

A Review of the use of the Health Belief Model (HBM), the Theory of Reasoned Action (TRA), the Theory of Planned Behaviour (TPB) and the Trans-Theoretical Model (TTM) to study and predict health related behaviour change

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JUNE 2006

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Summary

The National Institute for Health and Clinical Excellence (NICE) has been asked by the Department of Health to develop guidance on *‘the most appropriate means of generic and specific intervention to support attitude and behaviour change at population and community levels’*. This review, undertaken by The School of Pharmacy, University of London, was, with five others, commissioned by NICE to support the preparation of its response to this request.

Its aim is to examine the use of the Health Belief Model (HBM), the Theory of Reasoned Action (TRA), the Theory of Planned Behaviour (TPB) and the Trans-Theoretical Model (TTM, often also referred to as the Stages of Change – SoC – model) to study and predict health related behaviour change measured in terms of shifts knowledge, attitude, intention and behaviour. It in addition it considers the extent to which social, environmental and economic factors have been included in the models identified.

The five research questions addressed are as follows:

1. What concepts and constructs does each of the selected models contain?
2. To what extent is each model able to incorporate social, economic and/or environmental factors, particularly in relation to the occurrence of health inequalities?
3. In which areas has each model been used?
4. How effective has each model been shown to be at predicting changes in knowledge, attitudes and/or behaviour in these areas?
5. Have any changes in knowledge/attitudes/behaviours brought about in relation to use of these models been shown to effect health outcomes, expressed in terms of (population) morbidity and mortality?

The methodology employed and terms used are described in section 2 of the main review report. Its findings are presented here as summaries of evidence relating to the research questions listed above.

What concepts and constructs does each of the selected models contain?

The Health Belief Model (HBM), the Theory of Reasoned Action (TRA), the Theory of Planned Behaviour (TPB) and the Trans-Theoretical Model (TTM) are distinct models containing (in common with other psychological models of health behaviour change) a number of components. These are of various types, ranging from uni-dimensional variables to complex multi-dimensional constructs (Armitage and Conner 2000).

Each model has unique aspects. For example, the HBM's 'perceived threat' construct differs from all others contained in the TRA, the TPB and the TTM. Its specification also includes 'objective' demographic and other variables such as cues to action (including media information and personal or other behavioural reminders) not included in the other models' specifications (Rosenstock et al 1994).

While the HBM is health behaviour focused, the TRA and the TPB are framed at higher levels of generalisation (Ajzen 1998). They can thus be applied outside the health sphere. The TRA and the TPB share identical attitudinal and social norm related components (Fishbein and Ajzen 1975). In addition, the TPB contains constructs relating to control related beliefs and self-efficacy (Ajzen 2002). The TRA and the TPB are arguably mathematically better specified than the HBM and the TTM, and more parsimonious in design. That is, they have fewer, more precisely defined, components. This may enhance the efficiency and consistency of their use.

The TTM's SoC and process of change components are also important distinguishing elements (Prochaska and Velicer 1997, Burkholder and Nigg 2002). The TTM is the most complex of the models considered here, and the only one designed directly to facilitate behavioural change. This can be regarded as a fundamentally important structural and functional discriminator. In the context of the models' use in practice, further heterogeneity is derived from the fact that they are often only partially applied and/or adapted to meet particular research or programme requirements. Yet there are also important structural commonalities.

The structure and content of models such as the HBM, the TRA, the TPB and the TTM can be understood at several levels. For example, Smedslund (2000) has offered

a critical evaluation of health psychology models based on the fundamental descriptors ‘can’, ‘try’, ‘want’, ‘expected utility’ and ‘belief in ability’. Smedslund concluded that the HBM lacks an ‘intention to try’ construct.

Noar and Zimmerman (2005) analysed the components of HBM, the TRA, the TPB and the TTM (and also Bandura’s Social Cognition Theory – the SCT) in terms of structures appertaining to attitudinal beliefs; self-efficacy and behavioural control beliefs; normative beliefs; risk related beliefs and emotional responses; and intention, commitment and planning. Of the theories that are the subject of this review, these authors’ analysis suggests that the TTM has the most comprehensive component set. They concluded that at present there is extensive plurality/heterogeneity in the body of research available, and that it is uncertain what theory or theories can best be used to predict (and ultimately to change) health behaviour. Noar and Zimmerman called for more integrative approaches. Their findings have important implications for the commissioning of research and theory and practice development in this public health field.

Evidence statement

Psychological models commonly employed to explain, predict and facilitate health behaviours contain a wide variety of components. Some are unique to particular models. But many share identical or overlapping characteristics, and have evolved from common roots as a result of an evolutionary process of development (Armitage and Christian 2003, Noar and Zimmerman 2005). There is evidence derived at the level of narrative review that the efficacy and effectiveness of interventions to promote health behaviour change could, to the extent that these depend on the use of models like the TPB and the TTM, be further enhanced through better disciplined and directed future approaches to component and model development (Armitage and Conner 2000, Weinstein and Rothman 2005). This should be aimed directly at achieving improved health outcomes.

To what extent is each model able to incorporate social, economic and/or environmental factors, particularly in relation to the occurrence of health inequalities?

None of the models examined in this review is specified adequately to incorporate and interpret the significance of social, economic and/or environmental factors as predictors and determinants of health behaviour. Many of the components and psychological constructs they contain relate to cognitions and perceptions that are a function of subjects' responses to their environments. But this alone cannot be relied upon to allow social and economic realities to be adequately appreciated (Kippax and Crawford 1993). Although descriptions of the HBM include demographic and socio-economic variables, the evidence identified during the process of this review indicates that in practice this model has not normally been used effectively to exploit this potential strength.

This finding also has important implications for the commissioning of research and development in this public health field. It is relevant to issues such as the future integration of sociological and psychological approaches to understanding and changing health behaviours. At present apparent failings in this area imply that opportunities to understand cognitive dimensions of class and ethnicity related (and other) health inequalities are being lost.

The heterogeneity of health psychology studies and inconsistencies in the way that models are applied often renders it difficult or impossible to apply techniques such as meta-analysis in order to derive data on their predictive power and the effectiveness of alternative public health interventions. (See, for instance, Yarbrough and Braden 2001 **2-B**, Sutton 1998; for an explanation of levels of evidence, quality scores and UK applicability ratings see Table S1 below). Such failings may on occasions cause cost effective opportunities for interventions aimed at changing environmental and organisational determinants of health related behaviour to be ignored, while less productive attempts to change beliefs, attitudes and outcomes are pursued. In health improvement terms this may favour relatively advantaged groups, in as much as they are best placed to change relevant beliefs and attitudes.

Table S1. Levels of evidence, quality scores and UK applicability ratings

Levels of Evidence		
Level of evidence	Type of evidence	
1	Meta-analyses or systematic reviews of RCTs	
2	Meta-analyses or systematic reviews of non-randomised controlled trials, case-control studies, cohort studies, controlled before-and-after (CBA), interrupted time series (ITS), correlation studies	
3	Non-analytic studies (for example, case reports, case series)	
4	Expert opinion, formal consensus	
Quality scores		
Criteria	++	+
1. Was there a focused aim or research question?	Yes	Yes
2. Explicit inclusion / exclusion criteria	Yes	Yes
3. More than one assessor / selector	Yes	
4. Provide details of databases searched	Yes	Yes
5. Lists years searched	Yes	Yes
6. Followed up references in bibliographies	Yes	
7. Experts consulted for further sources		
8. Grey literature included / searched		
9. Specified search terms / strategy	Yes	Yes
10. Not restricted to English language papers only	Yes	
11. Quality assessed	Yes	Yes
12. Data supports conclusions	Yes	Yes
Notes: ++ must <i>at least</i> meet 10 criterion indicated above + must <i>at least</i> meet 7 criterion indicated above - 4 or less criteria		
UK applicability ratings		
<p>Applicability to the UK setting was graded according to the NICE criteria (A-D):</p> <ul style="list-style-type: none"> A. Includes UK studies B. Non-UK studies of interventions that would be most likely to equally apply to UK settings C. Non-UK studies that may have some application to UK settings but should be interpreted with caution. There may be strong cultural, ethnic, religious, climatic or institutional differences that would have impact on the effectiveness of the intervention if applied in the UK D. Non-UK studies that are clearly irrelevant to UK settings 		

Evidence statement

None of the psychological models evaluated during this review are adequately specified to analyse the significance of social, economic and/or environmental factors as predictors and/or determinants of health behaviour. When such models are used there are often failures to record information relevant to such factors. There is indirect evidence that this could cause relatively cost effective opportunities for interventions aimed at changing the environmental and organisational determinants of health behaviour to be neglected (Ferguson 1996 2-A). In some circumstance this could increase health inequalities.

In which areas has each model been used?

The evidence available indicates that the HBM has most frequently been employed in the context of health service uptake issues such as immunisation acceptance, and compliance with medical treatment (Becker 1974, Rosenstock 1974, Janz and Becker 1984, Harrison et al 1992 **2-B**). The more general theoretical frameworks offered by the TRA and the TPB have allowed them to be applied in the analysis of virtually all significant health behaviours (Kashima and Gallois 1993, Ajzen 1998) and, to a lesser extent, in predictive investigations and the design of health interventions (Hardeman et al 2002 **2-A**). Key areas of TRA and TPB application identified during the process of this review were:

- exercise intentions and behaviours (Ajzen and Driver 1991, Godin 1993, Blue 1995 **2-B**, Hausenblas et al 1997 **2-B**, Hagger et al 2002 **2-B**, Downs and Hausenblas 2005 **2-B**);
- weight gain prevention and eating behaviour (Godin and Kok 1996 **2-B**, Baranowski et al 2003);
- addiction related behaviours such as smoking and alcohol abuse (Godin and Kok 1996 **2-B**); and
- HIV prevention and condom use (Sheeran and Taylor 1999 **2-A**, Albarracin et al 2001 **2-B**).

Other areas of TRA and TPB use relevant to health included the maintenance of oral hygiene, clinical screening programmes and driving behaviour analysis. The use of the TPB in particular has been more extensive than that of the HBM, and less strongly focused on tobacco addiction than that of the Trans-Theoretical Model. In this review four of the systematic and meta-analytical reviews identified as relevant to the TTM were wholly or in part concerned with smoking cessation and prevention (Spencer et al 2002 **2+A**, Riemsma et al 2002 **1++A**, Riemsma et al 2003 **1-B**, van Sluijs et al 2004 **2++B**). The other principle areas covered in the TTM studies identified were:

- dietary change (Riemsma et al 2002 **1++A**, van Sluijs et al 2004 **2++B**);
- exercise and activity promotion (Marshall and Biddle 2001 **2-A**, Riemsma et al 2002 **1++A**, Adams and White 2003 **2-A**, van Sluijs et al 2004 **2++B**);
- sexually transmitted disease and pregnancy prevention (Horowitz 2003 **2-B**);
- breast cancer screening (Riemsma et al 2002 **1++A**);
- alcohol use control (Riemsma et al 2002 **1++A**); and
- treatment adherence (Riemsma et al, 2002 **1++A**).

Evidence statement

The HBM, the TRA, the TPB and the TTM are all widely used. Of these four models, the TPB and the TTM appear to be the most extensively employed. In the literature identified the four main areas investigated via the use of the social cognition models under evaluation were: *smoking cessation* (Spencer et al 2002 **2+A, Riemsma et al 2002 **1++A**, Riemsma et al 2003 **1-B**, and van Sluijs et al 2004 **2++B**); *exercise and activity promotion* (Blue 1995 **2-B**, Hausenblas et al 1997 **2-B**, Marshall and Biddle 2001 **2-A**, Hagger et al 2002 **2-B**, Riemsma et al 2002 **1++A**, Adams and White 2003 **2-A**, van Sluijs et al 2004 **2++B**, and Downs and Hausenblas 2005 **2-B**); *HIV transmission prevention* (Sheeran and Taylor 1999 **2-A**, Albarracin et al 2001 **2-B**, and Horowitz 2003 **2-B**); and *dietary change* (Godin and Kok 1996 **2-B**, Riemsma et al 2002 **1++A**, van Sluijs et al 2004 **2++B**).**

How effective has each model been shown to be at predicting changes in knowledge, attitudes and/or behaviour in these areas?

The HBM

The available evidence indicates that the HBM has a relatively weak predictive power. This is in part a result of poor construct definition, a lack of combinatorial rules and weaknesses in the predictive validity of the HBM's core psychological components (Armitage and Conner 2000, Harrison et al 1992 **2-B**). Zimmerman and Vernberg conducted a critical comparative meta-analysis of models of preventive health behaviour (1994 **2+B**). They found that that the Theory of Reasoned Action (see below) was a substantially better predictor of health behaviours than the HBM. The TRA was able to explain just over 34 per cent of observed health behavioural variance, as compared to 24 per cent in the case of the HBM. The authors concluded that the HBM is in essence a list of variables rather than a theory based on adequately specified relationships between its core components.

The TRA and the TPB

There is meta-analytical and systematic review evidence that the predictive performance of both the TRA and the TPB is superior to that of the HBM, and also that the additional constructs contained in the TPB allow it to predict a greater percentage of overall behavioural variance than the TRA. The available evidence indicates that, as it is presently specified, the use of the TPB can in countries such as the US and the UK typically account (notwithstanding possible over-estimates because of factors such as publication bias) for between 20 and 30 per cent of the observed variance in reported adult (although not necessarily child, adolescent and young adult) health behaviours (Godin and Kok 1996 **2-B**, Armitage and Conner 2001 **2-A**, Hagger et al 2002 **2-B**, Sutton 1998). Its capacity to predict behavioural intentions is significantly higher. But in practical health outcome terms this point is, presently at least, only of academic interest.

There is also evidence derived from both narrative and systematic reviews on the limitations of the TRA and the TPB and their applications in practice. For example, Hardeman et al (2002 **2-A**) concluded that the TPB is rarely used pro-actively to develop health promotion and other interventions. Even when it is so employed these

authors found that the effect sizes were generally small: intervention effectiveness was unrelated to the use of the theory at the development stage. Like the HBM, the TRA and TPB cannot themselves be used to address questions relating to how beliefs and attitudes underpinning behavioural intentions can be changed, and what strategies for this are likely to prove most (cost) effective.

The TTM

Although the potential of the TTM to improve public health appears on occasions to have been seriously overstated, it is well known to and positively valued by many professionals actively involved in health promotion (Davidson 1998, Jones and Donovan 2004). This fact has practical implications in that, for example, it might influence their motivation. In areas such as dietary change the application of stage-of-change based models such as the TTM may have advantages over alternative approaches (van Sluijs et al 2004 **2++B**). However, the available data indicates that TTM/SoC based approaches as normally applied in areas such as smoking cessation and exercise promotion are no more likely to be effective than alternative (rationally designed) interventions in achieving desired behavioural change outcomes (Adams and White 2003 **2-A**, Riemsma et al 2002 **1++A**, Riemsma et al 2003 **1-B**, van Sluijs et al 2004 **2++B**).

Some commentators argue that the use of the TTM may have detrimental effects, associated with the acceptance of ‘soft’ intermediate stage change based outcomes. Such views are predicated on the conclusion that staged models of health behaviour change (although heuristically and didactically useful) do not reflect cognitive reality, and concerns that the successful ‘marketing’ of the TTM may have excluded the use of potentially more productive health behaviour change promotion approaches (Whitelaw et al 2000, West & Hardy 2006, West & Sohal 2006). However, the evidence on the internal validity and effectiveness in use identified for the purposes of this review can neither confirm nor refute these hypotheses. It does not show use of the TTM to be any less effective in practice than any other specific alternative.

Additional observations relating to health behaviour change effectiveness

No evidence relating to the importance of delivery mode was revealed as a result of the searches carried out for this review. Evidence was similarly lacking in a range of

other areas considered, relating to factors such as intervener status, communication setting and the significance (as health behaviour determinants) of individual, family and group socio-economic status. However, this is not to say that such factors are unimportant or irrelevant. For instance, the HBM may be taken to suggest that behavioural cues such as media advertisements and written or personal reminders may have a fundamentally different function from communications aimed at changing beliefs and attitudes. If this is so failures to understand the significance of such variables might on occasions undermine the cost effectiveness of health behaviour change interventions.

Evidence statement

The Theory of Reasoned Action and the Theory of Planned Behaviour can both predict health related behaviour with greater effect than the Health Belief Model (Zimmerman and Vernberg 1994 2+B). The predictive power of the TPB exceeds that of the TRA (Hausenblas et al 1997 2-B). Across a wide range of health behaviours the TPB can explain 20 per cent or more of observed behavioural variance (Godin and Kok 1996 2-B, Armitage and Conner 2001 2-A, Sheeran and Taylor 1999 2-A, Albarracin et al 2001 2-B, Ajzen and Driver 1991, Godin 1993, Blue 1995 2-B, Hagger et al 2002 2-B, Downs and Hausenblas 2005 2-B).

However, there is evidence that TPB based research is infrequently used to inform behavioural change intervention design, and when this has been the case the additional health benefits gained have been very limited (Hardeman et al 2002 2-A). The body of evidence relating to the relative effectiveness of TTM based health behaviour change interventions is also mixed. In behavioural outcome terms the application of TTM/SoC based approaches in areas such as smoking cessation and exercise promotion is no more likely to be effective in achieving desired outcomes than the use of alternative interventions (Adams and White 2003 2-A, Riemsma et al 2002 1++A, Riemsma et al 2003 1-B, van Sluijs et al 2004 2++B).

Have any changes in knowledge/attitudes/behaviours brought about in relation to use of these models been shown to effect health outcomes, expressed in terms of (population) morbidity and mortality?

Major changes in morbidity and mortality have taken place in countries like the US and the UK since the start of the 1950s. In Western Europe and North America the demographic, epidemiological and health care transitions of the second half of the twentieth century were primarily driven by fundamental shifts in living conditions, survival expectations and medical technologies (Taylor and Bury, in press). Population level secular trends cannot logically be ascribed to changes in individual health behaviour intentions formed in isolation from their social contexts, or to health promotion interventions seen as (independent causal) determinants.

This review identified no evidence as to the extent to which the use of the HBM, the TRA, the TPB or the TTM has been responsible for (as distinct from being temporally associated with) major shifts in key fields such as cardio-vascular disease mortality and morbidity. Some investigators have questioned the impact of health behaviour change interventions in such contexts (Ebrahim and Davey Smith 1997). Further, despite claims made about the importance of theory in developing effective public health interventions, the evidence analysed during this review does not show that approaches utilising social cognition models outperform others, such as 'social marketing' programmes based more on outcome feedbacks than theoretical analyses.

However, it would be unwise to take an unduly simplistic, reductionist, approach towards 'what works in public health'. There can be little serious doubt that changes in health knowledge and consequently health attitudes do contribute to not only individual but also population behaviour changes over time (Fishbein 1995), even if the principle effect of health promotion interventions *per se* is only to accelerate, rather than to initiate, such changes.

Evaluated at this level, many studies provide evidence that interventions in fields such as smoking cessation, exercise, diet and HIV risk reduction have served to reduce mortality and morbidity from conditions such as lung cancer, chronic obstructive pulmonary disease (COPD), cardiovascular disease (CVD) and acquired-immune deficiency syndrome (AIDS). (See, for example, Godin and Kok 1996 **2-B**, Sheeran

and Taylor 1999 2-A, Albarracin et al 2001 2-B, Spencer et al 2002 2+A, Riemsma et al 2002 1++A, van Sluijs et al 2004 2++B). The extent to which the use of either the HBM, the TRA, the TPB or the TTM can be considered responsible for such gains is uncertain. But this does not mean that the potential of value of further work aimed, for instance, at increasing the power of public health interventions to effect behavioural changes through the development of well specified psychological, social and economic health behaviour change instruments should be ignored.

Evidence statement

Even if not fundamentally causal, changes in health knowledge and attitudes can contribute to individual and population behaviour changes over time (Fishbein 1995). There is evidence that health-behaviour change (HBC) interventions in fields such as smoking cessation, exercise, diet and HIV risk control have reduced mortality and morbidity from conditions such as lung cancer, chronic obstructive pulmonary disease (COPD), cardiovascular disease (CVD) and acquired-immune deficiency syndrome (AIDS) (Godin and Kok 1996 2-B, Sheeran and Taylor 1999 2-A, Albarracin et al 2001 2-B, Spencer et al 2002 2+A, Riemsma et al 2002 1++A, van Sluijs et al 2004 2++B). But the specific part played by psychological model use in achieving such health outcomes is uncertain.

Conclusion

Since the end of the Second World War much academic and health service effort has been devoted to developing and applying social cognition theory based models of health behaviour change. There is evidence that these can successfully predict a substantial degree of observed variance in behavioural intentions in adult populations, and to a lesser extent health behaviours. The extent to which the use of such models has in practice led to health gains that would not otherwise have been achieved is uncertain. But they have probably been of positive utility, and can almost certainly be employed to greater future effect.

There is evidence that the Theory of Planned Behaviour has a greater predictive power than the Health Belief Model or the Theory of Reasoned Action. But neither the TPB nor the TRA or the HBM is specified to offer insight into how health behavioural change can most effectively be facilitated. In this respect the Trans-Theoretical Model (which embodies both ‘stage-of-change’ and ‘process of change’ constructs) is fundamentally different in terms of its structure, and how it can be used to define and manage the delivery of health behaviour change interventions. It bridges a divide between social cognition theory based models of health behaviour and other, more practice focused, health promotion programme management instruments.

As a result, evaluations of the TTM have often been oriented towards assessing health outcomes achieved, rather than the percentages of observed or reported behavioural variance explained. This emphasis on the delivery of desired outcomes – rather than the formation of more theoretically relevant information – is to be welcomed. However, there is little unequivocal evidence that the use of TTM based health behaviour change strategies are better at promoting health behaviour change than other reasonably constituted approaches.

Such observations suggest a number of conclusions. First, it would be desirable from a public health improvement perspective if all investigations of health promotion models and interventions could be encouraged to use measures of effect size that relate directly to health gain achievement, such as life years saved or well defined volumes of disability avoided. Even if cost utility analysis constructs such as quality adjusted life years (QALYs) cannot be routinely used, moves in this direction should still facilitate advances in areas such as assessing the comparative value of alternative public health investments. In circumstances where it is not possible to offer estimates of health gains achievable, explanations of why this is so could promote greater clarity of thought in relation to distinguishing between descriptive theories and potentially effective health promotion interventions. This might in turn enable public health research and delivery programmes to become more focused on the delivery of tangible consumer benefit, as distinct from the pursuit of academic excellence or other ends.

Second, with specific regard to recent criticisms of the TTM, it appears very likely that in time superior models based on new approaches to combining socio-economic and psychological data and linking behavioural predictions to more effective change support interventions, will emerge. Yet recognition of this should not be allowed to undermine existing service level attempts to apply the TTM as productively as possible. Rather, awareness of the TTM's possible weaknesses should lead to its better informed employment, while at the same time renewed effort is made to develop and trial effective innovations.

A third, final, conclusion relates to public health research and development commissioning. This in the past may often have lacked the focused sense of purpose and direction more typically found in biomedical fields. To some extent, this might be a desirable reflection of the nature of the scientific and ethical challenges inherent in seeking to understand and, where it is judged appropriate, change individual and community health related choices. However, the extreme degree of heterogeneity across much of the research reported in this review, and the lack of systematically directed effort aimed at finding more effective instruments for understanding and facilitating more beneficial health behaviours that this implies, is unlikely to have been in the public's best interests.

A high priority task for all those seeking to promote future excellence in public health in the UK and elsewhere will be to build on the heritage offered by models such as the TPB and the TTM in integrated ways which extend existing capacities to predict and moderate the impacts of social, economic and psychological determinants of health behaviour. This will require sophisticated public health research and development commissioning skills, alongside further enhanced capacities to evaluate the efficacy and (cost) effectiveness of health behaviour change interventions.

Glossary

Term	Definition
Behaviours	The actions or reactions of an individual to a situation. They may be conscious or unconscious, voluntary or involuntary.
Behavioural beliefs*	These guide behaviours. They relate to a) the likelihood that an action might promote or negate a given outcome and b) evaluating outcomes achieved or avoided, in terms of their desirable and negative consequences.
Behavioural attitudes*	These are the multiplicative sum of the individual's relevant outcome likelihood and evaluation related behavioural beliefs. They can also be independently measured.
Behavioural intentions*	These are derived from the combination of behavioural attitudes and perceived (subjective) norms. Intentions rather than attitudes are regarded as the main proximal cognitive precursors to acting.
Cognitions	The conscious processes of knowing or being aware of thoughts or perceptions, including understanding and reasoning.
Components	All 4 of the models reviewed contain a plethora of apparently discrete (albeit on occasions conceptually ambiguous, overlapping or identical) components, defined as single concepts.
Constructs	These are complex psychological and sociological concepts (defined as multi-component theoretical concepts) such as attitudes, beliefs and subjective or descriptive norms contained in health behaviour change and other models.
Control beliefs*	These are salient to an individual's perceptions of a) the external factors inhibiting or facilitating an action and b) self-efficacy, the individual's internal, behaviour specific, executional self confidence.
Health Belief Model	A health specific social cognition model, the key complex theoretical components of which are: perceived susceptibility; perceived severity; perceived threat, the product/sum of severity and susceptibility; perceived benefits; perceived barriers; self-efficacy; expectations, which are the product/sum of perceived benefits, barriers and self-efficacy; cues to action; and demographic and socio-economic variables.
Health outcomes	A change in the health of an individual, a group of people or a population that is attributable to a health intervention or series of interventions.
Models	These are conceptual descriptions of a system, theory, or phenomenon that account for its known or inferred properties.
Normative beliefs*	These include a) referent beliefs about what behaviours others expect and b) the degree to which the individual wants to comply with others' expectations.
Perceived Behavioural Control (PBC)*	PBC is the product of control beliefs and self-efficacy. It is seen as acting as a determinant of intentions alongside subjective norms and behavioural attitude, and also as a direct influence on behaviour additional to intention.
Self-efficacy	Bandura (1977) first introduced this concept of act or task specific self confidence (i.e. belief in one's ability to execute a given behaviour).

Social cognition models	These examine the social context of cognitions which act as predictors and precursors to health behaviours.
Subjective norms*	These are defined as the multiplicative sum of the two sets of normative beliefs, although these are also independently assessed.
Theories	These are sets of statements or principles devised to explain a group of facts or phenomena that can be scientifically tested.
Theory of Reasoned Action (TRA)	Formulated towards the end of the 1960s, the TRA can in some respects be seen as refining and taking forward approaches embodied in the HBM. As expressed in its final form, the TRA combines two sets of belief variables, described under the headings of 'behavioural attitudes' and 'the subjective norm'.
Theory of Planned Behaviour (TPB)	Its design and dissemination followed Bandura's work on self-efficacy and the publication of his Social Cognitive Theory in 1986. It is differentiated from the TRA by the additional dimension of perceived behavioural control.
Trans-Theoretical Model (TTM)	The TTM was developed by Prochaska and DiClemente at the start of the 1980s. In order to link together concepts drawn from a variety of theories it uses a temporal dimension, the stages of change (SoC) construct, as a basic framework around which other model components relating to the promotion of behavioural change (that is, the processes of change components) and its monitoring and support are located.
Value-expectancy based theoretical concepts	Lewin (1951) argued that making behavioural choices involves assessments of the desirability of achieving specific ends being balanced by predictions about the likelihood of valued outcomes being attained as a result of acting. Such concepts are contained in many health behaviour change models.
* For the purposes of this report the definitions marked with an asterix have been taken from Ajzen (1988)	

1. Background

1.1 *The policy environment*

In 2004 the report *Securing Good Health for the Whole Population* (Wanless 2004) emphasised from a population perspective the importance of increased voluntary individual and overall public engagement in the pursuit of improved health, particularly in the context of conditions associated with variables such as tobacco use, diet, exercise and obesity. The subsequent public health White Paper *Choosing Health: Making Healthier Choices Easier* (DoH 2004) also emphasised the significance of well informed and appropriately supported choice in promoting better public health in modern economic and social settings, that guarantee most people access to clean water, adequate housing and plentiful food. Current government policies are aimed at facilitating increased choice and supporting healthy life styles throughout the health and social care sectors, and society more widely.

