The typical intervention provided to patients with long-term conditions targets single behaviors rather than the multiple behavioral changes often needed. These interventions rely on the assumption that people will also sustain multiple behavioral changes to lifestyle, as well as also monitoring symptoms and adapting treatment regimens. In reality, changes to behavior occur gradually, ahead of becoming habitual, often requiring ongoing support and where relapses are common [7,8]. Self-management interventions require integration into the wider family and / or health system to enable effective use [9]. The use of interactive healthcare applications, for example, has increasingly been seen as a means for delivering these interventions, where information technology is harnessed to teach and guide patient behavior [2,3]. Yet, despite the potential of these technologies, existing behavioral theory is seldom employed to develop these interventions [10,11].

The goal of many self-management interventions for patients with long-term conditions is to reduce the risk of preventable exacerbations. These interventions also attempt to reduce the risk of future complications - for example, by promoting sugar and blood pressure control in diabetes [10]. Patients are often asked to monitor a prognostic indicator, for example, blood glucose levels. This commonly takes the form of a goal to keep indicators under a risk threshold. There is no clear evidence that self-management interventions are effective in meeting the behavior challenges faced by patients with long-term conditions [1]. The degree to which self-management interventions have been successful at either individual level, or can be successfully integrated into wider support systems, is also unclear [12]. Cochrane reviews evaluating self-management interventions for long-term conditions such as asthma, chronic obstructive pulmonary disease and diabetes, suggest most have produced only small changes of limited clinical benefit. Their content has been mainly focused on knowledge acquisition about common symptoms and techniques for managing physical exacerbations [13-15]. Few studies included specific goal setting, external checking of goals or integration into healthcare systems [16]. Furthermore, many trials focused on 'proxy' outcomes, which may not accurately reflect actual changes in behavior. For instance, self-management interventions have been associated with a small reduction in symptoms (e.g., reduction in dyspnoea; weighted mean difference -0.53; 95% CI -0.96 to -0.10) and in hospital admissions (e.g., number needed to treat of 24; 95% CI 16 to 80) in individuals with chronic obstructive pulmonary disease [14]. However, most of these interventions did not review adherence to behavioral goals necessary to achieve these outcomes (e.g., attendance at exercise sessions) and few followed up patients for more than 18 months. Patients may fail to incorporate them into their lives [17].

The gap between the hope that that self-management will deliver behavior change and the actual attainment of patient goals may be due, in part at least, to a lack of guidance on how to develop interventions that recognize the complex sequence of moving from an awareness of the need to change, to the final steps of integrating behavior change into individualized routines that become an automatic part of the daily habits of the patient.

