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Facilitating progress in health behaviour theory development and modification: the reasoned action approach as a case study

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This paper explores the question: *what are barriers to health behaviour theory development and modification, and what potential solutions can be proposed?* Using the reasoned action approach (RAA) as a case study, four areas of theory development were examined: (1) the theoretical domain of a theory; (2) tension between generalisability and utility, (3) criteria for adding/removing variables in a theory, and (4) organisational tracking of theoretical developments and formal changes to theory. Based on a discussion of these four issues, recommendations for theory development are presented, including: (1) the theoretical domain for theories such as RAA should be clarified; (2) when there is tension between generalisability and utility, utility should be given preference given the applied nature of the health behaviour field; (3) variables should be formally removed/amended/added to a theory based on their performance across multiple studies and (4) organisations and researchers with a stake in particular health areas may be best suited for tracking the literature on behaviour-specific theories and making refinements to theory, based on a consensus approach. Overall, enhancing research in this area can provide important insights for more accurately understanding health behaviours and thus producing work that leads to more effective health behaviour change interventions.

Keywords: health behaviour theory; theory development; theory of reasoned action

Over the last four decades, researchers have developed a number of individual-level health behaviour theories (HBT) to understand and predict health behaviours. Reviews suggest that the most frequently used theories in the field are the transtheoretical model (TTM) and stages of change, social cognitive theory (SCT), the health belief model (HBM), the theory of reasoned action (TRA), and the theory of planned behaviour (TPB) (Glanz & Bishop, 2010; Painter, Borba, Hynes, Mays, & Glanz, 2008). The latter two HBTs stem from what has recently been labelled the reasoned action approach (RAA); this approach includes the TRA, TPB and the most recent development in this line of research, the integrated behavioural model (IBM; Fishbein & Ajzen, 2010). In addition to the TTM, SCT and HBM, these theories that make up the RAA have been widely used for the

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purposes of explaining and predicting a variety of health behaviours (Albarracín, Johnson, Fishbein, & Muellerleile, 2001; Blue, 1995; Montaña, Selby, Somkin, Bhat, & Nadel, 2004). Additionally, all the theories mentioned above have been broadly applied to design health behaviour change interventions (Glanz, Rimer, & Viswanath, 2008), including the RAA theories (Fishbein, 2000; Hardeman et al., 2002).

Despite the widespread use of HBTs contained in and beyond the RAA, researchers are beginning to raise concerns about the trajectory of theory development in the health behaviour field. In discussing the role of HBTs and cumulative knowledge, Noar and Zimmerman (2005) argued that '[just] because we are conducting more research on health behaviors does not necessarily mean that we are adding substantive cumulative knowledge to this area of research' (p. 275). This is especially concerning for those who apply this knowledge to the practice of health programme development; Crosby and Noar (2010) assert that 'unfortunately, theory development has not proceeded at a pace commensurate with the evolution of health promotion practice' (p. 259). Related to this, Rothman (2004) observes that 'although theories may fluctuate in their popularity, their properties have remained strikingly static over time' (para. 4). He makes the critical point that theory should be 'treated as a dynamic entity whose value depends on it being not only applied and tested rigorously, but also refined based on the findings afforded by those tests' (para. 4). Indeed, a critical aspect of theory testing is that theories are proposed, empirically tested and then modified based upon the findings of those empirical tests (Crosby, Kegler, & DiClemente, 2002). However, whether or not researchers are actually modifying the theories is contestable. Simply because a theory is testable does not necessarily mean that researchers are putting the said theory to the test. van Ryn and Heaney (1992) note that 'the testable nature of theory gives it a practical advantage over personal belief systems or common sense' (p. 319). But this advantage only holds if researchers are critically testing and concurrently modifying theory.

In an examination of this and other issues, Ogden (2003) conducted a systematic review of theoretical tests of HBTs. She found that:

...the majority of studies reported results that were not consistent with the predicted associations between constructs and left much of the variance in the outcome variable unexplained. However, *rather than using the data to challenge the models*, a range of explanations were offered relating to the wording used, the population studied, the behavior of concern, or the need for additional variables. All data are used to support the models, *but it is not clear what data would enable the models to be rejected*. (p. 426, emphasis added)

Thus, this review suggested that researchers are *not* using their data to challenge existing theory or to critically inform theory development.

In the current article, we explore in some detail one particular line of research – the RAA – as a case study that may help advance an understanding of why HBTs have been relatively static over time. In doing so, we raise and discuss several significant issues or barriers that are essential to HBT development and modification, and we ultimately make recommendations for how to move forward in this important area of inquiry.

Health Behaviour Theory and the Reasoned Action Approach

To ask and potentially answer questions about theory testing and development, we must first define what a theory is. A broad definition of theory is given by Kerlinger and Lee (1999): ‘a theory is a set of interrelated (concepts), definitions, and propositions that present a systematic view of phenomena by specifying relations among variables, with the purpose of explaining and predicting phenomena’ (p. 11). Hochbaum, Sorenson, and Lorig (1992) define HBTs specifically as ‘tools to help health educators better understand what influences health-relevant individual, group, and institutional behaviors and to thereupon plan effective interventions directed at health-beneficial results’ (p. 298). In addition, DiClemente, Crosby, and Kegler (2009) suggest that HBTs should ‘provide a conceptual framework for selecting key constructs hypothesized to influence health behavior and, as such, provide a foundation for empirical investigations, intervention development, implementation, and evaluation’ (p. 11). It is also important to note that there is a distinction between two general types of HBTs: stage models and continuum models. Stage models, like the TTM, identify processes of change and identifiable stages that individuals may progress through during the health behaviour change process. Alternatively, continuum models consider a number of predictors and their relationship to one another that ‘reflects the likelihood of action’; the RAA is of this type (Schwarzer, 2008, p. 3) (also see Weinstein, Rothman, & Sutton, 1998).

