# Consolidating Behaviour Change Approaches: A Theoretical and Practical Reduction


## *Abstract*

There is little consensus about how behaviour change specialists should go about choosing from the large number of available approaches that which is most likely to make their program effective. Here we engage in a systematic consolidation, classifying approaches into four categories, based on their explanatory goals: Psychological approaches focus on the proximate psychological determinants of behaviour, Stage approaches seek to divide the target population into categories according to their state of preparedness for behaviour change, Environmental approaches target the physical and social ecological context of behaviour, and Process approaches are concerned with the process of designing behavioural interventions. The elements characteristic of each of these four classes are then identified and used to produce consolidated models of each class, which identify the specific claims made by each class about how behaviour is determined. These four consolidated models are then amalgamated into a single generic framework, which shows how the various classes relate to one another in determining behaviour and suggests how those designing programs of behaviour change could use behaviour determination processes for insight. We argue that academic and behaviour change practitioners should combine their efforts at theory development and testing if we are to find better means of changing behaviour in future.



KEY WORDS: behaviour change, theory development, expectancy value, programme intervention, ecological context

## *Introduction*

The holy grail of health promoters, social workers, applied psychologists, marketers and policy makers is to be able to change people's behaviour, especially on a large scale. It is generally recommended that behaviour change programmes should be designed using theory, because this makes them more effective. (Michie & Abraham, 2004) For example, a systematic review of the recent HIV literature notes that all of the studies with good evidence of achieving behaviour change relied on at least one theory (Lyles et al., 2007). Using theory is certainly popular: a review of health promotion articles published between 1992 and 1994 found that 45% used a model or theory. (K. Glanz, Rimer, & Lewis, 2002)

The health promotion and related literatures contain a plethora of theories.[1] However, there is, no consensus as to which approach provides the best guidance for programme development and implementation, nor which has the greatest impact on behaviour, nor which approach should be applied to which kinds of behaviour. Because theories have generally been used in isolation and have not been tested against each other, we do not know which are the most predictive or the most practically useful. Complaints about this condition have been made for some time (Nigg, Allegrante, & Ory, 2002; Neil D. Weinstein, 1993; Zimmerman & Vernberg, 1994). However, it is hard to say that the situation is any better today; in a recent review of the health-related literature, only a few papers (0.4% of 2900 citations in the PsycInfo database) performed empirical tests which compared two or more theories (Noar & Zimmerman, 2005) (see e.g., (Tom Baranowski, Cullen, & Baranowski, 1999; McClenahan, Shevlin, Adamson, Bennett, & O'Neill, 2007; Neil D. Weinstein, 1993)).

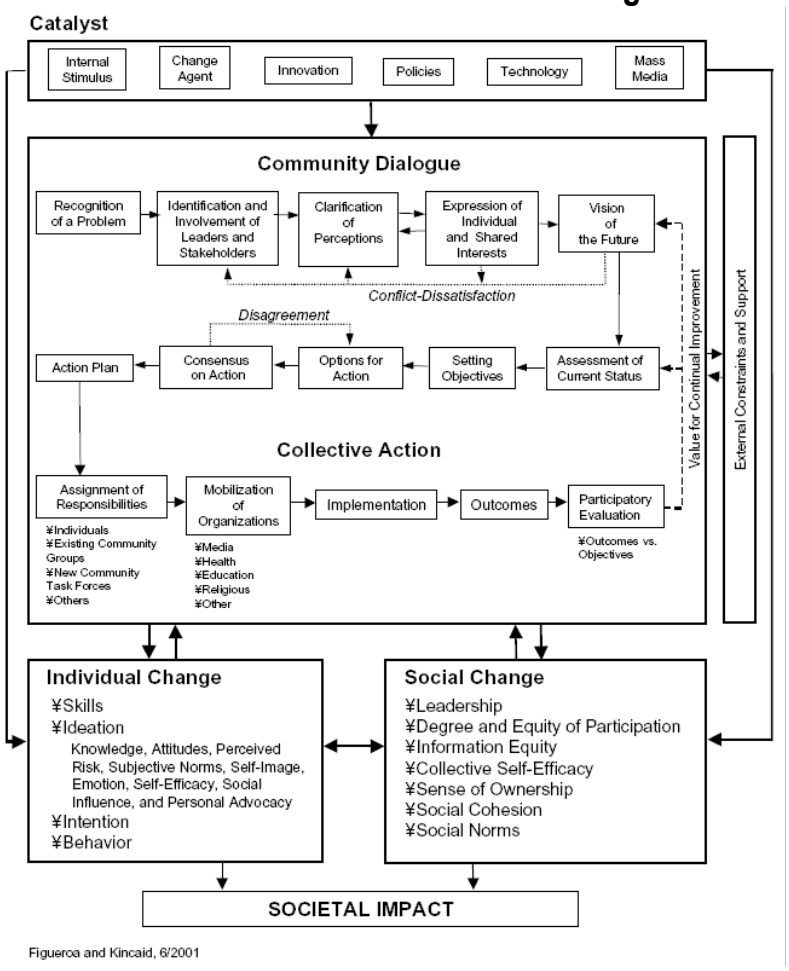
Meta-analyses and systematic reviews can help in one respect: they provide evidence that particular theories are more or less supported by field tests. Most meta-analyses tend to show some degree of support for the approach under review (e.g., the Health Belief Model (Harrison, Mullen, & Green, 1992; Janz & Becker, 1984); Theory of Reasoned Action and Theory of Planned Behaviour (Albarracin, Johnson, Fishbein, & Muellerleile, 2001; Godin & Kok, 1996; Hagger, Chatzisarantis, & Biddle, 2002; Hausenblaus, Carron, & Mack, 1997); Social Cognitive Theory (Bandura, 1998; Graves, 2003; Strecher, DeVellis, Becker, & Rosenstock, 1986); and the Transtheoretical Model (Keller & Velicer, 2004; J. O. Prochaska, DiClemente, & Norcross, 1992; J. O. Prochaska, Rossi, & Wilcox, 1991; Rosen, 2000; Spencer, Pagell, Hallion, & Adams, 2002)). It may be possible, given this literature, to say that Approach X has an average behaviour change effect of X% while Approach Y has a smaller average effect of Y%. However, this still does not provide sufficient grounds to declare that Approach X makes a better tool for behaviour change than Approach Y. The two statistical figures will be based on reviews composed of different numbers of studies, which examine different kinds of behaviour, in different contexts, and which may have been implemented using different techniques and strategies. [2] So, while meta-analyses and reviews can contribute to theory development, they cannot reduce the range and diversity of approaches because they do not compare approaches or their components directly.

While waiting for comparative studies showing that some theories can be excluded from the roster through empirical refutation (or at least a consistent failure to cause changed behaviour), it is possible for theorists to perform some form of theory reduction. A number of approaches have been attempted. One of these is *distillation*. Experts can be brought together to sift through available factors to produce a single theory of behaviour change which they advocate for general

use. (M Fishbein, Triandis, & Kanfer, 2001) For example, a 1991 National Institutes of Mental Health workshop on HIV, attended by advocates of a number of prominent approaches, produced a single model of behaviour change through an undisclosed process. This model suggested that three conditions are necessary and sufficient to determine behaviour: a strong intention, a lack of environmental constraints, and having the necessary skills. (M Fishbein, Bandura, Triandis, & al., 1992) [3] In another example, factors such as psychological determinants, community action and environmental influences were put together such that they exist in specific relationships to one another (see Figure 1). (Figueroa, Kincaid, Rani, & Lewis, 2002; Thompson & Kinne, 1999).

A second approach to theory consolidation is *consensus-building*. In one example, a group of health psychologists and health service practitioners recently assembled to find an agreed set of key theoretical constructs (a construct is an abstract concept used to describe mental faculties such as self-efficacy which, in practice, tend to remain hypothetical) for use in evidence-based practice of behaviour change (Michie et al., 2005). This workshop reduced 20 types of theory to 12 domains with 101 component constructs through a consensus-building process. The resulting list of domains and constructs was not put together into a single theoretical approach (as would be characteristic of *distillation*), but was rather presented as a tool-kit from which practitioners could choose relevant items.

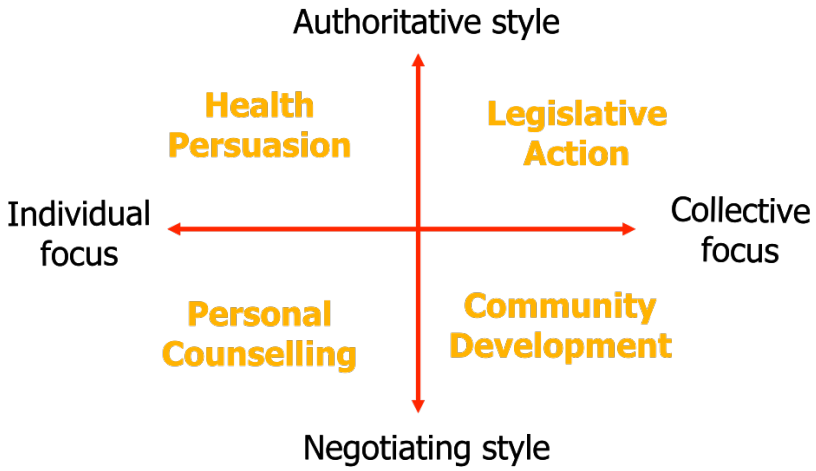
**Figure 1:**
**The Rockefeller Integrated Model of Communication for Social Change**



A third approach to managing theoretical diversity is *typologization* – the creation of categories of approaches. This strategy has been widely used. The most common typology is a unidimensional categorization based on the level of social organisation which is the primary target of intervention. (McLeroy, Bibeau, Steckler, & Glanz, 1988; Stokols, 1992) For example, in their influential overview of health promotion theory (Karen Glanz, Rimer, & Viswanath, 2008), Glanz and Rimer divide approaches into those targeted at the individual, at the interpersonal and at community levels. Nutbeam and Harris (Nutbeam & Harris, 2004) further identify approaches targeting organisations, communication and policy, whilst Edberg (Edberg, 2007) suggests three types of theory – aimed at the individual, the environment and at policy. All of these typologies distinguish types of approach according to their target level of influence.

