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Using theory to develop and test interventions to promote changes in health behaviour: Evidence, issues, and recommendations

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Abstract

Using theory to develop health behaviour interventions provides a useful framework to accumulate evidence and has been associated with larger changes in health behaviour. The present review suggests, however, that the evidence that using theory in this way produces greater health behaviour change is mixed. Furthermore, evaluating such evidence is difficult because: (i) a significant proportion of interventions are not based on theory; (ii) those that are, tend not to apply the theory extensively; (iii) theory-based and comparison groups can be confounded; and (iv) interventions may be based on multiple theories. Such difficulties delay theory evolution and the development of interventions that are capable of achieving significant and sustained changes in health behaviours. Recommendations are made to address these issues.

Introduction

Numerous theories have been applied to health behaviours[1-3]. Theory provides a framework within which to test hypotheses and accumulate evidence, identifies constructs that influence behaviour, and suggests which techniques should be incorporated in behavioural interventions. Theory, therefore, can inform the development of interventions designed to change health-related behaviours like physical activity and healthy eating. In return, the interventions can test and refine the underlying theory, illustrating the reciprocal relationship between theory and interventions. The present review will consider the evidence regarding the effect of using theory on the efficacy of interventions designed to change health behaviour, as well as the associated issues, and recommend possible solutions.

Main text

Several reviews suggest that using theory as a basis for developing interventions generates larger changes in health behaviour than interventions that do not use theory[4-6]. However, other reviews have provided equivocal support[7-13], although some of these reviews were based on relatively few studies. More worryingly, some reviews suggest that theory-based interventions are less effective than interventions that are not reliant on theory[14-16]. Several issues (see Figure 1) could explain the mixed effects of theory on health behaviour change. These issues can, however, be addressed through various solutions that can influence intervention effects directly or indirectly via the development of more appropriate theories to inform health behaviour change interventions.

Issue 1: Little use of theory or poor reporting of theory

Reviews[13,17] have implied that a relatively high proportion of interventions appear not to use theory at all. Formal tests of this idea suggest that between 36%[18] and 89%[19] of health

interventions are not explicitly based on theory. Moreover, even when interventions are explicitly based on theory they often do not apply it extensively[4,9,13,18,20,21]. For example, in a review of studies focusing on physical activity and diet, Prestwich et al. [13] found that 90% of studies reporting a 'theory-based' intervention did not identify the theoretical construct(s) that was targeted by each of the behaviour change techniques (BCTs) incorporated within the intervention. It was not always clear, therefore, why some BCTs were incorporated within the intervention (see also Mama et al. [18]). Indeed, others have noted that 'theory-based' interventions often employ techniques that are not consistent with the underlying theory[22]. Many studies in Prestwich et al.'s [13] review also failed to explicitly target all of the relevant theoretical constructs specified within a theory with a specific BCT. Therefore, only parts of the theory may have been tested rather than the theory as a whole (see also Avery et al.[4]; Gourlan et al. [23]). These issues could reflect little actual use of theory and/or poor reporting[24,25] (see also Abraham, Johnson, de Bruin, & Luszczynska[26], for associated criticisms), but either way serve to delay the refinement of theory (see issue 6).

Guidelines for the transparent reporting of the use (or non-use) of theory are needed so that it is easier to understand the implications of the effects (or lack thereof) of interventions for theory. Such guidelines also have the potential to increase the extent to which theory is used, because they draw attention to the importance of theory. Michie and Prestwich's[27] 19-item Theory Coding Scheme (TCS) may provide a useful basis for such an initiative. The TCS measures various features of theory use (e.g., which theoretical constructs were targeted by which specific BCTs; whether tailoring was delivered on the basis of theory; whether the intervention effects were mediated by theoretical constructs). Because reporting of the materials delivered to control groups is often sparse[26,28] , and differences between the

intervention and control groups should influence efficacy, the use of theory in the development of the materials delivered to the control group should also be clearly reported.

Issue 2: Blunt comparisons

Several reviews considering the effect of the use of theory on changes in health behaviour fail to consider how theory has informed the intervention. Instead, these reviews simply compare effect sizes between studies that explicitly report the theoretical basis for an intervention versus studies that do not[5,29]. However, it is possible that studies purporting to base an intervention on a specific theory fail to do so fully (see issue 1) and thus conclusions regarding the impact of theory on the effectiveness of interventions are limited. Studies are needed that directly compare the effectiveness of interventions that differ in their use of theory (either in the nature of the theoretical basis, use or non-use of theory, and so on). Experimental tests comparing theory-based interventions (e.g., based on theory X vs. based on theory X + an extra construct vs. based only on the extra construct vs. control) could provide strong tests of theory and a firmer basis for their refinement[30]. More novel methodological approaches may be required too. For example, evidence attests to non-linear, dynamic shifts in health behaviours that reflect sudden, unexpected changes in the uptake or stopping of health behaviours[31]. These dynamic shifts might be captured by simulation approaches[32], and/or frequent measurement of constructs and behaviour (beyond simple pre-post designs).