The RAA is an approach that extends beyond just the health arena, but as will be demonstrated in the current article, it has been heavily applied in health and, therefore, is one of the major HBTs (Glanz et al., 2008; Noar & Zimmerman, 2005). Indeed, the RAA approach is best understood as a line of research with four chronological phases (see Figure 1 for the RAA with shading to illustrate the different theories that make up this approach). In the first phase, Fishbein and Ajzen developed the TRA, a development that can be traced back to 1967 (Fishbein, 1967). The TRA posits that in addition to a host of indirect influences (e.g., demographic variables, norms and personality traits), attitudes towards the behaviour and subjective norms concerning the behaviour are direct antecedents to behavioural intention. Behavioural intention is then posited as most the direct antecedent to behaviour (Fishbein & Ajzen, 1975; Montaña & Kasprzyk, 2008). Across a number of behaviours, the TRA has been shown to have relatively strong predictive utility. In a meta-analysis of 87 studies, Sheppard, Hartwick, and Warshaw (1988) found an average correlation for the intention-behaviour relationship to be 0.53; the average relationship between attitude/subjective norm-intention was 0.66. Despite its strong performance, Ajzen believed the TRA was deficient in one significant way: it was insufficient in explaining behaviours that were not under volitional control (Ajzen, 1991). Subsequently, Ajzen developed the TPB by including the concept of perceived behavioural control in the model.

The addition of perceived behaviour control, which can be described as phase two in the RAA line of research, required two considerations for how it fit into the previously established TRA. First, Ajzen and Madden (1986) note that in part, ‘the effect of perceived behavioral control on behavior is *completely* mediated by intention’ (p. 458). In addition, they posited that ‘perceived behavioral control can help predict goal attainment independent of behavioral intention to the extent that it reflects actual control with degree of accuracy’ (pp. 458–459). The revised model,

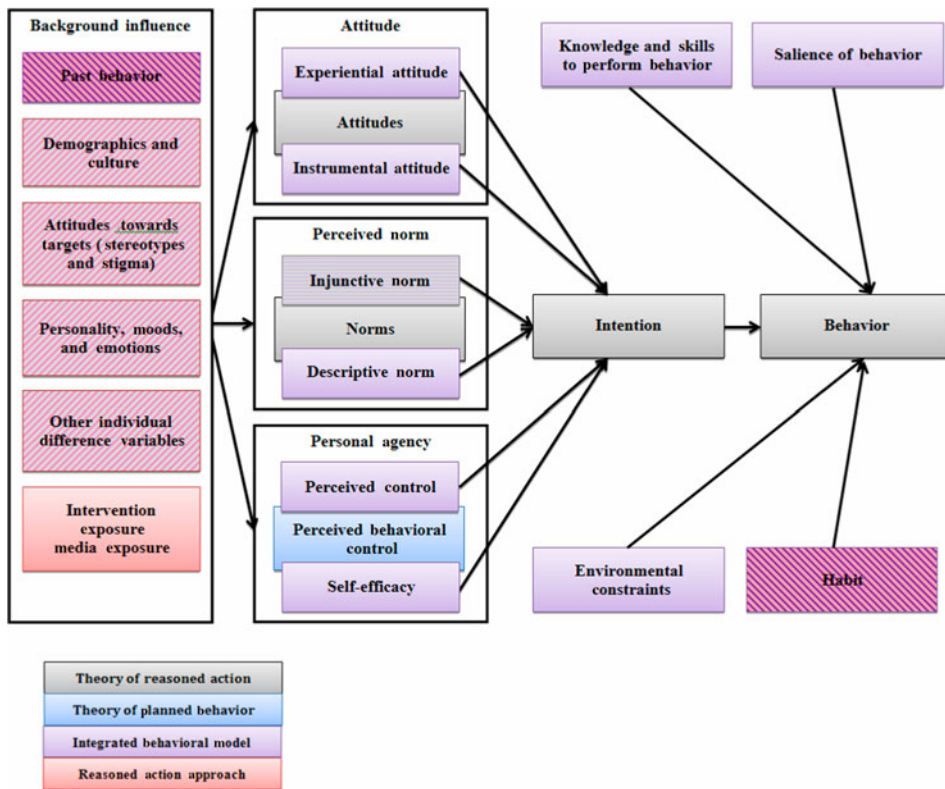


Figure 1. Reasoned action approach theories.

Note: Figure 1 uses colours to illustrate the development of theories within the RAA. *Attitude*, *Norms*, *Intention* and *Behaviour* are shaded grey but are present in all four models. The versions of each theory in this figure come from the best representations of the original theory, as found in following sources: TRA (Ajzen & Fishbein, 1980), TPB (Ajzen & Madden, 1986), IBM (Montaño & Kasprzyk, 2008), and RAA (Fishbein, 2008).

which included perceived behavioural control, was named the TPB. Ajzen (1991) claims the TPB ‘provides a useful conceptual framework for dealing with the complexities of human social behavior’, especially for instances in which a person feels they do not have complete volitional control over performing the behaviour (p. 206).