Beattie (Beattie, 1991) uses a different means of *typologising* approaches (see Figure 2). He places the target level of social organisation along one axis and the 'mode of intervention' – which measures the power relationship between programme implementers and the population (ranging from 'authoritative' to 'negotiated') – along an orthogonal axis. This second dimension is similar to the categorization provided by Rothman (J. Rothman, 2001) for community-based approaches to behaviour change where action can be initiated from within or outside the community or both.

**Figure 2:**
**Beattie's Typology of Behaviour Change Approaches**




The goal of such typologizations is not to reduce the number of approaches available; it does not throw approaches into a single framework, like *distillation*, but instead provides criteria for comparing theories on theoretical grounds. It can help practitioners to select which theory to employ depending on their behavioural problem and preferred style of interaction.

None of the techniques for theory organisation outlined above provides approaches simple or comprehensive enough to find common use amongst practitioners. *Distillation* can only result in a model which resembles existing ones: in the case described above, the popular Theory of Planned Behaviour, and so is not seen as an advance (Conner & Norman, 2005). It can also uncritically slide different kinds of models inside each other, forces new and untested relationships on those components. (Bandura, 1998; Rimer, 2002) The *consensus* approach offers a shopping list of behavioural determinants but remains atheoretical and hence does not provide heuristic means of using the elements or putting them together into a working model. In terms of theory reduction, *distillation* provides some reduction in the number of approaches but only with respect to a narrow range, and at the cost of introducing a new, more complex model. Efforts at *consensus* just adds to the confusion by creating new categories of factors without relating them to one another in a specific approach. Though *typologization* does not add to the total number of approaches available, it does not reduce them either.

The approach we use here is *consolidation*. Consolidation reduces the number of factors in some type of approach by eliminating overlap – finding the 'lowest common denominator' which encapsulates the insights of a type of approaches in a single representation. We accomplish this through a two-step process of theory *categorization*, followed by *abstraction*. The first step involves classifying each available approach by what it seeks to do. We argue that the fundamental categories of behaviour change approach can be categorised according to their primary explanatory goal. This step is similar to *typologization*, but is based on finding the shared objective of some class of approaches, rather than a shared trait (such as being an individual-level intervention). We argue that all of the approaches in the literature can be classed into four fundamental categories: Psychological, Stage, Environmental, and Process approaches (see below for rationale).

With the set of categories of approaches established, the second step in *consolidation* is *abstraction*, in which the minimal set of elements required to represent any approach in a category is represented in a graphical model. This requires a theoretical classification of the elements within a category, and elimination of duplication so that only a single representative of each class of elements is included in the minimal model of that category. For example, rather than including individual mental constructs such as self-efficacy or locus of control, a consolidated model subsumes them under a single rubric as a single element called 'constructs'.

Because consolidation results in only four category-based models, it is possible, in a final step, to consolidate all of the elements of each of these models into a single Generic Framework which then represents the fundamental insights from all the approaches. We believe this Generic Framework constitutes a major step toward theoretical reduction for the behavioural sciences. Having a parsimonious representation of the entire range of approaches to behaviour change should enable theoretical predictions about the nature of relationships among elements of behaviour change approaches to be made, and assist practitioners in choosing the most appropriate kind of theoretical foundation for their programme design and implementation, regardless of what type of behavioural change is desired.

The remainder of this paper lays out the methods we used to uncover behaviour change approaches in various literatures, describes the way in which we placed them into categories and how we simplified them using minimal diagrammatic models. A framework which encapsulates the insights of the various categories is then presented and discussed. We conclude with a brief discussion of the utility of our approach.

## *Methods*

We first conducted a rigorous search of the literature to identify the range of behaviour change approaches available. We were not interested in conducting a systematic review because our object was to collect together popular and widely used theories related to changing behaviour, rather than to identify every behaviour change theory ever proposed. Our procedure included the following searches:

- Amazon.com for books published within the last 10 years using the search terms 'behaviour change', 'behaviour change theory' (using both American and British spellings of 'behaviour'), 'health promotion' and 'social marketing' (Andreasen, 1995; Breinbauer & Maddaleno, 2005; Conner & Norman, 2005; A. Curtis, 2000; DiClemente, Crosby, & Kegler, 2002; Donovan & Henley, 2003; K. Glanz et al., 2002; Kotler, Roberto, & Lee, 2002; Nutbeam & Harris, 2004)
- PubMed, ScienceDirect, Google Scholar and Web of Knowledge databases for scientific articles which reviewed behaviour change theories using the search terms 'behaviour change', 'behaviour change theory', 'health promotion theory' and 'social marketing theory' (M Fishbein et al., 2001; RE Glasgow, Klesges, Dzewaltowski, Bull, & Estabrooks, 2004; Grier & Bryant, 2005; Hardeman, Griffin, Johnson, Kinmonth, & Warehman, 2000; King, Stokols, Talen, Brassington, & R., 2002; Michie et al., 2005; Nigg et al., 2002)
- A Google-based internet search using the search terms 'behaviour change theory', 'health promotion theory', and 'social marketing theory'.
- Reports of meetings on behaviour change (Figueroa et al., 2002) (Aunger, SPARK report)
- A 'snowball' search which mined the references of each of the references found by other means.

Seventy-seven different approaches to behaviour change were uncovered through these processes. (See Appendix 1 for a listing of all the approaches identified, together with the primary academic source of each approach). [4] In the following sections, we discuss the different categories of approach.

## *Categories of Approach*

In this set of seventy-seven approaches, four categories were identified, based on their distinct explanatory objectives:

- The Psychological approaches identify the psychological determinants of current behaviour. They consider psychological factors as the proximate determinant of behaviour. (S. Sutton, 2004) This large class includes the Health Belief Model (Hochbaum) and the Implementation Intentions approach (Gollwitzer, 1999).
- The Stage approaches segment groups of people in different stages of psychological preparedness for change (i.e., individual variation in the propensity to engage in a target behaviour). They have the aim of documenting the stages through which target audiences pass on the way to a change in behaviour. They can also categorize people by socio-demographic or psychological profile.
- The Environmental approaches identify the ecological context within which behaviour occurs. They tend to concentrate on the context of action, with environmental factors

being seen as constraints on, or enablers of, behaviour, and to set to one side individual behavioural outcomes in favour of wider concerns (e.g., community solidarity and population health). Examples include the Risk and Protective Factor Model (Catalano & Hawkins, 1996) and the Resilience approach (Bernard, 2004; Schoon, 2006; Werner & Smith, 1982).

- The Process approaches specify an optimal process for designing and monitoring the effectiveness of a behaviour change intervention or programme. They consider the sequence of organisational processes required to have an impact on a target population. Typical examples in this class are the PRECEDE–PROCEED approach (Green & Kreuter, 1991) and the social marketing process (Kotler et al.).

In the remainder of this section, each category is described in greater detail, and its consolidation demonstrated. [5]

## 1/ Psychological Approaches

The first type of approach to changing behaviour assumes that altering some aspect of psychology will affect the target behaviour. A wide variety of approaches have been proposed which predict behaviour by postulating relationships among various psychological constructs and behaviour; indeed this category includes the vast majority of the approaches identified. It is possible to distinguish a number of sub-categories within this set: approaches that focus on a single cause, approaches that derive from the view that behaviour is based on the value it is expected to return to the actor, approaches explaining how people can be persuaded to change their minds about a behaviour, others concerned with the stress of behaviour change, and a diverse variety of other psychological approaches. We have again subdivided the psychological approaches so as to consolidate them.

### *Single Strategy Approaches*

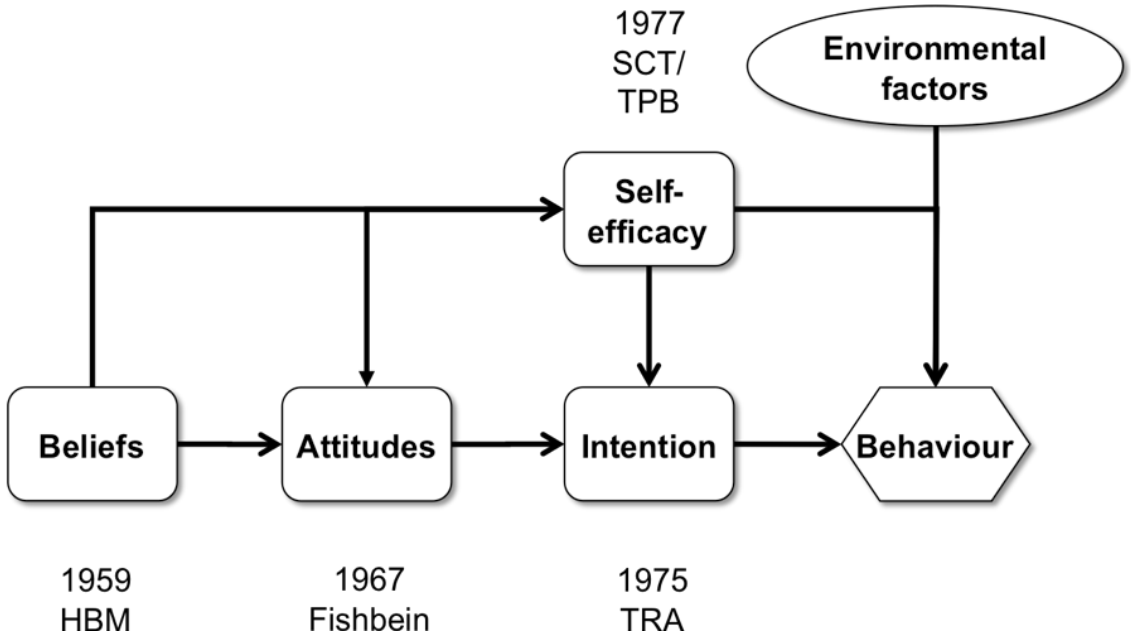
An approach in the Single Strategy category of psychological approaches is limited to one basic 'trick', typically involving one construct and its influence on behaviour. As one might expect, relatively simple approaches were the earliest to be developed. For example, the Social Comparison (Festinger, 1954) approach has one important trick: people care about what others in their social group do, and are likely to model their own behaviour on the example of others because people are intrinsically social and want to fit in. The strengths of these Single Strategy approaches include their simplicity, their sometimes strong empirical support, and the inclusion of specific mechanisms for changing behaviour. They also have a number of weaknesses, including their restricted domains of application, their inability to deal with problem behaviours that may have multiple causes, and constructs which can be abstract (e.g., locus of control) or complex (e.g., effort-reward imbalance).