Public health interventions often seek in some way to change individual and population knowledge, attitudes and behaviours related to health (Halpern et al 2004). Theoretically based approaches are employed in the belief that this will enable interventions to be more effective than would otherwise be the case. There is some evidence to support this view (Roe et al 1997, Jepson 2000, Swann et al 2003, Ellis and Grey 2003.) But it should not be assumed that this is always so, or that any given psychological theory or model is always usefully applicable. It was in the context of such concerns that the National Institute for Health and Clinical Excellence – NICE – was asked by the Department of Health to develop guidance on ‘*the most appropriate means of generic and specific intervention to support attitude and behaviour change at population and community levels*’, and that the work reported here (along with five other reviews) was initiated.

1.2 *Evolving understanding*

There are presently many health promotion and social cognition (see Appendix 11, page 212) models of health behaviour in use in the UK and internationally (Armitage and Conner 2000, Jones and Donovan 2004). They contain a plethora of apparently discrete (albeit on occasions conceptually ambiguous, overlapping or identical)

components (Ajzen 2002, Noar and Zimmerman 2005). In order to allow the four models/theories discussed in this document (the Health Belief Model, the Theories of Reasoned Action and Planned Behaviour and the Trans-Theoretical Model: these were selected by NICE because they are among those most commonly used in the field of health promotion) to be understood in the context of their historical development, an outline chronology is provided in Table 1. The remainder of this section offers further background information relevant to the genesis of these social cognition models' components and their use.

Table 1. A brief chronology of the development of social cognition and related models and concepts of health behaviour change (HBC) to 1990.

DATE	DEVELOPMENT
Middle to end 1800s	Early work on attitudes and behaviour, and <i>Social Learning Theory's</i> (SLT's) origins stem from this period. See, for example, William James and the social self (1890)
1913	The concept of <i>behaviourism</i> is initially developed in the first decade of the twentieth century. John Watson publishes on the interactions between people and their environments
1929	Thurstone and subsequently Likert publish on attitudinal scaling
1935	Gordon Allport describes attitudes as multidimensional phenomena
1940s/start of the 1950s	<i>Social Learning Theory</i> by Millar and Dollard published. Kurt Lewin develops value-expectancy theory. Skinner takes forward his work on behaviourism and operant conditioning
1952	The original version of the <i>Health Belief Model</i> (HBM) is created by Hochbaum, Kegels and Rosenstock
Mid 1950s	Mechanic begins his work on sociological aspects of health service use
1963	Bandura and Walters – <i>Social Learning and Personality Development</i>
1967	Fishbein's and Ajzen's <i>Theory of Reasoned Action</i>
1977	Bandura introduces the concept <i>self-efficacy</i>
1979/82	Prochaska and DiClemente's <i>Trans-Theoretical Model</i> is developed in its initial format
1986	Bandura's <i>Social Cognitive Theory</i> (SCT) published
1987	Leventhal and Cameron introduce the <i>Self-Regulatory Model</i> on coping with illness
1988	Ajzen builds on the TRA by incorporating the concept of self-efficacy in the <i>Theory of Planned Behaviour</i>

Note: see also Appendix 11 for further information on additional models and concepts

Psychologists first began to study the determinants of health related behaviours in the nineteenth and early twentieth centuries. Principle areas of investigation included the processes of social learning and the relationship between knowledge, attitudes and behaviours. Although at that time there was a frequently made assumption (in part stemming from the Freudian tradition) that much human behaviour is innate or driven by unconscious forces, many authorities active in the health arena appeared to assume that peoples' health behaviours are normally consistent with their observed attitudes (Armitage and Christian 2003). This implies rational volitional control.

In the decades between the First and Second World Wars such approaches led to a strong 'health education' focus on instilling knowledge as a means of promoting attitudinal shifts, and so behaviour and health outcomes. In countries such as the US and the UK knowledge-attitude-behaviour (KAB) based approaches (also sometimes referred to as the knowledge, attitude, practice, behaviour or KAPB model – Baranowski et al 2003, Abraham et al 1998) to a degree challenged the traditions of nineteenth public health pioneers. They had often focused on environmental improvement as a means of generating population level health gain (Kessel 2006). An awareness of this background is relevant to this review and present debates on the extent to which modern health promotion programmes are likely to be effective if they are aimed at changing knowledge and individual behaviour alone, in isolation from the contexts in which health behaviour choices are made.

However, the 1930s also saw advances in not only attitude measurement (for example, through Likert scaling) but also the work of Gordon Allport (Cantril & Allport 1935) on attitudes as multi-dimensional phenomena. Theorists such as Kurt Lewin (who had moved to the US from Germany in the 1920s) argued that human motivation and behaviour is in large part driven by complex forms of thought (cognition) and expectation relating to the social and physical worlds. In essence, he argued that making behavioural choices involves assessments of the desirability of achieving specific ends being balanced by predictions about the likelihood of valued outcomes being attained as a result of acting (Lewin 1951). Models derived from this approach are often referred to as value-expectancy based theories.

Thinking about social learning and the ways in which incentives, rewards and punishments guide the formation of habitual and other behaviours also moved forward in America during this period. (See, for example, Miller and Dollard 1941). When the US entered the Second World War American psychologists, like their British counterparts, were employed to find ways of enhancing morale and guiding population behaviour in strategically relevant ways. For instance, Lewin – who died in 1947 – helped to devise a programme aimed at encouraging people to choose diets consistent with the US food supply situation. Wartime food shortages were, perhaps ironically, in some instances associated with health improvements.

By the late 1940s two important streams of psychological thought relevant to health behaviour were thus developing alongside each other. These were cognitive approaches on the one hand, and operant conditioning/‘behaviourist’ based models (which built on the Pavlovian tradition) on the other. The Health Belief Model – the earliest of the models considered in this review, was initially devised at the start of the 1950s by Hochbaum, Kegels and Rosenstock. It is located firmly in the cognitive school. It served as a progenitor for subsequent models in this category. However, before detailed information relating to the structure and use of the HBM, the TRA, the TPB and the TTM three additional sets of introductory points should be made.

The first rests on the observation that in the post-war America of the early 1950s there was (as was also so in the UK) considerable optimism that economic growth, coupled with social changes, would rapidly eliminate health and other problems related to material and social deprivation. There was in addition hope that new medicines and vaccines would become available to eliminate infectious and other diseases, such as TB and polio. A central concern of investigators such as Hochbaum and his colleagues in the US Public Health Service was to help enable individuals and communities to take advantage of such positive opportunities through using new screening and treatment services.

But in the US political and social climate of that time there were also unresolved problems associated with issues such as racial prejudice and discrimination. Such factors may have created barriers for psychologists and others to research social and economic variables such as population health determinants. Although there were

valuable collaborations between sociologists and epidemiologists in such research, much social scientific endeavour was preoccupied with individual experience and interaction in everyday settings (including hospitals). The exploration of individual traits in relation to issues such as inequalities in health and health service use progressed significantly in the 1950s. (See, for instance, Mechanic and Volkart 1961 and – on the history of illness behaviour – Mechanic 1995). But the US setting in which cognitive behavioural research relating to health improvement became established nevertheless differed greatly from that in this country, both then and today.

Social scientists and epidemiologists in the UK have tended to acknowledge that social and material circumstances influence health outcomes more overtly than their US peers (Blaxter 2001, 2004, Marmot 2004), albeit that such relationships are of course also well recognised by American scholars (Lynch et al 2000). Personal effort and informed individual choice are important. Yet it has long been accepted in the UK that if inequalities in health are to be reduced, then determinants of health status outside the direct volitional control of individuals will need to be understood and addressed (Graham 2000, Graham and Kelly 2004).

1.3 *Time scales and research challenges*

A second important background point is that the temporal relationships underlying changes in health behaviour by individuals, groups and communities may extend over many decades. The historical experience of European and other countries in fields such as tobacco use and heart disease suggests that pandemics of behaviourally related illnesses play out over generations rather than single lifetimes. In the UK, for example, the rapid rise in cigarette smoking rates in the adult male population in the early twentieth century was in part due to the impacts of the First World War. Present UK declines in smoking can be seen as relating to reactions to the health consequences of mass tobacco use which are apparent from the 1950s onwards (RCP 1999).

To the extent that long time lags exist in the field of health behaviour change it is profoundly difficult to identify and accurately attribute effects relating to the dissemination of knowledge and/or other health promotion interventions. Individual

health service research and intervention programmes may have short-term goals. But the possibility of hidden long-term population benefits and cumulative cross programme synergies contributing to secular trends cannot be excluded.

Following on from the above, a third introductory point to stress is that the methodological challenges facing those seeking to evaluate health behaviour change (HBC) models and interventions also stem from the nature of the phenomena researchers in this area of science are investigating. Complex psychological and sociological constructs (defined as multi-component theoretical concepts) such as attitudes, beliefs and subjective or descriptive norms are inherently different from the objects and relationships normally explored by physical and bio-medical scientists.

In researching them across different health fields, primary psychological (and sociological) studies have frequently differed significantly in the instruments and analytical techniques they employ. Models are often applied in partial and inconsistent ways. (See, for example, Burkholder and Nigg 2002, Zimmerman and Vernberg 1994 **2+B**, Downs and Housenblas 2005 **2-B**. For an explanation of levels of evidence (1-4) see Table 2 page 30 and for quality scores see Table 3 page 31. For UK applicability ratings (A-D) see page 32). This inevitably limits the ability of meta-analyses and systematic reviews to provide unequivocal evidence on the predictive power and other properties of alternative HBC models and interventions.

Further, even when measures such as the percentages of behavioural variance accounted for by given models can be calculated with a degree of reliability, the significance of such findings may be uncertain. This is in part because statistics such as the percentages of behavioural variance associated with given beliefs or intentions are not direct indicators of the overall proportion of a population that will change behaviour if those beliefs (and the attitudes and intentions to act associated with them) can be modified (Sutton 1998, Abraham et al 1998). Such relationships will vary between contexts. The use of statistics such as percentages of behavioural variance explained as effect size indicators can on occasions be misleading from a practical public health perspective.

Also, programme impact rates may vary independently of their technical efficacy as a result of involvement rate differences (Prochaska and Velicier 2004); because alternative types of health risk modification (such as stopping tobacco smoking as compared to, say, increasing vegetable consumption) have inherently different cost and health outcome implications; and because statistical correlations between contrasting health beliefs, intentions and behaviours may not reflect causal linkages, regardless of what beliefs can in practice (cost effectively) be changed (Weinstein and Rothman 2005).

These observations partly explain why this review cannot offer answers to questions such as ‘how effective have the models reviewed been shown to be at predicting changes in knowledge, attitudes and/or behaviour?’ in health outcome oriented terms. For example, the percentages of people who will change their behaviour if they are exposed to a health promotion intervention based on one form of health behaviour change theory as opposed to another cannot meaningfully be answered. The research and systematic and meta-analyses available do not contain findings that can be used to generate such data. This is in itself an observation of potential practical value.

1.4 Review aims and structure

Against the above background and in the policy environment described in documents like the White Paper *Choosing Health: Making Healthier Choices Easier* (DoH 2004) the aim of this review (commissioned by NICE from the School of Pharmacy, University of London) is to examine the use of the Health Belief Model (HBM), the Theory of Reasoned Action (TRA), the Theory of Planned Behaviour (TPB) and the Trans-Theoretical Model (TTM, often also referred to as the ‘Stages of Change’ – SoC – model) to study and predict health related behaviour change measured in terms of shifts knowledge, attitude, intention and behaviour. It in addition considers the extent to which social, environmental and economic factors have been included in the models identified.

The five research questions that the School of Pharmacy team was asked by NICE to address were:

- 1 What concepts and constructs does each of the selected models contain?

- 2 To what extent is each model able to incorporate social, economic and/or environmental factors, particularly in relation to the occurrence of health inequalities?
- 3 In which areas has each model been used?
- 4 How effective has each model been shown to be at predicting changes in knowledge, attitudes and/or behaviour in these areas?
- 5 Have any changes in knowledge/attitudes/behaviours brought about in relation to use of these models been shown to effect health outcomes, expressed in terms of (population) morbidity and mortality?

The methodology employed is described in section 2. This review's findings are then presented in section 3 in the form of brief descriptive and narrative commentaries relevant to each model. Then in section 4 the five research questions listed above are addressed sequentially, and aggregated statements of evidence provided. This structure was adopted to enable readers develop a clear picture of the properties of each model's properties before considering issues requiring a more aggregated comprehension.

The findings relating to research questions 1-3 were in large part derived from articles other than systematic reviews and meta-analyses. Those to questions 4 and (to the extent to which it could be answered in this review) 5 were more reliant on the findings of meta-analyses and systematic reviews. This was because of the differences in the natures of the topics addressed, and the ways in which relevant information has been reported and analysed in the available research literature.

2. Methods

This review was conducted using methods set out by the NICE Public Health Guidance Methods Manual (National Institute for Health and Clinical Excellence 2006) and in collaboration with the Centre for Public Health Excellence (CPHE) technical team at NICE. The Methods Manual includes guidance about data extraction and quality assessment.

Because of the breadth of literature on these models, and in view of the relevant resource limits, a decision was made to carry out a ‘tertiary’ level review, or ‘review-of-reviews’, in order to provide comprehensive (and accessible) coverage. The benefits and limitations of carrying out a review of reviews are summarised in a publication by the Health Development Agency (HDA). An amended review Critical Appraisal Tool (CAT: see Appendix 1), based on the tool developed for this purpose by the Health Development Agency was used in accordance with guidance offered by the CPHE team.

2.1 *Literature search*

The electronic search strategy was developed by information specialists at NICE and the Centre for Reviews and Dissemination (CRD), University of York, in consultation with the London School of Pharmacy team. Searches were carried out by the CRD at the University of York and NICE.

Full details of the search terms used can be found in Appendix 2. A filter to limit the search to review level literature was applied to the search strategy.

The following databases were searched for published English language literature from 1990 onwards:

- MEDLINE
- EMBASE
- PsycInfo
- CINAHL
- BNI

- The King's Fund Database
- ASSIA
- Sociological Abstracts
- Social Policy and Practice.
- ERIC
- Cochrane Database of Systematic Reviews
- Database of Abstracts of Reviews of Effects (CRD administrative system)
- DH-Data

In addition, a citation search on the names of the originators of the different models was carried out in the ISI Sciences and Social Sciences Citation Indexes.

Search results were downloaded into Reference Manager and duplicates deleted.

In addition to the searches above reference lists of review articles were hand-checked and studies were included where they met the inclusion criteria. Relevant articles known by the review team and others found on an ad hoc basis were also included.

2.2 Selection of studies for inclusion

The inclusion criteria below are based on the requirements set out in the scoping document produced by the National Institute for Health and Clinical Excellence (NICE 2005).

Models

For all research questions reviews were included that focused upon the use of any of the four models listed in section 1 of this review in health-related areas. This excluded a large body of data where models have been applied in education and employment.

Types of reviews

All types of review (meta-analytic, systematic and narrative) were included in the relevant datasets. However, as questions 1-3 are more concerned with descriptive and allied issues than questions 4 and 5 (which are primarily focused on issues of comparative effect and effectiveness) responses provided to the former group drew

more on narrative reviews. In this context papers other than systematic and meta-analyses judged potentially suitable for inclusion for narrative purposes were eventually excluded if they were found on reading not to contain information additional to that already gained from papers included.

When appraised systematic and meta-analytical reviews selected for inclusion in the dataset for this review were graded for quality and type according to the set out in table 4.1 of the NICE Public Health Guidance Manual. These are adapted from the Scottish Intercollegiate Guidelines Network (2001) - see Table 2 below.

Table 2. Levels of Evidence

Level of evidence	Type of evidence
1	Meta-analyses or systematic reviews of RCTs
2	Meta-analyses or systematic reviews of non-randomised controlled trials, case-control studies, cohort studies, controlled before-and-after (CBA), interrupted time series (ITS), correlation studies
3	Non-analytic studies (for example, case reports, case series)
4	Expert opinion, formal consensus

2.3 Quality appraisal

The search strategy employed generated 2638 potential citations. Two NICE CPHE reviewers independently screened titles and abstracts against the inclusion criteria. A total of 251 reviews were identified as potentially relevant, and 217 of these were obtained by the University of York within the time available for this review and passed on to the School of Pharmacy team for critical appraisal. These reviews were independently appraised using the CAT for inclusion in the dataset for this review, and results were then compared. Any disagreements were resolved by team discussion. (For a list of citation papers identified, screened and accepted, see the flowchart in Appendix 3 and the summary of included papers in Appendix 4.)

2.4 Study categorisation

For reviews that met the inclusion criteria, data was extracted onto a specially designed form (see Appendix 5). The data extracted included:

- Type of review
- Research questions

- Inclusion and exclusion criteria
- Databases and sources searched
- Number of studies and participants included in the review
- Method of analysis
- Data extracted
- Summary of results and conclusions
- Cost effectiveness data, if provided.
- Strengths and weaknesses of review, including generalisability to UK
- Recommendations for future research
- Practice and policy implications
- Quality of review

Reviews were classified by quality and design according to the CPHE methods manual, summarised in Table 2 above. The criteria are set out in Table 3. Quality assessment was carried out using the CAT (see appendices B-H of the CPHE Methods Manual, Guideline Development Methods).

Table 3. Quality scores

Criteria	++	+
1. Was there a focused aim or research question?	Yes	Yes
2. Explicit inclusion / exclusion criteria	Yes	Yes
3. More than one assessor / selector	Yes	
4. Provide details of databases searched	Yes	Yes
5. Lists years searched	Yes	Yes
6. Followed up references in bibliographies	Yes	
7. Experts consulted for further sources		
8. Grey literature included / searched		
9. Specified search terms / strategy	Yes	Yes
10. Not restricted to English language papers only	Yes	
11. Quality assessed	Yes	Yes
12. Data supports conclusions	Yes	Yes

Notes: ++ must *at least* meet 10 criterion indicated above
 + must *at least* meet 7 criterion indicated above
 - 4 or less criteria

2.5 Assessing UK applicability

Applicability to the UK setting was graded according to the NICE criteria (A-D):

- E. Includes UK studies
- F. Non-UK studies of interventions that would be most likely to equally apply to UK settings
- G. Non-UK studies that may have some application to UK settings but should be interpreted with caution. There may be strong cultural, ethnic, religious, climatic or institutional differences that would have impact on the effectiveness of the intervention if applied in the UK
- H. Non-UK studies that are clearly irrelevant to UK settings

2.6 Synthesis

Detailed information about individual systematic reviews and meta-analysis studies (n=25) is presented in the evidence tables (Appendix 6). The reference list for these reviews is presented in Appendix 7. The papers are presented within Appendix 6 alphabetically due to the high level of cross-over in both psychological models and research questions addressed. (NB: the references classified as narrative reviews are listed in Appendix 8 and the excluded papers are listed in Appendix 9. The papers not received within the project timeframe are listed in Appendix 10). The data extracted from the systematic reviews and meta-analytical studies included the statistical methods employed and the results as stated in the relevant papers.

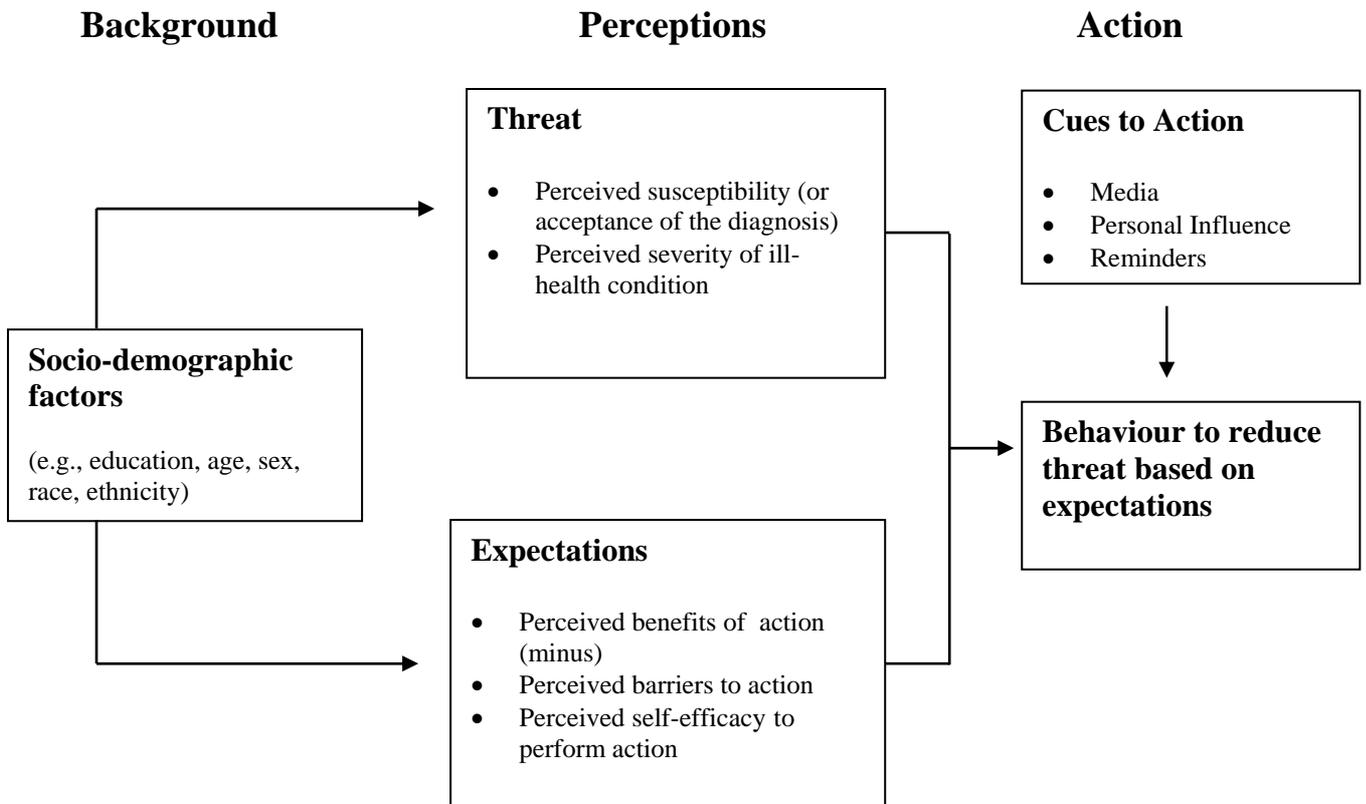
3. Findings – the Models

3.1 *The Health Belief Model*

The Health Belief Model presented in Figure 1 is an updated version of the original schema, primarily based on Rosenstock et al (1994). The HBM is a health specific social cognition model (Ajzen 1998), the key components and constructs (that is, complex theoretical components) of which are:

- **Perceived susceptibility.** The subjective perception of the risk the individual is at from a state or condition.
- **Perceived severity.** Subjective evaluation of the seriousness of the consequences associated with the state or condition.
- **Perceived threat, the product/sum of severity and susceptibility.** This combined quantum might be seen as indicative of the level of motivation an individual has to act to avoid a particular outcome.
- **Perceived benefits.** The subjectively understood positive benefits of taking a health action to offset a perceived threat. This perception will be influenced not only by specific proximal factors, but an individual's overall 'health motivation'.
- **Perceived barriers.** The perceived negatively valued aspects of taking the action, or overcoming anticipated barriers to taking it.
- **Self-efficacy.** This component has been added to the HBM on many occasions since the late 1970s, when Bandura first introduced this concept of act or task specific self confidence, i.e. belief in one's ability to execute a given behaviour (Bandura 1977 – see chronology in Table 1).
- **Expectations, which are the product/sum of perceived benefits, barriers and self-efficacy.** This may be seen as indicative of the extent to which the individual will try to take a given action (Smedslund 2000)
- **Cues to action.** Reminders or prompts to take actions consistent with an intention, ranging from advertising to personal communications from health professionals, family members and/or peers.
- **Demographic and socio-economic variables.** These may include age, race, ethnicity (cultural identity), education and income.

Figure 1. The Components of the Health Belief Model



Source: After Rosenstock et al (1994)

3.1.1 Social, economic and environmental factor integration

Applied in a systematic way the full set of model components described above (to which may on occasions be added a general health perception variable) would have the potential to provide a relatively comprehensive understanding of the influence of social, economic and environmental factors on health behaviours, in addition to that of cognitive factors contained in the psycho-social equation at the heart of the HBM. However, the use of this model has in practice focused largely on measurements and analyses of susceptibility, severity, benefit and barrier perception components alone. (See, for example, Chen and Land 1990, Yarbrough and Braden 2001 **2-B**, Crepaz and Marks 2002, Harrison et al 1992 **2-B**, Zimmerman and Vernberg 1994 **2+B**).

The research literature analysed during this review did not provide evidence that applications of the HBM have enabled the influence of social, economic or other environmental factors (including variables such as low income, exposure to racial

prejudice, cultural exclusion, low health valuations as cultural norms or inconvenient service access arrangements) to be better understood by researchers, practitioners or policy makers. This conclusion is consistent with that of commentators such as Cochran and Mays (1993).

However, where factors such as socio-economic status have been analysed in studies employing the HBM the results reported suggest impacts of comparable significance to, or greater significance than, its cognitive components. Chen and Land (1990) observed this in the context of dental care uptake. This point is also well illustrated by the work of Yarbrough and Braden (2001 **2-B**). They conducted a systematic review of the utility of the Health Belief Model as a guide for predicting breast cancer screening behaviours. These authors concluded that the application of the model was inconsistent, and that at best it ‘explained 47 per cent of the observed variance in screening behaviour when socio-economic status was included. Otherwise predictive power was low, ranging from 15 per cent to 27 per cent.’

3.1.2 Areas of use

Hochbaum was originally concerned with the uptake of TB screening opportunities provided via mobile X-ray units. In that context (in the early 1950s, when new medicines for tuberculosis were becoming available) it was found that beliefs about susceptibility to the infection and the benefits of screening were strongly correlated with chest X-ray acceptance. Subsequent extensions of the model were associated with efforts to apply it in other contexts, including not only other forms of screening but also immunisation and compliance with medical treatment for conditions such as diabetes, renal failure and hypertension (Becker 1974, Rosenstock 1974, Janz and Becker 1984, Harrison et al 1992 **2-B**). It has more recently still been used in areas ranging from HIV prevention to weight control. But various studies have questioned the extent to which cognitions such as perceived threats are effective behavioural motivators. (See, for example, Abraham and Sheeran 1994). This concern may be particularly relevant in the contexts of child and adolescent behaviours (Baranowski et al 2003, Finfgeld et al 2003).

3.1.3 Effectiveness in predicting and effecting behavioural change

The available evidence indicates that the HBM has only a weak predictive power in most areas of health related behaviour. This is in part a result of poor construct definition, a lack of combinatorial rules and weaknesses in the predictive validity of the HBM's core psychological components (Armitage and Conner 2000). Harrison et al (1992 **2-B**) conducted a meta-analysis of studies using the Health Belief Model in adult populations, aimed at quantifying the independent relationships between each of its four main components and the reported health behaviours. They found weak effect sizes, accounting for between 0.1 and 9 per cent of variance. These authors were not able to include other elements of the model because of the lack of studies incorporating them, and concluded that 'the weak effect sizes and lack of (study and construct) homogeneity indicate that it is premature to draw conclusions about the predictive validity of the HBM as operationalised'.