The third phase occurred in 1991 when a group of theorists (Albert Bandura, Marshall Becker, Martin Fishbein, Frederick Kanfer, and Harry Triandis) convened for a workshop sponsored by the National Institute of Mental Health (NIMH); the group was charged with developing a unified model of behaviour. The ultimate result of the workshop was the development of the IBM, which derives its main components from overlapping constructs in five health behaviour change theories, including TRA, TPB, SCT, HBM and the theory of interpersonal behaviour (Fishbein, 2000, 2009; Fishbein et al., 1992; Montaño & Kasprzyk, 2008). This model and similar versions of this model have proven useful in understanding and predicting both HIV prevention behaviours and cancer screening behaviours (Kasprzyk, Montaño, & Fishbein, 1998; Montaño, et al., 2004; Montaño,

Thompson, Taylor, & Mahloch, 1997; von Haeften, Fishbein, Kasprzyk, & Montano, 2001). Despite its promising utility, the IBM in its current form has not yet been employed extensively by researchers. This may be the result of inadequate exposure for the model; the workshop occurred in 1991 and while an NIMH report of the model appeared in 1992 (Fishbein et al., 1992), it wasn't until 1998 that a primary research article testing this model appeared in the mainstream research literature (Kasprzyk et al., 1998).

In the fourth phase of RAA, Fishbein and Ajzen began working together again. They note in their last book (Fishbein & Ajzen, 2010) that their career paths had diverged in the early 1980s, with Fishbein focusing on his work on HIV prevention using the TRA and Ajzen devoting his time to developing the TPB. However, after the NIMH theorists' workshop when Fishbein proposed the IBM, it did not go unnoticed that the IBM 'was almost identical to Ajzen's TPB...[but] incorporated Bandura's...notion of self-efficacy rather than Ajzen's more recent concept of perceived behavioral control' (p. 19). This led both men to realise that 'even though we were at that time working quite independently, we were moving in similar directions' and they began working together again in 2001 'when we began to reconcile the differences between our models' (pp. 19–20). This reconciliation and the broader programme of research that encompasses all of the theoretical variations of this approach has been labelled the RAA. In describing the approach, Fishbein (2008) states that 'what the reasoned action approach attempts to do is to identify a relatively small set of variables that can account for a substantial proportion of the variance in any given behavior;' these variables include 'intentions, attitude, perceived norms, self-efficacy or perceived behavioral control, behavioral beliefs (which are often referred to as cost-benefits or outcome expectancies), normative beliefs, and control beliefs' (pp. 834–835).

In sum, the RAA is essentially an approach that began with the TRA and is now composed of a number of similar theories which posit that variables such as attitudes, norms and perceived behavioural control are important predictors of behavioral intention and, ultimately, behaviour. A critical examination of the entire RAA, however, reveals that the approach has changed little since this line of research first began. First, the external variables or 'background influence' variables (see Figure 1) that are in many ways presented as 'new' in the IBM (Fishbein, 2009) were actually included in the TRA more than 30 years ago (see Ajzen & Fishbein, 1980, Figure 7.1, p. 84). This set of variables has thus long been hypothesised to affect behaviour indirectly through RAA variables (see Ajzen & Fishbein, 1980, pp. 82–90). Second, more fine-tuned understandings of some variables (e.g., norms – now represented as injunctive and descriptive norms, and attitudes – now represented as experiential and instrumental attitudes) have added value to the model, but these arguably do not represent significant theoretical modifications. Third, the addition of self-efficacy to the model, as indicated above, essentially parallels Ajzen and Madden's addition of perceived behavioural control to the TPB, which took place more than 25 years ago (Ajzen & Madden, 1986). It should be noted that other researchers had suggested adding self-efficacy to the TRA more than a decade before Fishbein formally added the variable to the model in the form of the IBM (see de Vries, Dijkstra, & Kuhlman, 1988). Also, as will be described below, several additional variables have been tested and shown empirical value but have not been added to the model. Fourth, interesting (and potentially important) feedback loops from attitude to beliefs and behaviour to

beliefs, evident in early TRA work (see Fishbein & Ajzen, 1975, pp. 15–16, Figures 1.1, 1.2), have apparently been dropped from newer scholarship. In this manner, one could argue that theories such as IBM are less complex and realistic than the earliest work with the TRA and have changed little for the better across several decades. Finally, if we consider the fact that other ‘new’ IBM variables such as environmental constraints and skills and abilities are listed as part of the IBM but only treated in a very cursory manner (see Fishbein, 2000, 2009), we are perhaps left wondering why so little has changed over four decades of research (i.e., the IBM of today looks quite similar to the original TRA of 1975). Scholars who conduct health behaviour change research should critically consider if HBTs like those in the RAA have been adequately tested and refined. If not, what is obstructing progress in theory development and how can we overcome barriers in the future?

Important theory development considerations

Theoretical domain

If we are to first consider why HBTs such as the RAA have not advanced more fully than they have, we must first address what we are trying to develop in the first place. That is, what is the purview of an HBT? As an example, if the point is to develop a theory that is focused only on beliefs and attitudes, then we should only consider those types of variables as possible additions to the RAA. If the point is to develop a more comprehensive theory of health behaviour, then we should consider a much broader possible set of influences for the theory.