### *The Expectancy Value group*

Many psychologists assume that all human behaviour is goal-directed. (F Heider, 1958; Johnson-Laird, 2006; Lewin, 1951) Goal-directed behaviour is controlled by the expectation of what that behaviour will cause -- its consequences. Thus, goal-directed behaviour should be sensitive to changes in the returns from behaviour. Perhaps as a consequence of this belief, the dominant model of behaviour in psychology for over fifty years has been the expectancy value approach. (M Fishbein & Ajzen, 1975) This dominance is particularly impressive in the field of health

psychology where the 'Expectancy Value' group – such as the Health Belief Model (Hochbaum, 1956), Theory of Planned Behaviour (Ajzen & Fishbein, 1973), Social Cognitive Theory (Bandura, 1977), and Theory of Interpersonal Behaviour (Triandis, 1977) – constitutes the most popular type of model.

**Figure 3:**
**The Consolidated Value Expectancy Model**




Due to the highly constrained development of this branch of theorizing, it is possible to represent the historical development of expectancy value models in a single diagram, which constitutes a mini-consolidation for this subcategory of approach (see Figure 3; a legend for interpreting the elements of the figures to follow is provided with Figure 8 below). This line of theorizing can be said to have begun historically as a response to behaviourism, which suggested that people (and other animals) can learn any behaviour through a sufficiently complex, precise training regime ('operant learning'). (Skinner, 1938) However, experimental results suggested some behaviours could not be learned no matter how complex the training. (Garcia & Koelling, 1966) As a result, the concept of belief was added to the model in the late 1950s. Beliefs are mental representations about the world, and are the first 'intervening variables' considered, largely in sympathy with the so-called 'cognitive revolution' happening in psychology around this time. Beliefs were shown to be closely related to behaviour and lifestyle choices, and are thought to be more modifiable than other predictors of behaviour (such as personality or mood), and so constitute appropriate targets for behaviour change.

Subsequent models assumed that people make rational decisions based on the *expected value* of outcomes from their behaviour. The key construct is *attitude*: or a predisposition to act in a positive or negative way toward a behaviour or event. Attitudes were added to this school of models because of poor belief-behaviour correlations; in effect, it was noted that beliefs must be

motivated, or the behaviour does not happen. Attitudes are composed of beliefs about the consequences of performing a behaviour multiplied by the individual's valuation of these consequences. (Martin Fishbein, 1967) According to Fishbein, the motivation to reach any outcome should therefore be a function of how much one *values* the outcome and the strength of one's belief that this outcome will follow from the behaviour in question (i.e., *expectancy*). Fishbein (M Fishbein & Ajzen, 1975) emphasized the need to consider both the attributes that people believe to be associated with the goals toward which they strive and the values they place on those attributes (so-called 'expectancy value' modelling).

A later addition to this kind of model was *intention*, or a determination to act in a certain way, reflecting an individual's readiness to perform a given behaviour. The Theory of Reasoned Action (M Fishbein & Ajzen, 1975), which adds intentionality to the expectation-value approach, was born largely out of frustration with empirical research, which found weak correlations between attitude measures and the performance of volitional behaviours. (Hale, Householder, & Greene, 2003) This implied that people must form a decision (i.e., intention) to engage in some kinds of behaviour, which is assumed to be the immediate antecedent of behaviour. (Ajzen, 2002)

Subsequently, it was realised that that intention does not always lead to behaviour because of circumstantial limitations (i.e., 'barriers'). Intention cannot be the exclusive determinant of behaviour where an individual's control over the behaviour is incomplete. Roughly simultaneously, Fishbein and Ajzen (M Fishbein & Ajzen, 1975) and Bandura (Bandura, 1977) published ideas about a construct which has come to be called 'self-efficacy': a belief in one's own ability to execute the actions necessary to reach an outcome. Self-efficacy is a compound of controllability over outcomes through one's own behaviour and perceived ease or difficulty of performing the behaviour. By adding this construct, Ajzen intended to extend the Theory of Reasoned Action to cover volitional behaviours, which he called the Theory of Planned Behaviour. Bandura believes that self-efficacy is the most important precondition for behaviour change because whether a behaviour is enacted depends on the degree to which people believe they can successfully perform it. The history of these models is thus one in which new kinds of constructs have repeatedly been added between the existing model and behaviour, to increase the ability to predict behaviour.

The expectancy value models vary in what they propose to be determinants of behaviour. In particular, there is little overlap in the individual constructs postulated by the three most popular approaches: the Health Belief Model, the Theory of Planned Behaviour, and Social Cognitive Theory (e.g., 'perceived susceptibility' appears only in the Health Belief Model; 'subjective norm' only in the Theory of Planned Behaviour). Within this class there is, however, some consensus about the importance of the same classes of elements: beliefs, attitudes, norms, intentions and environmental barriers as determinants of behaviour. There is also some overlap between models in the relationships proposed to hold between constructs. For example, it is common for environmental variables to be considered as exogenous determinants of beliefs, attitudes and expectations. Beliefs, attitudes and expectations, in turn, often feed into the formulation of an intention, which is considered the proximate determinant of behaviour by many of these approaches.

A key strength of this class of models is their broad applicability. They are popular, and considerable empirical evidence for the utility of some constructs and approaches has been provided. (For example, many of the relationships among constructs hypothesized by Social Cognitive Theory are well-supported (T. Baranowski, Perry, & Parcel, 2002) and implementations based on this approach are commonly viewed as effective (Bandura, 1998)). The weaknesses of

approaches in this category are their almost exclusive reliance on individual psychology as a determinant of behaviour, when other factors – such as environmental and policy barriers – also play an important role in determining behaviour. Finally, many of the approaches assume that behaviour change is intentional – that is, under volitional control – when it is likely that there are other kinds of drivers of behaviour change. (E. L Deci & Ryan, 1985; Mook, 1996; West, 2006)

### *Other groups*

Another category of psychological approaches is concerned with modelling how attitudes are changed by messages. Approaches in this class, such as the Elaboration Likelihood Model (Petty & Cacioppo, 1986), begin with a communication stimulus, and proceed to deal with how processes such as attention, arousal and motivation are influenced by in-coming messages, such that the message is comprehended and then assimilated through downstream impact on other psychological states like beliefs and attitudes. Persuasion is the name often given to this process of changing minds through communication. Such concerns are clearly at the 'front-end' of the problem of behaviour change (at least in expectancy-value terms), because behaviour is presumably downstream of attitudes (although this contention is typically left implicit in persuasion-oriented approaches).

Other approaches, such as the Transactional Theory of Stress and Coping (R. S. Lazarus, 1966; R. S. Lazarus & Cohen, 1977), arise from clinical concerns, largely about reducing stress, often in the context of work. These approaches do not always explicitly address behaviour, being rather concerned with the management of internal states or traits such as stress or attitudes. For example, the Stress Reduction and Persuasion approaches tend to target changes to psychological states as their primary objective, rather than behaviour itself.

The final sub-category of psychological approaches is a 'Diverse' group, a number of which have origins from outside of cognitive psychology. For example, the Information-Motivation-Behavioural Skills (IMB) model (Fisher & Fisher, 1993) derives from the HIV/AIDS literature, and Social Regulation Theory (Carver & Scheier, 1981) from cybernetics. As a result, these models tend to focus on kinds of causes ignored by other Psychological approaches – such as individual characteristics, or social networks – or contain combinations of elements not present in other categories (e.g., the Social Action Approach (Ewart, 1991) subsumes biological traits, environmental settings, psychological constructs and organisational systems in a single approach).

### *Consolidation*

Having now set out the approaches which are primarily concerned with identifying the psychological factors that determine behaviour, at least proximally, we are in position to find a consolidated model which encompasses their insights. This is accomplished in two steps. First, we found the set of ontologically distinct elements in the approaches covered – that is, categories of elements which make different claims about what kinds of things they are or how they influence behaviour. We argue that there are eight such kinds of elements in these psychological approaches: stimuli, mental processes, mental constructs, physiological states, individual characteristics, environmental factors, behaviour and outcomes (see Table 1 for definitions of these element categories and example members from the literature).

**TABLE 1: Types of Elements in Psychological Approaches**

| ELEMENT TYPE | DEFINITION | EXAMPLES |
|---|---|---|
| **Stimuli** | momentary environmental signals | communications |
| **Mental processes** | active manipulations of information by the brain | attention, problem-solving, appraisal, comparator [cybernetic control mechanism], reinforcement |
| **Mental constructs** | mental representations or states (typically outputs of processes) | beliefs, attitudes, intentions, plans, self-concept, outcome expectancies |
| **Physiological states** | body-based 'felt' conditions | mood/arousal, motivation, tension/stress |
| **Individual characteristics** | relatively fixed features specific to individuals | genetic endowment, needs, personality traits, skills, habits, coping resources, social relationships |
| **Environmental factors** | stable influences external to the individual agent | culture, technology, built environment, social support/networks, organisations, community resources |
| **Behaviour** | an interaction between an individual and their environment | vaccination, exercise, product purchase, effort, treatment adherence |
| **Outcomes** | measures of the consequences of behaviour | work performance, well-being, quality of life, stress reduction |

The second step involves determining all of the relationships identified between these kinds of elements in the approaches reviewed thus far. Figure 4 shows the relationships between these elements present in the literature, with a single example of each ontological category being included in the simplified model, to represent that class of determinant. As the psychological approaches constitute a majority of all the approaches uncovered in our search, some detailed justification for this simplification is required. We therefore provide a complete linkage analysis in Table 2, in which representative sources for each link are identified.