Method

We developed a logic model to structure the development of behavior change interventions [18]. The logic model was informed by a review of behavior change interventions targeted at 4 long-term conditions (type 2 diabetes, asthma, COPD and heart disease) [19]. Social Cognitive Theory [20], the Transtheoretical Model [21] and Self-Regulation Theory [22] were among the most commonly cited theories used in the development and content of interventions. We then categorized the constructs from these theories that influence behavior change and that predict behavior change. Drawing on our reading of the literature and experience of behavior change techniques and interventions [23,24], we identified gaps in the use of these constructs [19]. We observed that few interventions attempted to enhance *motivation*, bring about self-management or had a plan to *sustain* behavior change.
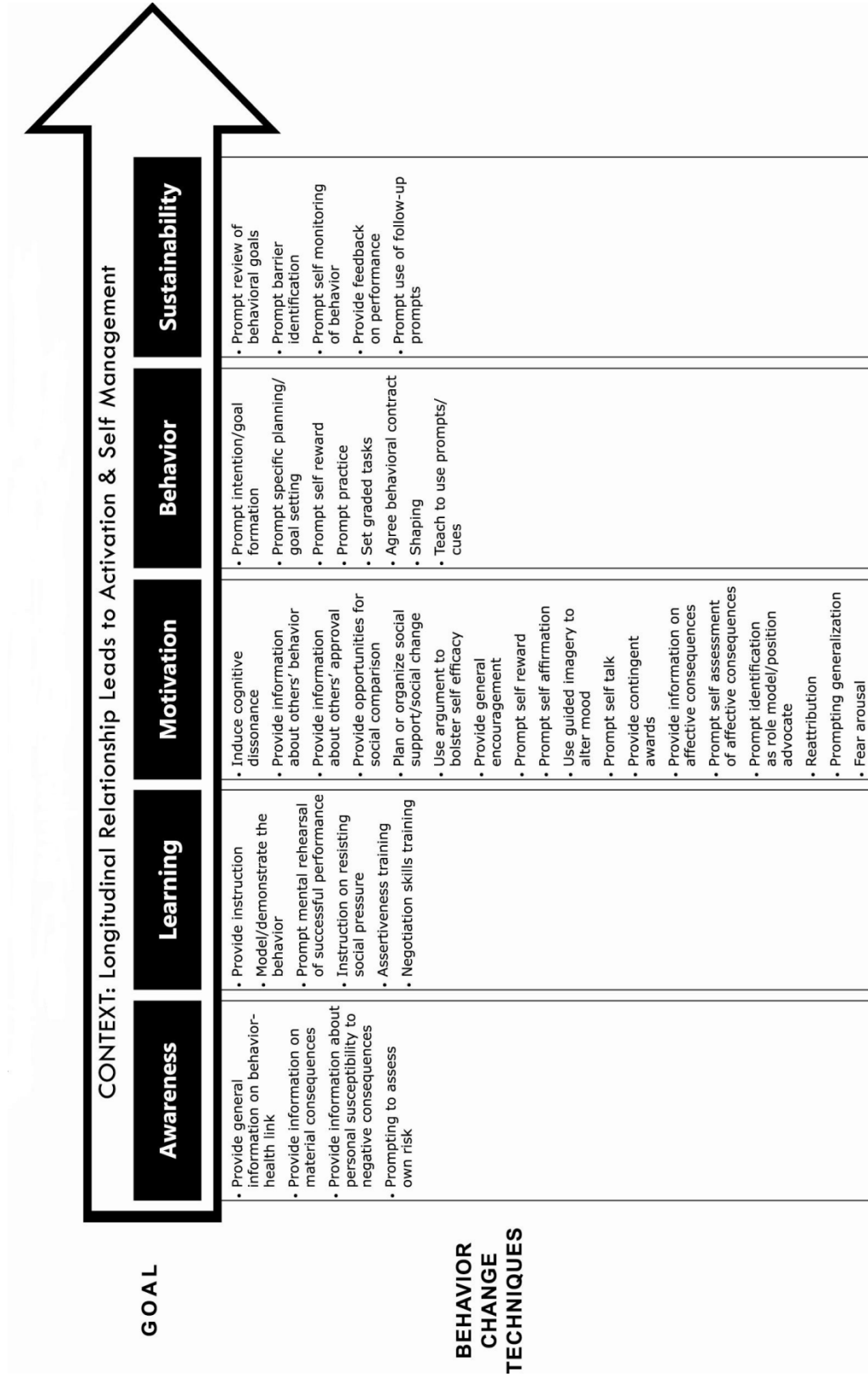
Results

The logic model operationalizes behavior change theories into 5 steps that are the most likely to lead to sustained behavior change. The model is designed to act as a guide to intervention developers, to help them identify appropriate content by mapping the behavior change techniques identified in Abraham and Michie's taxonomy [25] against successive steps. If developers notice gaps in intervention content, they should consider which behavior change techniques might best support patients to achieve each step towards attaining *sustained* changes in behavior.

Figure 1 shows the 5 distinct steps to achieve sustained behaviour change: (1) Awareness - raising the individuals awareness of the link between specific behaviour and risk, for example, high blood pressure and sugar levels in individuals who have diabetes; (2) Learning - providing information to the individual on how they could and why they should change their behaviour to reduce risk levels of future illness; (3) Motivation - motivating and encouraging the individual to change their behaviour in the required direction; (4) Behaviour - supporting the individual in undertaking the specific behaviour change & (5) Sustainability - ensuring that the behaviour change is sustained over the long-term and after the initial intervention to induce behaviour change has ended.