Advocates of the RAA approach, such as Montaña and Kasprzyk (2008), state that the ‘TRA was developed to better understand relationships between attitudes, intentions and behaviors’ (p. 68). This suggests that the purview of the theory is relegated to the social psychological realm of attitudes and beliefs. Ajzen (1991) seems to take a broader view, stating that the TPB is ‘a theory designed to predict and explain human behavior’ (p. 181). While clearly the earliest work with the TRA was focused on attitudes and beliefs (Fishbein & Ajzen, 1975), Fishbein’s more recent IBM does include some variables that go beyond that realm (e.g., environmental constraints, skills and abilities). However, as indicated above, these variables seem to be added in a more cursory fashion and the focus appears to be the extent to which they constrain or advance the ability of attitudes and intention to affect behaviour (Fishbein & Ajzen, 2010). The point here is that HBT researchers should engage in a dialogue about what type of theory is most valuable to ‘build’. Without a roadmap that directs the path, we are sure to get lost along the way.

In addition, the purview of an HBT has to do with whether its ultimate goal is prediction, intervention or both. Writings on the RAA appear to suggest that this theoretical approach serves both purposes – behavioural prediction and intervention – with perhaps prediction being the primary goal and intervention being a secondary use (or application) of the theory (Fishbein, 2009). The requirements for such a theory are likely to be different than one being developed solely for prediction or intervention, and to date, the RAA may be more precise for the former than the latter. For example, Hardeman et al. (2002) examined how the TPB was applied in behaviour change interventions and unfortunately discovered that scholars were not clear in how they used – and tested – the TPB. First, they

found that the targeted components of the TPB were poorly identified or not identified at all, meaning it was difficult to assess how the TPB was actually used in the intervention. Second, despite finding positive changes in behavioural intention and behaviour in these studies, it was unclear how the TPB was used to design the interventions and, therefore, the findings could not be attributed to the TPB's role. They argue 'to allow judgment of the effectiveness of using the TPB to develop interventions . . . studies would need to apply the TPB more comprehensively and be more explicit about how it has been applied' (p. 148). They conclude that 'at present there thus is insufficient evidence to judge whether TPB components mediate changes in intention and behavior within evaluated interventions' (p. 149).

Related to this, a study conducted by Cooke and French (2008) examined the TRA and the TPB to predict intentions and attendance at screening programmes. They claim 'the TRA/TPB was an effective framework for predicting screening intentions and attendance. The next step is to perform experimental research that builds on these findings to improve screening attendance' (p. 763). Several scholars have recently advocated such an approach (Noar & Mehrotra, 2011; Sniehotta, 2009; Weinstein, 2007), as there is no guarantee that factors found to be associated with intentions and behaviours can be applied in interventions as causal factors that will result in behavioural changes. To date, however, the field has almost entirely operated under a survey research paradigm, using (mostly cross-sectional) survey research studies to test HBTs and then applying those HBTs as bases for health behaviour interventions. This reasoning essentially involves a leap of faith that those factors found to be associated with behaviours in tests of HBTs will act as causal mechanisms in the context of interventions. While the paradigm in this area may begin to shift towards more experimental research, currently most theory testing is conducted using survey research. Thus, the status quo is such that we have much more evidence that HBTs contain factors that are associated with and may predict behaviour and much less evidence that changes in those factors in the context of interventions will lead to health behaviour changes. While there is some support for the notion that theory-based interventions are more efficacious than those that lack a theoretical basis (Glanz & Bishop, 2010), the difficulties in separating out the contribution of theory to intervention efficacy, including the lack of mediation analyses in many published interventions, has left open questions about the precise role of theory in intervention efficacy (Noar & Mehrotra, 2011).

Tension between generalisability and utility

A key aspect of theory is that it is generalisable, or it is 'robust and therefore may be applicable across diverse venues, populations, and social environments' (DiClemente, Crosby, & Kegler, 2002, p. 3). Thus, if a theory performs similarly well across diverse behavioural areas, then this contributes to evidence of its generalisability. Another aspect of theory is that it must have utility, or the degree to which the theory is 'useful and helpful' in the field (Prochaska, Wright, & Velicer, 2008, p. 577). In many ways, these two dimensions could at times be in conflict with one another, particularly in the HBT area. As health behaviour change researchers, we should ask ourselves – is it better to have a broad theory that predicts across behaviours but is not very precise (in other words, one that is generalisable), or a more specific theory that predicts

more precisely (and has utility to practitioners/researchers) but has differences across behaviours or with regard to other factors?

When we examine the data in the HBT area, it is fairly clear that the relationship between theoretical constructs in the RAA varies depends on the behaviour studied. For example, Godin and Kok (1996) reviewed 56 health behaviour studies reporting 87 applications of the TPB and found that the average correlations between theoretical constructs in the TPB varied according to the health behaviour category. The average correlation between attitude and intention for addictive behaviours was $r = 0.53$, while the average correlation between attitude and intention for healthy eating was $r = 0.34$. Moreover, behaviour-specific reviews of TRA/TPB have often thoughtfully suggested adding variables to the theories that are specific to a particular domain (e.g., Sheeran, Abraham, & Orbell, 1999), but to our knowledge no formalised behaviour-specific TRA or TPB exists. The literature does suggest, however, that researchers should strongly consider having behaviour-specific versions of theories like the TPB in order to (1) better understand particular behaviours and (2) provide more relevant theoretical guidance for designing interventions for specific behaviours.