**TABLE 2: Justification of model linkage diagram**

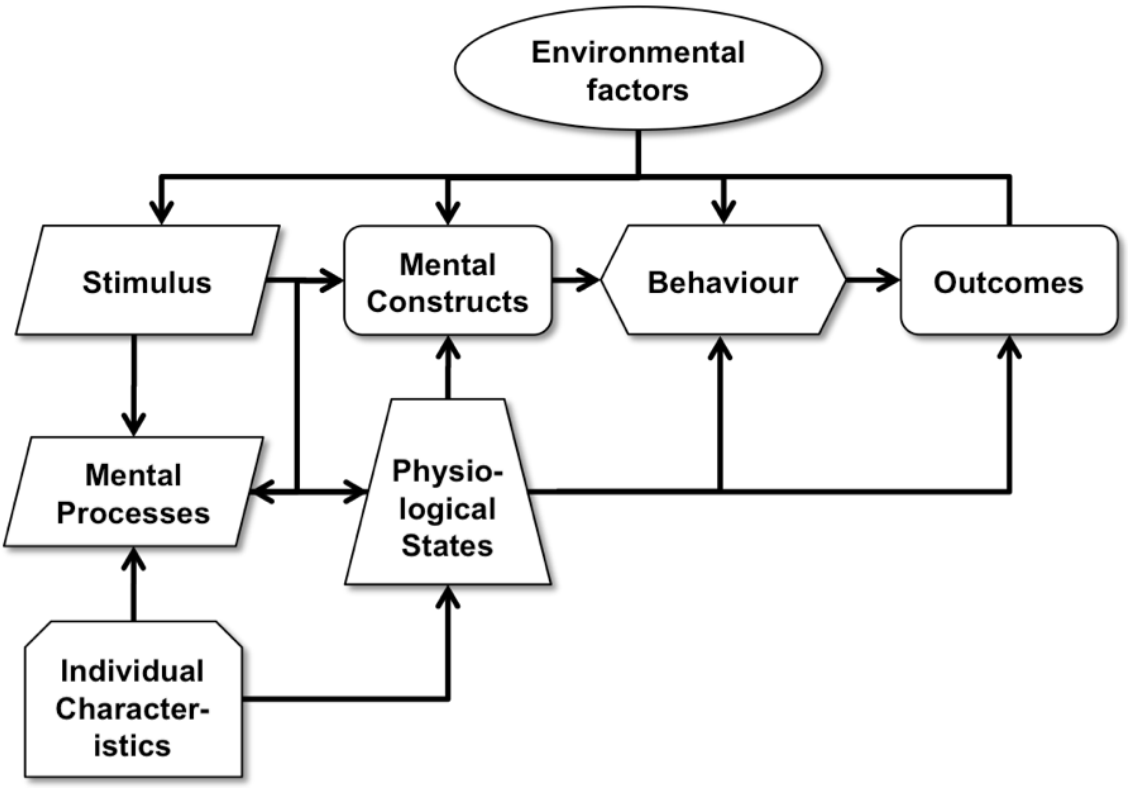
| FROM | TO | SOURCE |
|---|---|---|
| Environmental Factors | Behaviour | Fishbein Integrated Model, Theory of Interpersonal Behaviour, Social Networks and Social Support |
| Environmental Factors | Mental Constructs | Social Cognitive Theory, Theory of Interpersonal Behaviour |
| Stimulus | Mental Processes | Elaboration Likelihood |
| Stimulus | Mental Constructs | Self-regulation model, Stress-reduction approaches |
| Individual Characteristics | Mental Processes | Health Belief Model |
| Individual Characteristics | Physiological States | Information-Motivation-Behaviour, Social Action Model |

| | | |
|---|---|---|
| Physiological States | Mental Processes | Transactional Theory of Stress and Coping |
| Physiological States | Behaviour | Information-Motivation-Behaviour, Maslow/ERG, Effort-Reward Imbalance Model |
| Physiological States | Outcomes | Stress-reduction approaches |
| Physiological States | Mental Constructs | Health Action Model |
| Mental Processes | Mental Constructs | Health Action Model |
| Mental Processes | Physiological States | Stress-reduction approaches |
| Mental Constructs | Behaviour | Expectancy-value models, Single Strategy approaches |
| Mental Constructs | Physiological States | Fear Appeal Theory |
| Behaviour | Outcomes | Behavioural Perspective Model |
| Outcomes | Stimulus | Self-regulation Theory, Social Regulation Theory, Cybernetic Theory of Organisational Stress |

The resulting Psychological Model, shown in Figure 4, is complex, although perhaps not as much as one might expect of a model of the way the human mind determines behaviour. It suggests that brains respond to incoming stimuli, which are fed to mental processes for interpretation, and sometimes directly call up particular mental constructs. The operation of mental processes reflects the influence of the long-term characteristics of an individual, such as their personality, as well as the rapidly changing influence of physiological states, such as arousal and motivation (which, in turn, can also reflect an impact from an individual's gender or age). Behaviour is the result of mental constructs formed by mental processes, together with the energizing force of physiological states such as motivation, in the context of a particular environment. Behaviour, in turn, has 'outcomes'. For example, in public health an outcome could be a decrease in morbidity due to some desired change in behaviour. [6] These outcomes can then feed back to the individual in the form of new stimuli.

This consolidated model is itself a model because it describes causal relationships between *classes* of constructs. It is thus a model at a higher level of abstraction than individual constructs (which are themselves abstractions from psychological mechanisms). We believe this abstraction is useful, as it suggests there is a good deal of consistency between the approaches in this category that can only be uncovered by the consolidation process. This model can be considered a generalized model of mental functioning, since the insights from a very large class of approaches are summarized in this single diagram. The fact that it retains a significant amount of structure suggests that there is a consistent vision of how the mind works in the psychology literature, and indicates that not every kind of relationship between elements is possible. For example, individual characteristics are not influenced by any temporary change in the brain, but can influence two other aspects of the brain: physiological states and mental processes. Further, in many cases, only a few kinds of states or processes are mentioned in the literature, so these categories typically have a relatively small number of members.

**Figure 4:**
**The Consolidated Psychological Model**




This analysis illuminates some interesting facts. It shows that the expectancy-value models, for example, concentrate almost exclusively on one kind of psychological determinant: mental constructs. On the other hand, stress reduction models are almost all about physiological states, while the persuasion models are about mental processes. It also highlights how the many popular psychological approaches that rely on only one 'trick' may be missing a trick or two. Only by attempting to consolidate the wide range of approaches which share the common objective of isolating the primary determinants of behaviour can we show how these sub-categories relate to one another in this way.

## 2/ Stage Approaches

The central problem for health promoters is that many people do, or do not, practice particular behaviours. The approaches covered thus far suggest that behaviour can be predicted by measuring psychological constructs. (Conner & Norman, 1996; Michie et al., 2005; N.D Weinstein, Rothman, & Sutton, 1998) However, not everyone is the same. At any given moment in time, some people may not even be contemplating changing their behaviour; others will have the intention to change in the future, while yet others may already have adopted healthy behaviours.

***Description***

A number of approaches in the psychological literature – in particular, the Stages-of-Change approach (also called the Transtheoretical approach) (J. Prochaska & DiClemente, 1983), the self-regulatory approaches (e.g., Rubicon model (Gollwitzer & Sheeran, 1993) and its brethren), and the Diffusion of Innovation approach (E. Rogers, 1995) – have addressed the fact that people vary with respect to their intent or ability to change behaviour. In particular, some working in the expectancy-value tradition noticed that, despite considerations of self-efficacy, intention-behaviour relations can remain weak. Meta-analysis of intention-behaviour relationship in many studies suggested that there was a need to fill the 'intention-behaviour gap' (Sheeran, 2002). To fill this gap, models such as the Health Action Process Approach (Schwarzer, 1992) suggest there is a post-intentional 'volitional phase' mediating the intention-behaviour relationship which involves planning the necessary actions in advance, devising self-regulatory strategies to control this sequence of actions, and coping (backup plans). These processes assist individuals to enact their intentions by initiating, maintaining and restarting behaviour when setbacks occur.

Stage approaches thus presume that changes happen in sequential steps, associated with progress through different segments, heading toward the adoption of a new behaviour. For example, the Transtheoretical and Diffusion of Innovation models exhibit a degree of parallelism with respect to their description of each segment of the population: pre-contemplation/awareness, contemplation/interest, preparation for action/trial, action/decision, and maintenance/adoption (Stages of Change/Diffusion of Innovation terms, respectively). These approaches share with the Psychological Determination approaches a concern with psychological characteristics; however, they differ in their objective: not to ascertain what constructs are proximally associated with behaviour change, but to determine how people in different states of preparedness to change can be distinguished psychologically. The outcome is not the isolation of specific psychological factors which need to be manipulated to cause new patterns of behaviour, but psychological markers which can be used to categorise people into particular stages or population segments.

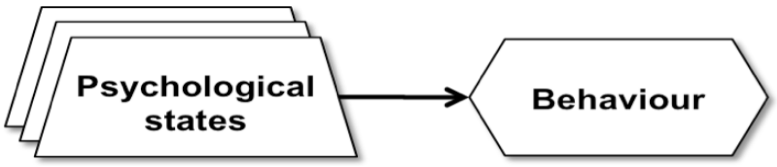
### *Consolidation*

These approaches suggest that behaviour adoption only occurs when some final threshold has been crossed and individuals enter the final stage, when the target behaviour is the outcome of being in that stage. Thus some stages precede others, and are not directly linked to the behaviour in question (although these earlier stages may have behavioural outcomes of their own). Each individual in the population can be assigned to a particular stage, as a consequence of their psychological state; Figure 5 shows this minimal set of concerns, with only the last in a series of sequential psychological states leading to behaviour. [7] Stages can be interpreted in two ways. For example, the Stages of Change approach emphasizes a changing relationship to the target behaviour: an individual can plan to make changes, be engaged in the target behaviour sporadically, regularly, or lapse from its practice. The Diffusion of Innovation approach suggests that beliefs and attitudes about the target behaviour can change, such as the perception about how many others are already engaged in the practice, with adoption of the practice being fraught with the possibility of lapsing back to an older, more familiar behaviour (as in the Stages of Change approach). Thus, the stacked set of boxes can be thought of as indicating either that individuals in a population at some point in time vary in psychological terms, or that the same individual must progress through a temporal sequence of changes in psychological constructs before the behavioural consequence is observed.

This is the only category to deal with the important problem of population segmentation – a primary strength of this kind of model. The Stages of Change approach is overtly concerned with

behaviour change, while the Diffusion of Innovation approach recognizes the possibility that an intervention can have added value if it causes interpersonal transmission effects (e.g., 'word-of-mouth'). However, linear progress through the Stages of Change is not well-supported, (Littell & Girvin, 2002) while the Diffusion of Innovation approach applies only to population attitudes toward product novelty, and not to the many other dimensions on which people vary.