The behavior change techniques listed are not exhaustive. We suggest that intervention developers identify where intervention content might be required to support patients; for example, how best to generate motivation after learning about the relevance of a change in behavior, or how to sustain a behavior after having being motivated to initiate it.

By separating behaviour change into distinct steps the model explicitly acknowledges that people with long-term

Figure 1 Sustainable Change Sequence: a logic model for developing self-management support interventions

GOAL

CONTEXT: Longitudinal Relationship Leads to Activation & Self Management

BEHAVIOR CHANGE TECHNIQUES

Awareness	Learning	Motivation	Behavior	Sustainability
• Provide general information on behavior-health link • Provide information on material consequences • Provide information about personal susceptibility to negative consequences • Prompting to assess own risk	• Provide instruction • Model/demonstrate the behavior • Prompt mental rehearsal of successful performance • Instruction on resisting social pressure • Assertiveness training • Negotiation skills training	• Induce cognitive dissonance • Provide information about others' behavior • Provide information about others' approval • Provide opportunities for social comparison • Plan or organize social support/social change • Use argument to bolster self efficacy • Provide general encouragement • Prompt self reward • Prompt self affirmation • Use guided imagery to alter mood • Prompt self talk • Provide contingent awards • Provide information on affective consequences • Prompt self assessment of affective consequences • Prompt identification as role model/position advocate • Reattribution • Prompting generalization • Fear arousal	• Prompt intention/goal formation • Prompt specific planning/goal setting • Prompt self reward • Prompt practice • Set graded tasks • Agree behavioral contract • Shaping • Teach to use prompts/cues	• Prompt review of behavioral goals • Prompt barrier identification • Prompt self monitoring of behavior • Provide feedback on performance • Prompt use of follow-up prompts

illnesses are at different stages in their behaviour change journey. For example, moving from awareness to sustained behaviour change may be inappropriate for an individual recently diagnosed with type 2 diabetes. The gap between knowing *why* something is important (awareness) is a critical initial step and one that is often overlooked. The gap between *knowing what to do* and *doing it regularly* (behaviour change) is difficult for many people to navigate, often because they have a low motivation, or unresolved ambivalence about the urgency of making changes when faced with other priorities. In this situation, an intervention comprising of behavior change techniques to enhance motivation and prompt and sustain behaviour change may be more appropriate than one focusing on creating awareness of the link between protective behaviours and good health. Likewise, an individual who has successfully changed behaviour in the short term (e.g., losing weight) may need support in the long-term to sustain this change and may benefit from intervention content to maintain change (e.g., re-setting goals or relapse prevention).

This logic model is distinct from the approach proposed in the Transtheoretical Model [21]. The Transtheoretical Model seeks to *explain* the process of behaviour change by proposing that individuals move from pre-contemplation to action, by progression through a series of stages [21]. The logic model we propose does not have the same ambition. Rather, the goal is to act as a framework for intervention developers, so that they can assess whether their efforts would help individuals understand the need for change and then act to support the process of learning, acting and sustaining change. The critical difference is that the model illustrates where behaviour change techniques could be used in sequence to enhance the chances of success and which techniques that can be applied, adapted and revisited according to an individual's personal circumstances.

Although most self-management interventions will have content that will aim to increase awareness, increase learning and promote motivation, few interventions include components to initiate and sustain changes in behaviour. We also note that relationships between patients and their providers will influence the success of these interventions. Encouragement by health professionals may well be critical in achieving the sustained change. While the goals of creating *awareness* and achieving *learning* can be delivered by standalone programs (e.g., those offered on DVD or websites), it is unlikely that these tools in isolation can successfully attain motivation and sustained behaviour change [26,27].

Discussion and Conclusion

The logic model offers a pragmatic method of identifying the required components of an intervention to produce long-term self-management: it operationalizes behavior change theories into concrete steps into which well-described behavior change techniques fit and have the best chance of success. In order to help individual patients to

self-manage long-term conditions, interventions need to be organized according to a model that explicitly addresses the need to provide a sequence of behavior change techniques and which does so within a person-centered, relationship based context. Organizations that develop behavior change interventions are adopting this logic model to evaluate and enhance their tools [28,29].

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