Moreover, it is apparent *in practice* that many researchers are already using the behaviour-specific (or utility) approach. Painter et al.'s (2008) examination of the use of HBTs found that researchers use theory along a continuum, from studies being merely informed by theory to the opposite end where theory is being built and created. Applying an entire theory for theory testing or intervention was found to rarely be the case. One category, testing theory, was used by only 7.2% of the studies examined and even then, a study only had to measure and explicitly test *half* of the theoretical constructs for the theory used. They concluded that to advance the use of theory in health behaviour research, 'theory should be used more thoroughly . . . this can be done by measuring and testing the full set of key constructs in a theory' (p. 362). Despite this call, it is more common for researchers to pick and choose theoretical and other constructs based upon what support is found in the empirical literature concerning the particular behaviour under study, rather than attempting to measure and test the entire theory (Glanz & Bishop, 2010).

Hochbaum et al. (1992) provide a good explanation for this phenomenon. They state that:

although *academics* may wish to test whether (or demonstrate that) some given theories contribute to a project's success and look for opportunities to do so, *practitioners* search for ways to assure success . . . [and] they must search for and utilise anything and everything that will help them plan and conduct programs to assure success. (pp. 303, emphasis added)

In sum, the tension between generalisability and utility can in some ways be understood as a tension between academics, who desire theoretical fidelity in research, and practitioners, who desire theories that can guide programme development for specific contexts.

Criteria for adding/removing variables

One of the most visible ways a theory can develop is through the addition or removal of variables that can help better explain and predict behaviour. This is also one of the

most important ways that HBT develops because ‘improvements in both HBT and intervention methods depend on each other’ (Rothman, 2004, p. 2). Glanz et al. (2008) argue ‘the best theory is informed by practice; the best practice should be grounded in theory’ (p. 24). However, there is little agreement and even less guidance for how theorists and/or researchers should go about adding and removing variables. In other words, it is unclear how researchers should use data from tests of theory in the field to inform theory development and add or remove variables. Indeed, the existing evidence suggests that when researchers observe null findings for particular variables in their theory-testing studies, they often ‘explain away’ this phenomenon by pointing to measurement problems or other issues rather than possible problems with the theory itself (Ogden, 2003). While we cannot prove the null hypothesis, and thus there may indeed be methodological issues that play into this problem, we still need criteria that can help guide what decisions to make about adding and removing variables from a theory. This may not be as important in the context of a single study, but it is critical when, over time (e.g., meta-analytic review), it becomes evident that evidence is gathering that a particular variable should be added or removed from a theory.

Dubin (1978) posits that an ‘unconstrained willingness to admit all possible units into a scientific model provides the widest range of opportunities for theory building’ (p. 58). He outlines numerous ways in which theorists may add (or invent) variables (or units) for a theory. These include invention by extension of an existing unit, invention by subdivision of an existing variable, invention through disproving the null hypothesis (i.e. a relationship or significant difference does exist), invention through factor analysis, invention through scale analysis and invention of an intervening variable. Despite these many suggestions, Dubin is unclear about the specific standards for adding a new variable. For instance, many argue that a new variable must explain variance in the outcome variable. Ajzen (1991), when discussing additions to the TPB, says, ‘the theory of planned behavior is, in principle, open to the inclusion of additional predictors if it can be shown that they capture a significant proportion of the variance in intention or behavior after the theory’s current variables have been taken into account’ (p. 199). Furthermore, Dubin discusses the removal of variables from a theory. He states that ‘when it is possible to postulate *no* interaction between units, we may exclude one or both from a model’ (p. 86). In other words, if a predictor variable does not explain variance in an outcome variable, or it is not meaningfully related to other model variables in a mediating or moderating role, it should be considered for removal from the theory.

The RAA has undergone some changes in this category since the original TRA was developed. First, one can see that a few new variables have been added. For example, as previously mentioned, the added construct of perceived behavioural control has been shown to be a significant predictor of behaviour, especially in behaviours not completely under volitional control (Ajzen, 1991). Second, some variables have been divided into more precise constructs; for example, norms in the IBM is conceptualised as both injunctive norms and descriptive norms, rather than solely injunctive norms (originally called subjective norms in the TRA; Fishbein & Ajzen, 1975). These changes appear to have been made based upon empirical evidence demonstrating the contribution of these variables to the theory, and that progress is to be commended.

However, as indicated earlier in this paper, the RAA has made what we would describe as only minor changes after more than four decades of research. In addition, there are likely to be several important variables that could be strong candidates to add to the RAA approach, given that there is room for improvement in the theory. In fact, research has demonstrated a host of variables that meet Ajzen's criteria listed above, and yet these variables have not been formally added to the theory. While RAA theories have fairly good prediction/association for a theory that attempts to predict behaviour, meta-analyses also suggest that much of the variance is left unexplained (Conner & Armitage, 1998; Sandberg & Conner, 2008). For example, Armitage and Connor (2001) conducted a meta-analysis ($k = 185$) of studies testing the TPB and found that the average multiple correlation of attitude, subjective norm and perceived behavioural control with behavioural intention was $R = 0.63$, explaining 39% of the variance ($R^2 = 0.39$). Additionally, the average multiple correlation of behavioural intention and perceived behavioural control with behaviour was $R = 0.52$, explaining 27% of the variance ($R^2 = 0.27$). While these data represent fairly good prediction in the context of these studies, we need to recognise that there are several limitations of such theoretical tests. These include errors and bias in self-report data (e.g., social desirability), the overreliance on cross-sectional data which may exaggerate a theory's true effects (Weinstein, 2007), the lack of controlling for past behaviour in analyses and the limitations of predicting intention as it relates to the intention-behaviour gap (Sheeran, 2002). Thus, these theories may not actually be performing as well as the data suggest that they do, and we should continually seek to improve the prediction of our theories where possible.