Zimmerman and Vernberg conducted a critical comparative meta-analysis of models of preventive health behaviour (1994 **2+B**). This quality rated and included a total of 60 studies overall. Of these 30 (50 per cent) were HBM studies. They found that that the Theory of Reasoned Action (see below) was a substantially better predictor of health behaviours than the HBM. The TRA was able to explain just over 34 per cent of observed health behavioural variance, as compared to 24 per cent in the case of the HBM. The authors concluded that the HBM is in essence a list of variables rather than a theory based on adequately specified relationships between its core components.

3.1.4 Impact on health outcomes

This review identified no evidence indicative of the extent to which the use of HBM based interventions has contributed positively to improved health outcomes in the United Kingdom. See discussion relating to this research question in section 4 below¹.

¹ This conclusion does not, of course, constitute evidence that the use of the HBM or sets of its components has not on occasions enabled individuals or groups to design and deliver health promotion contributions that have effectively changed health related behaviours. Individual intervention evaluations are required to demonstrate this, although it is unlikely that in such circumstances outcomes could meaningfully be attached to the use of the HBM *per se*. Similar points apply in relation to other models discussed in this review.

3.1.5 Overall model evaluation and summary evidence statement

The development of the Health Belief Model was of pioneering significance in the early 1950s. Systematic analyses using the full range of components that it today incorporates might cast light on the impact of social and other factors associated with inequalities in health, and the reasons why individuals and groups may not take up health improvement or protection opportunities. However, the HBM is not in itself clearly or adequately specified, and the available evidence indicates that in practice its application appears to be inadequate for such purposes. Further, although the HBM may be used to derive information that may then prompt interventions designed to change health beliefs and behaviours, using the model itself cannot inform decision making as to how such interventions might best be structured.

The value of the ‘perceived threat’ element serving as a central indicator of behavioural motivation in the HBM has been questioned. So has the phenomenological orientation of its design. Notwithstanding components like perceived barriers and demographic and socio-economic descriptors, as normally applied this model may be taken implicitly to assume that people are rational actors, driven by their conscious perceptions of the world. This may misleadingly suggest that health behaviours can always best be understood as being under volitional control, rather than in a large part determined by combinations of circumstantial reality and individuals’ habitual, emotional, unconscious and/or otherwise non-rational reactions to the external world. The research identified provides evidence that the overall explanatory power of the HBM is limited, even simply as compared to that of alternative social cognition models such as the TRA.

Evidence statement

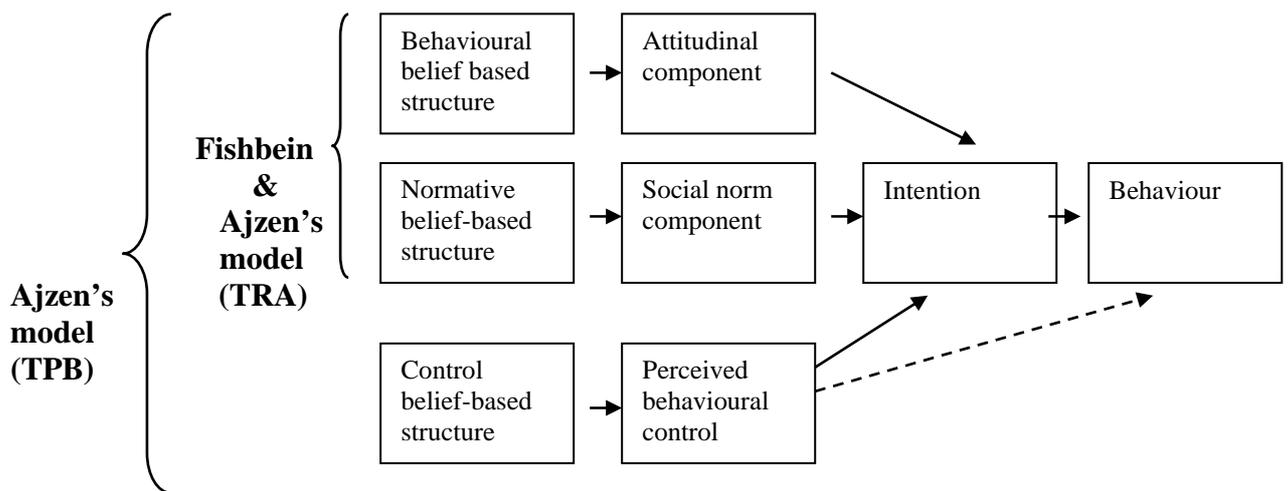
The HBM is characterised by a lack of adequate combinatorial rules and inconsistent application (Armitage and Conner 2000, Yarbrough and Braden 2001 2-B). Its main components have weak effect sizes, and its predictive capacity is limited as compared to that of other social cognition models (Harrison et al 1992 2-B, Zimmerman and Vernberg 1994 2+B).

3.2 The Theory of Reasoned Action (TRA) and The Theory Planned Behaviour (TPB)

The historical development of these two closely associated theories was such that they are best described here together, rather than sequentially. The Theory of Reasoned Action was formulated towards the end of the 1960s, and in some respects may be seen as refining and taking forward approaches embodied in the HBM. At that time psychologists were concluding that attitudes (at least in the form of uni-dimensional phenomena) have very limited validity as predictors of future behaviour (Wicker 1969, Fishbein and Ajzen 1975). As expressed in its final form, the TRA (see Figure 2) combines two sets of belief variables, described under the headings of ‘behavioural attitudes’ and ‘the subjective norm’.

The Theory of Planned Behaviour built further on this framework. Its design and dissemination followed Bandura’s work on self-efficacy and the publication of his Social Cognitive Theory in 1986 (Ajzen 1985, 1988). It is differentiated from the TRA, as Figure 2 shows, by the additional dimension of perceived behavioural control.

Figure 2. The Theory of Reasoned Action and the Theory of Planned Behaviour



After Godin (1993)

Both the TRA and the TPB assume that the immediate cognitive precursors to behaviours are not attitudes but behavioural intentions. These are in essence defined

as complex amalgams of prior beliefs. Hence the shared components of the TRA and the TPB are:

- **Behavioural beliefs**, salient to a) the likelihood that an action might promote or negate a given outcome and b) evaluating outcomes achieved or avoided, in terms of their desirable and negative consequences.
- **Behavioural attitudes**, defined as the multiplicative sum of the individual's relevant likelihood and evaluation/severity related behavioural beliefs. However such attitudes may also be independently measured.
- **Normative beliefs**, including a) referent beliefs about what behaviours others expect and b) the degree to which the individual wants to comply with others' expectations.
- **Subjective norms**, which (like behavioural attitudes) are defined as the multiplicative sum of the two sets of normative beliefs, although these may also be independently assessed.
- **Behavioural intentions**, derived from the combination of the behavioural attitude and the subjective norm. Intentions rather than attitudes are, as noted above, regarded as the main proximal cognitive precursors to acting.

In the case of the TPB, behavioural intentions and behaviours are also taken to be functions of:

- **Control beliefs**, salient to the individual's perceptions of a) the external factors inhibiting or facilitating an action and b) self-efficacy, the individual's internal, behaviour specific, executional self confidence.
- **Perceived Behavioural Control**, defined as the product of the control beliefs and self-efficacy. PBC is seen as acting as a determinant of intentions alongside subjective norms and behavioural attitude, and also as a direct influence on behaviour additional to intention.

Like the HBM, the TRA and the TPB are both value-expectancy theory based models. Although they lack the threat concept normally seen as central to the HBM, their constructs in part reflect the perceived susceptibility/severity and benefits/barriers

balances incorporated in the latter. Ajzen (1998) has pointed out that the TRA and TPB are both mathematically and structurally better specified than, and framed at a higher level of generalisation than, the HBM. But he has also commented that the TRA was developed to promote understanding of volitional behaviours, rather than those in large part determined by situational factors outside the control of the subject. The extent to which the additional of the PBC construct to the TPB in fact corrects this limitation is a critically important issue.

3.2.1 Social, economic and environmental factor integration

The Theory of Reasoned Action has been criticised because it is said to ignore the social nature of human action. (See, for example, Kippax and Crawford 1993). Behavioural and normative beliefs are derived from individuals' perceptions of the social world they inhabit, and are hence likely to reflect the ways in which economic or other external factors shape behavioural choices. Yet there is a compelling logical case to the effect that the model is inherently biased towards individualistic, rationalistic, interpretations of human behaviour. Its focus on subjective perception does not necessarily permit it to take meaningful account of social realities.

Proponents of the TRA might reasonably respond that it was designed to elucidate cognitive rather than other variables, and that its authors did not purport to be offering a comprehensive understanding of the social and economic determinants of health behaviour. Rather, its focus is on identifying patterns of belief and attitude which if changed could help individuals respond more effectively to their objective situations, through where possible taking rational advantage of available health protection and improvement opportunities.

However, the acceptance by Ajzen of the need to include PBC within the TPB model can be regarded as an acknowledgement on his part that the TRA was by itself unable adequately to predict health related behaviours, especially in fields characterised by low levels of volitional control. The PBC construct introduces into the TPB model self-efficacy, which may in part be determined by social positioning. It might also further facilitate the inclusion of perceptions of external influences such as, say, economic barriers to service access or discriminatory racial attitudes amongst service providers or other users.

But individuals' beliefs about such issues are again unlikely to reflect entirely accurately the potentially observable social facts. Thus although a constructive use of the TRA and TPB in research and/or public health intervention programmes might well contribute valuably to understanding issues related to health inequalities and the roles that, say, ethnicity related or other environmental factors have in determining health behaviours and outcomes, neither the TRA nor the TPB are specifically structured for this purpose.

3.2.2 Areas of use

The general theoretical frameworks of the TRA and the TPB have allowed them to be very widely used in the retrospective analysis of health behaviours (Kashima and Gallois 1993) and to a lesser extent in predictive investigations and the design of health interventions (Hardeman et al 2002 **2-A**). Examples of their use could be taken from any area of health promotion relating to health behaviour change. But in the current English and other UK policy environments the most relevant areas of application include:

- exercise intentions and behaviours (Ajzen and Driver 1991, Godin 1993, Blue 1995 **2-B**, Hausenblas et al 1997 **2-B**, Hagger et al 2002 **2-B**, Downs and Hausenblas 2005 **2-B**);
- weight gain prevention and eating behaviour (Godin and Kok 1996 **2-B**, Baranowski et al 2003);
- addiction related behaviours such as smoking and alcohol abuse (Godin and Kok 1996 **2-B**); and
- HIV prevention and condom use (Sheeran and Taylor 1999 **2-A**, Albarracin et al 2001 **2-B**).

Other areas of use identified during this review include blood donation (Ferguson 1996 **2-A**, which is for the purposes of this analysis is regarded as a health behaviour) and also oral hygiene, clinical screening, and driving behaviours. The use of the TRA and even more so the TPB appears to have been more extensive than that of the HBM

and also less strongly focused on the issue of tobacco addiction than that of the Trans-Theoretical Model.

3.2.3 Effectiveness in predicting and effecting behavioural change

There has recently been extensive debate on issues such as whether or not the TPB should be further extended to include additional components. (See, for example, Abraham et al 1998, Sutton 1998). Problems relating to the statistical interpretation and analytical as opposed to synthetic status of the findings that the TRA and TPB generate have also been raised (French and Hankins 2003, Ogden 2003, Ajzen and Fishbein 2004). There has also been a robust consideration of topics like the extent to which the PBC construct is essentially the same as, or should be seen as strengthening or weakening the application of, Bandura's self-efficacy concept (Ajzen 2002).

But for the immediate purposes of this review the key observation to make is that there is a large volume of research indicating that both the Theory of Reasoned Action and the Theory of Planned Behaviour have utility in predicting health behaviours, and that observed statistical relationships between their internal constructs based on behavioural, normative and control beliefs have significance across a wide range of contexts (Armitage and Christian 2003).

For example, Hausenblas et al (1997 **2-B**) investigated via a meta-analysis the application of the TRA and TPB in the context of exercise behaviour. These authors found strong general support for the validity of both theories. Hausenblas et al reported large effect sizes for the relationships between intention and exercise behaviour, attitude and intention, attitude and exercise behaviour, PBC and intention and PBC and exercise behaviour. By contrast, the correlations they found between the subjective norm and intention and behaviour were respectively moderate and zero. The authors interpreted this as providing an accurate insight into the nature of exercise motivation. They concluded that the TPB has greater explanatory power in relation to sports and allied behaviours than the TRA.

Similar conclusions have been reported by Blue (1995 **2-B**) and Hagger et al (2002 **2-B**). For example, the meta-analysis by Hagger and his colleagues reported that TRA model constructs explained 37 per cent of variance in exercise intentions and 26 per

cent of behavioural variance. With the addition of self-efficacy, the TPB model accounted for 50 per cent of intentional variance and 29 per cent of the variance in behaviour. Attitudinal differences were again found to be the dominant factor in influencing intentionality. These figures broadly correspond with Godin and Kok's (1996 **2-B**) earlier systematic review finding that in the exercise context the TPB could account for 42 per cent of the variance in intentions and 36 per cent of the variance in behaviour.

Taking all eight of the fields this last study covered together (addictive behaviours, clinical screening, driving behaviours, eating, exercising, HIV/AIDS and oral hygiene, with results drawn from a total of 56 studies), the overall proportion of variance in intention predicted by the PBC was 41 per cent. The equivalent average figure for reported behavioural variance was 34 per cent. The reported behaviour specific statistics ranged from just over 15 per cent in the case of clinical interventions and screening uptake to 42 per cent in the case of HIV/AIDS prevention related behaviours such as condom use.

Finally in this context, Downs and Housenblas (2005 **2-B**) emphasise the importance of detailed belief elicitation studies in the context of using the TPB to understand cognitive aspects of exercise. Their systematic review covered 47 studies conducted over a period of 22 years. They reported that the most salient behavioural belief is that exercise improves physical and psychological health; that family members have the strongest normative influence on exercise; and that beliefs about physical limitations have the most important control effects. Overall belief variations accounted for between 34 and 56 per cent of the reported variances in attitudes, subjective norms and perceived behavioural control. These authors also commented that most studies failed to report demographic variables. This makes it impossible directly to compare and contrast their findings on cognitive and behavioural variations in this context with other data on the social and economic determinants of exercise and health behaviour.

Two meta-analyses have examined the predictive power of the TRA and the TPB in relation to condom use. Sheeran and Taylor (1999 **2-A**) found that while the HBM variables had small (weighted average correlation) associations with condom use, the TRA and TPB had medium to strong correlations. Attitudes and subjective norms

were more strongly predictive than the PBC. But the authors noted that its inclusion in the TPB enhanced its predictive power. They interpreted their findings as showing that in the HIV prevention context beliefs about condom use *per se* are more important motivational factors than beliefs about HIV. They also noted the additional importance of sexual partner norms and descriptive norms. That is, perceptions relating to the condom use patterns that partners are anticipated to require and that other community members are believed to be practicing.

Albarracin et al's (2001 **2-B**) meta-analysis came to a similar conclusion about the predictive power of both the TRA and the TPB in this context, and confirmed the significance of attitudes and behavioural norms as determinants of intention, and intention as a predictor of reported condom use (weighted mean correlation $r = 0.45$). Perceived behavioural control was observed to be a statistical determinant of intention, but was not found to be a significant contributor to actual condom use. However, in low risk populations and teenagers the TRA/TPB models did not fit well. The authors also questioned the validity of condom use self reporting, and as with other studies referred to here expressed concerns relating to the homogeneity of the primary studies and associated effect heterogeneity. Like Sheeran and Taylor, they also raised questions regarding the extent to which past behaviour determines ongoing beliefs, intentions and behaviours.

Ferguson (1996 **2-A**) undertook a systematic review of the relative efficacy of theoretical models in predicting future behaviours in relation to blood donation. Although this covered a range of studies using varying constructs, he was able to conclude that intentions can be shown to account for a significant (19 per cent) proportion of the reported behavioural variance in this field. However, organisational factors relating to variables such as waiting times and other aspects of convenient service access and use accounted for a similar proportion of variance (17 per cent). Given the difficulties and uncertainties inherent in trying to change behaviour via modifying knowledge, beliefs, attitudes and intentions, this author argued that is likely to be easier (and more cost effective) to seek to moderate factors such as service organisation.

Finally, Armitage and Conner (2001 **2-A**) published a meta-analytic review aimed at providing a quantitative integration of research findings on the overall performance of the TPB and its main constructs, based on 185 studies covering a wide range of health and other fields. Its specific relevance to health may therefore be questioned. But in response it should be noted that one of the potential strengths of both the TRA and the TPB is that they are framed at a high level of generalisability – they are not health specific models (Ajzen 1998). It may also be argued that the level of contextual variance likely to be encountered within the health behaviour arena could be as great as that likely to be found between health and other behavioural fields.

Armitage and Conner calculated that in aggregate the TPB accounted for 39 per cent of variation in intentions, and 27 per cent of reported variation in behaviour. When behaviour measures were self reports the TPB accounted for 11 per cent more of the overall variance than when behaviours were externally observed. This implies an ‘objective’ figure of 21 per cent of behavioural variance explained. This is below Godin and Kok’s (1996 **2-B**) reported aggregate figure of 36 per cent, which was not similarly adjusted. Armitage and Conner also found the subjective norm construct to be a relatively weak behavioural predictor, and discussed ways in which the TPB’s predictive power might in future be enhanced.

3.2.4 *Impact on health outcomes*

As with the HBM model, this review has identified no evidence relating to the extent to which the use of TRA and TPB informed interventions has contributed to either improved or reduced health outcomes in the United Kingdom, over and above changes achievable via other theoretically or non-theoretically based interventions. This can in large part be explained by the fact that TRA and TPB based studies have mainly been aimed at predicting and understanding intentions and behaviours. As presently specified, neither the TRA nor the TPB address issues relating to how behavioural change goals can most effectively be pursued. Indeed, in as much as they rather serve as instruments that can only be used to generate information on the cognitive determinants of health behaviours, it is arguably incorrect to refer to any health behaviour change intervention as being TRA or TPB ‘based’.

It follows logically from this that even though the available evidence indicates that use of the TPB model can normally explain a greater degree of behavioural variance associated with beliefs and cognitions than either the HBM or the TRA, this does not necessarily mean that interventions designed on TPB research based information will in practice out-perform other theory based or more pragmatically derived interventions. The health gains derived from HBC interventions will in any given context depend largely on the effectiveness of the behaviour change strategy or strategies employed.

To the extent that the TRA and TPB may, for instance, have biased some 'health educators' in the direction of seeking to change knowledge levels rather than other behavioural determinants, their employment could in some cases have been relatively unproductive. However, it is also important to note that in areas such as HIV/AIDS prevention there are also reasons to hope that the use of such social cognition models has been of positive value (Fishbein 1995, Abraham et al 1998, Fishbein 2000).

In 2002 Hardeman et al (2-A) undertook a systematic review of 30 published applications of the TPB in behaviour change interventions. These authors concluded that the TPB is relatively rarely used pro-actively to develop health promotion and other interventions. When reported, about two thirds of the interventions were effective in changing behaviours. But effect sizes were generally small and effectiveness was unrelated to the use of the theory to develop interventions. The authors called for more effort to be put in to comparing the utility of TPB based approaches with alternative models and interventions.

In response to these and allied concerns a number of researchers have suggested that the predictive power of the TPB could be further enhanced by the inclusion of additional factors aimed either at improving the prediction of intentions, or better understanding or supporting the translation of intentions into desired behaviours (Maddux 1993, Abraham et al 1998, Sutton 1998, Conner and Armitage 1998, Armitage and Conner 2000, Ajzen 2001, Hobbis and Sutton 2005). Illustrations of the types of possible modification identified include:

- **Applying the outcomes of research on moderating factors such as variations in the temporal stability of, and ambiguities in, beliefs and attitudes to increase the strength of intentions as predictors of behaviours.** Cooke and Sheeran (2004 **2-A**) conducted a meta-analysis offering substantive evidence that 7 identified factors act as moderators in the relationships between TPB constructs. This indicates that the predictive power of the TPB could be further improved, albeit at some cost to the model's parsimony.
- **Re-specifying the PBC construct to take into account additional moderators.** Notani (1998 **2-B**) published a meta-analysis indicating that the PBC may be strengthened as a behavioural predictor when operationalised as a global (i.e. overall) rather than plural belief based measure, and/or conceptualised to reflect control over factors internal to rather than external to the individual.
- **Using descriptive norms as predictors of intention.** Ravis and Sheeran (2003 **2-A**) undertook a meta-analysis that found that the additional use of descriptive norms (cognitions relating to how others actually behave) would increase the variance explained by intention by circa 5 per cent.
- **Promoting involvement in preparatory activities as a prelude to enabling individuals to successfully implement their expressed intentions** (Abraham et al 1998). Opportunities in this area may also stem from an improved understanding of self regulation skills and supports.
- **Applying Cognitive Behavioural Therapy based methods to support health related belief, attitude and behaviour change goals identified via TPB based approaches.** Hobbis and Sutton (2005) have suggested that, despite underlying differences between the TPB and the assumptions upon which CBT is based, the use of CBT in this way could enable people to experience 'mastery' of cognitive and subsequent behavioural change, and enable the productive application of TPB based insights in health behaviour change interventions.

This last proposal has engendered mixed reactions, in part because of its possible service cost implications (Baranowski 2005, Conner 2005, Fishbein and Ajzen 2005). But as with the concept above on preparatory behaviours its potential significance

relates to operationalising TPB health interventions, and facilitating the model's development in a direction parallel to that of the TTM. If this proposal were taken forward in an appropriately structured way it would be possible to compare the cost effectiveness of TTM as opposed to TPB based HBC interventions in meaningful ways, relevant to health outcome oriented measures of their impacts.

3.2.5 Overall model evaluation and summary evidence statement

There is systematic and meta-analytical evidence that in relation to changes in health behaviour the predictive performance of both the TRA and the TPB is in most superior to that of the HBM. Further, there is also evidence that the additional components/constructs contained in the TPB normally allow it to predict a greater percentage of behavioural variance than the TRA. The available evidence indicates that, as it is presently specified, the use of the TPB can in countries such as the UK and the US typically account for between 20 and 30 per cent of the observed variance in adult (although not child or adolescent and young adult) health behaviours (Godin and Kok 1996 **2-B**, Armitage and Conner 2001 **2-A**, Hagger et al 2002 **2-B**, Sutton 1998). Its capacity to predict behavioural intention is higher.

However, there is also evidence derived from both narrative and systematic reviews regarding the limitations of the TPB as a social as distinct from a cognitive theory, and its applications in practice (Hardeman et al 2002 **2-A**). While the potential significance being able to explain in the order of 20 per cent of the observed variance in health behaviours should not be under-estimated, neither should the potential benefits of being able to understand and act to complement or offset the remaining 80 per cent be ignored.

In itself the TPB cannot be used to answer questions relating to how beliefs and attitudes underpinning behavioural intentions can most cost effectively be changed, or what health promotion strategies are likely to prove most productive in health gain terms. The effect size measures normally quoted to indicate the efficacy of social cognition based models of health behaviour have no direct relevance to their possible public health impacts. To the extent that long-standing health inequalities are functions of factors such as material and other socio-cultural differences between and within communities, interventions based mainly on changing individual cognitions are

unlikely to eliminate them. Indeed, they may even exacerbate them. This indicates that further developments in models such as the TPB, aimed at enhancing the latter's power to predict health behaviours and also help individuals and groups to achieve desired changes in their daily lives, would be a logical step forward.

Evidence statement

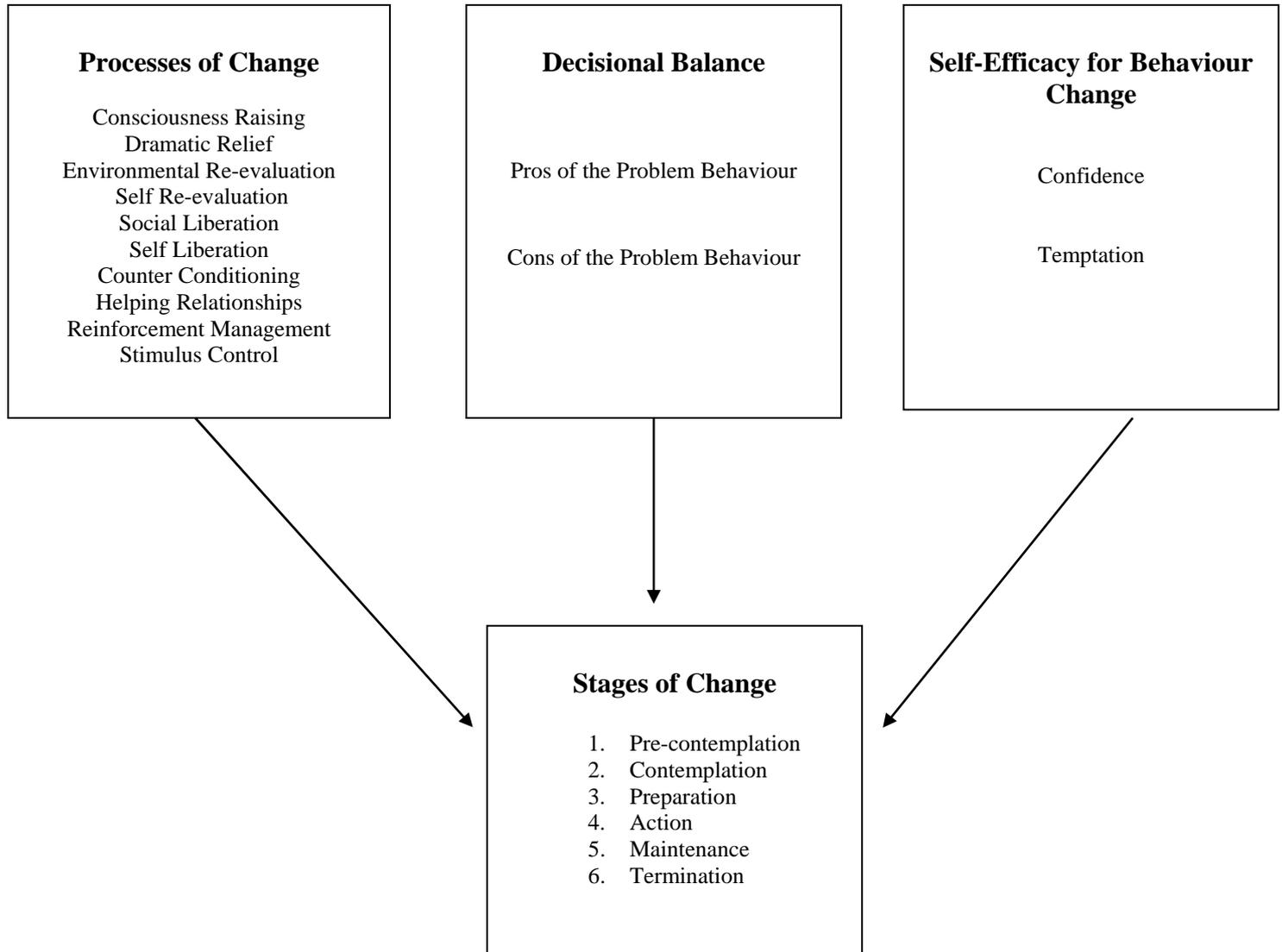
There is evidence that the Theory of Reasoned Action and the Theory of Planned Behaviour can both be used to predict health related behaviour with greater effect than the Health Belief Model (Zimmerman and Vernberg 1994 2+B). There is also evidence that the predictive power of the TPB exceeds that of the TRA (Hausenblas et al 1997 2-B). Across a wide range of health behaviours the TPB can explain 20 per cent or more of observed behavioural variance (Godin and Kok 1996 2-B, Armitage and Conner 2001 2-A, Sheeran and Taylor 1999 2-A, Albarracin et al 2001 2-B, Ajzen and Driver 1991, Godin 1993, Blue 1995 2-B, Hagger et al 2002 2-B, Downs and Hausenblas 2005 2-B). However, there is also evidence that TPB based research is infrequently used directly to inform behavioural change interventions, and when this has been the case the additional health benefits gained appear to have been relatively limited (Hardeman et al 2002 2-A).