**Figure 5:**
**The Consolidated Stage Model**




## 3/ Environmental Approaches

Nearly all of the factors appearing in the approaches considered so far are measures of individual psychological functioning (i.e., malleable constructs and relatively permanent psychological traits). An important category of behavioural causation is largely ignored by these models – that of the physical and social context in which behaviour is performed. In the psychological approaches, the environment is conceptualised as being uni-dimensional, being represented (at best) in the form of a single factor: 'environmental constraints' (or somewhat more elaborately, in the Health Belief Model, as the perceived difficulty of performing the behaviour and cues to action). Behaviour change programmes targeted at an individual's psychology are not prompted to deal directly with the environmental and institutional factors that may inhibit or encourage behaviour change. Although users of construct-based approaches know they cannot ignore the influence of environment, the context of behaviour is poorly conceptualized in these models. Some practitioners therefore advocate turning to approaches more explicitly concerned with the environmental constraints on action (Brug, Oenema, & Ferreira, 2005; Jeffery, 2004). By targeting interventions at a higher level of social organisation than individuals (e.g., institutions or communities), barriers to behavioural change can be removed at scale. For example, making sidewalks and playgrounds easier to access can increase people's willingness to exercise. (Owen, Humpel, Leslie, Bauman, & Sallis, 2004) Similarly, providing an organisational climate that favoured handwashing improved hand hygiene compliance in hospitals. (Larson, Early, Cloonan, Sugrue, & Perides, 2000)

### *Description*

Environmental models recognize that people live in social and physical ecological contexts which impact on their health, and that that various forms of 'guidance' for targeted behaviours can be embedded in the environment. The defining feature of such models is that they take into account the physical environment and its relationship to people at individual, interpersonal, organizational and community levels. Interventions might therefore need to address multiple, interdependent levels of causation, as the influence of an intervention at one level works its way down through layers of environmental factors, to affect behaviour. For example, physical conditions in a

workplace are influenced by state and national health and safety regulations. (Stokols, 1992) In a sense, this is advocating psychologically-based behaviour change at one remove: the gatekeepers at various levels of social organisation must be convinced to change the environment within which the targeted people make their decisions. This requires the development of intervention strategies aimed at changing the minds of policy-makers. (Brug et al., 2005)

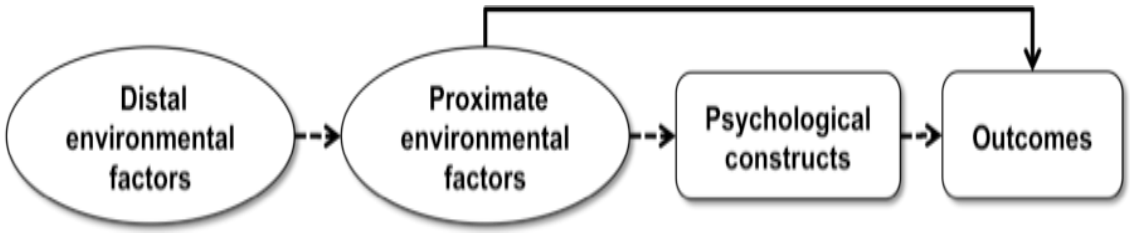
The key difference between these approaches and the previous categories is that they believe environments directly affect behaviour, not just through their effects on psychological constructs. (Barker, 1968) Ecological factors are also not only seen as constraining, but also in some cases as enabling behaviour, unlike Psychological approaches, which tend to emphasize the negative aspects of environmental contexts, captured by the notion of environmental 'barriers'.

***Consolidation***

The basic assumption of these models is that causality works from more distal kinds of ecological or environmental factors through more proximal ones to reach individuals. Ecological influences are thus typically represented as nested sets of factors (e.g., familial factors encircled by community-level factors). However, as noted above, environmental factors need not necessarily work through individual-level psychology to influence outcomes, but can have a direct impact – for example legislation against the emission of toxins into the environment.

Figure 6 thus shows how this class of approaches emphasizes the role of a number of aspects of the environment, in some cases working through a variety of psychological constructs, to determine some kind of outcome (usually a measure of population health). Environmental approaches are not models in the sense of defining causal connections between specific factors, but rather frameworks that offer additional levels of organisation at which to consider behavioural influences. For this reason, the arrows in Figure 6 are dotted, rather than the solid lines used previously in figures to illustrate claims about causal relationships. They are useful heuristically to get researchers who may be concerned with social cognition to broaden their scope of attention

**Figure 6:**
**The Consolidated Environmental Approach**




Environmental approaches emphasize the role played by different contextual determinants of behaviour – a definite strength. They are also concerned about the health consequences of behaviour. However, they tend to ignore behaviour *per se*, being more concerned with health outcomes. (It seems that it is difficult to consider environmental or structural causes of behaviour and still keep a focus on brain and behaviour.) Environmental approaches have also not been

widely used or tested, and so require additional exploration to verify their effectiveness. Further, they typically include a number of types of environmental factors but do not explain how these factors interact; this is especially crucial if different environmental factors (e.g., social, community, local) are nested within one another (as in the Social Ecology model), so that any influence of higher levels of organisation must filter down through lower ones to have an impact.

## 4/ Process Approaches

Besides having a predictive theory of behaviour, practitioners also need models to guide the implementation of behaviour change programmes. A number are available; they set out the process by which the design and implementation of population-level interventions should take place. We call these Process models. These models are unusual in that, while the proximate goal is to move through a normative process, the ultimate goal is explicitly to change behaviour at scale (or at least to have an impact on health, or some other outcome, through behaviour). For this reason, they can serve as useful models for behaviour change programmes. In fact, they serve two functions simultaneously, because Process models are models in two senses: they constitute ideal examples to follow (i.e., a normative model), and are conceptual simplifications of the reality of implementing behaviour change programmes (i.e., a descriptive model).

### *Description*

Process models are typically designed to help develop and evaluate complex interventions. We will argue that they come in two varieties: those which are purely programmatic, and those which advocate group activation as the primary means through which interventions should be designed and take place.

Programmatic approaches such as Social Marketing distinguish a number of steps through which an interventionist should proceed in order to optimally design and evaluate an intervention programme. Such steps can include conducting background research on the topic at hand, planning the programme intervention, implementing it, and evaluating the results. On the other hand, the Group Activation approaches include approaches which seek to guide change in groups rather than individuals, where the group can be an organisation, such as a CBO, a business or a neighbourhood. This guidance can be explicitly targeted at increasing the involvement of target groups in the intervention process itself. [8]

Advocates of community-level interventions typically believe that if community members participate in each phase of a behaviour change programme -- including development, implementation and evaluation – a sense of ownership is created that increases the programme's effectiveness, presumably because the people affected by a programme are in better position to define and find sustainable solutions to their own problems. (Chambers, 1983; Fals-Borda & Rahman, 1991) The emphasis on community involvement by the Group Activation approaches is a politico-moral stance. They are designed to generate political and community support, and can potentially lead to sustainable, institutionalized behaviour change or provide other spin-off benefits in the long term.

An emphasis on intervention processes thus brings two rather different classes of approach together: Social Marketing and Participatory Action Research are not generally considered to be similar, given their rather different political stances on opposite sides of Beattie's divide (in terms of intervention style). However, they are united in their concern for helping interventionists to lead

interest groups through normative processes that will result in significant benefits for target populations.

Programmatic and Group Activation-based Process models can be used to direct the design of any intervention programme. This is a major advantage because they can use feedback from results to learn lessons for future interventions. While many accept a formal approach to programme planning and design is necessary, (Brug et al., 2005) the effectiveness of any programme is still likely to depend upon the validity of the behavioural change model at its core.

Both the Programmatic and Group Activation approaches tend not to discuss the role of behaviour itself in producing the health outcomes with which they are concerned: somehow, the interventions, through community effort or an unspecified process, produce the desired changes in outcomes like health (though the PRECEDE–PROCEED approach (Green & Kreuter, 1991) is unusual within this class in including some behavioural determinants). By ignoring what motivates individuals, the proximate cause of any behaviour change, most of these approaches miss an important focus of effective intervention.

***Consolidation***

Figure 7 schematises the approaches of the process models. This model differs from the previous ones in that it is concerned with action steps rather than the factors that may influence behaviour. The temporal order of these action processes is also key to successful implementation.

**Figure 7:**
**The Consolidated Process Approach**

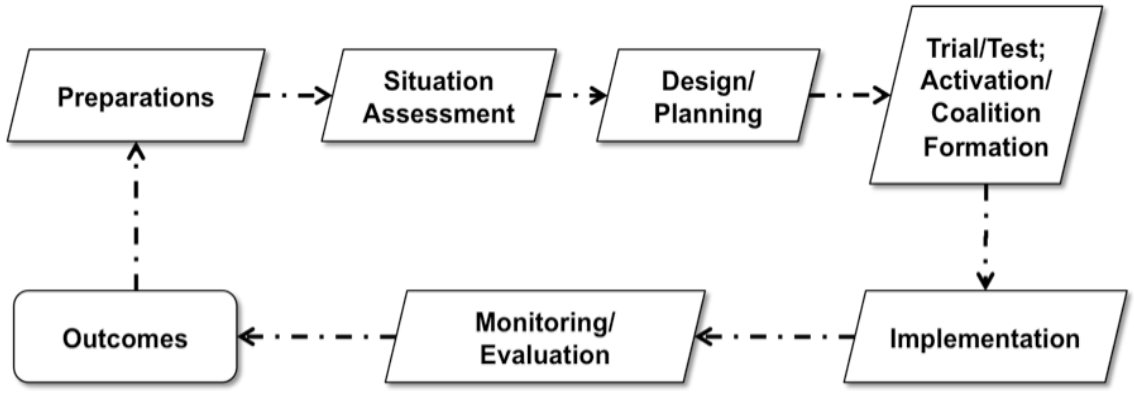



Figure 7 is a representation of the processes of design, delivery and evaluation of interventions. The lines in this diagram are dash-dotted to indicate that they represent steps in a process, rather than causal influences or relationships. The elements represent actions undertaken by interventionists (except for outcomes). First, preparations (which can include choice of team members or theory to be used to guide) inform the ways in which the situation 'on the ground' will be assessed by behaviour change team members or their agents. Situation assessments may more or less systematically document behaviour, psychological constructs, environmental variables, and sometimes the state of current interventions, so as to inform the design of

programme interventions. (Marketers call this 'consumer research', social scientists 'formative research' (V. Curtis et al., 1997)).