To further inform this discussion, Table 1 presents data from several meta-analyses of the TPB, which have considered the influence of additional variables that are *not* formally a part of the theory. While each meta-analysis tends to confirm the association of the formal TPB variables with behavioural intention (and in one case, with behaviour), these meta-analyses reveal that other variables – such as anticipated regret, moral norms and self-identity – exhibit associations with intention that are equal to or greater than the traditional TPB variables. Moreover, each meta-analysis demonstrates that the novel variables add unique variance in the prediction of intention over and above the traditional TPB predictor variables, and thus they do not appear to be redundant with current TPB variables. Thus, these variables appear to meet Ajzen's criteria for adding variables to the TPB. While the first meta-analysis lends support for a change that was made to the IBM (adding descriptive norms to the theory), none of the other novel variables in these meta-analyses have been formally added to any RAA theories. Nor have other mediating or moderating variables been added to the theory, despite compelling research on such factors (e.g., Gollwitzer & Sheeran, 2006; Sheppard et al., 1988). In fact, one of the most compelling areas for extension of the RAA is with regard to the intention-behaviour gap, which refers to the phenomenon that many intend to *not* engage in the intended behaviour, in contrast to the clear prediction from RAA theories (Sheeran, 2002). Recent meta-analytic (experimental) research demonstrates that a large increase in intentions produces only a small increase in behaviour, further illustrating this point (Webb & Sheeran, 2006). While much research suggests a variety of variables that may help us better understand and 'close' this gap – such as implementation intentions (Gollwitzer & Sheeran, 2006; Orbell, Hodgkins, & Sheeran, 1997), preparatory behaviours (Abraham et al., 1999; Bryan, Fisher, &

Table 1. Some examples of meta-analyses that have empirically demonstrated the value of additional variables in the context of the theory of planned behaviour.

Study	Variable	<i>r</i> -I	<i>r</i> -PB	<i>r</i> -FB	Additional findings
Rivis and Sheeran (2003) – 18 studies conducted across various behaviours	Descriptive norm	0.46	–	–	Descriptive norm was significantly ($p < 0.001$) associated with intention when controlling for all TPB predictor variables.
	Attitude	0.58	–	–	
	Subjective norm	0.44	–	–	
	Perceived behavioural control	0.21	–	–	
Sandberg and Conner (2008) – 20 studies conducted across various behaviours	Anticipated regret	0.47	0.34	0.28	Anticipated regret was significantly ($p < 0.001$) associated with intention and future behaviour when controlling for all TPB predictor variables. When past behaviour was added to the models, anticipated regret remained significant ($p < 0.001$) in the intention model but was reduced to non-significance in the future behaviour model.
	Attitude	0.44	0.30	0.27	
	Subjective norm	0.43	0.18	0.21	
	Perceived behavioural control	0.30	0.31	0.11	
Rise, Sheeran, and Hukkelberg (2010) – 33 studies conducted across various behaviours	Self-identity	0.47	–	–	Self-identity was significantly ($p < 0.001$) associated with intention when controlling for all TPB predictor variables; when past behaviour was added to the model, it remained significant ($p < 0.001$).
	Attitude	0.50	–	–	
	Subjective norm	0.39	–	–	
	Perceived behavioral control	0.35	–	–	

Table 1 (Continued)

Study	Variable	<i>r</i> -I	<i>r</i> -PB	<i>r</i> -FB	Additional findings
Rivis, Sheeran, and Armitage (2009) – 27 studies conducted across various behaviours	Moral norms	0.47	–	–	Moral norms was significantly ($p < 0.001$) associated with intention when controlling for all TPB predictor variables; when anticipated affect was added to the model, it remained significant ($p < 0.001$).
	Anticipated affect	0.42	–	–	Anticipated affect was significantly ($p < 0.001$) associated with intention when controlling for all TPB predictor variables; when moral norms was added to the model, it remained significant ($p < 0.001$).
	Attitude	–	–	–	
	Subjective norm	–	–	–	
	Perceived behavioural control	–	–	–	

Note: All *r*'s are weighed correlations from meta-analysis; *r*-I = correlation with intention; *r*-PB = correlation with past behaviour; *r*-FB = correlation with future behaviour.

Fisher, 2002) and strategic or action planning (Schwarzer, 2008; Snichotta, Scholz, & Schwarzer, 2005) – RAA theories have done virtually nothing to integrate such work into its approach. Moreover, the notion of intention itself has been challenged and questioned, with studies showing that in at least some cases, constructs such as behavioural willingness (Gibbons, Gerrard, Blanton, & Russell, 1998) or susceptibility (Pierce et al., 1996) may be more appropriate to understanding individuals who may engage in the behaviour. To date, the RAA approach has *not* integrated any of this work.