3.3 The Trans-Theoretical Model of Health Behaviour Change

The Trans-Theoretical Model was developed by Prochaska and DiClemente at the start of the 1980s. As with the HBM, the TRA and the TPB it in part builds on concepts pioneered by Lewin. But the TTM's roots are also closely linked to the desire of its originators to integrate and enhance the effectiveness of psychotherapeutically oriented efforts to address and reduce the harm caused by tobacco smoking (Burkholder and Nigg 2002). In order to link together concepts drawn from a variety of theories it uses a temporal dimension, the stages of change (SoC) construct, as a basic framework around which other model components relating to the promotion of behavioural change (that is, the processes of change components) and its

monitoring and support are located (Prochaska et al 1994, Prochaska and Velicer 1997, Velicer et al 1998).

FIGURE 3 The Trans-Theoretical Model of health behaviour change



Source: After Burkholder and Nigg (2002)

The TTM therefore differs significantly from the other models considered in this review. This is because it is designed to be of direct value in the delivery of desired behavioural change in individuals and populations. Nevertheless, some of the elements it includes are similar or identical to those utilised in other social cognition based models of health behaviour change (Noar and Zimmerman 2005). The precise

format of the TTM and its central stages of change construct has varied over time. But the main components of the model described diagrammatically in Figure 3 above are:

- **The five (or six) stages of change (SoCs).** These are *pre-contemplation* (in which the individual has no intention of changing his or her behaviour in the foreseeable future); *contemplation*, in which the individual is considering changing his or her behaviour in the next six months; *preparation*, in which change is planned within the coming month; *action*, in which stage the individual has made the behaviour change within the last six months; and *maintenance*, in which the health behaviour has been sustained for at least six months. A final stage, *termination*, is included in some versions of the TTM. In this stage the new behaviour is seen as being fully established, after a period of five or more years. The progress of individuals between stages is not seen as linear, but as ‘a spiral staircase’ upon which subjects may on occasions ‘jump’ either up or down.
- **The ten processes of change.** These are sub-divided into experiential and behavioural processes, which the model indicates are of varying significance at different stage transitions (Adams and White 2003). The processes seen as most significant at the time of the pre-contemplation/contemplation shift are *consciousness raising* (creating new awareness of a problem), *dramatic relief* (emotional expression and affective change) and *environment re-evaluation* (consideration of the problem in the context of the individual’s social and physical world). The move from contemplation to preparation is considered to involve *self re-evaluation*, defined as the intellectual and emotional acceptance of changed values. At the preparation/action interface *social* and *self liberation* are believed to be key drivers. These processes involve heightening awareness of alternative lifestyles that negate the problem, and developing a strengthened personal sense of commitment and ability to change. At the action through to maintenance stage the main behavioural processes involved are *counter-conditioning* (adopting alternative behaviours, like chewing gum instead of smoking) forming *helping relationships*, and *reinforcement management* and *stimulus control*. These relate to behavioural

conditioning, and the reward of desired actions and the avoidance of cues associated with unwanted habits.

- **Decisional balance.** This component is derived from the work of Janis and Mann (1977), who researched the ways in which people weigh the costs and benefits and identified two sets of four positive and four negative variables. Thus the decisional balance schema incorporated in the TTM differs from that in the HBM and TRA/TPB. Yet all these models share the concept of an implicitly innate psychological cost/benefit mechanism that is important in driving and/or directing (health) behaviour.
- **Self-efficacy relating to the desired behavioural change.** This construct is now also incorporated in both the HBM and the TPB. Within the TTM framework of analysis self-efficacy is predicted to rise as individuals move towards the action and maintenance stages.
- **Temptation.** This component is not mentioned in all descriptions of the TTM. It reflects the intensity of urges to engage in the undesired behaviour, and may thus be a function of both physical addiction and social conditioning. Such urges may also become apparent when an individual is stressed and/or distressed. Temptation frequency and strength is predicted to fall as self-efficacy rises.

In the application of the TTM model measures of decisional balance, self-efficacy and temptation can be used both as population descriptors and as individual care or case management instruments. They are employed to monitor progress and identify and manage crises. However, as with the HBM many studies and programmes appear to use only a truncated form of the TTM, and there is a large degree of heterogeneity in its application within and across disparate health fields. (See, for example, Spencer et al 2002 **2+A**, Whitelaw et al 2000, van Sluijs et al 2004 **2++B**). Failures to define adequately stages and behavioural change goals may on occasions account for apparent limitations in the effectiveness of TTM based interventions. (Similarly, in the case of the TRA or the TPB a lack of correspondence or compatibility between a

measured intention – the behavioural predictor – and the observed behaviour may similarly account for a lack of model efficacy, as measured in terms of its capacity to explain variances - Sutton 1998).

To the extent that the TTM has been widely used in interventional programmes aimed at changing health behaviour and health outcomes (rather than simply to provide a framework for identifying correlates which may or may not be indicative of causal relationships), the body of evidence relating to its effectiveness is substantively different from that available in the contexts of the HBM, the TRA and the TPB. This difference has arguably allowed the TTM and TTM based interventions to be subject to testing in a manner that the other social cognition models of health behaviour change considered in this report have not been, and perhaps cannot be (Ogden 2003). The TTM has, in part because of its widespread popularity amongst health education and promotion practitioners (Whitelaw et al 2000, Jones and Donovan 2004), attracted criticism from a number of psychologists (Davidson 1998, West 2005a).

In addition to concerns about its ability to integrate social and economic factors, a central focus of such concern has been on the validity of the stages of change (SoC) construct in relation to smoking cessation and changing other (addictive and non-addictive) behaviours, such as dietary habits and exercise patterns (Adams and White 2003 **2-A**, Adams and White 2005, Riemsmas et al 2002 **1++A**, Brug et al 2005, Buxton et al 1996, Etter 2005, Hodgins 2005, Horwarth 1999, Rosen 2000 **2-B**, Sutton 2005, West 2005b, West & Hardy 2006, Whitelaw et al 2000). Rosen (2000 **2-B**) in his meta-analysis on the sequencing of change processes by stage, found that stage assignment explained only 11 per cent of the reported variance in use of cognitive affective (experiential) processes and 14 per cent of the variance in behavioural processes. The use of cross-sectional as opposed to longitudinal research based data has been criticised as being meaningless in relation to demonstrating the validity of the TTM's SoC hypotheses. The statistical integrity of some of the key studies used in the TTM's formulation has also been questioned (Callaghan 2005).

Notwithstanding the availability of instruments such as University of Rhode Island Change Assessment Scale – URICA – there are additional concerns about TTM staging validity. There is narrative, systematic and meta-analytical review evidence

(see below) indicating that TTM stages are in many instances unlikely to reflect cognitive realities. The processes of change/stages of change linkages specified in the model appear to be weak.

Davidson (1998) has pointed out that there are several other influential stage of change models in health related social and clinical psychology. For example, Kubler-Ross (1969) described five stages of change in emotional responses to terminal illness. These were denial, anger, bargaining, fear/depression and acceptance. In reality, not everyone goes through such stages. It would almost certainly be counter-productive for health professionals to assume they do. But Davidson suggests that for heuristic and didactic purposes the Kubler-Ross model is of value, provided that its limitations are understood and it is not rigidly applied.

Davidson's analysis suggests that this is also a reasonable way to approach a consideration of the TTM's utility. It could also inform the application of social cognition based HBC models more broadly (DiClemente 2005, Michie 2005, Littell and Girvin 2002 **2-B**). Ajzen and Fishbein have, for instance, agreed that for the TPB to be of practical value its findings need to be translatable into action. This logically implies a temporal relationship between cognitive re-adjustments and subsequent behavioural changes (Fishbein and Ajzen 2005). Nevertheless, assessments of the TTM should also take into account the possibility that it might be detrimental to health improvement if its use were to displace more effective approaches, or lead to a misleading acceptance of intermediate stage changes as (false) indicators of progress towards desired health outcomes.

3.3.1 *Social, economic and environmental factor integration*

As with other social cognition models the TTM does not normally include objective – defined here as external fact based – measures of health related social, economic and environmental variables. Although it could be used in conjunction with such measures, and so might be able to support action relevant to the reduction of health inequalities, it is not primarily designed to facilitate such approaches. The body of TTM research identified for the purposes of this review contains no evidence directly relevant to the social and economic determinants of individual or population health, or

the ways in which such factors might impact on class (or other social/cultural position) related variations in cognition or health related behaviour.

3.3.2 Areas of use

As previously noted, the TTM was initially developed as a vehicle for understanding and actively promoting behaviour change in the context of tobacco smoking. The TTM literature remains in large part focused on this topic. In this review four of the relevant systematic and meta-analytical reviews identified were wholly or in part concerned with smoking cessation and prevention (Spencer et al 2002 **2+A**, Riemsma et al 2002 **1++A**, Riemsma et al 2003 **1-B**, van Sluijs et al 2004 **2++B**). The other principle areas covered in TTM studies identified during this review were:

- dietary change (Riemsma et al 2002 **1++A**, van Sluijs et al 2004 **2++B**);
- exercise and activity promotion (Marshall and Biddle 2001 **2-A**, Riemsma et al 2002 **1++A**, Adams and White 2003 **2-A**, van Sluijs et al 2004 **2++B**);
- sexually transmitted disease and pregnancy prevention (Horowitz 2003 **2-B**);
- breast cancer screening (Riemsma et al 2002 **1++A**);
- alcohol use control (Riemsma et al 2002 **1++A**); and
- treatment adherence (Riemsma et al, 2002 **1++A**).

The TTM has in addition been employed in virtually all other health behaviour change fields.

3.3.3 Effectiveness in predicting and effecting behavioural change

With regard to smoking cessation, which in avoidable harm terms may still greatly outweigh the burdens being inflicted on the UK population by other behaviours that can realistically be regarded as subject to volitional control, the comparative evidence available as to the effectiveness of TTM based as opposed to alternative interventions is mixed. Spencer et al (2002 **2+A**) systematically reviewed a total of 148 published peer reviewed articles in this area. They reported on 54 validation studies, 73 population studies and 37 intervention studies. Spencer et al concluded that ‘evidence for the validity of the TTM as it applies to tobacco use is strong and growing; however, it is not conclusive’. A majority of the stage-matched interventions assessed

produced positive results, and were judged to be of better overall quality than those unsupportive of stage matched interventions.

Spencer et al also found that interventions tailored to a smoker's stage were more effective than non-tailored interventions in moving smokers forward to following stages. But as West (2005a, West & Sohal 2006) and others have stressed, forward stage movement should not be confused with successful cessation/behaviour change. To the extent that the TTM staging construct is of doubtful validity, its use in this context is potentially misleading. Spencer et al reported concerns about the staging construct and its measurement – 8 different staging mechanisms were identified in the literature they examined. They also stated that US population validated stage distributions may not apply in other countries or regions.

Riemsma et al (2003 **1-B**) conducted a systematic review of 23 studies of stage-based interventions to promote smoking cessation. This study identified 11 trials that had compared stage-based and non-stage-based interventions, only one of which reported statistically significant effect in favour of the SoC intervention. They concluded that limited evidence exists for the effectiveness of stage-based interventions when compared with non-stage-based interventions, or no intervention.

This finding is similar to that previously reported by the same authors in relation to the effectiveness of stage-based interventions to promote individual behavioural change across a range of the health fields (Riemsma et al 2002 **1++A**). Out of the 37 studies that this high quality systematic review included (of which 13 were focused on smoking cessation, and two did not permit comparisons of SoC versus non-SoC behavioural outcomes) 17 showed no significant differences between stage-based and non-stage-based interventions. Eight found mixed effects and 10 showed effects in favour of a stage-based approach. The authors concluded that there is little evidence that stage-based interventions are more effective than non-stage-based interventions, although at the same time their research does not reveal evidence of dis-benefit associated with the application of the TTM or allied models.

Further support for this conclusion is provided by a systematic review undertaken by van Sluijs et al (2004 **2++B**) in the Netherlands. In this research a total of 29 trials

relating to life style primary care interventions were selected for inclusion. Of these 14 were aimed at smoking cessation, 13 included interventions aimed at changing physical activity levels and five included a dietary intervention. Overall, they reported that limited or no evidence was found for an effect of stage-based interventions on either quit rates or further stage change, albeit that the quantitative analysis undertaken by these authors did indicate a small positive effect of stage-based interventions in primary care on smoking cessation rates. Van Sluijs et al concluded that the most effective approach to smoking cessation in primary care is (brief) personal advice from the physician, with subsequent *ad hoc* reinforcement and support. This is consistent with other evidence (Stead et al 2005).

In relation to physical activity van Sluijs et al (2004 **2++B**) found no evidence of an advantageous effect of stage-based interventions as against alternative approaches. This reflects the results reported by Riemsma et al (2002 **1++A**) in this context. In that study one of the seven physical activity trials included lacked data on behavioural change. Of the remainder three trials reported no differences between SoC and alternative interventions. Two showed mixed effects. One reported outcomes favouring the SoC.

Adams and White (2003 **2-A**) undertook a systematic review of the effectiveness of 16 TTM based activity promotion interventions, and reported that 73 per cent of short-term (< 6 month) studies reported a positive effect of TTM studies over 'control conditions'. The equivalent long-term (> 6 months) proportion was 29 per cent. As have others, these authors commented on the heterogeneity of the research analysed, and the fact that several studies noted that at completion the majority of the subjects still involved included tended to be white, middle class and physically active. Subsequently, Adams and White (2005) commented that there is little evidence that individualised stage-based activity interventions are any more effective than (rationally designed) alternatives in promoting long term increases in physical activity levels. In their view the possible reasons for this relate to the complexity of exercise behaviour; the wide range of factors influencing it; inadequate staging; and the possibility that SoC base approaches encourage an unproductive focus on stage progression.

However, Marshall and Biddle (2001 **2-A**) undertook a meta-analysis of the application of the TTM to physical activity and exercise, based on 71 published reports. They by contrast concluded that there are sufficient data to confirm that stage membership is associated with not only different levels of activity, but also significant self-efficacy and decisional balance variances. Yet they too were unable to confirm whether or not physical activity changes can meaningfully be staged, or should rather be regarded as located on a continuum.

Similarly, Horowitz (2003 **2-B**) reviewed 9 intervention studies, 11 population studies and 12 validation studies relating to the use of the TTM in the context of unwanted pregnancy and sexually transmitted disease (including HIV/AIDS) prevention. He too concluded that self-efficacy and decisional balance constructs are related to stage change, and that his research demonstrated the internal consistency of the construct relationships within the TTM. This analysis included 9 stage-matched interventions. A majority (5) of these suggested a positive link between stage tailored interventions and outcomes. However, no firm conclusions about the effectiveness of TTM applications as against alternatives in terms of behavioural change achievement could be drawn.

With regard to dietary interventions, Riemsma et al (2002 **1++A**) found that two of the five trials they analysed that were targeted at dietary change reported significant effects in favour of stage-based interventions. Of the remainder, two showed mixed effects. Similarly, van Sluijs et al (2004 **2++B**) reported relatively favourable outcomes resulting from stage-based primary care interventions in this context, with particular reference to dietary fat reduction. This was found at both in both the short and long-term contexts, although medium term (6 month data). The authors stated that, because of limitations in study sizes and numbers, their positive finding on the relative effectiveness of SoC based interventions in promoting dietary change should be interpreted with caution.

The remaining studies included in the review undertaken by Riemsma et al (2002 **1++A**) reported no significant findings concerning the relative efficacy of stage-of-change based interventions in other preventive, or multiple dimension, life style change contexts. One of two studies aimed at increasing mammography uptake

reported a significant difference in favour of a stage-based intervention, as did the one included trial on treatment adherence.

Taken in the round, the evidence presented here suggests that it is unlikely that TTM based interventions as currently commonly employed in health promotion have any marked advantages over alternative (appropriate) health improvement interventions. Given the centrality of Prochaska and DiClemente's stages of change construct to the TTM, this finding may be taken as supportive of Littell and Girvin's (2002 **2-B**) conclusions. They systematically reviewed a total of 87 studies, with the objective of ascertaining the degree to which behavioural change stages can be shown to exist as discrete states with sequential transitions between them. They found that the assumption that there are common stages of change across a wide range of HBC fields (and/or in different populations) cannot be validated by the available empirical data. Nor, they reported, is there convincing evidence of discrete stages of change in relation to specific problem behaviours such as substance abuse or cigarette smoking.

Nevertheless, the evidence presented here should not be regarded as constituting any substantive degree of proof that TTM/SoC based interventions are less effective than alternatives of comparable scale and quality, including those based on findings derived from applications of findings derived from the TPB. It is also the case that none of the information gathered for this review provides a definitive answer to the question of whether or not the constructs contained in the TTM would in aggregate terms be likely (if appropriately employed) to be able to predict more or less HBC variance than those contained in alternatives such as the TPB.

3.3.4 *Impact on health outcomes*

The TTM has been extensively used in health behaviour change programmes in this country and elsewhere. Regardless of their relative efficacy, such programmes appear to have contributed to achieving intermediate health outcomes such as (for example) smoking cessation. The evidence available is also strongly supportive of the view that in the case of smoking cessation improved health outcomes will have in time resulted from such interventions, and that the average cost per quality adjusted life year

(QALY) gained is likely to have been modest (Riemsma et al 2003 **1-B**). The estimates of the latter reported by Riemsma et al are in the order of £200 - £400 ².

Similar health gains could very probably have been achieved via the application of alternative health promotion techniques. Yet this should not be assumed without question. For example, to the extent that use of the TTM and/or the SoC construct it incorporates is of heuristic and motivational value to staff working in health promotion it may, for instance, have contributed positively to outcomes in ways which are difficult to quantify. Such possibilities need to be placed alongside speculation that the use of stage-of-change based approaches could have had detrimental effects. It is also unknown whether or not the use of the TTM/stages-of-change model has increased or decreased gender, class or ethnicity related health inequalities due to variations in its relevance to differing social groups.

Innovative primary research would be needed to resolve such questions. Looking to the future, the Trans-Theoretical Model ought, its name suggests, be open to adaptation as new theoretical insights and additional information relevant to health behaviour emerge. For example, it might be modified to include more powerful measures of, say, physiological addiction, social status and/or of relative or absolute economic deprivation. However, because the SoC construct central to the TTM is of questionable validity, some believe that it cannot be improved through the addition of further components (West 2005a, West 2005b, West and Hardy 2006a). Rather, they have called for its abandonment.

3.3.5 Overall model evaluation and summary evidence statement

Although the structure of the TTM is significantly more complex than that of the other models considered in this review, many authors have described it as a popular, intuitively plausible, model of health behaviour change. Its strengths lie in its capacity to integrate a wide range of information and serve as an instrument for the design and

² Cost per QALY findings may in this context be subject to considerations such as the extent to which health promotion interventions serve to accelerate, as distinct from cause, long-term trends. Conventional estimations may overstate the cost effectiveness of health promotion interventions, because benefits ascribed to them may to a degree have resulted from other factors driving secular trends.

management of both individual and community or population level health behaviour change intervention programmes.

In some areas, such as dietary change, its application might have advantages over alternative approaches (van Sluijs et al 2004, 2++B). Yet the TTM's critics believe that its potential has on occasions been seriously overstated, and that the use of stage change based targets as proxies for health gain can be counter-productive. There have hence been calls for its use to be curtailed in the UK. But commentators associated with the development of the TTM have argued that it should not be discarded in the absence of compelling evidence that practically superior alternatives exist (DiClemente 2005). In this context it would be relevant to consider the impact of any possible recommendation to the effect that the use of the TTM should be discouraged on the motivation and morale of health promotion specialists committed to the application of this model.

Evidence statement

The body of evidence relating to the internal validity of the TTM and the relative effectiveness of TTM based health behaviour change interventions is mixed. A number of substantive analyses have reported findings consistent with hypotheses underpinning the TTM (Marshall and Biddle 2001 2-A, Spencer et al 2002 2+A, Horowitz 2003 2-B). But the evidence available indicates that in behavioural outcome terms the application of TTM/SoC based approaches in areas such as smoking cessation and exercise promotion is no more likely to be effective in achieving desired outcomes than the use of alternative (rationally designed) interventions (Adams and White 2003 2-A, Riemsma et al 2002 1++A, Riemsma et al 2003 1-B, van Sluijs et al 2004 2++B). The proposition that there are common consistently definable stages of change across a wide range of health behaviour fields and/or observable across many populations cannot be validated by the available empirical data (Littell and Girvin 2002 2-B).

4. Findings – The Research Questions

4.1 *What concepts and constructs does each of the selected models contain?*

The Health Belief Model (HBM), the Theory of Reasoned Action (TRA), the Theory of Planned Behaviour (TPB) and the Trans-Theoretical Model (TTM) are distinct models containing (in common with other psychological models of health behaviour change) a number of components. These are of various types, ranging from uni-dimensional variables to complex multi-dimensional constructs (Armitage and Conner 2000).

Each model has unique aspects. For example, the HBM's 'perceived threat' construct differs from all others contained in the TRA, the TPB and the TTM. Its specification also includes 'objective' demographic and other variables such as cues to action (including media information and personal or other behavioural reminders) not included in the other models' specifications (Rosenstock et al 1994).

While the HBM is health behaviour focused, the TRA and the TPB are framed at higher levels of generalisation (Ajzen 1998). They can thus be applied outside the health sphere. The TRA and the TPB share identical attitudinal and social norm related components (Fishbein and Ajzen 1975). In addition, the TPB contains constructs relating to control related beliefs and self-efficacy (Ajzen 2002). The TRA and the TPB are arguably mathematically better specified than the HBM and the TTM, and more parsimonious in design. That is, they have fewer, more precisely defined, components. This may enhance the efficiency and consistency of their use.

The TTM's SoC and process of change components are also important distinguishing elements (Prochaska and Velicer 1997, Burkholder and Nigg 2002). The TTM is the most complex of the models considered here, and the only one designed directly to facilitate behavioural change. For the purposes of this review this last can be regarded as a fundamentally important structural and functional discriminator. In the context of the models' use in practice, further heterogeneity is derived from the fact that they are often only partially applied and/or adapted to meet particular research or programme

Table 4. Similar and identical components of the HBM, TRA, TPB and TTM. (After Noar and Zimmerman, 2005)

Concept fields	Concept tenets	HBM	TRA	TPB	TTM
Attitudinal beliefs	The perceived positive benefits must outweigh the perceived negative costs of a behaviour	Benefits, barriers and health motivation	Behavioural beliefs and derived attitudes	Behavioural beliefs and derived attitudes	Pro and con evaluations, decisional balance
Self-efficacy, control beliefs	Belief in one's ability to perform a behaviour is often necessary for its execution	Self-efficacy (in later version)	–	Perceived behavioural control components	Self-efficacy (and temptation as a negative indicator, plus self liberation?)
Normative beliefs and norm related activity influences	Belief that significant others desire one to adopt a behaviour Beliefs that peers have adopted the behaviour Positive re-enforcements, behavioural reminders	Cues from family, friends and media – (?) Cues from mass media and other sources	Normative beliefs and motivation to comply – –	Normative beliefs and motivation to comply – –	Helping relationship related processes Social liberation related processes Reinforcement management and stimulus control processes
Risk related beliefs and emotional influences	One feels at risk of a defined disease/condition, with will inflict negative consequences	Perceived susceptibility	–	–	Dramatic relief processes
Intention setting and commitment planning	One has formed intentions and/or commitments in relation to achieving a specific behaviour	–	Behavioural intentions	Behavioural intentions	Self liberation and social liberation processes, contemplation, preparation and action stages of behavioural change

requirements (Salazar 1991). Yet there are also important structural commonalities (Noar and Zimmerman 2005). As Table 4 above indicates, these involve components relating to how individuals balance the perceived costs and benefits of alternative behaviours; beliefs about others' expectations and values relating to health

behaviours; the formation of (except in the case of the HBM) intentions to act; and (except in the case of the TRA) individuals' self efficacy perceptions in relation to taking behavioural action.

The structure and content of models such as the HBM, the TRA, the TPB and the TTM can be understood at several levels. For example, Smedslund (2000) has offered a critical evaluation of health psychology models based on the fundamental descriptors 'can', 'try', 'want', 'expected utility' and 'belief in ability'. Smedslund concluded that the HBM lacks an 'intention to try' construct.

Fishbein (1995) listed eight factors relating to behavioural prediction and execution. These were:

- the existence of a positive intention or commitment to act;
- the absence of environmental constraints that would make a given behaviour impossible;
- the possession of necessary skills;
- a positive attitude, based on the belief that the behaviour's advantages will outweigh its costs;
- a similarly positive balance of perceived normative pressures;
- consistency of the behaviour with the individual's self image and personal standards;
- a positive balance of emotional reaction to the behaviour; and
- confidence with respect to the specific behaviour.

Theories or models such as the TPB and the TTM contain components relating to all these factors. But in part because they are often applied in a variable manner it is in many instances uncertain how far their use in fact facilitates understanding of such variables. It is also the case that all the social cognition models considered here relate primarily at least to conscious perceptions, rather than external social facts or thoughts inaccessible to the conscious mind. (See below and Fishbein 2000).

Noar and Zimmerman (2005) analysed the components of HBM, the TRA, the TPB and the TTM (and also Bandura's Social Cognition Theory – the SCT) in terms of their structures appertaining to attitudinal beliefs; self-efficacy and behavioural control beliefs; normative beliefs; risk related beliefs and emotional responses; and intention, commitment and planning – see Table 4. Of the theories that are the subjects of this review, these authors' analysis suggests that the TTM has the most comprehensive component set. They concluded that at present there is extensive plurality/heterogeneity in the body of research available, and that it is uncertain what theory or theories can best be used to predict (and ultimately to change) health behaviour. Noar and Zimmerman called for more integrative approaches. Their findings have important implications for the commissioning of research and theory and practice development in this public health field. It has been suggested that better use could be made of existing knowledge of the psychological determinants of health behaviour if a more coherently informed and organised approach were instituted (Weinstein and Rothman 2005).

Evidence statement

Psychological models commonly employed to explain, predict and facilitate health behaviours contain a wide variety of components. Some are unique to particular models. But many share identical or overlapping characteristics, and have evolved from common roots as a result of an evolutionary process of development (Armitage and Christian 2003, Noar and Zimmerman 2005). There is evidence derived at the level of narrative review that the efficacy and effectiveness of interventions to promote health behaviour change could, to the extent that these depend on the use of models like the TPB and the TTM, be further enhanced through better disciplined and directed future approaches to component and model development (Armitage and Conner 2000, Weinstein and Rothman 2005). This should be aimed directly at achieving improved health outcomes.

4.2 *To what extent is each model able to incorporate social, economic and/or environmental factors, particularly in relation to the occurrence of health inequalities?*

The conclusion of this review is that none of the models examined is specified adequately to incorporate and interpret the significance of social, economic and/or environmental factors as predictors and determinants of health behaviour. Many of the components and psychological constructs they contain relate to cognitions and perceptions that are a function of subjects' responses to their environments. But this alone cannot be relied upon to allow social realities adequately to be appreciated (Kippax and Crawford 1993). Although descriptions of the HBM include demographic and socio-economic variables, the evidence identified in the process of this review indicates that in practice this model has not normally been used effectively to exploit this potential strength. (See Chen and Land 1990).

This finding also has important implications for the commissioning of research and development in this public health field. It is relevant to issues such as the future integration of sociological and psychological approaches to understanding and changing health behaviours. At present apparent failings in this area imply that opportunities to understand cognitive dimensions of class and ethnicity related (and other) health inequalities are being lost. They also imply that health behaviour change research is often aimed at developing psychological insight at a theoretical level, rather than at strengthening multidisciplinary approaches to the actual achievement of better public health.