Findings from the situation assessment are then fed into a process of design and testing of interventions. These are specific actions taken by interventionists designed to alter aspects of the environment, and hence to influence behaviour. Design and Planning should thus include determination of the kind of intervention and the means for its delivery. The Programmatic approaches include phases for research and especially the design and testing of intervention strategies; Group Activation approaches tend to leave out research or testing of designs prior to implementing interventions and so do not usually carry out the full Process model. Group Activation approaches also tend to put intervention *before* research and design (contra our graphical representation of the Process model in Figure 7): the intervention consists of the introduction of outside change-agents (such as community development experts) who wish to collaborate with community members in action planning.

Design and planning can be followed by the goal to get support for this plan from the target population (e.g., in community-based approaches) or actual field testing, often on small scale, of the intervention itself, prior to rolling it out at full scale. Implementation might include building a public park or developing, manufacturing and distributing a new product or buying media space for an advertising campaign (affecting the physical environment), or advocating a change in the level of taxation on tobacco, or activating a community's concern about gender-based discrimination in the workplace (affecting the social environment). Once the intervention is in place, monitoring and evaluation begin (represented at the lower edge of the framework). Monitoring and evaluation use the reverse processes from formative research in that they seek to document what has changed in the environment, in brains, in behaviour, and sometimes in health outcomes too, due to the intervention. The results of monitoring assist with programme adjustment, and outcome evaluations are expected to provide information that is useful for the next generation of interventions. (Patton, 2002)

## *A Generic Framework*

If we look at the consolidated models of the four different categories of approach side-by-side, it can be seen that there are significant areas of overlap. This suggests that it might be useful to take another step toward consolidation – that of creating an overall Generic Framework which represents the concerns of all of the approaches.

Constructing this framework is a form of *distillation*; however, it is accomplished using a number of principles not typically used during *distillation*. First, we are explicit about how the elements of the framework have been selected and how they have been put together into a generic structure. Second, we maintain a consistent level of abstraction. By contrast, the Rockefeller framework, for example (depicted in Figure 1), combines elements which are highly abstract (e.g., mass media, policy, evaluation), with elements which are individual constructs (e.g., self-efficacy, intention). Third, we use rigorous rules for abstraction: those elements which appear in more than one categorical model only appear once in the Generic Framework. Thus only one representative of each distinct kind of element from the four category-based consolidated models (e.g., mental constructs, environmental factors, behaviour) appears in the Generic. Fourth, we are explicit about the way in which ontologically distinct elements relate to one another (see below). Interpretation of the representation should always keep in mind the ontologically different natures of different elements, which restrict the kinds of inferences that can be made about their

relationships. As a result of these constraints on construction, this Generic Framework should avoid the problems of interpretation which *distillation* can exhibit (i.e., an apparently random mix of elements with indefinite relationships).

Figure 8 represents this Generic Framework. At its core is what can be called a 'Behaviour Determination Model', which is similar to the consolidated Psychological Model, except that it is embedded in a representation of the environment. The essential insight of the Environmental approaches is encapsulated in the nested set of environments, which represent the contention that some kinds of social or physical elements of a situation can be causally distant from behaviour, working through other kinds or levels of ecological factors to achieve an impact on behaviour. The Behaviour Determination Model defines how individuals interact with their environments to behave, and thus cause outcomes. Surrounding the model of Behaviour Determination as the 'frame' of the Generic Framework is the Process consolidation model (the outside area), with its elements representing an optimal sequence of behaviours to be undertaken by interventionists. [9] Note the assumption that all behaviour change is a result – however indirect – of an intervention, or change in the environment.

Stage approaches can be imagined as adding another dimension to this framework. In effect, each population segment can be represented by a different set of parameter values for the various psychological factors used to segment the target population. Thus, several sets of psychological constructs are layered on top of one another in the Generic Framework, to capture the primary insight of the Stage approaches that psychological constructs need to progress through a series of iterative changes (the overlaid boxes indicating a number of distinct states associated with specific population segments) before behaviour can result. Similar dynamism arises from the fact that some stress-reduction models (e.g., the Transactional Model (R. Lazarus, 1991)) assume that stress is gradually reduced through a feedback process of improved coping and tension reduction, so physiological states can also progress through a sequence of conditions during behaviour change.

Obviously, the components of the Generic Framework represent different kinds of things, ranging from psychological processes which impact causally on each other, to environmental influences which might constrain action in some way, to kinds of activities which interventionists must undergo to effect changes in behaviour. Some of these are abstract (e.g., 'mental processes'); others more concrete. The framework does, however, make specific claims about what kinds of elements interact with others, and in what ways (as indicated by the nature of the arrow connector – some claims being about causal relations, others about optimal sequencing of activities).

Several of the components have dual natures, crossing ontological boundaries between different parts of the framework. For example, the elements which link the Behaviour Determination and Process sections together (i.e., interventions and outcomes) have a heterodox ontological status, being both Process actions and things-in-the-world. For example, an intervention such as a TV ad is both the product of a design and trial process, and something which can be perceived by the target population; an outcome is simultaneously an environmental 'fact' (e.g., increased body weight) as well as a conceptual measure in the minds of interventionists (e.g., a percent change in the likelihood of dying). For this reason, the box representing outcomes crosses the border between the Process Model and the Behaviour Determination Model. In this way, the process of intervention design and implementation interact with the real world – otherwise public health wouldn't be improved! Some elements of the Behaviour Determination Model are also heterodox

because they cut across categories of determinants – such as behaviour, which is both a phenomenon which takes place in time and space, but also a product of bodily motion.

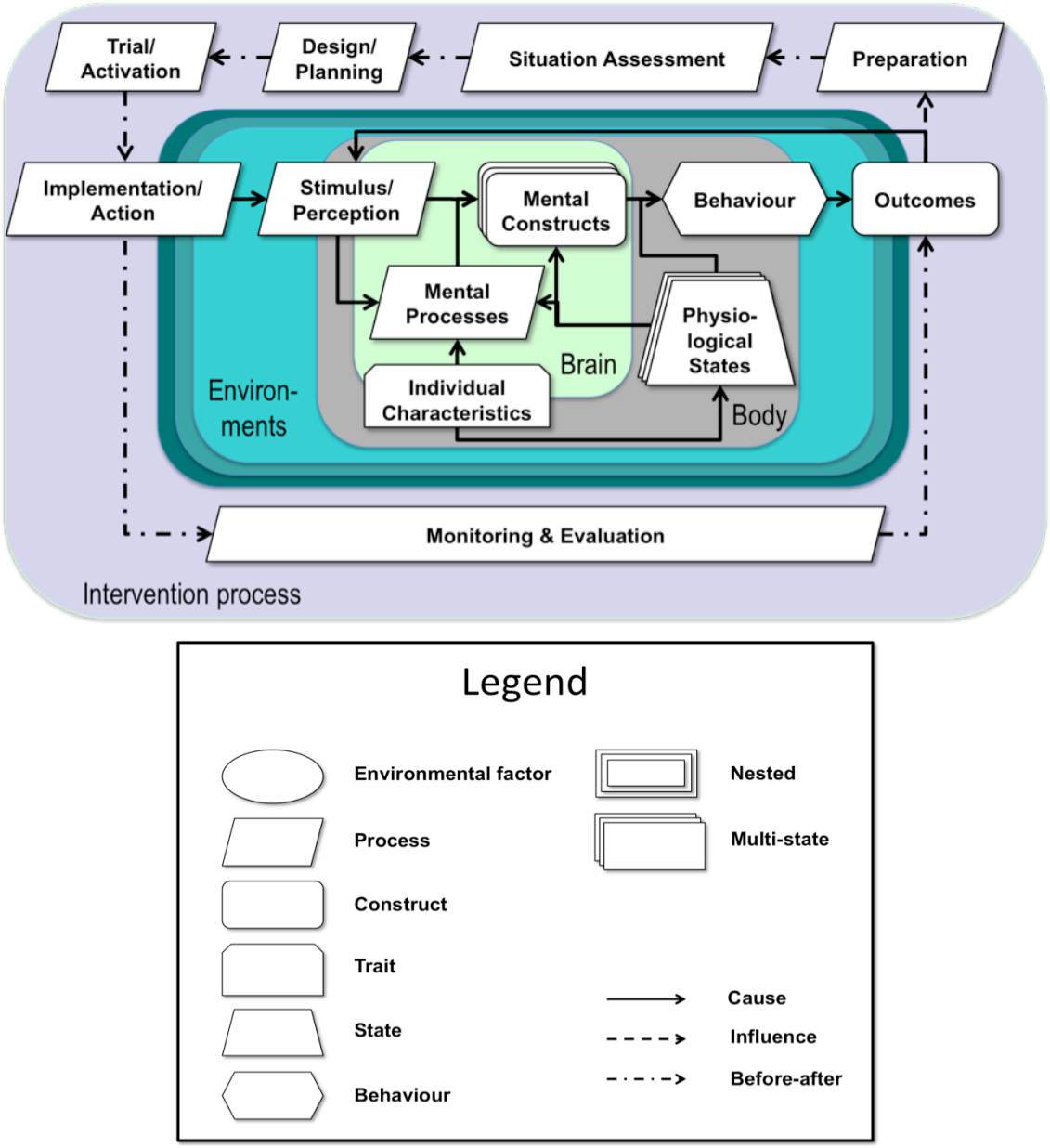
This way of summarising and simplifying the main approaches to, and theories of, behaviour change is different to previous efforts in this direction. Unlike the *distillation* approach, we have used a principled means of selecting and linking behavioural determinants at a constant level of abstraction, not mixing the unlike and not forcing new and untried relationships on component constructs. Unlike the *consensus* approach, where many and various determinants of behaviour were gathered into long lists, we have been able to order the relationships between types of behavioural determinants. Unlike *typologisation,* we have included all spheres of influence in one model rather than separated them into different categories.

We believe this framework has a number of uses. First, by placing elements from different categories of approach together in the same analysis, we can see how they relate to one another, something that previous approaches have not been able to offer. For example, it becomes clear that the popular Expectancy Value approaches are almost totally restricted to a single element of the framework, mental constructs, while another category of approaches, the stress reduction models, are almost all about physiological states, and the persuasion models are about mental processes. Each of these categories thus inhabits small, isolated corners of the possible universe of factors which might influence behaviour change.

Second, the structure of the framework also suggests that particular kinds of factors interact with one another in specific ways. For example, it allows one to ask how an intervention to change the availability of an environmental factor (e.g., a tool) might lead to an improvement in self-efficacy over time, and hence change behaviour. Alternatively, one might hypothesise that providing new information about a how much a belief is shared could change a norm in the social environment, which, in turn, would change the perceived value of a behaviour and make it more likely to be performed. Testing such hypotheses can provide rich information about how and why interventions succeed, or, perhaps more usefully, about where and why they fail.