It is important to note that Fishbein and Ajzen (2010) have at least *considered* some of these variables as possible additions to their approach. One key reason given for not adding such variables is that some of these variables are seen as only applying to particular behaviours and not more broadly across numerous classes of behaviour (Fishbein & Ajzen, 2010, pp. 282–284). Thus, whereas generality appears to be preferred by the developers of the RAA, practitioners/interventionists are more likely to prefer specificity and better prediction of a particular behaviour.

Power to change a theory

Rothman (2004) states that ‘the development and specification of theories of human behavior depend upon an iterative series of research activities in which theoretical principles initially formulated by basic behavioral scientists are tested and evaluated

by applied behavior scientists' (p. 3). He goes on to say, 'these tests provide critical information that enables basic scientists to revise, refine, or reject their initial principles' (p. 3). Despite evidence that changes *should* be made to the RAA, few changes have been made over the years. In addition to the three previous sections discussing this issue, one final question remains – who has the authority to change a theory? Only the original theorist of that particular theory? Any researcher in the field? This is an important issue that has been given only scant attention in the literature.

One approach would dictate that any researcher who finds evidence of a needed change and publishes that information in an academic journal has *suggested* a change in the theory. However, the published literature is full of studies in which empirical evidence suggests changes that could or should be made to the RAA, and these changes are often not embraced by the theorists themselves (Fishbein & Ajzen, 2010) or other researchers in the field. If we look at the history of RAA theories, we see that the TRA and TPB were developed primarily by two researchers who presented these theories at conferences and published work in academic journals and books. However, with the massive amount of health-related research and so many researchers undertaking such work, an important conference presentation or journal publication might get lost in the milieu. Indeed, simply keeping up with the large amount of research in particular theoretical domains can be difficult given how much research is published, particularly in the health behaviour field. Also, the theorists themselves may not be as open to adding new variables to their theory as compared to particular research communities. Indeed, we have already made the case that agendas differ – while the theorists wish to understand the smallest set of variables that predict the largest numbers of behaviours, applied researchers are more interested in the most precise understanding of a *particular* behaviour. These theory development goals are quite different from one another.

Instead, organisations that sponsor work in theory development in specific behavioural domains and provide avenues for dissemination of new or modified theories may be a better way to organise theoretical developments. In fact, it is worth pointing out that the catalyst for the development of the IBM was a theorist's workshop organised by the NIMH that brought several scholars together with the goal of developing a unified theory of behavioural prediction focused on HIV/AIDS-related behaviours. If this effort had not occurred, the RAA approach may have evolved even less than it has to date. Also, if this effort had been followed up with an organisational focus on HIV/AIDS-related theories and models that were supported by the latest research, more developments might have come from that workshop effort than solely the IBM. Such products could have been disseminated to relevant researchers, using several mechanisms at the disposal of organisations such as the National Institutes of Health (e.g., special journal issue, website, Funding Opportunity Announcement, etc.).

Recommendations for theory development in the RAA

The previous section proposed four important barriers to consider in theory development, modification and dissemination. While these were presented within the context of a case study of the RAA, they can and should be considered with regard to the development of other HBTs. With that in mind, suggestions on the use

and modification of RAA theories and other HBTS are discussed below and summarised in [Table 2](#).

First, the theoretical domain for theories such as RAA should be clarified. Theories like the TRA, TPB and IBM were initially developed as social psychological theories, but it remains unclear as to what theoretical territory they seek to cover now and in the future. Are the theories open to variables that reside outside the social psychological domain, or are they instead relegated solely to that domain? This issue is also related to the second issue of intervention development, as to date, virtually all of the RAA variables are social psychological and thus amenable to change in psychologically oriented interventions. An exception to this was the addition of environmental constraints to the IBM, which has the potential to move the theory beyond the social psychological domain. To date, the addition of that variable appears to be largely cursory in nature; it may also be related to calls to separate *actual control* (i.e., environmental constraints) from *perceived* behavioural control in the TPB (Godin & Kok, 1996).

We have noted throughout this paper that HBTs are continually used as bases for health behaviour interventions. However, we have also noted that the bulk of research on these theories is correlational, and the primary function of HBTs has been to explain and predict behaviours. Thus, we should be careful when using theories in designing interventions, as the extent to which the predictor variables represent causal mechanisms in behaviour change is not known. In addition to clarifying how theoretical variables are translated within particular interventions (Hardeman et al., 2002), we also need increased experimental research, using the

Table 2. Recommendations for advancing health behaviour theory development and modification.