Issue 3: Potential confounds

Researchers who report using theory to develop and test their interventions may be more inclined to adopt stringent methodological procedures than those using atheoretical interventions, thereby confounding the comparison. For example, Diep et al.[10] found that,

after controlling for study quality, a weak effect of interventions on vegetable intake remained (initially theory-based interventions $g_+ = 0.18$ vs. non theory-based $g_+ = 0.14$) while effects on fruit only and combined fruit and vegetable intake disappeared. Primary and secondary research should, therefore, employ strict methodological and statistical controls to account for potential confounds.

Issue 4: Combining theories

Given that using theory can render interventions more effective, it might be expected that drawing on multiple theories would lead to larger effects than drawing on a single theory. However, Diep et al.[10] reported that the number of theories applied by a given intervention was unrelated to the effects of interventions on fruit and vegetable intake. Furthermore, there is some evidence that combining theories may actually reduce effect sizes relative to interventions based on single theories[13,23]. As noted by Gourlan et al.[23], many authors using interventions based on combinations of theories do not provide a rationale for their integration. Piecing theories together in this way could render the intervention atheoretical and without an evidence-base[33]. More careful integration of theories is, therefore, required if new theories are to emerge that are better than the sum of their parts[34-36].

Issue 5: Selecting appropriate theories for interventions

Certain theories have received extensive correlational support illustrating their ability to predict behaviour but experimental support has been more limited[37]. Several reviews suggest that interventions based on Social Cognitive Theory (SCT[38]), the Health Belief Model[39], Theory of Planned Behaviour[40] or Protection Motivation Theory[41] can achieve small to moderate effects on health behaviours, but there is limited evidence that these changes are explained by changes in the relevant theoretical constructs[42-45]. Other reviews

of experimental evidence[13,46] show limited support for SCT or for the Transtheoretical Model[47]. In addition, most popular theories (SCT, being a notable exception) do not specify how to change constructs to facilitate behaviour change[48]. Consequently, theories that are often used to inform interventions may not be particularly suitable for this purpose.

Several steps could be taken to develop more effective theories for promoting health behaviour change. First, theories should identify evidence-based means to change the putative determinants of behaviour. Systematic reviews of techniques designed to change key determinants including self-efficacy[49] and perceived susceptibility and worry[16] can help to address this issue. Second, more rigorous testing and reporting of theories is required (see also Issue 2). Reviews testing the efficacy of techniques designed to change behaviour, particularly combinations of techniques, could examine the effects of techniques aligned with a specific theory. For example, Michie, Abraham, Whittington, McAteer and Gupta[50] examined the efficacy of techniques derived from Control Theory[51] (Carver & Scheier, 1982); namely goal-setting, monitoring and feedback (see also Dusseldorp et al. [52]). Third, recent research has identified more novel, but promising determinants of health behaviour and its maintenance including implicit processes[53,54], affect[55-57], habit[58,59], justifications or self-licensing[60,61] and compensatory beliefs[62]. Further research is required to integrate these ideas within existing theories or to establish these as important theories in their own right. Fourth, theories should consider influences on behaviour beyond those at the level of the individual including dyadic or interpersonal factors such as social support[63]. Fifth, while there is often tension between the generalisability and utility of a theory, a focus on utility should lead to larger changes in health behaviour. To achieve this, a movement towards theories that focus on specific behaviours or clusters of behaviour[64] may be useful[65,66].

Issue 6: Reluctance to change theories

Many theories have remained popular despite little experimental support[36,37,48,67]. One reason is that when studies provide evidence against a theory, authors are often reluctant to suggest refining the theory[4,13] (but see Kok & Ruiter[68]). Such reluctance is likely to slow down the development of interventions capable of achieving significant, sustained health behaviour change. Paying attention to successful and unsuccessful replication attempts[69] and the adoption of a system to monitor and act on the accumulated evidence is needed[65]. This system would not discard a theory in the light of a disconfirming test but would be open to changing the theory when the evidence against it is overwhelming. As there is evidence that interventions often do not apply theory extensively[13,18], such a system should also carefully monitor how theory was applied.

Conclusions

The evidence regarding the association between the use of theory to develop interventions and the resultant change in health behaviour is mixed. Complications include a significant proportion of interventions not extensively applying theory, risk of confounds, and theories being integrated ineffectively. Well designed experimental tests of theory, aided by widely adopted guidelines for reporting the use (and non-use) of theory in developing interventions, are needed. Careful monitoring of the evidence generated by these tests should help to refine existing theory in order to achieve more significant and sustained changes in health behaviours.

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