The heterogeneity of the health psychology studies and inconsistencies in the way that models are applied often renders it difficult or impossible to apply techniques such as meta-analysis in order to derive data on their predictive power and the effectiveness of alternative public health interventions. (See, for instance, Yarbrough and Braden 2001 **2-B**, Sutton 1998). Such failings may on occasions cause cost effective opportunities for interventions aimed at changing environmental and organisational determinants of health related behaviour to be ignored, while less productive attempts to change beliefs, attitudes and outcomes are pursued. In health outcome improvement terms this will favour relatively advantaged groups, to the extent that they are best placed to change relevant beliefs and attitudes.

This may be illustrated by the work of Ferguson (1996 2-A). He conducted a systematic review of the relative efficacy of alternative models in predicting future behaviours in relation to blood donation. Despite application differences, he reported that donation intentions account for 19 per cent of the reported behavioural variance. However, organisational factors relating to variables such as waiting times accounted for 17 per cent. Given the difficulty of changing behaviour via modifying salient beliefs, he argued that it would be more cost effective to seek to improve service organisation.

Evidence statement

None of the psychological models evaluated during this review are adequately specified to analyse the significance of social, economic and/or environmental factors as predictors and/or determinants of health behaviour. When such models are used there are often failures to record information relevant to such factors. There is indirect evidence that this could cause cost effective opportunities for interventions aimed at changing the environmental and organisational determinants of health behaviour to be ignored (Ferguson 1996 2-A). In some circumstance this could increase health inequalities.

4.3 *In which areas has each model been used?*

All the models considered here have been widely used. However, the evidence available suggests that the HBM has in relative terms most frequently been employed in the context of health service uptake issues such as immunisation acceptance, and compliance with medical treatment (Becker 1974, Rosenstock 1974, Janz and Becker 1984, Harrison et al 1992 2-B). The more general theoretical frameworks offered by the TRA and the TPB have allowed them to be applied in the analysis of virtually all significant health behaviours (Kashima and Gallois 1993, Ajzen 1998) and, to a lesser extent, in predictive investigations and the design of health interventions (Hardeman et al 2002 2-A).

Key areas of TRA and TPB application identified during the process of this review were:

- exercise intentions and behaviours (Ajzen and Driver 1991, Godin 1993, Blue 1995 **2-B**, Hausenblas et al 1997 **2-B**, Hagger et al 2002 **2-B**, Downs and Hausenblas 2005 **2-B**);
- weight gain prevention and eating behaviour (Godin and Kok 1996 **2-B**, Baranowski et al 2003);
- addiction related behaviours such as smoking and alcohol abuse (Godin and Kok 1996 **2-B**); and
- HIV prevention and condom use (Sheeran and Taylor 1999 **2-A**, Albarracin et al 2001 **2-B**).

Other areas of TRA and TPB use relevant to health included the maintenance of oral hygiene, clinical screening programmes and driving behaviour analysis. The use of the TPB in particular has been more extensive than that of the HBM, and less strongly focused on tobacco addiction than that of the Trans-Theoretical Model. In this review four of the systematic and meta-analytical reviews identified as relevant to the TTM were wholly or in part concerned with smoking cessation and prevention (Spencer et al 2002 **2+A**, Riemsma et al 2002 **1++A**, Riemsma et al 2003 **1-B**, van Sluijs et al 2004 **2++B**). The other principle areas covered in the TTM studies identified were:

- dietary change (Riemsma et al 2002 **1++A**, van Sluijs et al 2004 **2++B**);
- exercise and activity promotion (Marshall and Biddle 2001 **2-A**, Riemsma et al 2002 **1++A**, Adams and White 2003 **2-A**, van Sluijs et al 2004 **2++B**);
- sexually transmitted disease and pregnancy prevention (Horowitz 2003 **2-B**);
- breast cancer screening (Riemsma et al 2002 **1++A**);
- alcohol use control (Riemsma et al 2002 **1++A**); and
- treatment adherence (Riemsma et al, 2002 **1++A**).

Evidence statement

The HBM, the TRA, the TPB and the TTM are all widely used. Of these four models, the TPB and the TTM appear to be the most extensively employed. In the literature identified the four main areas investigated via the use of the social cognition models under evaluation were: *smoking cessation* (Spencer et al 2002 2+A, Riemsma et al 2002 1++A, Riemsma et al 2003 1-B, and van Sluijs et al 2004 2++B); *exercise and activity promotion* (Blue 1995 2-B, Hausenblas et al 1997 2-B, Marshall and Biddle 2001 2-A, Hagger et al 2002 2-B, Riemsma et al 2002 1++A, Adams and White 2003 2-A, van Sluijs et al 2004 2++B, and Downs and Hausenblas 2005 2-B); *HIV transmission prevention* (Sheeran and Taylor 1999 2-A, Albarracin et al 2001 2-B, and Horowitz 2003 2-B); and *dietary change* (Godin and Kok 1996 2-B, Riemsma et al 2002 1++A, van Sluijs et al 2004 2++B).

4.4 *How effective has each model been shown to be at predicting changes in knowledge, attitudes and/or behaviour in these areas?*

The HBM

The available evidence indicates that the HBM has only a weak predictive power. This is in part a result of poor construct definition, a lack of combinatorial rules and weaknesses in the predictive validity of the HBM's core psychological components (Armitage and Conner 2000, Harrison et al 1992 2-B). Zimmerman and Vernberg (1994 2+B) conducted a critical comparative meta-analysis of models of preventive health behaviour. They found that that the Theory of Reasoned Action (see below) was a substantially better predictor of health behaviours than the HBM. The TRA was able to explain just over 34 per cent of observed health behavioural variance, as compared to 24 per cent in the case of the HBM. The authors concluded that the HBM is in essence a list of variables rather than a theory based on adequately specified relationships between its core components.

The TRA and the TPB

There is meta-analytical and systematic review evidence that the predictive performance of both the TRA and the TPB is superior to that of the HBM, and also that the additional constructs contained in the TPB allow it to predict a greater percentage of overall behavioural variance than the TRA. The available evidence indicates that, as it is presently specified, the use of the TPB can in countries such as the US and the UK typically account (notwithstanding possible over-estimates because of factors such as publication bias) for between 20 and 30 per cent of the observed variance in reported adult (although not necessarily child, adolescent and young adult) health behaviours (Godin and Kok 1996 **2-B**, Armitage and Conner 2001 **2-A**, Hagger et al 2002 **2-B**, Sutton 1998). Its capacity to predict behavioural intention is significantly higher. But in practical health outcome terms this point is, presently at least, only of academic interest.

There is also evidence derived from both narrative and systematic reviews on the limitations of the TRA and the TPB and their applications in practice. For example, Hardeman et al (2002 **2-A**) concluded that the TPB is rarely used pro-actively to develop health promotion and other interventions. Even when it is so employed these authors found that the effect sizes were generally small: intervention effectiveness was unrelated to the use of the theory at the development stage. Like the HBM, the TRA and TPB are implicitly based on an assumption of human rationality that is likely to be of limited validity. Further, they cannot themselves be used to address questions relating to how beliefs and attitudes underpinning behavioural intentions can be changed, and what strategies for this are likely to prove most (cost) effective.

To the extent that health inequalities within and between communities are functions of material and social differences, interventions based primarily on changing individual cognitions would be unlikely to eliminate such disparities. Indeed, as previously noted, they might (at least in the short to medium-term) exacerbate them through conferring relative benefit on those best positioned to change their beliefs, attitudes, intentions and behaviours. It is also relevant to stress that (although their possible importance should not be ignored or understated – Abraham et al 1998) the effect size measures normally quoted to indicate the predictive power of social cognition based models of health behaviour such as the TPB (that is, the percentage of observed

behavioural variance explained) have limited or no relevance to the potential public health impact of interventions derived from their application.

The TTM

Although the potential of the TTM to improve public health appears on occasions to have been seriously overstated, it is well known to and positively valued by many professionals actively involved in health promotion (Davidson 1998, Jones and Donovan 2004). This fact has practical implications in that, for example, it might influence their motivation. In areas such as dietary change the application of stage-of-change based models such as the TTM may have advantages over alternative approaches (van Sluijs et al 2004 **2++B**). However, the available data indicates that TTM/SoC based approaches as normally applied in areas such as smoking cessation and exercise promotion are no more likely to be effective than alternative (rationally designed) interventions in achieving desired behavioural change outcomes (Adams and White 2003 **2-A**, Riemsma et al 2002 **1++A**, Riemsma et al 2003 **1-B**, van Sluijs et al 2004 **2++B**).

Some commentators argue that the use of the TTM may have detrimental effects, associated with the acceptance of 'soft' intermediate stage change based outcomes. Such views are predicated on the conclusion that staged models of health behaviour change (although heuristically and didactically useful) do not reflect cognitive reality, and concerns that the successful 'marketing' of the TTM may have excluded the use of potentially more productive health behaviour change promotion approaches (Whitelaw et al 2000, West & Hardy 2006, West & Sohal 2006). However, the evidence on the internal validity and effectiveness in use identified for the purposes of this review can neither confirm nor refute these hypotheses. It does not show use of the TTM to be any less effective in practice than any other specific alternative.

A number of analyses have reported findings consistent with hypotheses underpinning the TTM (Marshall and Biddle 2001 **2-A**, Spencer et al 2002 **2+A**, Horowitz 2003 **2-B**). But it has also been found that the proposition that there are common, consistently definable, stages of change observable across a wide range of health behaviour fields and/or across many populations cannot be validated by the available empirical data (Littell and Girvin 2002 **2-B**).

Additional observations relating to health behaviour change effectiveness

No evidence relating to the importance of delivery mode was revealed as a result of the searches carried out for this review. However, models such as the HBM imply that behavioural cues such as media advertisements and written or personal reminders may have a fundamentally different function from communications aimed at changing beliefs and attitudes. If this is so failures to understand the significance of such variables might on occasions significantly undermine the cost effectiveness of health behaviour change interventions. For example, activities such as individual counselling and labour intensive community health promotion programmes could be favoured at the expense of potentially more economic forms of mass communication, aimed at supporting the implementation of established intentions.

Similarly, no evidence relating to intervener status (such as the gender, age or social positioning of message providers) was revealed as a result of the searches carried out for this review. An appropriate use of social cognition models might contribute to understanding in this field, and of how variations in cognitive factors can determine the effectiveness of alternative communicators such as, say, doctors as against nurses or pharmacists, or older females as opposed to younger males. Likewise, no evidence relating to the importance of communication settings and the nature of barriers to effective health behaviour change were identified, albeit that the significance of self efficacy levels is commonly recognised in the HBM, the TPB and the TTM. This has potentially important implications for professional practice and health behaviour change intervention design in that, for instance, it highlights the likely value of 'mastery' experiences.

Finally, consistent with the findings reported above, no evidence relating to the significance (as health behaviour determinants) of factors such as individual, family and group socio-economic status was found during this review. Such 'external' environmental factors are clearly important - the persistence of health inequalities between groups indicates that socio-economic and allied 'ecological' variables influence health behaviours. Yet despite this the most commonly employed social cognition models of health behaviour change have not been specified, or normally used, in ways that enable the wider social reasons for relevant behavioural differences between groups, communities and wider populations to be adequately appreciated.

If they had been so employed, their findings might usefully have helped improve insight into topics such as how collective as opposed to individual behavioural transitions in contexts such as fertility, dietary, exercise and tobacco and alcohol use behaviours (which may in some respects be likened to those that regularly take place in areas such as dress fashion) occur across communities. They could also have helped policy makers differentiate more clearly between situations in which increasing (relative) health inequalities should be regarded as an indicator of policy and/or market failure, and those in which such trends may rationally be taken to reflect desirable freedom of choice and positive long-term social progress.

Evidence statement

The Theory of Reasoned Action and the Theory of Planned Behaviour can both predict health related behaviour with greater effect than the Health Belief Model (Zimmerman and Vernberg 1994 2+B). The predictive power of the TPB exceeds that of the TRA (Hausenblas et al 1997 2-B). Across a wide range of health behaviours the TPB can explain 20 per cent or more of observed behavioural variance (Godin and Kok 1996 2-B, Armitage and Conner 2001 2-A, Sheeran and Taylor 1999 2-A, Albarracin et al 2001 2-B, Ajzen and Driver 1991, Godin 1993, Blue 1995 2-B, Hagger et al 2002 2-B, Downs and Hausenblas 2005 2-B).

However, there is evidence that TPB based research is infrequently used to inform behavioural change intervention design, and when this has been the case the additional health benefits gained have been very limited (Hardeman et al 2002 2-A). The body of evidence relating to the relative effectiveness of TTM based health behaviour change interventions is also mixed. In behavioural outcome terms the application of TTM/SoC based approaches in areas such as smoking cessation and exercise promotion is no more likely to be effective in achieving desired outcomes than the use of alternative interventions (Adams and White 2003 2-A, Riemsma et al 2002 1++A, Riemsma et al 2003 1-B, van Sluijs et al 2004 2++B).

4.5 Have any changes in knowledge/attitudes/behaviours brought about in relation to use of these models been shown to effect health outcomes, expressed in terms of (population) morbidity and mortality?

Major changes in morbidity and mortality have taken place in countries like the US and the UK since the start of the 1950s. In Western Europe and North America the demographic, epidemiological and health care transitions of the second half of the twentieth century were primarily driven by fundamental shifts in living conditions, survival expectations and medical technologies (Taylor and Bury, in press). Population level secular trends cannot logically be ascribed to changes in individual health behaviour intentions formed in isolation from their social contexts, or to health promotion interventions seen as (independent causal) determinants.

This review identified no evidence as to the extent to which the use of the HBM, the TRA, the TPB or the TTM has been responsible for (as distinct from being temporally associated with) major shifts in key fields such as cardio-vascular disease mortality and morbidity. Some investigations have questioned the impact of primary health behaviour change interventions in such contexts (Ebrahim and Davey Smith 1997). Further, despite claims made about the importance of theory in developing effective public health interventions, the evidence analysed during this review does not show that approaches utilising social cognition models outperform others, such as ‘social marketing’ programmes based more on outcome feedbacks than theoretical analyses.

However, it would be unwise to take an unduly simplistic, reductionist, approach towards ‘what works in public health’. The complexities of human behaviour mean that it is not scientifically possible to anticipate the unintended consequences and forgone benefits associated with seeking to focus (public) health interventions only on those for which there is conclusive evidence of effect. There can be little serious doubt that changes in health knowledge and consequently health attitudes do contribute to not only individual but also population behaviour changes over time (Fishbein 1995), even if the effect of health promotion interventions *per se* is only to accelerate, rather than to initiate, such changes.

Evaluated at this level, many studies provide evidence that interventions in fields such as smoking cessation, exercise, diet and HIV risk reduction have served to reduce

mortality and morbidity from conditions such as lung cancer, chronic obstructive pulmonary disease (COPD), cardiovascular disease (CVD) and acquired-immune deficiency syndrome (AIDS). (See, for example, Godin and Kok 1996 **2-B**; Sheeran and Taylor 1999 **2-A**, Albarracin et al 2001 **2-B**, Spencer et al 2002 **2+A**, Riemsma et al 2002 **1++A**, van Sluijs et al 2004 **2++B**). The extent to which utilisations of either the HBM, the TRA, the TPB or the TTM can be considered responsible for such gains is uncertain. But this does not mean that the potential of value of further work aimed, for instance, at increasing the power of public health interventions to effect behavioural changes through the development and use of well specified and integrated psychological, social and economic health behaviour change instruments should be ignored.

It is also relevant to note that the currently available evidence suggests that a proportion of the observed health and longevity differences between the most and least advantaged socio-economic classes in the United Kingdom relates to factors that appear to operate via social and economic status related mechanisms that act independently of presently known physical risk factors (Wilkinson 1996, Marmot 2004, 2005). Similar considerations may apply in the field of mental illness. Understanding such phenomena is likely to become an increasing priority as health risks such as tobacco smoking and physical inactivity are better controlled. It may in future be the case that improvements in psychological models relevant to health will significantly enhance the options available for intervening in such pathologies at individual, community and/or population levels.

Evidence statement

Even if not fundamentally causal, changes in health knowledge and attitudes can contribute to individual and population behaviour changes over time (Fishbein 1995). There is evidence that HBC interventions in fields such as smoking cessation, exercise, diet and HIV risk control have reduced mortality and morbidity from conditions such as lung cancer, chronic obstructive pulmonary disease (COPD), cardiovascular disease (CVD) and acquired-immune deficiency syndrome (AIDS) (Godin and Kok 1996 2-B, Sheeran and Taylor 1999 2-A, Albarracin et al 2001 2-B, Spencer et al 2002 2+A, Riemsma et al 2002 1++A, van Sluijs et al 2004 2++B). But the specific part played by psychological model use in achieving such health outcomes is uncertain.

5. Conclusion

Since the end of the Second World War much academic and health service effort has been devoted to developing and applying social cognition theory based models of health behaviour change. There is evidence that these can successfully predict a substantial degree of observed variance in behavioural intentions in adult populations, and to a lesser extent health behaviours. The extent to which the use of such models has in practice led to health gains that would not otherwise have been achieved is uncertain. But they have probably been of positive utility, and can almost certainly be employed to greater future effect.

There is evidence that the Theory of Planned Behaviour has a greater predictive power than the Health Belief Model or the Theory of Reasoned Action. But neither the TPB nor the TRA or the HBM is specified to offer insight into how health behavioural change can most effectively be facilitated. In this respect the Trans-Theoretical Model (which embodies both ‘stage-of-change’ and ‘process of change’ constructs) is fundamentally different in terms of its structure, and how it can be used to define and manage the delivery of health behaviour change interventions. It bridges a divide between social cognition theory based models of health behaviour and other, more practice focused, health promotion programme management instruments.

As a result of this evaluations of the TTM have often been oriented towards assessing health outcomes achieved, rather than the percentages of observed or reported behavioural variance explained. This emphasis on the delivery of desired outcomes – rather than the formation of more theoretically relevant information – is arguably to be welcomed. However, there is as yet little unequivocal evidence that the use of TTM based health behaviour change strategies is better at promoting new health behaviours than other reasonably constituted approaches.

Criticisms to the effect that some applications of SoC based strategies for supporting health behaviour change are counterproductive, in that (for instance) they could encourage the use of misleading proxy outcome indicators, may be valid. Yet they were not substantiated by the research analysed in this review. Similarly, it may be suggested that TTM has, when applied comprehensively and with intelligent

commitment, a significant potential to predict and deliver health behaviour change. But this too was not conclusively demonstrated by the research reviewed here. It is also the case that none of the models evaluated are adequately specified to analyse the significance of social, economic and/or environmental factors as determinants of health behaviour.

Such observations offer a number of conclusions. First, it would be desirable from a public health improvement perspective if all investigations of health promotion models and interventions could be encouraged to use measures of effect size that relate directly to health gain achievement, such as life years saved or well defined volumes of disability avoided. Even if utility analysis constructs such as quality adjusted life years (QALYs) cannot be routinely used, moves in this direction could still facilitate advances in areas such as assessing the comparative value of alternative public health investments. In circumstances where it is not possible to offer estimates of health gains achievable, explanations of why this is so could promote greater clarity of thought in relation to distinguishing between descriptive theories and potentially effective health promotion interventions. This might in turn enable public health research and implementation programmes to become more focused on the delivery of tangible consumer benefit, as distinct from the pursuit of academic excellence or other ends.

Second, with specific regard to recent criticisms of the TTM, it appears very likely that in time superior models based on new approaches to combining socio-economic and psychological data and linking behavioural predictions to more effective change support interventions, will emerge. Yet recognition of this should not be allowed to undermine existing service level attempts to apply the TTM (or any other informed health behaviour change approach) as productively as possible. Rather, awareness of the TTM's possible weaknesses should lead to its better informed employment, while at the same time renewed effort is made to develop and trial effective innovations.

This leads on to the third and final conclusion offered in this review. It relates to public health research and development commissioning. This in the past may often have lacked the focused sense of purpose and direction more typically found in

biomedical fields. To some extent, this might be a desirable reflection of the nature of the scientific and ethical challenges inherent in seeking to understand and, where it is judged appropriate, change individual and community health related choices. However, the extreme degree of heterogeneity in much of the research reported in this review, and the lack of systematically directed effort aimed at finding more effective instruments for facilitating beneficial health behaviours that this implies, is unlikely to have been in the public's best interests.

To the extent that this finding is valid, a high priority task for all those seeking to promote future excellence in public health in the UK and elsewhere will be to build on the heritage offered by models such as the TPB and the TTM in integrated ways, which extend existing capacities to predict and moderate the impacts of social, economic and psychological determinants of health behaviour. This will require sophisticated public health research and development commissioning skills, alongside further enhanced capacities to evaluate the efficacy and (cost) effectiveness of health behaviour change interventions.

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* References marked with an asterix have been cited within the evidence statements in the report

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APPENDIX 1: Critical appraisal tool

Ref:

Authors _____

Year of publication _____

Title _____

Source _____

Form completed by _____ **Date** _____

Relevance to topic			
Does this paper address your topic area?	Yes	No	Unsure
Selection Criteria			
Did the paper have a clearly focussed aim or research question?	Yes	No	Unsure
Consider whether the following are discussed:	Yes	No	Unsure
• The population studied	Yes	No	Unsure
• The interventions given	Yes	No	Unsure
• The outcomes considered	Yes	No	Unsure
• Inclusion and exclusion criteria	Yes	No	Unsure
• Types of studies	Yes	No	Unsure
Did the paper consider inequalities?	Yes	No	Unsure
Systematicity			
Do the reviewers include all:			
a) Relevant databases searched	Yes	No	Unsure
b) Years searched	Yes	No	Unsure
c) Were references from bibliographies followed up?	Yes	No	Unsure
d) Were experts consulted?	Yes	No	Unsure
e) Was grey literature searched?	Yes	No	Unsure
f) Were search terms specified?	Yes	No	Unsure
g) Is the search strategy adequate?	Yes	No	Unsure
h) Did the review include English language studies only?	Yes	No	Unsure
Is it worth continuing?	Yes	No	
Why/why not?			

Quality			
Did the authors assess the quality (rigour) of the included studies?	Yes	No	Unsure
Consider whether the following are used:	Yes	No	Unsure
<ul style="list-style-type: none"> ▪ A rating system ▪ More than one assessor 	Yes	No	Unsure
If study results have been combined, was it reasonable to do so?	Yes	No	Unsure
Consider whether the following are true:	Yes	No	Unsure
<ul style="list-style-type: none"> • Are the results of included studies clearly displayed? • Are the studies sufficiently similar in design? • How were the variations between studies investigated? 	Yes	No	Unsure
Are there sufficient data to support conclusions?	Yes	No	Unsure
Relevance to UK			
Can the results be applied/are generalisable to a UK population/ population group?	Yes	No	Unsure
<ul style="list-style-type: none"> ▪ Are there differences in health care provision with the UK? ▪ Is the paper focused on a particular target group (age, sex, population sub-group etc)? 	Yes	No	Unsure
Accept for inclusion?	Yes	No	Refer to third party
Additional comments:			

APPENDIX 2: Search strategy

The search strategy below was used for MEDLINE. This core strategy was adapted for the other databases searched.

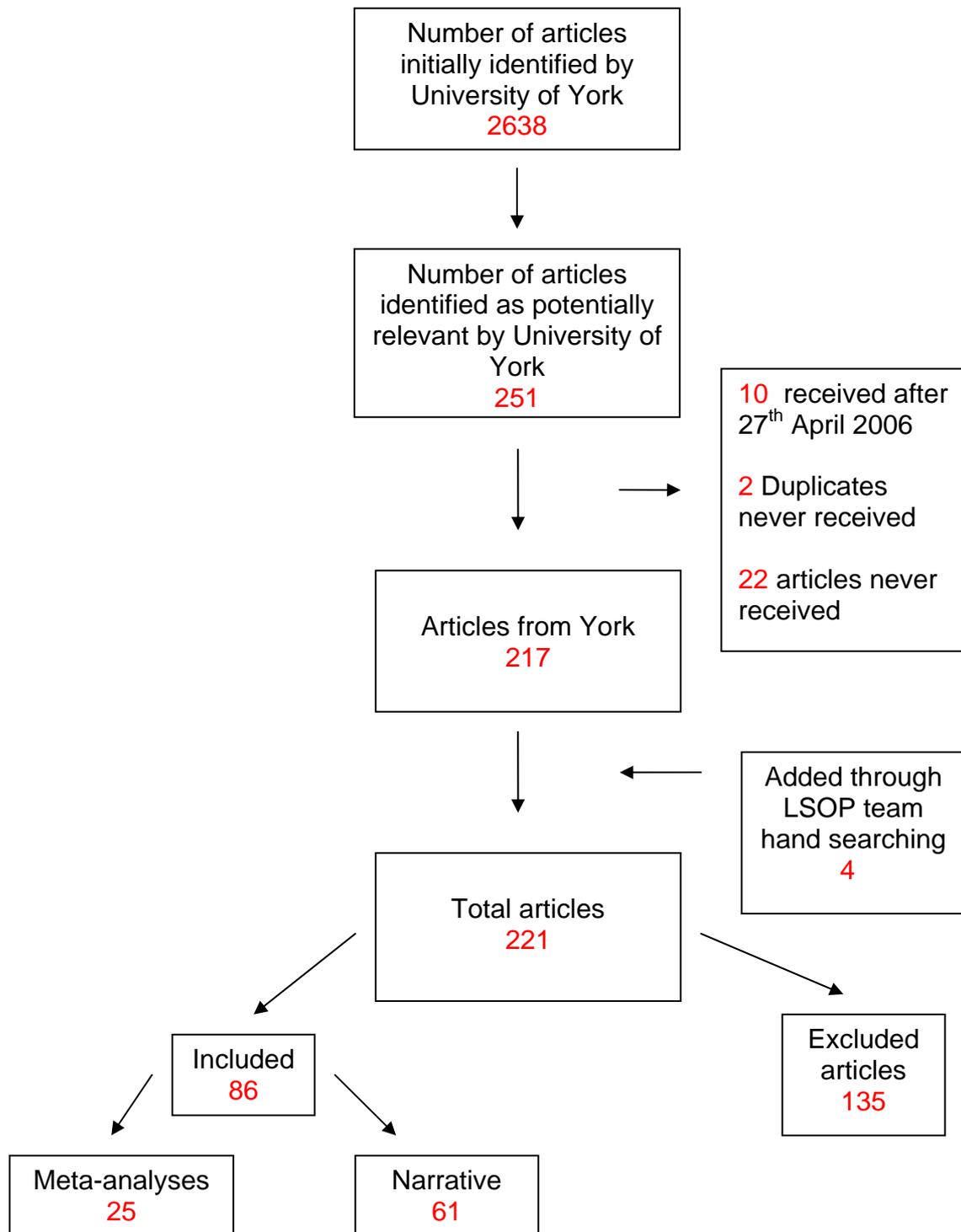
MEDLINE (Dialog Datastar)

Date searched: 24 March 2006

1. (REASONED ADJ ACTION\$).TI,AB.
2. (PLANNED ADJ BEHAVIOUR\$).TI,AB.
3. (PLANNED ADJ BEHAVIOR\$).TI,AB.
4. (HEALTH ADJ BELIEF NEAR (MODEL OR MODELS OR MODELL\$ OR THEORY OR THEORIES)).TI,AB.
5. (TRANSTHEORETICAL OR TRANS ADJ THEORETICAL).TI,AB.
6. ((STAGES OR STAGE) ADJ CHANGE).TI,AB.
7. SELF-EFFICACY.DE.
8. 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7
9. ROSENSTOCK-I\$.AU.
10. HOCHBAUM-G\$.AU.
11. ROSENSTOCK.TI,AB.
12. HOCHBAUM.TI,AB.
13. (ROSENSTOCK ADJ HOCHBAUM).TI,AB.
14. FISHBEIN-M\$.AU.
15. AJZEN-I\$.AU.
16. FISHBEIN.TI,AB.
17. AJZEN.TI,AB.
18. (FISHBEIN ADJ AJZEN).TI,AB.
19. PROCHASKA-J\$.AU.
20. DICLEMENTE-C\$.AU.
21. PROCHASKA.TI,AB.
22. DICLEMENTE.TI,AB.
23. 9 OR 10 OR 11 OR 12 OR 13 OR 14 OR 15 OR 16 OR 17 OR 18 OR 19 OR 20 OR 21 OR 22
24. 8 OR 23
25. REVIEW.TI,AB.
26. PT=REVIEW
27. (META ADJ (ANALYSIS OR ANALYSES)).TI,AB.
28. (METAANALYSIS OR METAANALYSES).TI,AB.
29. PT=META-ANALYSIS
30. SYNTHESIS\$.TI,AB.
31. METASYNTHESIS\$.TI,AB.
32. (METAETHICS OR META ADJ ETHICS).TI,AB.
33. (META-EVALUATION\$ OR META ADJ EVALUATION\$).TI,AB.
34. (METAETHNOGRAPH\$ OR META ADJ ETHNOGRAPH\$).TI,AB.
35. (METARESEARCH OR META ADJ RESEARCH).TI,AB.
36. (METASUMMAR\$ OR META ADJ SUMMAR\$).TI,AB.
37. (METATHEORETICAL OR META ADJ THEORETICAL).TI,AB.
38. (META ADJ ANALYTIC).TI,AB.
39. (COCHRANES\$ OR MEDLINE OR MEDLARS OR EMBASE OR CINAHL OR SCISEARCH OR PSYCHINFO OR PSYCINFO OR PSYCHLIT OR PSYCLIT).TI,AB.
40. (HAND OR MANUAL\$ OR DATABASE\$ OR COMPUTER OR COMPUTERS OR COMPUTERIS\$ OR COMPUTERIZ\$ OR ELECTRONIC\$) NEAR SEARCH\$.TI,AB.
41. (ELECTRONIC\$ OR BIBLIOGRAPHIC\$) NEAR DATABASE\$.TI,AB.