Another implication of the consolidated Generic Framework is more practical. Faced with a given health problem, the framework offers a heuristic guide to the selection of an appropriate approach, and a convenient representation of all the factors which theory suggests should be considered during programme development. Hence, for example, faced with a substance abuse problem, an interventionist would be reminded to think of physiological as well as psychological causes of behaviour, and faced with a hygiene problem, would be reminded to look for cues to habitual behaviour in the environment. By keeping the Generic Framework in mind, a practitioner is not allowed to forget that environments affect brains, or the fact that some members of the target population might be in different states of preparedness for change, or that health outcomes are a product of behaviour. In this way, the choice of an appropriate approach is constrained *a priori.*

**Figure 8:**
**The Generic Framework**




## *Discussion*

Our review of behaviour change approaches has a number of implications. First, it points to the need to develop behaviour change theory further. In particular, it throws into sharp relief the many determinants of behaviour that are poorly represented in the behaviour change literature. For example, few current models use well-established neuroscientific constructs such as attention, affect, memory and reward. Instead, most of the inspiration for behaviour change theories comes from cognitive psychology, built on the computer metaphor.

Further, while existing Psychological models may do well at predicting cognitively determined behaviours, they can only partially explain motivated types (where some Single Strategy models such as the Social Comparison Theory {Festinger 1954} might help), and habitual behaviours not at all. This is problematic because there is increasing evidence that much of human behaviour is

based on unconscious or implicit mental processes, (Bargh & Chartrand, 1999; Dijksterhuis & Nordgren, 2006; Wilson, 2004) a fact which has hitherto been largely ignored in the behaviour change literature. Habits – or learned automatisms – are another important type of behaviour which have different causes from the beliefs or attitudes which figure prominently in most approaches. (McCaul, Glasgow, & O'Neill, 1992; Bas Verplanken, 2006; Wood, Quinn, & Kashy, 2002) By one measure, about half of our everyday activities are performed habitually. (Quinn, Neal, & Wood, submitted) In particular, any behaviours of relevance to public health are habitual, such as eating, exercising, drinking, driving and hygiene practices. It is therefore surprising to realize that the construct of habit has appeared in very few of the approaches we have discussed (where it has appeared – e.g., in the Theory of Interpersonal Behaviour (Triandis, 1977) – it is only as one of the determinants of any behaviour, and not recognizing that habits have an altogether different kind of causal relationship with behaviour). Habit performance is cued by the environment, so changes to beliefs and attitudes -- for example, through informational or persuasive messages -- have little effect on habitual behaviours. (Webb & Sheeran, 2006) This obviously has significant implications for behaviour change interventions. Successful programmes to change habitual behaviours will have to rely either on changing the environmental context of behaviour – for example, by intervening to change cues, or through policies that reduce access to unhealthy products, (B Verplanken & Wood, 2006) or techniques for challenging people to develop cognitive plans specifically designed to instigate new habit formation (B Verplanken, 2005). Much work is still needed to understand how new habits can be instilled and old ones removed.

The Stage approaches suggest that there is temporal structuring of behaviour, but understanding of temporal dependence remains poor. In large part, Psychological models ignore the dependence of what is happening now on what has happened before. Some models consider the influence of past behaviour on current behaviour. (Ronis, Yates, & Kirscht, 1989; S Sutton, 1994) However, this consideration is limited to past behaviour of the same kind, not the probability that behaviour X will be followed, at some remove, by behaviour Y – a more generalized sequence dependence which is surely characteristic of most behaviour. Similarly, a number of expectancy-value models (e.g., the Health Belief Model and Theory of Planned Behaviour) focus on possible future behaviour, but only in the form of risk perception, considered as the probability of acquiring a particular condition in future. However, the more general phenomenon of the imagined future consequences on current behaviour has not been rigorously investigated. Temporal interdependence between behaviours, especially in the form of routines in everyday behaviour, needs further attention. (R. Aunger, 2007)

Few current approaches in the behaviour change literature deal in any depth with the issue of how stimuli are perceived and responded to – an issue that is key to designing effective interventions. Further, the process of how best to develop interventions is under-developed in the literature. Formative research is not a standard approach in the development of behaviour changing interventions despite its obvious utility. {Curtis, 2004; Curtis, 1997; NIMH Collaborative HIV/STD Prevention Trial Group, 2007} Very little attention has been directed at the question of how understanding and insight from formative research, or even from the results of a health psychology study, can actually be translated into the elements of an intervention that is effective at changing behaviour. There is little conceptual or practical guidance in the literature. Marketing techniques for generating, filtering and testing creative options may provide some of the most sophisticated approaches available to do this. (V Curtis, 2004)

Another strategy which has gone relatively unexploited for choosing among intervention options by both theoreticians and practitioners is experimentation, using either lab-based situations which

mimic the real world, computer simulation or internet-based surveys. The primary virtue of these approaches is that they provide a way to reduce the cost of finding effective interventions by screening, or comparing multiple options for their ability to change behaviour relatively quickly and easily, in controlled circumstances. (Judah, Aunger, Curtis, Schmidt, & Michie, 2009) With the most effective intervention isolated in this way, the final programme can be rolled out at scale. Such tests are often considered to be ecologically invalid, and hence relatively uninformative. However, there is evidence that this fear is overestimated. (Gosling, Vazire, Srivastava, & John, 2004) In any case, given the cost of many full-scale interventions, they should be considered more often.

It is striking to note that of all of the approaches to behaviour change we collected, only Stage approaches have behaviour change itself as their primary objective**.** However, these approaches are few, and not well supported empirically. Developing models that focus explicitly on behaviour *change* will require several advances. First, investment will be needed to find out which constructs identify real psychological mechanisms. Many of the constructs used in the approaches we have covered have been validated statistically – that is, in terms of their ability to be reliably measured. They have also regularly been found to correlate significantly with the practice of a particular behaviour. However, this does not necessarily mean that they are the best possible constructs, because they may overlap with -- but not pinpoint – the real psychological mechanisms that produce behaviour. Theoretical work as well as empirical testing will be required to isolate, measure, and find means of targeting these mechanisms for truly effective behaviour change.

Empirically, competing approaches should be tested side-by- side for their success at modelling intermediate and outcome variables. This should give us the ability to distinguish those theories that are most predictive and hence begin the important process of rejecting those that fare less well. Thus far, very few trials have taken place which explicitly test the claims of one approach against another. (Noar & Zimmerman, 2005) Many more such experiments will be required to determine which causal pathways significantly influence behaviour.

Finally, this exercise in theory consolidation has implications for the disciplinary practice of health psychology and other behaviour change professionals (health promoters, social marketers, organisational and occupational psychologists and public health practitioners). Many practitioners will no doubt continue the common practice of picking an existing Psychological approach 'off the shelf' (e.g., the Social Cognition approach or Theory of Planned Behaviour). However, to do so risks missing many of the key determinants of behaviour, especially if it is true that health behaviours can have different kinds of causes (cognitive, motivated or automatic). The consolidated Psychological model shows that they also risk missing the key role of the environment, of stimulus processing, of temporal factors and physiological causes. Health psychologists must cast their net wider than expectancy value approaches if they are to assist practitioners in designing interventions that can change problem behaviours.

Further, practitioners tend to concentrate on the Process model; academics on the Behaviour Determination Model. We suggest that both disciplines would do well to take on board the entire Generic Framework: academics could do with more research on the situation of their target populations prior to interventions being introduced and more understanding of how to produce better interventions; practitioners would benefit from studying the psychology of the behaviour they seek to change in greater detail before designing implementations. In the end, theoretical and practical advances will need to go hand in hand; progress will require feedback between improved theory and intervention methods, in the form of empirical testing, to improve our ability

to change behaviour. (A. J. Rothman, 2004) The Generic Framework is quite explicit about how the process of practice integrates with the theory of behaviour determination, and so should help this kind of progress.

## APPENDIX 1:
## The Approaches

| APPROACH | PRIMARY SOURCE |
|---|---|
| **PSYCHOLOGICAL** | |
| ***Single Strategy Group*** | |
| Operant Conditioning | (Skinner, 1938) |
| Balance Theory | (F. Heider, 1946) |
| Attribution Theory | (F. Heider, 1944; Kelly, 1967) |
| Social Comparison Theory | (Festinger, 1954) |
| Congruity Theory | (Osgood & Tannenbaum, 1955) |
| Cognitive Dissonance | (Festinger, 1957) |
| Equity Theory | (Adams, 1963) |
| Locus of Control | (Rotter, 1966) |
| Expectancy Theory | (Porter & Lawler, 1968; Vroom, 1964) |
| Goal-setting Theory | (Locke, 1968) |
| ERG theory | (Alderfer, 1969) |
| Learned Helplessness | (Seligman, 1975) |
| Sensation-Seeking Theory | (Zuckerman, 1979) |
| Hierarchy of Needs | (Maslow, 1970) |
| Intrinsic Motivation Theory | (Edward L Deci, 1975) |
| Unrealistic Optimism | (Neil D. Weinstein, 1983) |
| Cognitive Adaptation Theory | (Taylor, 1983) |
| Social Norms | (Perkins & Berkowitz, 1986) |
| Conservation of Resources Theory | (Hobfoll, 1989) |
| Effort-Reward Imbalance | (Siegrist, 1996) |
| Implementation Intentions | (Gollwitzer, 1999) |
| ***Expectancy Value Group*** | |
| Health Belief Model | (Hochbaum, 1956) |
| Theory of Reasoned Action/ Planned Behaviour | (Ajzen & Fishbein, 1973) |
| Social Cognitive Theory | (Bandura, 1977) |
| Theory of Interpersonal Behaviour | (Triandis, 1977) |
| Behavioural Reasoning Theory | (Westaby, 2005) |
| ***Persuasion Group*** | |
| The Communication-Behaviour Change Model | (Finnegan Jr & Viswanath, 2002) |
| Social Influence Approach | (Lewis, DeVellis, & Sleath, 2002) |