Issue	Recommendations
Theoretical domain	Clarify theoretical territory of RAA theories; advance discussion of prediction vs. intervention applications of RAA theories; conduct new experimental research on RAA theories
Generalisability vs. utility	Recognise differing agendas of basic versus applied researchers; consider two lines of advancement for RAA theories – a general theory that applies to the most behaviours and behaviour-specific theories in key health areas such as diet, exercise, safer sex, etc.
Criteria for changing theory	Advance conversation on criteria for adding/amending/removing variables from theory; make formal changes to general and behaviour-specific RAA theories based on the research literature (in particular using data generated from meta-analysis)
Organisational tracking of theoretical developments	Discuss new ways to track theoretical developments in HBT; consider a consensus approach that takes theory modification decisions out of the hands of the few; move forward with either an expert panel approach or a wiki-platform approach to theoretical tracking and modification

RAA approach (Noar & Mehrotra, 2011; Weinstein, 2007). Indeed, it is somewhat remarkable that it took more than two decades from the development of the theory for the first experimental test of the TPB to be conducted, published quite recently (Sniehotta, 2009). Rather than conducting a test of the theory, using the typical survey research approach, this study conducted a factorial experiment to examine the impact of interventions based on particular TPB factors (e.g., behavioural beliefs and normative beliefs). While results indicated some support of the theory in terms of changing some TPB factors and intentions, results with regard to behaviour change were inconsistent with TPB predictions. While increased experimental research has the potential to greatly advance our understanding of HBT and behaviour change mechanisms, to date it has only seldom been applied in testing HBTs (Noar & Mehrotra, 2011; Sniehotta, 2009). More experimental research with HBTs is greatly needed.

Second, when there is tension between generalisability and utility, utility should be given preference, given the applied nature of the health field. We have already demonstrated that applied researchers are apparently giving preference to utility over generalisability (Glanz & Bishop, 2010; Painter, et al., 2008). Additionally, and perhaps more importantly, by giving preference to utility we create a research environment in which we are following conceptual thinking but also empirical data to where they lead. Moreover, the health field is largely divided into areas where researchers study different diseases and behaviours, and to the extent that different behaviours can be best predicted by variations on particular theories, we should work to understand this and formalise such theories. However, given that Fishbein and Ajzen's (2010) stated goal is to have a general theory that applies broadly across behaviours, such a general theory will likely always exist. Further, in the HBT domain, understanding what factors are common to behaviour and behaviour change across theories is certainly of interest, especially in the context of multiple behaviour change interventions (Noar, Chabot, & Zimmerman, 2008). However, in an applied context, it is clear that behaviour-specific versions of theories such as TPB will be most precise in terms of behavioural prediction, and they are also most likely to be instructive for intervention development. As one example of this, research in the realm of safer sex has suggested a whole set of factors that could fruitfully inform a safer sex TRA/TPB, from partner norms to condom communication to preparatory behaviours (Abraham et al., 1999; Bryan et al., 2002; Sheeran et al., 1999). Despite this, no behaviour-specific TRA/TPB formally exists, even though such a development would likely better build the cumulative theoretical knowledge in the safer sex and other arenas.

Third, and related to utility, we must be open to changing our theories when particular elements within those theories do not work when empirically tested in the real world. More specifically, if variables are not performing in a particular area, then they should be seriously considered for removal (or amendment) from the theory in that particular domain; similarly, variables demonstrating important (theoretical and empirical) contributions should be seriously considered for addition to a given theory. Importantly, this draws attention to the fact that there can be vastly different characteristics for different health behaviours. In fact, previous research has shown that for individual behaviours, the RAA may work in different ways and additional variables may be needed to explain and predict particular behaviours, while other variables may need to be removed or amended with regard to other behaviours (Blue,

1995; Godin & Kok, 1996). This is entirely consistent with a behaviour-specific approach.

Fourth, the process for tracking and disseminating findings on theory development can be greatly improved. In an age, where a plethora of information exists and a large number of researchers and practitioners use theory, it is easy for potential developments to get 'lost in the shuffle.' Organisations with a stake in particular health areas may be best suited for tracking the literature on particular behaviour-specific theories and, over time, making refinements to the theories. Organizations such as the Centers for Disease Control and Prevention and the National Cancer Institute have major stakes in the accuracy and completeness of HBTs in particular health domains, and they also have considerable influence and dissemination capabilities. Such organisations would thus be well suited to the task of tracking theoretical developments in high-priority behavioural domains, and putting out their own versions and suggested modifications of HBTs in the form of publications, on websites, and in relation to funding announcements. Moreover, the advantages of putting a theory online are such that a 'living' version of the theory could be posted and modified over time as additional empirical evidence is generated and evaluated by an expert group charged with this task.

However, to ensure that changes to the theory are made thoughtfully, an advisory committee could consult on how empirical data would be used to modify the theory and would recommend theoretical changes at specified intervals, based on the empirical evidence in the literature. Alternatively, this process could use a 'wiki' model where the broad community of researchers has direct control over modifications to the theory online, and changes are made by anyone within the research community. Under this model, which has been very successful in the case of websites such as Wikipedia, changes made that are inaccurate or not agreed upon by most of the community are amended by a member of that community. Such a project could be hosted by the National Cancer Institute's grid-enabled measures website, which already uses a wiki-based platform for health behaviour (and other) constructs, definitions, measures, datasets and other items (see <http://cancercontrol.cancer.gov/brp/gem.html>).

Conclusion

The purpose of this paper was to explore the issues related to barriers to theoretical development in HBTs. Using the RAA as a case study, we explored, in-depth, four important considerations for theory development and testing and then provided recommendations for stimulating progress in these areas. If those of us who research health behaviour and test and apply these theories begin to demand more of our theories, the result will ultimately be more advanced and precise theories than those that exist today. We will not be guilty of continuing the trend of a large theory-testing literature that seems to have relatively little impact on the actual make-up of our current HBTs (Crosby & Noar, 2010; Rothman, 2004). Instead, we can develop theories that are informed by data and are more effective at explaining and predicting health behaviours as well as improving the ability of our interventions to change health behaviour.

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