42. (EMPIRICAL ADJ (LITERATURE OR STUDY OR STUDIES OR EVIDENCE)).TI,AB.
43. SYSTEMATIC.TI,AB.
44. OVERVIEW\$.TI,AB.
45. (WHAT ADJ WORKS).TI,AB.
46. (SCOPING ADJ (STUDY OR STUDIES)).TI,AB.
47. 25 OR 26 OR 27 OR 28 OR 29 OR 30 OR 31 OR 32 OR 33 OR 34 OR 35 OR 36 OR 37 OR 38 OR 39 OR 40 OR 41 OR 42 OR 43 OR 44 OR 45 OR 46
48. 24 AND 47
49. PT=COMMENT OR PT=EDITORIAL OR PT=LETTER
50. 48 NOT 49
51. ANIMAL=YES
52. HUMAN=YES
53. 51 NOT (51 AND 52)
54. 50 NOT 53
55. LG=EN
56. 54 AND 55
57. limit set 56 YEAR > 1979

APPENDIX 3: Flow chart of papers identified, received and screened



APPENDIX 4: Summary of papers relating to behaviours and models

Meta-analyses and systematic reviews (n=25)

<i>Theory</i>	<i>Number of articles</i>
HMB	2
TRA/TPB	9
TTM/SOC	6
Mixed	6
No specific theory(comment)	2

<i>Behaviour</i>	<i>Number of articles</i>
Smoking	2
Diet	0
Physical activity	5
Sexual health	3
Cancer	1
No specific behaviour	14

Narrative papers (n=61)

<i>Theory</i>	<i>Number of articles</i>
HMB	3
TRA/TPB	8
TTM/SOC	18
Mixed	25
No specific theory(comment)	7

<i>Behaviour</i>	<i>Number of articles</i>
Smoking	4
Diet	3
Physical activity	4
Sexual health	8
Cancer	41
No specific behaviour	1

Excluded papers (n=135)

<i>Theory</i>	<i>Number of articles</i>
HMB	13
TRA/TPB	5
TTM/SOC	36
Locus of control	1
Mixed	27
No specific theory(comment)	53

<i>Behaviour</i>	<i>Number of articles</i>
Smoking	16
Diet	9
Physical activity	14
Sexual health	14
Other*	22
No specific behaviour	60

* - Other is pregnancy, TB, mental health, oral health, counselling, sexual abuse, cancer, genetic testing, drug abuse, alcohol abuse, addiction, eating disorders, pain and non English

APPENDIX 5: Data extraction form fields

Reference ID	Data extracted by	Date of extraction
Author(s)	Year	
Title		
Source		
Type of study		
Research question(s)		
Databases/sources searched		
Years searched		
Inclusion criteria		
Exclusion criteria		
Number of studies		
Number of participants		
Method of analysis		
What data extracted?		
Results		
Conclusions		
Criticism of conclusions?		
Evidence of effect in sub-groups?		
Strengths/weaknesses of the evidence		
Results generalisable to the UK?		
Recommendations for future research		
Cost-effectiveness data		
Policy implications		
Implications for practice		
Comments		

APPENDIX 6: Evidence tables via research question

1. What concepts and constructs does each of the selected models contain?

Reference ID 148	Data extracted by NC	Date of extraction 21.4.06
Author(s) Cooke R & Sheeran P	Year 2004	
Title Moderation of Cognition-Intention and Cognition-Behaviour Relations: A Meta-Analysis of Properties of Variables from the Theory of Planned Behaviour		
Source British Journal of Social Psychology		
Type of study Systematic review (meta analysis)		
Research question(s) What is the impact of the 7 properties of cognitions (accessibility, temporal stability, direct experience, involvement, certainty, ambivalence and affective-cognitive consistency) as moderators of the 5 relationships in the TPB, namely attitude-behaviour, intention-behaviour, PBC-behaviour, attitude-intention and subjective norm-intention relations?		
Databases/sources searched Dissertations Abstracts Online, Index to Theses, PSYCLIT, Social Sciebnce Citation Index and Web of Science and ancestry		
Years searched Jan 1981-Nov 2002		
Inclusion criteria A bivariate statistical relationship between cognitions and intention (or behaviour) for participants classified as high or low on the moderator variable had to be retrieveable from the studies.		
Exclusion criteria Not stated		
Number of studies 45		
Number of participants Not stated		
Method of analysis Meta-analysis		
What data extracted? The characteristics and effect sizes obtained from the studies. 33 studies reported cognition-behaviour correlations, 8 studies reported cognition-intention relations and 5 studies reported both cognition-behaviour and cognition-intention relations.		
Results The effect size estimate employed was a weighted average of the sample correlations using Fisher's hypothesis. Homogeneity analyses were conducted using the χ^2 statistic to determine whether variation among the correlations was greater than chance. The studies reviewed related to a wide range of behaviours: healthy-eating, voting, product choice, alcohol consumption, health screening, donation behaviour, exercise, contraception, computer game play, puzzles, volunteering, condom use, research, exams, studying, diet, smoking and fuel use. Accesibility moderated cognition-behaviour: participants with more accessible cognitions possessed stronger cognition-behaviour relations ($r+=.60$) than participants with less accessible cognitions ($r+=.52$). Looking at specific cognition-behaviour relations accessibility was a successful moderator of attitude-behaviour relations: participants who possessed highly accessible attitudes showed stronger attitude-behaviour consistency compared with participants with less accessible attitudes. Overall temporal stability moderated cognition-behaviour relations: participants with more stable cognitions possessed greater cognition-behaviour consistency ($r+=.62$) than participants with less stable cognitions ($r+=.27$). Direct experience did not moderate cognition-behaviour relations. Participants who were more involved with the attitude object showed greater consistency between attitude and intention/behaviour ($r+=.57$) than participants who were less involved ($r+=.31$). Participants with more certain cognitions showed a stronger relation between cognitions and		

and intention/behaviour ($r=+.61$) than participants with less certain cognitions ($r=+.25$). Participants with low ambivalence possessed stronger associations between attitude and intention/behaviour ($r=+.60$) than participants with higher ambivalence ($r=+.49$). Moderation by affective-cognitive consistency was reliable. All 7 variables included in the review were employed as moderators of the attitude-behaviour relationship. Temporal stability produced the largest effect size ($r=.37$).

Conclusions

Accessibility was a reliable moderator of both attitude-behaviour and intention-behaviour relations in the review. Direct experience moderated both attitude-behaviour relations and intention-behaviour relations but did not moderate PBC-behaviour relations. Involvement moderated attitude-intention but not attitude-behaviour relations. Certainty moderated attitude-behaviour, intention-behaviour, attitude intention and subjective norm-intention associations. Ambivalence moderated both attitude-intention and attitude-behaviour relations. In summary, the 7 properties of cognitions (accessibility, temporal stability, direct experience, involvement, certainty, ambivalence, and affective-cognitive consistency) were all reliable moderators of cognition-intention and/or cognition-behaviour relations. Comparisons among the variables indicated that temporal stability was the most effective moderator of cognitive-behaviour relations.

Criticism of conclusions?

Several factors are likely to affect how well properties moderate cognition-intention and cognition-behaviour relations. Firstly, the type of behaviour under consideration. Studies of different moderator variables have tended to examine different focal behaviours and there is no single behaviour that permits comparison of all 7 moderators. The authors state that it was not possible to derive a meaningful system for categorising behaviours that would allow determination of the impact of behaviour type on how well properties moderate particular relationships. Other factors that may affect moderation by properties of cognitions are publication status and the temporal continuity of cognition and behaviour measures.

Evidence of effect in sub-groups? None

Strengths/weaknesses of the evidence Great heterogeneity of reviewed behaviours within the studies reviewed, not all were health-related. The behaviours studied ranged from health eating, to voting, product choice, alcohol consumption, health screening, donation behaviour, exercise, contraception, computer game play, puzzles, volunteering, condom use, research, exams, studying, diet, testicular self-examination, smoking, and fuel use.

Results generalisable to the UK?

Yes, includes UK studies

Recommendations for future research

Further research (preferably experimental) research is needed in order to examine the effects of these moderator variables in relation to the same behaviour. Such research would be valuable both “to confirm the findings obtained here” and to test the hypothesis that temporal stability may mediate the effects of the other moderators on cognition-behaviour relations.

Cost-effectiveness data None stated

Policy implications None stated

Implications for practice None stated

Comments

Type of outcome measures (self-report or objective) used within each of the studies not stated.
Rating score 2-A

Reference ID 1334	Data extracted by NC	Date of extraction 28.4.06
Author(s) Notani A S	Year 1998	
Title Moderators of Perceived Behavioral Control's Predictiveness on the Theory of Planned Behaviour: A Meta-Analysis		
Source Journal of Consumer Psychology		
Type of study Systematic review (meta-analysis)		
Research question(s) What is the robustness of the TPB? What are the conditions that moderate support for the theory?		
Databases/sources searched ABI Inform, Psychological Abstracts, PSYCLIT and ancestry		
Years searched Not stated		
Inclusion criteria Not stated		
Exclusion criteria Review or conceptual articles, those that did not measure PBC or measured it differently than recommended in the theory of planned behaviour, had unrecoverable correlations or were based on the same data as other studies.		
Number of studies 36		
Number of participants Not stated		
Method of analysis Meta-analysis		
What data extracted? Study design and measurement methods, sample characteristics, intervention details, moderator variables and results.		
<p>Results</p> <p>The studies used either global or belief-based measures of perceived behavioural control. A global measure consists of 2 to 4-item scale designed to directly measure a person's overall perception of control; whereas a belief-based measure consists of a list of individual control beliefs that the sample considers salient. The studies examined a wide range of behaviours (not all health-related) from students' participation in 5 leisure activities to intention to pay for leisure activities, attending classes or getting an A in class, mother's ability to limit sugar intake of babies, engaging in 3 dishonest actions (cheating on examination, shoplifting and lying), interest in participating in a smoking cessation programme, teacher's intention to use new investigative teaching methods for example.</p> <p>The effect size chosen for the meta-analysis was r, the zero-order Pearson product-moment correlation coefficient. The analysis was conducted in accordance with procedures suggested by Hedges & Olkin (1985). The pairwise correlations are modest, with attitude-behavioural intention being the largest ($r=.51$) and subjective norms-behaviour the smallest ($r=.13$). Homogeneity tests revealed that none of the pairwise relations featuring PBC can be considered homogeneous. Using aggregated study effects, the overall fit of the TPB was tested using LISREL. Overall, the model provides a good fit to the data, $\chi^2=0.62$. The structural paths are significant although the perceived behavioural control-behaviour path is the weakest. Although both the perceived behavioural control-behavioural intention and perceived behavioural control-behaviour paths are significant for the model based on global measures of PBC, only the behavioural control-behavioural intention link is significant for the model based on belief-based measure of PBC. Thus, the behavioural control-behavioural intention paths are significant for the global and belief model however contrary to expectations the perceived behavioural control-behaviour link is stronger for the model based on global measures of PBC. Both the behavioural control-behavioural intention and perceived behavioural control-behaviour paths are significant in the model based on an internal conceptualisation of PBC. On the other hand, only the behavioural control-behavioural intention path is significant for the model based on external conceptualisation of PBC. Although both the behavioural control-behavioural intention and perceived behavioural control-</p>		

behaviour paths are significant for the model based on familiar contexts, neither path is significant for the model based on unfamiliar contexts.

Conclusions

The results indicate that the pairwise relations featuring PBC cannot be considered homogeneous across studies. Using a matrix of aggregated effect sizes, a causal model was estimated to assess the significance of the causal relations specified in the theory. The model performed well, with PBC serving as an antecedent to both behavioural intention and behaviour. Conditions under which PBC can be expected to be stronger versus a weaker predictor of behaviour and behavioural intention were identified. The results show that PBC is a stronger predictor of behaviour when it a) is operationalised as a global (vs. belief-based) measure, b) is conceptualised to reflect control over factors primarily internal (vs. external) to an individual, and c) is used for nonstudent (vs. student) samples and familiar (vs. unfamiliar) behaviours and is equally predictive under the operationalisation (global or belief) and conceptualisation (internal or external control) moderators.

Criticism of conclusions?

Generalisability may be limited by the exclusion of unpublished studies. Although the author found that the moderators examined in this study were able to account for all the variation across studies, other sets of moderators could be found.

Evidence of effect in sub-groups?

For the model based on the student sample, the perceived behavioural control-behavioural link is not significant, whereas it is significant for the nonstudent sample. These results support the expectation that adult samples should provide better predictions of behaviour from PBC compared to student samples. In further support of the expectation, the perceived behavioural control-behavioural intention is significant only for the student sample.

Strengths/weaknesses of the evidence

Several analyses were conducted on cells with unequal cell sizes because not all studies reported correlations for all the pairwise relations. There is a possibility of confounds or overlaps in the coded characteristics.

Results generalisable to the UK?

Non-UK studies but likely to apply to UK settings

Recommendations for future research None stated

Cost-effectiveness data None stated

Policy implications None stated

Implications for practice None stated

Comments Rating score 2-B

Reference ID 1414	Data extracted by NC	Date of extraction 26.4.06
Author(s) Ravis A & Sheeran P	Year 2003	
Title Descriptive Norms as an Additional Predictor in the Theory of Planned Behaviour: A Meta-Analysis		
Source Current Psychology: Developmental, Learning, Personality, Social		
Type of study Systematic review (meta-analysis)		
Research question(s) What is the relationship between descriptive norms and intentions? What is the predictive validity of descriptive norms after TPB predictors have been taken into account? What is the influence of age and type of health behaviour (health-risk versus health-promoting) as potential moderators of the relationship between descriptive norms and intentions?		
Databases/sources searched PSYCLIT, Web of Science, Index to Theses, Conference Papers Index, and ancestry.		
Years searched Not stated		
Inclusion criteria A bivariate statistical relationship between intention and descriptive norms had to be retrieveable from the studies.		
Exclusion criteria Not stated		
Number of studies 18 papers (21 tests of the relationship)		
Number of participants 8,097		
Method of analysis Meta-analysis		
What data extracted? Characteristics (sample, behaviour) and effect sizes obtained from each test of the descriptive norm-intention relation.		
<p>Results</p> <p>The studies reviewed addressed the following behaviours: health eating, milk and bread choice, extradyadic sex, condom use, dieting, cannabis use, cannabis and ecstasy use, cigarette smoking, illicit drug use, binge drinking and physical exercise, binge drinking, lottery play and physical exercise.</p> <p>The effect size was the weighted average of the sample correlations, r^+. R^+ describes the direction and strength of the relationship between 2 variables with a range of -1.0 to +1.0. Homogeneity analyses were conducted using the chi-square statistic. The authors use Cohen (1992) guidelines for interpreting the size of sample weighted average correlations (r^+). Cohen states $r^+ = .10$ is small, $r^+ = .30$ is medium and $r^+ = .50$ is large. Across all studies a large positive sample size weighted average correlation between descriptive norms and intention was obtained ($r^+ = .44$). The average r was highly significant and had a narrow 95% confident interval (95% CI= .43-.46). The sample weighted average correlation between subjective norms and descriptive norms was only .38. Descriptive norms had a similar correlation with attitude ($r^+ = .38$) but a small average r with perceived behavioural control ($r^+ = .08$). Health-risk behaviours had significantly stronger descriptive norm-intention relations than health-promoting behaviours. The average correlation for health-risk behaviours ($r^+ = .48$) was significantly larger than the correlation for health-promoting behaviours ($r^+ = .37$).</p>		
<p>Conclusions</p> <p>The fact that descriptive norms had a larger regression coefficient in the prediction of intention than did subjective norm suggests that observing the behaviour of others may be of greater importance in health-related decision making than social pressure from others, particularly in the case of health-risk behaviours. The findings support the inclusion of descriptive norms as an additional predictor in the</p>		

TPB. To summarise, the review found a medium to strong average correlation between descriptive norms and intention and, showed a significant improvement in the predictive validity of the TPB when descriptive norm was included as an additional predictor. Younger samples (children and students) and health-risk behaviours (rather than health-promoting behaviours) were both associated with stronger correlations between descriptive norms and intention.

Criticism of conclusions?

Although the findings suggest that descriptive norms are an important factor in motivating behavioural decisions, the correlational data upon which the analyses are based preclude causal inferences. Thus, the data do not indicate whether perceptions of other people's behaviour direct behavioural intentions or vice versa.

Evidence of effect in sub-groups?

The effect size for children and students ($r = .46$) was significantly larger than the effect size for "older samples" ($r = .41$) (no age range provided). Thus, the intentions of children and students are more strongly associated with their perceptions of others' behaviour than are the intentions of "older samples".

Strengths/weaknesses of the evidence

Small sample sizes in some studies preclude meaningful comparisons of strong versus weak identifiers.

Results generalisable to the UK?

Yes, includes UK studies

Recommendations for future research

Future research might systematically explore the relationship between group identification, descriptive norms and intentions in relation to a wide range of behaviours to enable more definitive conclusions to be reached.

Cost-effectiveness data None stated

Policy implications None stated

Implications for practice

The finding that young people are particularly susceptible to descriptive norms, as indicated by moderator analysis, suggests that interventions should be tailored to the unique needs of adolescents.

Comments

Rating score 2-A

Reference ID 551	Data extracted by NC	Date of extraction 21.4.06
Author(s) Rosen C S	Year 2000	
Title Is the Sequencing of Change Processes by Stage Consistent Across Health Problems? A Meta-Analysis		
Source Health Psychology		
Type of study Systematic review (meta analysis)		
Research question(s) Is the sequencing of change processes observed in studies of smoking replicated in other health problems?		
Databases/sources searched PSYCLIT, MEDLINE, Dissertation Abstracts International, and the National Institute of Alcohol Abuse and Alcoholism Science Data Base and ancestry		
Years searched 1980-1999		
Inclusion criteria Studies that provided cross-sectional data on use of change processes by stage or University of Rhode Island Change Assessment cluster, included at least 3 stages or clusters, and provided information on either individual change processes or on higher order composites that differentiated cognitive-affective and behavioural processes. All studies assessed change processes using a variant of the processes of change questionnaire.		
Exclusion criteria Not stated		
Number of studies 47		
Number of participants Not stated		
Method of analysis Meta-analysis		
What data extracted? Studies were coded for the method they used to assign stage of change, the number of stages or groups included in the study and whether the study included data on either the action stage or participation cluster. Studies were also coded for publication status and for the health problem being studied (smoking cessation, recovery from substance abuse, exercise adoption, diet change, psychological problems or other problems). Another variable was whether participants received no intervention, were at baseline in an intervention trial, were in treatment for a related problem (e.g. cardiac or diabetes patients in a study on exercise) or were in treatment for the target problem (e.g. patients receiving psychotherapy for psychological problems).		
Results Two effect sizes were calculated per study, one for cognitive affective processes of change and one for behavioural processes of change. The effect size eta squared (η^2) was used to assess the overall strength of association between processes and stages of change. It is the percent of variance explained by stage membership, identical to r^2 in an analysis of variance (ANOVA). 10 studies dealt with smoking cessation, 7 with substance abuse, 13 with exercise, 5 with diet change, and 6 with psychiatric disorders or counselling. 6 studies dealt with problems that did not fit any of the other categories: 1 examined safer sex practices among college students, 1 concerned college students on academic probation, and 4 samples from one dissertation studied glucose monitoring among individuals with diabetes. 44 studies provided data that could be used to calculate effect sizes for the overall association between processes and stages of change. The mean effect size for variation in cognitive-affective processes was .11. The mean effect size for behavioural processes was .14. Effect sizes for behavioural processes tended to be higher in studies that had more groups or stages. Effect sizes for behavioural processes by stage varied by health problem and intervention status. Effects were larger in studies of exercise than in studies of substance abuse or psychological problems. 34 studies provided		

data on mean use of cognitive-affective and behavioural processes in specific stages of change. For most health problems, use of behavioural processes increased fairly linearly from precontemplation through action. Less than half of all studies showed cognitive-affective processes peaking during contemplation or preparation, as predicted by the TTM. 29 studies included the action stage of change and reported data that could be used to compare n^2 for specific processes of change. Across health problems, the 2 processes that varied most strongly by stage were self-liberation (committing to change) and counter-conditioning (substituting new behaviours). Effect sizes for counter-conditioning by stage were largest in studies of exercise adoption and weakest in studies of psychological problems. 2 cognitive-affective processes, self-reevaluation and consciousness-raising and 2 behavioural processes, reinforcement management and stimulus control had moderately large effects for stage.

Conclusions

On average stage assignment explained 11% of the variance in use of cognitive-affective processes and 14% of the variance in behavioural processes. Effect sizes for cognitive-affective processes were independent of any between-study variables. The processes that varied most by stage were self-liberation, counter-conditioning, self-reevaluation, consciousness raising, reinforcement, and stimulus control. The TTM raises clinically important questions about the function and timing of specific strategies in promoting lifestyle change, but it provides only partial answers. Although use of change processes varies substantially across stages, no sequence of change processes is common to all health behaviours.

Criticism of conclusions?

The studies reviewed have several limitations, including variation in how stage of change was measured and confounding of intervention status with health problem. Assessment of both stage and processes are based on self-report measures and the latter have yet to be validated against diaries or other measures of behaviour. The authors also state that cross-sectional studies are inherently descriptive and cannot prove causality. The authors state that the finding that use of helping relationships was only moderately related with stage seems incongruous with literature showing social support can facilitate behaviour change. The value of the TTM relative to other models of health behaviour may depend on the health problem being studied.

Evidence of effect in sub-groups? None

Strengths/weaknesses of the evidence

The process of change questionnaire may not differentiate people who internalise changing norms from those who are aware of but defiantly oppose them.

Results generalisable to the UK?

Non-UK studies but likely to apply to UK settings

Recommendations for future research

The next generation of longitudinal research should focus on: which particular processes facilitate adoption or cessation of health related behaviours, do these vary by health problem and are there critical periods during which these processes have maximal impact?

Cost-effectiveness data None stated

Policy implications None stated

Implications for practice

“Those who look to the TTM for a blueprint for interventions are likely to be disappointed”

Comments Rating score 2-B

2. To what extent is each model able to incorporate social, economic and/or environmental factors, particularly in relation to the occurrence of health inequalities?

Reference ID 1019	Data extracted by NC	Date of extraction 28.4.06
Author(s) Ferguson E	Year 1996	
Title Predictors of Future Behaviour: A Review of the Psychological Literature on Blood Donation		
Source British Journal of Health Psychology		
Type of study Systematic review		
Research question(s) What are the relative efficacies of different theoretical models at predicting future behaviours in relation to blood donations		
Databases/sources searched PSYCLIT, and ancestry		
Years searched Not stated		
Inclusion criteria Studies were selected only if they were published articles, if they measured actual donations over time, assessed an identifiable theory, and contained identifiable information on the effect size, p-value and N.		
Exclusion criteria None stated		
Number of studies 16		
Number of participants Not stated		
Method of analysis Narrative synthesis		
What data extracted? Theory, time scale, donor group, effect size, p values and country of study.		
Results A meta-analytic review of some of the studies revealed that the intentionality construct accounted for 19.3% of the variance, subjective norm 1.4%, attitudes 7.5%, role merger 3.6% and waiting time 17.4%. Intentionality, from the theory of planned/reasoned action, emerged as the best predictor of future donor behaviour, but appeared to offer little in the way of suggesting interventions. The predictive power of intentionality reduced as the time interval between its measurement and the recording of actual donor behaviour increased. A number of organisational factors (e.g. waiting time) were identified as important and good predictors of future behaviour. Further, the stage-like nature of blood donor behaviour is highlighted.		
Conclusions The TTM of behaviour change is introduced both as a viable alternative to theories like reasoned action and a conceptual framework for organising interventions. The TTM is seen as applicable to the blood donation situation as it captures something of the stages of blood donation. It is also argued that other theoretical perspectives (e.g. self-efficacy) need to be examined in this context. From the data available it appears that intentions account for a sizable proportion of the explained variance in donor behaviour (19%). However organisational factors account for 17% of the explained variance. Non-psychological variables, therefore provide a predictive status and, unlike intentionality are open to easier manipulation.		
Criticism of conclusions? Lack of methodological clarity such as the number of studies examined and their sample sizes.		

Evidence of effect in sub-groups? None
Strengths/weaknesses of the evidence Heterogeneity across the studies despite the same health-related behaviour being examined. The timescales were also widely variable from 2 days to 2 years.
Results generalisable to the UK? Yes, 2 studies based in the UK
Recommendations for future research Organisational factors deserve further further investigation in this area and other areas of applied psychology. For advances in blood donor research future studies need to address 2 issues: 1) The inclusion of the donor career in their analyses and 2) The application of other theoretical perspectives (i.e. TTM, stress theory and self-efficacy theory).
Cost-effectiveness data None stated
Policy implications None stated
Implications for practice Beneficial factors have been identified and these include: heightened intentionality, heightened social norms, observing positive role models, persuasive communications, offering non-financial incentives and education. Possible interventions related to the transtheoretical stages are suggested: education for the pre-contemplative stage, modelling and education for the contemplative stage, increased intentionality, social norms for the preparation stage, non-financial incentives (and some organisational factors may be important e.g. signposting) in the action stage and non-financial rewards, persuasive communications and reminder letters (as well as some of the organisational factors which may be of importance e.g. convenience) in the maintenance stage.
Comments Rating score 2-A

Reference ID 707	Data extracted by NC	Date of extraction 19.4.06
Author(s) Yarbrough S S & Braden C J		Year 2001
Title Utility of Health Belief Model as a Guide for Explaining or Predicting Breast Cancer Screening Behaviours		
Source Journal of Advanced Nursing		
Type of study Systematic review		
Research question(s) What is the utility of HBM as a theoretical guide for predicting breast cancer screening and therefore for guiding intervention studies?		
Databases/sources searched CINAHL, MEDLINE, and cancer literature bases		
Years searched 1990-1999		
Inclusion criteria Search terms included breast cancer screening, mammography, BSE, health promotion, health protection, HBM and each of the HBM variables.		
Exclusion criteria Theory based studies		
Number of studies 16		
Number of participants Greater than 7,977 however the sample sizes for 2 of the studies are not included		
Method of analysis Narrative synthesis		
What data extracted? Data extracted on the HBM variables, the measurement strategies used within the studies, the screening activity, the relationship between the variable and the screening, the relationship between variables, the strength of the relationships and the external validity.		
Results Application of HBM to the study of breast cancer screening was not uniform across studies. Relationships between HBM variables and screening behaviour were specified as linear rather than multiplicative in many studies. HBM concepts were measured using existing instruments, specifically those for breast cancer screening. The model was operationalised in different ways using from 2 to 6 factors specified in the original model. While the specific methods for operationalising the model varied from study to study, the instruments used to measure chosen variables were adequate (Chronbach alpha validity scores ranged from 0.61 to 0.92). Barriers was the most frequently addressed factor associated with screening choices, but it was uniquely defined and operationalised in each. No study validated hypothesised relationships between benefits and barriers or their interaction with the product of susceptibility and severity. Both benefits and barriers contributed to total correlation with outcome measures. Susceptibility and severity were conceptualised and measured in various ways as well. The multiplicative interaction between these 2 concepts was not demonstrated in the reviewed studies. Outcome measures varied addressing one or more behaviours, most usually mammography and or breast self examination (BSE). Measurement of mammography utilisation was vague. Clinical breast examination was addressed in only one study that included all 3 behaviours, which were not correlated to values or beliefs. HBM factors were related to screening behaviour in the directions predicted by the model, with susceptibility, severity, and benefits positively relating to screening and barriers negatively related. However interactions between variables were influenced by other factors and were not related to each other as predicted in the model. At best HBM with added socioeconomic status variables predicted 47% of variance in prior mammography participation. When the same model was used to predict women's intentions to have a mammogram the power of the model was reduced to 27%.		