| | |
|---|---|
| Fear Appeal Theory | (Witte, 1992) |
| Elaboration Likelihood Model | (Petty & Cacioppo, 1986) |
| ***Stress Reduction Group*** | |
| Cybernetic Theory of Organizational Stress | (Cummings & Cooper, 1979) |
| Transactional Theory of Stress and Coping | (R. S. Lazarus, 1966) |
| Theory of Preventative Stress Management | (Quick, Quick, Nelson, & Hurrell, 1997) |
| Self-regulatory (or Common Sense or Parallel Process) Model of Illness Behaviour | (Meyer, Leventhal, & Gutmann, 1985) |
| ***Diverse Group*** | |
| Health Action Model | (Tones, 1995) |
| Behavioural Perspective Model | (Foxall, 2001) |
| Social Regulation Theory | (Carver & Scheier, 1981) |
| Job Characteristics Model | (Hackman & Oldham, 1976) |
| Motivation-Hygiene Theory (Two-Factor Theory) | (Herzberg, Mausner, & Snyderman, 1959) |
| Social Action Theory | (Ewart, 1991) |
| Person-environment Fit Theory | (Dawis & Lofquist, 1984) |
| Information-Motivation-Behavioural Skills Model | (Fisher & Fisher, 1993) |
| Social Networks and Social Support | (Heaney & Israel, 2002) |
| Social Influence | (Lewis et al., 2002) |
| Gender and Power Theory | (Connell, 1987) |
| Protection Motivation Theory | (R. W. Rogers, 1975) |
| Self-Determination Theory | (E. L Deci & Ryan, 1985) |
| The Authoritative Parenting Model | (Simons-Morton & Hartos, 2002) |
| Buyer Behaviour Theory | (Howard & Sheth, 1969) |
| Natural Helper Model | (Collins & Pancoast, 1976; Israel, 1985) |
| **STAGE** | |
| Stages-of-Change/Transtheoretical approach | (J. Prochaska & DiClemente, 1983) |
| AIDS Risk Reduction Model | (Catania, Kegeles, & Coates, 1990) |
| Health Action Process Approach | (Schwarzer, 1992) |
| Precaution Adoption Process Model | (N. D. Weinstein & Sandman, 1992) |
| The Multi-Stage Model of Health Behaviour Change | (Lippke & Sniehotta, 2003) |
| Health Behaviour Goal Model | (Maes & Gebhardt, 2000) |
| Diffusion of Innovation | (E. Rogers, 1995) |
| **ENVIRONMENTAL** | |
| Social Ecological Model | (McLeroy et al., 1988; Stokols, 1992) |
| Behavioural Ecological Model | (Hovell, Wahlgren, & Gehrman, 2002) |

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| Risk and Protective Factor Model | (Catalano & Hawkins, 1996) |
| Resilience Approach | (Bernard, 2004; Werner & Smith, 1982) |
| **PROCESS** | |
| ***Programmatic Group*** | |
| PRECEDE-PROCEED | (Green & Kreuter, 1991) |
| Intervention Mapping | (Bartholomew, Parcel, Kok, & Gottlieb, 2001) |
| RE-AIM | (R Glasgow, Vogt, & Boles, 1999) |
| Social Marketing | (Kotler et al., 2002) |
| Medical Research Council Model | (Campbell et al., 2000) |
| Prevention Marketing | (Kennedy & Crosby, 2002) |
| Interactive Domain Model | (Kahan & Goodstadt, 2001) |
| ***Group Activation Group*** | |
| Community Coalition Action Theory | (Butterfoss, 2006) |
| Participatory Action Research | (Kemmis & McTaggart, 1988) |
| Collaborative Community Change Model | (Taylor-Powell, Rossing, & Gerran, 1998) |
| Community Building and Organisation | (Minkler & Wallerstein, 2002) |
| Social Capital Theory | (Putnam, 1995) |
| Settings-based Approach | (Baric, 1993; Whitelaw et al., 2001) |
| Systemic Inter-Organisational Network Model | (Alter & Hage, 1993) |
| Organisational Development Approach | (Porras & Roberston, 1987) |
| Stage Theory of Organisational Change | (Beyer & Trice, 1978) |

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## *Notes*

[1] We define the key technical terms as follows:

- **Theory**: a set of related statements or principles devised to explain a group of facts or phenomena. (Kerlinger, 1986) These related propositions make phenomena comprehensible by describing the relevant structure, operation and circumstances under which they occur.
- **Model**: a simplified description of a complex entity or process. Models allow complex systems to be understood and their behaviour predicted within the scope of the model, but may give incorrect descriptions and predictions for situations outside the realm of their intended use. A conceptual model can be a component of a theory that represents some process or phenomenon with a set of variables and a set of logical and quantitative relationships between them.
- **Approach**: describes a model or theory which has been used as the method of dealing with the problem of large-scale behaviour change by some group of people (such as psychologists or public health workers) and hence has a tradition in the behaviour change literature

[2] For example, a cross-theoretical review shows that there are significant differences in the degree of success of media-based health campaigns in the United States depending on what kind of behaviour is targeted: getting people to use seat belts being relatively easy, while sexual behaviour is much harder to change. (Snyder et al., 2004)

[3] The participants in this workshop also argued that five other variables are key in determining the strength of intention: belief that the advantages outweigh the disadvantages (costs, outcome-related factor valuation), perception of social normative support for the behaviour, consistency of behaviour with self-image and personal standards, positive emotional valence, and self-efficacy.

[4] All approaches discovered were included in this analysis. Theoretical interest or empirical utility could have been used to reduce the number of approaches included in the analysis; however, it was difficult to find a standard against which theoretical novelty or power could be judged. Further, it was felt that – given considerable variation in the degree of attention devoted to the various approaches – using the weight of empirical evidence for changing behaviour as a criterion was unfair, as only those approaches subjected to many tests would likely be excluded on such a basis.

[5] Our categorization is not based on the 'levels of influence' principle used by most of our predecessors (see discussion above). For example, Glanz/Rimer put Social Cognitive Theory in the interpersonal category because of its emphasis on social learning, even though it is an approach based on individual-level psychological constructs. (Others put it in the individual-level category.) Further, both Glanz/Rimer and Nutbeam/Harris call Diffusion of Innovation a community-based approach. However, Diffusion of Innovation is a population, not community-based approach; unlike other community-based approaches, it is not about building fellow-feeling within social groups or reorganizing the community to increase its solidarity. Putting Diffusion of Innovation with community-based approaches is to confuse its objective, makes the category heterogenous, and separates Diffusion of Innovation from the other stage-based approaches, such as the Transtheoretical approach.

Glanz/Rimer and Edberg put ecological approaches in the 'Theory and Practice' section of their book because environments are the context in which behaviour occurs (much like Nutbeam/Harris' category of policy). However, practice – or *putting into* practice – is about the process of inducing, or engaging in, behaviour change. This process can involve working with, or

through, social organisations and physical constraints – the elements of ecological approaches, but such approaches do not indicate who to approach with what kind of intervention to be successful. So while practitioners will likely use the concept of nested (group) structures as the context of the behaviour they wish to change, recognition of these nested environments does not specify the steps through which one needs to progress to achieve changed behaviour. Context is not equivalent to practice, and ecological approaches do not belong in the Intervention Process category.

Finally, Nutbeam/Harris, Edberg and Glanz/Rimer separate community and process approaches, whereas here they have been grouped together (although as separate subcategories of Intervention Process approaches). This ignores the fact that both kinds of approach share a fundamental quality: being about best-practice intervention design and implementation, albeit in sometimes different contexts and with different philosophies among practitioners of each subcategory. (Nutbeam's Policy category can be seen as part of environment; no theories are actually mentioned in that chapter.)

We believe that the idiosyncratic placements of approaches entailed by use of the 'levels of influence' criterion make it a less attractive way of categorizing behaviour change approaches than the 'primary behavioural objective' criterion used here, which results in a more insightful, but still parsimonious, categorization of the behaviour change literature.

[6] Outcome could be defined in such a way that behaviour is not required to achieve it. For example, an individual could be convinced (via an intervention) to take a drug which enhances their sense of well-being (the target outcome) without them undertaking any specific action. This would constitute a direct construct-outcome link, contrary to the specification of our framework. However, since we are interested here in approaches to behaviour change, we assume that outcomes are sequelae of behaviour.

[7] Note, however, that there is a separate tradition of segmentation from marketing that is not based on a theory of progression through stages. Instead, marketing-based segmentation approaches divide populations into distinguishable groups simply by what kind of place they live in (urban or rural), or by socioeconomic class, or by any other characteristic that seems relevant (including psychological traits such as personality variation). Marketers have long recognized that populations exist as segments with different profiles, only one of which can be expected to respond to any given effort. (Andreasen, 1995; Kotler et al., 2002; Malbach, Rothchild, & Novelli, 2002) For example, suppose an intervention about the disgusting nature of smoker's lungs convinces 10% of the population to give up smoking. Then another series of ads using disgust has considerably less effect. The reason may be that the population suggestive to messages about disgust has been exhausted and another sub-group now needs to be targeted using a different kind of tactic. However, this kind of segmentation is a largely atheoretical endeavour (indeed, no representatives of this kind of approach appeared in our literature search). The objective is primarily to determine what distinguishes different groups, so that they can be most appropriately targeted so as to change their behaviour, with specific materials or interventions being designed for each segment.

[8] Empowerment and participation are theoretically and practically separable aspects of a Group activation approach. For example, members of a community can be empowered through legislative fiat, which gives members benefits outright, with no participatory process being necessary (as when a policy-maker gets new services or infrastructure provided to a community). Alternatively, participation can be very inclusive, and active at many stages of an intervention, but as a consequence of the process being poorly managed, no sense of empowerment results. (Indeed the opposite can occur, in the form of new levels of contention and division within the

community). Thus, Group activation approaches need not involve empowerment or participation. However, provision of services and infrastructure is typically the goal of a Multi-Level (particularly an ecological) approach, and while some Group activation approaches may target one or the other of these two aspirations, an increase in participation *and* empowerment is typically the implicit means desired by any such approach to achieve a better community-level outcome.

[9] Putting two quite different kinds of approaches together in this way might seem to be an example of the *distillation* strategy which we suggested in the Introduction can force relationships between elements which are not warranted by the evidence. However, the design of the Generic Approach is based on an existing approach – the PRECEDE-PROCEED model (Green & Kreuter, 1991) – which has a similar behavioural model in its centre, with the intervention process representation around the fringe. So our step toward a Generic Approach essentially takes a set of already-postulated relationships and generalizes them to a representation of the literature as a whole.