<p>Conclusions</p> <p>Limited predictive power of HBM for explaining breast cancer screening. The explanatory power of the model is not strong based upon the statistical findings of the studies. Although the correlation scores were significant, the strength of the relationships were for the most part low. The strongest correlation was between confidence ($r = 0.48$), not actually a HBM variable, and BSE proficiency ($r = 0.50$). Moreover, the amount of variance explained by HBM variables and either mammography or BSE was at best 47%.</p>
<p>Criticism of conclusions?</p> <p>The findings can only be generalised to a limited population of women, those in middle age (age range not provided) whose actual risk of developing breast cancer is low.</p>
<p>Evidence of effect in sub-groups?</p> <p>Benefits were negatively associated with education ($r = -0.28$) and positively related to ethnicity ($r = 0.33$). Susceptibility was negatively correlated to ethnicity ($r = -0.29$).</p>
<p>Strengths/weaknesses of the evidence</p> <p>Sample sizes ranged from 89 to 3684. Mean ages ranged from 44.7 to 55.36 for the majority of studies.</p>
<p>Results generalisable to the UK?</p> <p>Non-UK studies but likely to apply to UK settings</p>
<p>Recommendations for future research</p> <p>Research should focus on older women, as well as the social meanings of breast cancer and breast cancer screening. Qualitative research is required to provide descriptions of women's perceptions and articulation of components influencing choices and therefore behaviour.</p>
<p>Cost-effectiveness data None stated</p>
<p>Policy implications None stated</p>
<p>Implications for practice</p> <p>Theoretical descriptions are not strong enough to predict points for targeting interventions.</p>
<p>Comments</p> <p>Heterogeneity of the outcome measures. Rating score 2-B</p>

3. In which areas has each model been used?

Reference ID 6	Data extracted by NC	Date of extraction 20.4.06
Author(s) Adams J & White M	Year 2003	
Title Are Activity Promotion Interventions Based on the Transtheoretical Model Effective? A Critical Review		
Source British Journal of Sports Medicine		
Type of study Systematic review		
Research question(s) Are activity promotion interventions based on the transtheoretical model effective?		
Databases/sources searched MEDLINE and PSYCINFO		
Years searched 1982-2001		
Inclusion criteria 1) An intervention explicitly based on the TTM that aimed to promote physical activity levels 2) Study participants were adults and living within the community 3) Some assessment of physical activity levels both before and after the intervention		
Exclusion criteria Non English language studies		
Number of studies 26 papers documenting 16 intervention programmes		
Number of participants 7,465		
Method of analysis Narrative synthesis		
What data extracted? Nature of sample completing the study, the study country, the study design, details of the experimental intervention, the control conditions if applicable, the follow-up period and the study results.		
Results The review extracted the results given for the studies under review and then stated whether the interventions had been effective (any evidence of superiority of TTM based intervention compared with control in terms of stage progression or activity levels using a significance level of $p < 0.05$) over the short-term (over 6 months or less) and long-term (more than 6 months). The TTM based activity promotion programmes reviewed generally found some short-term benefit in terms of activity levels to stage of activity change. Longer-term effects seemed to be harder to achieve and therefore the authors question the overall benefit of these programmes. One of the studies highlighted that the intervention was most effective in people originally in the contemplation stage of activity change. A number of studies reported an intervention effect on stage of activity change without a concurrent effect on actual activity levels.		
Conclusions 73% of short term studies reported a positive effect of TTM based interventions over control conditions, whereas only 29% of long term studies did.		
Criticism of conclusions? The review may not include all reports published in this area. There is significant heterogeneity in the programmes reviewed in terms of the intervention design, recruitment methods, participants recruited, outcome measures, length of follow up and results reported. This highlights the many different ways in		

which the TTM can be interpreted for intervention design.
Evidence of effect in sub-groups? None
<p>Strengths/weaknesses of the evidence</p> <p>One of the studies was uncontrolled, and there were high levels of sample attrition within the studies. A number of the studies reviewed reported that despite initial recruitment of representative samples, the subjects who completed all follow-up measurements were primarily white, middle class, female and regularly active. Long-term studies are much less likely to be performed. Less than half of the studies reviewed carried out follow up beyond 6 months. There were numerous different methods of measuring physical activity used within the studies, none of which the authors claim were necessarily valid, all measuring slightly different constructs.</p>
<p>Results generalisable to the UK?</p> <p>Yes, includes 7 studies based in the UK</p>
<p>Recommendations for future research</p> <p>Future work according to the authors should focus on: comparative work to determine the most effective TTM based activity promotion interventions, careful design and evaluation of interventions to confirm that people in each stage of activity change receive a tailored and effective intervention, innovative strategies to recruit and retain candidates who are hard to reach, including people in all stages of activity change, measuring physical activity as well as stage of activity change and focusing on activity more than stage of change as an outcome measure, achieving adherence as well as adoption of increased activity levels and following up participants long enough to confirm this, investigating the effects of brief measurement interventions, developing standardised measures of physical activity and stage of activity change, ensuring treatment fidelity, assessing whether TTM based activity promotion counselling is any more effective than well delivered generic counselling, exploring whether a group of staged interventions allocated on the basis of the stage of activity change are any more effective than random allocation of the same group of interventions, and acknowledging the complexities of physical activity behaviour and incorporating this into interventions and outcome measures.</p>
Cost-effectiveness data None stated
Policy implications None stated
<p>Implications for practice</p> <p>The authors suggest that a brief measurement intervention can have some effect and should perhaps be exploited in future intervention development.</p>
<p>Comments</p> <p>Type of outcome measures (self-report or objective) used within the studies not stated Rating score 2-A</p>

Reference ID 12	Data extracted by NC	Date of extraction 20.4.06
Author(s) Albarracin D et al	Year 2001	
Title Theories of Reasoned Action and Planned Behaviour as Models of Condom Use: A Meta-Analysis		
Source Psychological Bulletin		
Type of study Systematic review (meta analysis)		
Research question(s) Can condom use behaviour be modelled on the basis of the theories of reasoned action and planned behaviour?		
Databases/sources searched PSYCLIT, Social Science Citation Index and the Educational Resources Information Center		
Years searched Not stated (reports that were available by June 1996 were considered for inclusion)		
<p>Inclusion criteria</p> <ol style="list-style-type: none"> 1) Studies that directly involved condom use 2) Studies that had a measure of either intention or behaviour or both. Composite measures of either intention or behaviour were accepted only when they concerned alternative condom use behaviours e.g. the average of intentions to use condoms with occasional and steady partners. 3) Eligible studies measured both attitudinal and normative factors 4) Eligible studies testing the theory of planned behaviour also included a measure of perceived behavioural control (PBC). They considered that a study measured PBC if it measured the extent to which a) participants can use condoms if they want to do so, b) using condoms is up to them and/or c) using condoms is easy or difficult 5) The presence of adequate statistics, associations between at least 2 of the cognitive and behavioural variables were required. Although studies did not always report complete correlation matrices, they were included if they reported the correlations or regressions coefficients among the factors that pertain to the relations in the theories of reasoned action and planned behaviour <p>Exclusion criteria If composite measures (refer to inclusion criteria) included factors other than condom use e.g. average of using a condom and engaging in a conversation about sexual history, the study was excluded.</p>		
Number of studies 42 papers containing 96 data sets		
Number of participants 22,594		
Method of analysis Meta-analysis		
<p>What data extracted?</p> <p>Each study was coded along several dimensions that described the the behaviour and population in question. Behavioural factors included: type of sex (e.g. vaginal), type of partner (e.g. steady). Population factors included: mean age of sample, percentage of males in each sample, risk level (e.g. higher risk including men who have sex with men, clients of STD clinics, injecting drug users, female sex partners of injecting drug users, sex workers, and multiple partnered homosexuals). From the studies correlations involving future behaviour, intentions, direct attitudes, direct norms, indirect attitudes, indirect norms and past behaviour were retrieved. The data-sets were divided on this basis where possible.</p>		
<p>Results</p> <p>Reported correlations were retrieved or derived from reports of multiple coefficients. In order to identify the relative contribution of attitudes, norms, and perceived behavioural control, the authors regressed intentions on attitudes, norms and perceived behavioural control. Even when regression</p>		

coefficients could not be used to retrieve correlations, they were used to calculate average regression weights as reported in the studies. The weighted mean correlation between intention and future behaviour was .45. The weighted mean correlation between behaviour and PBC was .24. Past behaviour was found to have a very small direct influence on future behaviour. Although attitudes were found to have direct influences on behaviour, they did not contribute over and above the impact of intentions. The multiple correlation coefficients when regressing intentions on attitudes and norms was .70, and the correlation between attitudes and indirect, belief based attitudes was .56.

Conclusions

The review indicates that the theories of reasoned action and planned behaviour are successful predictors of condom use. They found that people are more likely to use condoms if they have previously formed the corresponding intentions. These intentions to use condoms appear to derive from attitudes, subjective norms, and PBC. These attitudes and norms in turn appear to derive from outcome and normative beliefs. On the basis of the standardised root mean residual results, there were 2 samples for which the models did not fit well. The first sample was teenagers, which may suggest that the models fail to represent condom use amongst this population. The other sample was the lower risk populations (categorised as those individuals not defined as within the higher risk groups (i.e. men who had sex with men, clients of STD clinics, injecting drug users, sex workers and multiple partnered heterosexuals) and samples for whom the authors of the studies provided no information).

Criticism of conclusions?

The authors highlight the limitations of the review: the validity of condom use reports, potential effects of measurement unreliability, and effect heterogeneity. The heterogeneity of the correlations summarised across the works that provided effect sizes indicates the presence of behavioural, personal, situational or measurement factors that have the potential to increase some correlations and decrease others. No comments made of the quality of the reviewed studies.

Evidence of effect in sub-groups? Refer to conclusion

Strengths/weaknesses of the evidence

The review assumes that self-reported behaviours are accurate reflections of a person's actions.

Results generalisable to the UK?

Non-UK studies but likely to apply to UK settings, 9% of the studies performed in Europe

Recommendations for future research

The authors state that appropriately conducted baseline research will always provide the most valid information for guiding the development of interventions.

Cost-effectiveness data None stated

Policy implications None stated

Implications for practice

The authors state that, to the extent that condom use can be predicted successfully, practitioners ought to be able to improve the efficacy of interventions for targeted communities and individuals. The authors cite examples of the 2 theories inspiring a number of preventive efforts such as the CDC's AIDS Community Demonstration Projects. In addition to attempts to induce favourable attitudes and supporting social norms, interventions could be used to increase behavioural control among participants according to the authors.

Comments

Heterogeneity of the correlations extracted.
Rating score 2-B

Reference ID 67	Data extracted by NC	Date of extraction 21.4.06
Author(s) Blue C L	Year 1995	
Title The Predictive Capacity of the Theory of Reasoned Action and the Theory of Planned Behavior in Exercise Research: An Integrated Literature Review		
Source Research in Nursing and Health		
Type of study Systematic review		
Research question(s) What is the predictive capacity of the theories of reasoned action and planned behaviour with respect to exercise?		
Databases/sources searched MEDLINE, CINAHL, Sport and Leisure Index, Sociology of leisure and Sport Abstracts, Physical Fitness/Sports Medicine, Psychological Abstracts and ancestry		
Years searched 1980 - to present (article received for publication 1993)		
Inclusion criteria All published studies employing the theory derived measures for constructs within the TRA and TPB framework with respect to exercise behaviour were included in the review		
Exclusion criteria Not stated		
Number of studies 23		
Number of participants 5,014		
Method of analysis Narrative synthesis		
What data extracted? Author, year and purpose of study, sample size and characteristics, sampling method, type of research design, measurement of the theory constructs, reliability of the measurement tools, threats to validity, definition of exercise variables, and variance explained by the constructs.		
Results The sample for the TRA studies (16) included healthy adults, school age children, pregnant women, persons with cardiovascular disease and disabled persons. The sample sizes ranged from 56 to 698. In no study was the use of a statistical technique to determine sample size or statistical power reported. Cross-sectional survey designs were used most frequently. A quasi-experimental design was used in only one TRA study. 20 of the TRA and TPB studies reported either internal consistency or test-retest reliability of the measures used (instruments). 7 TRA and 1 TPB studies used intention to perform exercise as the dependent variable, and 11 TRA and 4 TPB studies used exercise behaviour as the dependent variable. The authors state that consistent with TRA and TPB, intention was predictive of a person's performance of a specific behaviour in most of the studies. In the majority, behaviour was measured from 2 weeks to 2 months after intention was measured. These differences in time-frames did not appear to affect the intention-behaviour correlations. However in the Mullen et al study (1987) intention was only a weak predictor of behaviour after 8 months. Only 17.9% of the variance in behaviour was explained by intention. In general, the higher correlations between intention to exercise and exercise behaviour were found in studies where intention was measured by likeliness or probability. 7 studies used the TPB with subjects in a variety of settings. All used similar items for a direct measure of perceived control. The findings of these 7 studies are mixed. However the results suggest that for studies of exercise behaviour the TPB may be superior to the TRA in that the TPB has more predictive qualities for exercise intention and does not make the assumption that control for exercise behaviour rests solely in the individual.		
Conclusions The TRA and TPB provided a theoretical structure for examining exercise behaviour in a number of		

settings and populations. In most of the studies correlations of subjective norm with behavioural intention were not significant. When this relationship was significant, the normative correlation was lower than the attitude-intention correlation. This was consistent with the TRA and TPB models that postulate that some intentions (behaviours) are likely to be under attitudinal control and therefore predicted by attitude, whereas intentions to perform other behaviours are likely to be under normative control and be predicted by subjective norm. It appears that the influence of social pressure on exercise intentions as defined by the TRA and TPB is small. Where the intention-behaviour component of the model was measured, intention was significantly predictive of exercise behaviour in all but one study. The addition of PBC significantly increased the prediction of intention to exercise, but there were mixed results in the prediction of exercise behaviours. These differences in studies may be a result of the early development of measures of control beliefs and PBC. In addition PBC influences behaviour directly when perceptions of control reflect actual control.

Criticism of conclusions?

Comparisons between the studies reviewed was limited by the wide variety of ways in which exercise was defined. The authors cite threats to validity contained within the studies. These were selection bias as volunteers for exercise studies may be individuals who are more health conscious and have higher levels of income and education than the general population, attrition bias, problems related to the measurement of exercise by self-report, the social desirability with respect to exercise, and seasonal variations occurring in physical activity levels.

Evidence of effect in sub-groups? None

Strengths/weaknesses of the evidence

Heterogeneity of the reviewed studies in relation to their methodological aspects from samples, to measurement of the concepts, research designs, and the measurement of exercise.

Results generalisable to the UK?

Non-UK studies but likely to apply to UK settings

Recommendations for future research

Future studies might examine the effectiveness of targeted programs with respect to the adoption and maintenance of exercise. The authors also provide recommendations for future studies regarding study design and construct measurement.

Cost-effectiveness data None stated

Policy implications None stated

Implications for practice

The TRA and the TPB are useful in identifying psychological determinants of self-reported exercise behaviour and could be useful for developing community and individual exercise programs. Based on the results of the studies reviewed exercise programs would be more efficient when components that would encourage positive beliefs for the individual are included in the program design. Exercise programs that offer a positive experience would enhance intention to exercise, which in turn influences exercise behaviour.

Comments

Type of outcome measures (self-report or objective) used within each of the studies not stated.
Rating score 2-B

Reference ID 924	Data extracted by NC	Date of extraction 27.4.06
Author(s) Downs D S & Hausenblas H A	Year 2005	
Title Elicitation Studies and the Theory of Planned Behavior: A Systematic Review of Exercise Beliefs		
Source Psychology and Sport Exercise		
Type of study Systematic review		
Research question(s) What are the salient behavioural, normative and control beliefs for exercise elicitation studies? What is the strength of the associations among behavioural beliefs-attitude, normative beliefs-subjective norm, and control beliefs-perceived behavioural control; and hierarchical multiple regression, path analysis, or structural equation modelling findings of the beliefs for predicting attitude, subjective norm, and perceived behavioural control? Is there an association between the study methods used to elicit beliefs and the main theory of planned behaviour study participants?		
Databases/sources searched PSYCLIT, MEDLINE, SPORTdiscuss, Dissertation Abstracts Online, and hand searching of specific journals (American Journal of Health Promotion, British Journal of Social Psychology, Canadian Journal of Applied Sport Psychology, European Journal of Social Psychology, Health Psychology, International Journal of Sport Psychology, Journal of Applied Social Psychology, Journal of Applied Sport Psychology, Journal of Behavioral Medicine, Journal of Health Psychology, Journal of Leisure Research, Journal of Personality and Social Psychology, Journal of Sport & Exercise Psychology, Journal of Sport behavior, Medicine and Science in Sports and Exercise, Perceptual and Motor Skills, Preventive Medicine, Research Quarterly for Exercise and Sport, and the Sport Psychologist).		
Years searched PSYCLIT (1975 to the present - article submitted for publication 2002), MEDLINE (1975 to present), SPORTdiscuss (1975 to present), Dissertation Abstracts Online (1975 to present)		
Inclusion criteria 1) If a study examined at least 2 of the TPB constructs (i.e. beliefs, attitude, subjective norm, perceived behavioural control, intention) and leisure time or exercise behaviour, and/or 2) It conducted an exercise elicitation study (i.e. examining people's behavioural, normative, or control beliefs)		
Exclusion criteria Not stated		
Number of studies 47		
Number of participants Not stated, greater than 9,494		
Method of analysis Narrative synthesis		
What data extracted? The study year, publication format, participant characteristics (number of participants, type of population, M age or age range, sex, race, and socioeconomic status), number and type of elicited behavioural, normative and control beliefs.		
Results The procedures of Hedges (1981) and Hedges & Olkin (1985) were used to calculate the effect size. Because effect sizes are positively biased in small sample sizes, each effect size was multiplied by a correction factor to obtain an estimate of the effect size (Hedges). A mean effect size and variance was calculated by weighing each effect size by the reciprocal variance (Hedges & Olkin). Most of the studies were published (70.2%) and conducted in the 1990s (59.6%). For the main TPB study characteristics, the majority of the studies included male and female participants, and the participants were community adults (26.1%), undergraduate students (23.9%), worksite employees (15.2%), patients (13%), older adults (10.9%) and other (10.9%). Most of the studies did not report the		

participant's ethnicity or socioeconomic status. However in the studies that did report these characteristics Caucasian middle to upper class adults were the most frequently studied. In regard to the elicitation study characteristics, most of the studies examined men and women (61.7%) and included community adults (25.5%), undergraduates students (23.4%), worksite employees (14.9%), older adults (12.8%) patients (12.8%) and other (10.6%). The majority of the studies elicited behavioural beliefs (n=40) and the average number of beliefs reported per study was 7. The most salient advantages of exercise were: improves physical and psychological health (100%), controls weight (73.7%), improves daily functioning (68.4%), increases energy (57.9%) and relieves stress and promotes relaxation (47.4%). The majority of the studies elicited normative beliefs (n=38). The most salient referents were: family members (100%), friends (90%) and healthcare professionals (90%). More than half of the studies elicited control beliefs, the most frequently reported were: health issues, inconvenience, lacking motivation and energy, time and lacking social support. Large associations were found for: behavioural beliefs and attitudes (M effect size 1.36), normative beliefs and subjective norm (M effect size 1.20) and control beliefs and perceived behavioural control (M effect size 1.04).

Conclusions

In general, the authors found that: people have a variety of beliefs about exercise; large associations were found among the beliefs and attitude, subjective norm, and perceived behavioural control; and few studies reported the predictive contributions of beliefs and the demographic characteristics of their elicitation study participants. Consistent with other researchers' conclusions the most salient behavioural advantage of exercise was that it improves people's physical and psychological health. In addition, the most common behavioural disadvantages were experiencing health problems such as pain, soreness and illness. These findings indicate that people have a variety of positive and negative behavioural beliefs about exercise. Second, the most frequently reported normative influences were from family and friends, also consistent with previous research. Third, the most common control beliefs obstructing exercise were: health issues, inconvenience/lack of access to exercise facilities, lacking motivation and energy, and lacking social support. Fourth, the most salient control beliefs facilitating exercise behaviour were convenience, pleasure and social support. Fifth, the magnitude of the effect between behavioural beliefs and attitude, normative beliefs and subjective norm, and control beliefs and PBC were large. Behavioural beliefs explained 54% of the variance in attitude, normative beliefs explained 56% of the variance in the subjective norm, and control beliefs explained 34% of the variance in PBC.

Criticism of conclusions?

None stated. Heterogeneity of studies examined and methods used.

Evidence of effect in sub-groups? None

Strengths/weaknesses of the evidence

Because of the lack of information provided for elicitation studies the authors were unable to examine the elicitation study methods. 92% of the studies did not report sufficient information for the participant characteristics, and 55% of the studies did not report adequate details to determine the measures and procedures used to elicit the beliefs.

Results generalisable to the UK?

Non-UK studies but likely to apply to UK settings

Recommendations for future research

Researchers are encouraged to: conduct elicitation studies, consider Ajzen and Fishbein's 1980 guidelines for elicitation studies; examine the associations among behavioural beliefs and attitude, normative beliefs and subjective norm, and control beliefs and PBC; obtain correspondence between the elicitation and main TPB study participants; and report more detail regarding the elicitation study participants, measures and procedures.

Cost-effectiveness data None stated

Policy implications None stated

Implications for practice

Practitioners may use the study findings when designing exercise programs with specific populations to

target these beliefs. Intervention specialists are encouraged to emphasise the advantages of exercise, while also developing strategies for helping people to overcome perceived barriers.

Comments

Rating score 2-B

Reference ID 1019	Data extracted by NC	Date of extraction 28.4.06
Author(s) Ferguson E	Year 1996	
Title Predictors of Future Behaviour: A Review of the Psychological Literature on Blood Donation		
Source British Journal of Health Psychology		
Type of study Systematic review		
Research question(s) What are the relative efficacies of different theoretical models at predicting future behaviours in relation to blood donations		
Databases/sources searched PSYCLIT, and ancestry		
Years searched Not stated		
Inclusion criteria Studies were selected only if they were published articles, if they measured actual donations over time, assessed an identifiable theory, and contained identifiable information on the effect size, p-value and N.		
Exclusion criteria None stated		
Number of studies 16		
Number of participants Not stated		
Method of analysis Narrative synthesis		
What data extracted? Theory, time scale, donor group, effect size, p values and country of study.		
Results A meta-analytic review of some of the studies revealed that the intentionality construct accounted for 19.3% of the variance, subjective norm 1.4%, attitudes 7.5%, role merger 3.6% and waiting time 17.4%. Intentionality, from the theory of planned/reasoned action, emerged as the best predictor of future donor behaviour, but appeared to offer little in the way of suggesting interventions. The predictive power of intentionality reduced as the time interval between its measurement and the recording of actual donor behaviour increased. A number of organisational factors (e.g. waiting time) were identified as important and good predictors of future behaviour. Further, the stage-like nature of blood donor behaviour is highlighted.		
Conclusions The TTM of behaviour change is introduced both as a viable alternative to theories like reasoned action and a conceptual framework for organising interventions. The TTM is seen as applicable to the blood donation situation as it captures something of the stages of blood donation. It is also argued that other theoretical perspectives (e.g. self-efficacy) need to be examined in this context. From the data available it appears that intentions account for a sizable proportion of the explained variance in donor behaviour (19%). However organisational factors account for 17% of the explained variance. Non-psychological variables, therefore provide a predictive status and, unlike intentionality are open to easier manipulation.		
Criticism of conclusions? Lack of methodological clarity such as the number of studies examined and their sample sizes.		
Evidence of effect in sub-groups? None		

<p>Strengths/weaknesses of the evidence Heterogeneity across the studies despite the same health-related behaviour being examined. The timescales were also widely variable from 2 days to 2 years.</p>
<p>Results generalisable to the UK? Yes, 2 studies based in the UK</p>
<p>Recommendations for future research Organisational factors deserve further further investigation in this area and other areas of applied psychology. For advances in blood donor research future studies need to address 2 issues: 1) The inclusion of the donor career in their analyses and 2) The application of other theoretical perspectives (i.e. TTM, stress theory and self-efficacy theory).</p>
<p>Cost-effectiveness data None stated</p>
<p>Policy implications None stated</p>
<p>Implications for practice Beneficial factors have been identified and these include: heightened intentionality, heightened social norms, observing positive role models, persuasive communications, offering non-financial incentives and education. Possible interventions related to the transtheoretical stages are suggested: education for the pre-contemplative stage, modelling and education for the contemplative stage, increased intentionality, social norms for the preparation stage, non-financial incentives (and some organisational factors may be important e.g. signposting) in the action stage and non-financial rewards, persuasive communications and reminder letters (as well as some of the organisational factors which may be of importance e.g. convenience) in the maintenance stage.</p>
<p>Comments Rating score 2-A</p>

Reference ID 275	Data extracted by NC	Date of extraction 21.4.06
Author(s) Godin G & Kok G	Year 1996	
Title The Theory of Planned Behavior: A Review of Its Applications to Health-Related Behaviors		
Source American Journal of Health Promotion		
Type of study Systematic review		
Research question(s) What is the efficacy of Ajzen's theory of planned behaviour in explaining and predicting health-related behaviours?		
Databases/sources searched Current Contents (Social and Behavioral Sciences and Clinical Medicine)		
Years searched 1985 - to date (article submitted for publication 1995)		
<p>Inclusion criteria All studies considered were those that provided the basic information on the following variables: intention, attitude toward the action, subjective (social) norm and PBC. Regarding PBC studies were included as long as such control was assessed in one of the following manners: according to Ajzen or Ajzen & Madden specifications (i.e. PBC or sum of perceived barriers), according to Triandis (i.e. facilitating conditions or perceived constraints), according to Bandura (i.e. self-efficacy).</p> <p>Exclusion criteria Studies that applied the TPB in other domains than health. Cross-sectional studies that reported prediction of current behaviour instead of intention were not included as prediction of current behaviour does not respect the causal associations underlying the theory.</p>		
Number of studies 56		
Number of participants Not stated		
Method of analysis Narrative synthesis		
<p>What data extracted?</p> <p>The following aspects of the studies were scrutinised: the strength of the association between each of the theoretical constructs with intention and behaviour, the explained variation in intention and behaviour, the importance of PBC to explain a significant proportion of variance in intention and behaviour, the contribution of other theoretical constructs to explain intention and predict behaviour, and the influence of how PBC was assessed on the relationships between the variables.</p>		
<p>Results</p> <p>The 58 behavioural applications contained within the 56 studies were classified via behavioural categories: addictive, automobile, clinical and screening, eating, exercising, HIV/AIDS and oral hygiene. The information extracted and scrutinised was: correlation coefficients, standardised regression coefficients, standardised regression coefficients, multiple r^2, change in r^2 attributed to PBC, and any other statistical strategies providing a test of the theory. 46.4% of the studies provided data on the prediction of the behaviour. 56 publications reported a total of 87 applications regarding intention. Among these 87 applications, 57 reported the correlation coefficients. The overall average correlations between intention and attitude, subjective norm and PBC were .46, .34, and .46 respectively. The r^2 value was available in 76 of the 87 applications. Overall, the average explained variance in intention was 40.9% varying from 32% (eating behaviours) to 46.8% (oral hygiene behaviours). PBC was found significant in 65 of 76 analyses reported in the publications, whereas attitude and subjective norm were found significant, respectively, in 62 and 36 of these applications. For studies that reported a significant additional contribution of PBC, above attitude and subjective norm, the average added r^2 was 13.1%, this value varied from 5% (eating behaviour) to 24.3% (oral hygiene behaviours). 26 studies provided information on 40 applications predicting future behaviour. Among these 40</p>		

applications only 26 presented information on correlation coefficients. The overall average correlations between behaviour and intention and PBC were .46 and .39 respectively. The r^2 value was available 35 of the 40 applications. Overall the average explained variance in behaviour was 34%, varying from 15.6% (clinical and screening behaviours) to 42.3% (HIV/AIDS related behaviours). Among 41 applications providing information on the added contribution of PBC, above intention, there was an almost perfect split between the applications where PBC reached or did not reach the significance level.

Conclusions

The averaged r^2 for intention and behaviour were .41 and .34 respectively. In the domain of health about a third of the variations in behaviour can be explained by the combined effect of intention and PBC. Intention however remains the most important variable, 66.2% of the explained variance is attributed to intention.

Criticism of conclusions?

Limitations in making inferences for the studies given the low number of published articles reporting data on behavioural prediction (longitudinal studies), addictive (19.7% of the 40.7% explained variance) and clinical and screening (7% of the 15.6% explained variance) behaviours are categories where PBC carries more weight than intention.

Evidence of effect in sub-groups? None

Strengths/weaknesses of the evidence

The theory seems to perform quite well across behavioural categories with respect to explaining intention. For, the prediction of behaviour however its efficiency varies. For example the r^2 was quite low for clinical and screening behaviours whereas much higher values were observed for addictive and HIV/AIDS related behavioural categories. Several of the studies reviewed reported that variables not included in the TPB contributed to explain significant portion of variance in intention and in a few cases, in behaviour. In this regard the following 2 variables seem to be important: personal norm, assessed as self-identity or role identity, and moral norm or personal normative beliefs. The authors observe that numerous methods were used to assess the constructs of the theory, sometimes generating confusion in the interpretation of findings.

Results generalisable to the UK?

Non-UK studies but likely to apply to UK settings

Recommendations for future research

Appropriate procedures to guide the development of research instruments especially in the health domain are urgent. Role beliefs and feelings of personal responsibility should be added to the TPPB for studying health-related behaviours.

Cost-effectiveness data None stated

Policy implications None stated

Implications for practice None stated

Comments

Rating score 2-B

Reference ID 1095	Data extracted by NC	Date of extraction 20.4.06
Author(s) Hagger M S et al	Year 2002	
Title A Meta-Analytic Review of the Theories of Reasoned Action and Planned Behavior in Physical Activity: Predictive Validity and the Contribution of Additional Variables		
Source Journal of Sport and Exercise Psychology		
Type of study Systematic review (meta analysis)		
Research question(s) What are the relations between behaviour, intentions, attitudes, subjective norms, perceived behavioural control, self-efficacy and past behaviour across studies using the theories of reasoned action and planned behaviour in a physical activity context?		
Databases/sources searched ATLANTES, HERACLES, MEDLINE EXPRESS, PSYCINFO, SPORT discuss, and Social Science Citation Index, and a manual search of Dissertation Abstracts International and Psychological Abstracts		
Years searched ATLANTES (1980-1996), HERACLES (1975-1997), MEDLINE EXPRESS (1980-2001), PSYCINFO (1977-2001), SPORT discuss (1975-2001) and Web of Social Science Citation Index (1980-2001)		
Inclusion criteria Studies that defined the target behaviour as physical activity, either as leisure time physical activity or more formal forms such as sports training or exercise, and reporting at least one correlation between constructs derived from the TRA or TPB.		
Exclusion criteria Some studies were rejected because they did not report the necessary correlations between the TRA/TPB variables or were qualitative in nature.		
Number of studies 72		
Number of participants 21,916		
Method of analysis Meta-analysis		
What data extracted? The number of study participants, the composition of the sample, the A-I correlation, A-I strength, mean age, age category, time frame for past behaviour measure and the proximity.		
Results The measure of effect size adopted was the average correlation coefficient across the studies corrected for statistical artifacts. The meta-analytic strategy reported by Hunter & Schmidt (1990) was used to correct the intercorrelations between the TRA/TPB variables and past behaviour for sampling and measurement error. The strongest association found was between attitude and intention, followed by the intention-behaviour, PBC-intention, and the subjective norm-intention relationships. Moderate to strong, positive-corrected average correlations between self-efficacy and the TRB variables were demonstrated. Strong associations were also observed between the TRA/TPB variables and past behaviour, except for the subjective norms/past behaviour relationship. In relation to the TRA, intentions significantly predicted behaviour, attitudes were the strongest significant predictor of intention, while subjective norms had a small but significant influence on intentions. Attitude accounted for much of the social influences on intention. In relation to the TPB, attitude and PBC were the best predictors of intentions. The contribution of PBC to behaviour was significant. Self-efficacy was a significant predictor of physical activity intention and behaviour. Overall the TRA model constructs explained 37.27% of the variance in intentions and 26.04% of the variance in behaviour. The TPB model accounted for more variance in intention than the TRA (44.5%). When the second version of the TPB including the PBC variable was analysed this version accounted for slightly more		

variance in behaviour (27.41%) compared with the first version. When self-efficacy was included the model accounted for 50.30% of the variance in intention and 29.10% of the variance in behaviour. Furthermore when past behaviours were included, the model constructs accounted for the greatest amount of variance in intentions (60.18%) and behaviour (46.71%).

Conclusions

The review suggests that people's attitudes, and to a lesser extent PBC and self-efficacy seem to be key influences in forming intentions to participate in physical activity. The authors conclude that the substantial independent contributions made by PBC and self-efficacy to the explanation of intention and behaviour suggests that the TPB augmented by self-efficacy seems to provide a comprehensive account of the social-cognitive influences on physical activity motivation and participation.

Criticism of conclusions?

Limitations of the review are not specifically addressed e.g. issues of heterogeneity and the quality of the reviewed studies

Evidence of effect in sub-groups?

When examining age as a moderator of the TPB relationships, the authors found “older samples” (no age range provided) had a significantly stronger relationship between intentions and behaviour than younger samples (age <25 years). This suggests that the “older samples” may be more likely to translate their intentions to participate in physical activity into actual behaviour.

Strengths/weaknesses of the evidence

The review has controlled for artifacts and demonstrated that while past behavioural effects do attenuate the TPB relationships, current cognitions, particularly control and self-efficacy, are the most important predictors physical activity behaviour.

Results generalisable to the UK?

Non-UK studies but likely to apply to UK settings

Recommendations for future research

Future studies in the physical activity domain adopting the TPB as a framework would do well according to the authors to account for past physical activity behaviour in their analyses in order to examine the unique influences of conscious social cognitions on intentions and behaviour.

Cost-effectiveness data None stated

Policy implications None stated

Implications for practice

Interventions based on the enhancement of attitudes toward physical activity may lead to a concomitant increase in physical activity behaviour.

Comments

Type of outcome measures (self-report or objective) used within the studies not stated.
Rating score 2-B

Reference ID 1101	Data extracted by NC	Date of extraction 28.4.06
Author(s) Hardeman W et al	Year 2002	
Title Application of the Theory of Planned Behaviour in Behaviour Change Interventions: A Systematic Review		
Source Psychology and Health		
Type of study Systematic review		
Research question(s) How often and in what way has the TPB been applied to interventions aimed at behaviour change and/or their evaluation? What methods have been used to alter components of the model? How many interventions have been effective in changing targeted TPB components, intention and behaviour? Were any changes in intention and behaviour mediated by TPB components?		
Databases/sources searched MEDLINE, PSYCLIT, EMBASE, Cochrane Library, and Current Contents		
Years searched MEDLINE (1966-May1999), PSYCLIT (1887-March 1999), EMBASE (1980-February1999), Cochrane Library, and Current Contents (13.4.98-5.4.99)		
Inclusion criteria Published studies with an explicit application of the TPB or revised TRA to an intervention and/or its evaluation. Studies in which the TPB was used alongside other theories and models as long as the TPB was explicitly mentioned.		
Exclusion criteria Studies that only used other models were excluded. Studies that measured a mix of components of the TPB and other theories, without explicit mention of the TPB. Studies in which self-efficacy was measured alongside the TRA were excluded if the authors did not report that they used self-efficacy as a proxy measure of PBC.		
Number of studies 30		
Number of participants Not stated, greater than 12,957		
Method of analysis Descriptive review		
What data extracted? Target behaviour, characteristics of participants, study design, use of the TPB, intervention package, targeted TPB components, change in targeted components, change in intention and behaviour, and mediation of change by TPB components.		
Results Effect sizes were calculated using mean scores in experimental and control groups at follow-up, divided by the standard deviation in the control group (Hedges & Olkin 1985). 21 interventions targeted health-related behaviours, including infants' sugar intake, smoking cessation, exercise, testicular self-examination, and drink driving. The remaining interventions involved signing up for a chemistry course, working in projects and job seeking. Most interventions targeted school and university students. Participants were mixed sex, unless the intervention focused on a sex-specific health issue. Groups selected by risk adverse outcomes of their behaviour included adults with a low fruit and vegetable consumption, intravenous drug users and crack smokers, inner-city African American adolescents, participants of a weight loss programme, adults with gingivitis and unemployed people. 9 interventions were short and consisted of an audio-taped, audiotaped/printed, printed, audiovisual, or videotaped message or single instruction. All but one of these interventions were applied among students. The 15 longer interventions comprised exercise classes, an educational session and a series of educational sessions. The duration was less than a month in 5 studies, and between 1 and 6 months in 9 studies. Evaluation studies of 14 interventions had a RCT design, and 7 were non-randomised trials. 1 study was longitudinal, and 2 were surveys. In all interventions TPB components were measured but		

only 1 measured the full range of components. The descriptions of the interventions were limited. As a result, some behaviour change methods were either not described or not classifiable. Evaluation studies of 13 interventions reported on change in behavioural intention, with 6 showing some positive effect. Of the 6 effect sizes could be calculated for 4 studies, and they were small to moderate in 2 studies and large in the other 2. 4 studies reported no change in the intervention group compared to the control. Evaluation studies of 13 interventions reported on change in behaviour. 7 reported at least 1 positive change in the intervention group compared to the control group. Effect sizes were very small in one study, small to moderate in 2, moderate to large in 1, and large in 1. Effect sizes based on proportions, calculable for 3 studies ranged from 3.7% to 50%. With the studies that used the TPB to develop the intervention (12), 4 found positive changes in behaviour, with effect sizes very small in 1 study, small to moderate in 1 and moderate to large in another.

Conclusions

The TPB was mainly used to measure process and outcome variables and to predict intention and behaviour, and less commonly to develop the intervention. Behaviour change methods were mostly persuasion and information, with increasing skills, goal setting, and rehearsal of skills used less often. When reported, half of the interventions were effective in changing intention, and two thirds in changing behaviour, with generally small effect sizes, where calculable. Effectiveness was unrelated to use of the theory to develop intentions. Evidence about mediation of effects by TPB components was sparse. The TPB may have potential for developing behaviour change interventions, but more comprehensive studies are needed that compare the utility of the TPB with other social cognition models and behavioural techniques.

Criticism of conclusions?

The authors highlight the fact that they did not search the grey literature as a limitation of their review. It was according to the authors sometimes difficult to judge whether the TPB was applied to an intervention.

Evidence of effect in sub-groups? None

Strengths/weaknesses of the evidence

Intervention drop-out rates were reported within the studies were significant (up to 75% in some). Great heterogeneity across the studies. About one third of the studies did not report on the reliability of the measured components, and more than half measured behaviour by self-report. Studies were often of poor design, more precise estimations of effectiveness of interventions could be made if studies had a RCT design, longer follow-up period, intention to treat analysis, and used standardised, reliable measures of constructs and more objective measures of behaviour. It would aid interpretation if authors reported recruitment and dropout rates, to provide insight into the feasibility and acceptability of the intervention, and the generalisability of findings.

Results generalisable to the UK?

Yes, includes 5 studies based in the UK

Recommendations for future research

Well designed studies that evaluate carefully developed interventions, specifically targeting TPB components and measuring the effect on cognitions as well as behaviour, are needed to provide evidence about the utility of the TPB in this area. Studies are required that have a RCT design, longer follow-up period, intention to treat analysis, and used standardised, reliable measures of constructs and more objective measures of behaviour. It would aid interpretation if authors reported recruitment and dropout rates, to provide insight into the feasibility and acceptability of the intervention, and the generalisability of findings.

Cost-effectiveness data None stated

Policy implications None stated

Implications for practice

The TPB may have potential for developing behaviour change interventions, but more comprehensive studies are needed that compare the utility of the TPB with other social cognition models and behavioural techniques.

Comments

Type of outcome measures (self-report or objective) used within the studies not stated.
Rating score 2-A

Reference ID 1104	Data extracted by NC	Date of extraction 28.4.06
Author(s) Hausenblas H A et al	Year 1997	
Title Application of the Theories of Reasoned Action and Planned Behaviour: A Meta-Analysis		
Source Journal of Sport and Exercise Psychology		
Type of study Systematic review (meta-analysis)		
Research question(s) What is the utility of the TRA and the TPB for the explanation and prediction of exercise behaviour?		
Databases/sources searched PSYCLIT, MEDLINE, SPORTdiscuss, and Dissertation Abstracts, and hand searching.		
Years searched 1975 to the present - manuscript submitted Jan 1996		
Inclusion criteria 1) That the study focused on exercise 2) and incorporated at least 2 of the constructs contained in the TRA or TPB.		
Exclusion criteria Studies were excluded that failed to provide usable statistics to compute an effect size.		
Number of studies 31		
Number of participants 10,621		
Method of analysis Meta-analysis		
What data extracted? The characteristics of the study, the program of exercise, the participants, and the measures were extracted and coded for each article. Also extracted were: sample size, response rate, client selection, psychometrics, and theory tested. The program category included the duration of the treatment and its frequency. The participant category included gender, age, occupation, socioeconomic status, ethnicity, special population e.g. disabled or pregnant, and training status.		
Results Effect sizes were calculated using the techniques of Hedges (1981) and Hedges & Olkin (1985). 41.9% examined TPB and 58.1% examined the TRA. The psychometric properties of the scales were reported in 83.9% of the studies. That is 58.1% reported internal consistency values, 12.9% reported test-retest reliabilities, and 12.9% reported both. The majority of the studies were conducted in a university setting (50%), followed by corporations (6.5%), fitness clubs (6.5%), the community (16.1%) and home (16.1%). The majority of the participants were volunteers (64.5%) followed by target groups (22.6%) and random assignment (9.7%). The results showed that the distribution of effect sizes was homogeneous, nonetheless the relationships among the individual constructs of the TRA and TPB were further examined. Using Cohen's recommendations for interpretation of values, the majority of effect sizes were in the moderate to large range. No significant differences in the magnitude of effect size were observed between unpublished and published research for any of the principal relationships in TRA. The direct determinant of exercise behaviour according to the TRA is intention. A large effect size of 1.09 was found between intention and behaviour. According to TRA, the direct determinants of an intention to adopt exercise behaviour are the constructs of attitude and subjective norm. Attitude was over 2 times more useful as a predictor of intention to exercise than was subjective norm. In relation to the utility of PBC, PBC had a large relationship with both exercise behaviour (effect size= 1.01) and intention to exercise (effect size=0.97). No differences were observed between the magnitude of the effect size for the intention-proximal behaviour relationship and the intention-distal behaviour relationship (however there were a small number of studies that		

addressed this issue).

Conclusions

The results provided strong general support for the validity of TRA and TPB. The effect size for the relationships a) between intention and exercise behaviour, attitude and intention, attitude and exercise behaviour, PBC and intention, and PBC and exercise behaviour was large; b) between subjective norm and intention was moderate; and c) between subjective norm and exercise behaviour was zero order. The results also supported the conclusions that a) TPB is superior to TRA in accounting for exercise behaviour, b) there is no difference in the ability to predict exercise behaviour from proximal and distal measures of intention, and c) expectation is a better predictor of exercise behaviour than intention.

Criticism of conclusions?

The relatively small number of studies contributing to the computation of some of the effect sizes.

Evidence of effect in sub-groups?

Only 9.7% of the studies reported on ethnicity, 19.4% on participant occupation, and 19.4% on socioeconomic status.

Strengths/weaknesses of the evidence

The constructs within TRA and TPB are interrelated. The effect sizes reported are undoubtedly overestimate the magnitude of the overall relationships within these models according to the authors. Due to insufficient power neither a hierarchical regression nor a path analysis were computed.

Results generalisable to the UK?

Non-UK studies but likely to apply to UK settings

Recommendations for future research

Researchers should continue to examine the TPB in exercise behaviour with a view to determining potential moderator variables (e.g. age, gender and training status) that are related to physical activity levels. Also future studies should report elicitation studies and psychometric properties of the scales used. Future studies should examine the predictive power of an intention to exercise behaviour over time.

Cost-effectiveness data None stated

Policy implications None stated

Implications for practice

The constructs embedded in the TPB have considerable utility in predicting and explaining exercise behaviour. A knowledge of TPB could help exercise practitioners understand the key elements associated with initiating and maintaining exercise behaviour. It could help them evaluate changes in exercise behaviour that occur as a result of planned interventions.

Comments

Type of outcome measures (self-report or objective) used within the studies not stated.
Rating score 2-B

Reference ID 312	Data extracted by NC	Date of extraction 27.4.06
Author(s) Horowitz S M	Year 2003	
Title Applying the Transtheoretical Model to Pregnancy and STD Prevention: A Review of the Literature		
Source American Journal of Health Promotion		
Type of study Systematic review		
Research question(s) What is the quality of evidence supporting the use of tailored or stage-matched pregnancy and STD prevention programmes? What are the factors that influence stage distribution? How is the validity of the TTM and its constructs, as applied to pregnancy and STD prevention, supported by research?		
Databases/sources searched ASSI, BA, CJA, CINAHL, CC, CIJE, EI, ERIC, EM, FI, IM, MEDLINE, MEA, PSYCINFO, PA, RA, SSCI, SWA, SA and hand searching		
Years searched Up to 31 December 2001 (no starting date provided)		
Inclusion criteria All English, peer-reviewed, original articles on the TTM as it relates to pregnancy and STD prevention published prior to 31 December 2001 were included.		
Exclusion criteria Editorials, commentaries, theses/dissertations, unpublished studies, technical reports and books were not included.		
Number of studies 32		
Number of participants Not stated, greater than 16,841		
Method of analysis Narrative synthesis		
What data extracted? Articles were categorised as intervention, population or validation studies. Data extracted included purpose of study, sample size and characteristics, study design, measures used, intervention elements, findings and conclusions.		
Results The articles included 9 intervention studies, 11 population studies and 12 validation studies. Of the interventions studies the studies were categorised into sample type: adolescents/university students and adult at risk/special populations. In the adolescent group 5 studies assessed interventions, 2 focusing on clinical populations, 1 on low income African American girls, 2 on 10th graders and 1 on university students (one study used 2 different samples). The results were mixed and can be partially attributed to the content of the interventions, the duration of treatment period, the health status of the participants, data collection methodologies and sample size. In the adult sample group 3 studies described intervention programs targeted to adults with 2 studies addressing at-risk populations and 1 assessing a clinical population. Results were mixed, and in some cases difficult to interpret because of insufficient description. The population studies were categorised into young adult/university, clinical, and community/high risk/special populations. 2 studies fell into the young adult/university category, 4 into the clinical group and 5 into the third group of community/high risk/special populations. In the clinical samples there were diverse populations, making comparisons between studies difficult and in the last category gender, age partner type, self-efficacy, outcome expectancy, peer norms, and cohabitation were all factors in stage distribution. In the validation studies 75% of the studies dealt with individuals at high risk of HIV infection from unsafe sexual behaviours or injecting drug use. Condom use purpose, partner type, virgin status and perceived advantages/disadvantages of condom use helped explain stage distribution but HIV serostatus did not.		

<p>Conclusions</p> <p>Age, partner type, gender, reasons for engaging in safer sex behaviours (i.e. pregnancy vs. disease prevention), self-efficacy, sexual assertiveness, and perceived advantages and disadvantages of condom use were related to stages of change. The use of TTM to reduce risk of pregnancy and STDs is a relatively new area of research but because of the wide-ranging differences in methodologies and samples, no strong conclusions about its effectiveness can be made. Of the 9 stage matched interventions, 5 supported a cause and effect relationship between tailored interventions and positive outcomes. When comparing the quality of those studies that supported tailored interventions to those that did not support them, the former appeared to have fewer threats to internal validity and more often used experimental or quasi-experimental designs. Self-efficacy and decisional balance constructs were related to stage of change. Greater self-efficacy and higher outcome expectancy of condom use were associated with progression to later stages. Horowitz declares that the internal consistency of TTM constructs has been satisfactorily supported in the research.</p>
<p>Criticism of conclusions?</p> <p>The framework for analysing study designs and outcomes according to the author was ultimately subjective although it was systematic.</p>
<p>Evidence of effect in sub-groups?</p> <p>Horowitz states that more research is needed on the measurement of stage membership for condom use adoption in diverse populations, for different types of sexual intercourse, and for main and other sexual partners. In the studies reviewed, different samples contained varying percentages of Caucasians, African Americans and Hispanics but no studies compared stage distribution or intervention effects specifically by race.</p>
<p>Strengths/weaknesses of the evidence</p> <p>Although the majority of intervention studies reported a movement individuals toward action and maintenance stages for safer sex knowledge, self-efficacy and practices, no study provided data for all 5 stage distributions.</p>
<p>Results generalisable to the UK?</p> <p>Non-UK studies but likely to apply to UK settings</p>
<p>Recommendations for future research</p> <p>The author suggests that studies are required to validate the measurement of stage membership for condom use adoption in diverse populations, for different types of sexual intercourse, and for main and other sexual partners. There are also needs of standardisation of adoption stages and staging algorithms used in studies. Researchers must provide better descriptions of how the processes of change are operationalised. A meta-analysis of studies evaluating TTM based pregnancy and STD prevention programs to quantitatively assess the literature.</p>
<p>Cost-effectiveness data None stated</p>
<p>Policy implications None stated</p>
<p>Implications for practice</p> <p>The author states that although knowledge of the TTM advances, practitioners need to recognise its limitations. Using peer leaders trained in STD and pregnancy risk reduction strategies could be an effective way to change knowledge, attitudes and behaviours in middle and high school students. Interventions must address sexual relationships and disease outcomes and target men and women's needs separately to be more effective.</p>
<p>Comments Rating score 2-B</p>

Reference ID 412	Data extracted by NC	Date of extraction 27.4.06
Author(s) Marshall S J & Biddle S J H		
Year 2001		
Title The Transtheoretical Model of Behavior Change: A Meta-Analysis of Applications to Physical Activity and Exercise		
Source Annals of Behavioral Medicine		
Type of study Systematic review (meta-analysis)		
Research question(s) What are the findings from empirical applications of the TTM in the physical activity domain?		
Databases/sources searched MEDLINE, PSYCLIT, Sports Discuss, UnCover and a manual search		
Years searched 1983-2000		
<p>Inclusion criteria Studies were included if they applied to, empirically, at least one of the core constructs of the TTM to physical activity, exercise behaviour or both (i.e. a staging algorithm with a concurrent physical activity measure, decisional balance, self-efficacy, processes of change). Studies that included other variables considered by expert review to represent a proxy measure of a core construct were also included. In particular, measures of PBC were used in the absence of self-efficacy measures, physical activity attitude measures were used in the absence of Pro scales and barriers to exercise measures were used in the absence of Con scales.</p> <p>Exclusion criteria Non-English language studies. Samples that included only a stage of change measure or used a continuous measure to stage participants were omitted from the meta-analysis.</p>		
Number of studies 71 published reports with 91 independent samples		
Number of participants 74,965		
Method of analysis Meta-analysis		
<p>What data extracted?</p> <p>Data extracted: sample, study design, setting, sampling method, recruitment method, publication status, gender, age, country, number of participants, criterion for action, stage of change measure, process of change measure, self efficacy measure and concurrent measure of physical activity.</p> <p>For study coding purposes, measures of exercise pros were grouped into 3 categories: behavioural belief measures (expectancy x value), benefits of exercise scales, and the Pros scale from the Decisional Balance Questionnaire. Exercise cons measures were grouped into 2 categories: barriers to exercise and the Cons scale from the Decisional Balance Questionnaire. Self-efficacy measures were grouped into 3 categories; Short-term Likert measures, long-item Likert measures, and perceived behavioural control items.</p>		
<p>Results</p> <p>All analyses were conducted using the effect size estimate Cohen's d with the adjustment computations proposed by Hunter & Schmidt. After the correction for sampling error, measurement error, and study weighting, 5 summary statistics were computed for each construct at each stage transition: mean sample weighted corrected effect size, mean sample size weighted total variance of corrected effect size, mean sample weighted error variance of corrected effect size, variance of population effect sizes, and standard deviation of population effect sizes. The homogeneity of mean corrected effect sizes for each construct at each stage transition was examined to determine if the variability in outcomes was greater than expected from sampling error and measurement error. Of the 71 published reports, 54 used a cross-sectional design, 6 were longitudinal, 10 were quasi experimental and 1 was a RCT. The</p>		

proportion of individuals in each stage differed depending on the criteria used to define regular physical activity. Consistent with the predictions of the TTM, the level of physical activity increased as individuals moved to a higher stage of change. As expected the largest effect was evident for preparation to action ($d=0.85$) the point at which individuals begin to meet an established criterion for physical activity. Effect estimates for self-efficacy across the stage transitions were all positive and significant, suggesting that confidence to be active increases with each stage of change, as proposed by the TTM. However in contrast to theoretical predictions the pattern of increase appeared nonlinear, with effects characterised as moderate (precontemplation to contemplation), small to moderate (contemplation to preparation), moderate (preparation to action), and moderate to large (action to maintenance). All effect estimates for behavioural pros were significant and positive suggesting that perceived benefits of change increase for every forward stage transition. Of the 40 effect sizes presented 25 are statistically different from zero. Across all processes of change the largest effects were evident from precontemplation to contemplation (d range = 0.55-1.18), then from preparation to action (d range = 0.27-0.72).

Conclusions

Three general conclusions are offered. First, existing data are unable to confirm whether physical activity behaviour change occurs in a series of stages that are qualitatively or along adjacent segments of an underlying continuum. Second, the growing number of studies that incorporate TTM concepts means that there is an increasing need to standardise and improve the reliability of measurement. Finally, the role of processes of change needs reexamining because the higher order constructs are not apparent in the physical activity domain and stage by process interactions are not evident. There are now sufficient data to confirm that stage membership is associated with different levels of physical activity, self-efficacy, pros and cons, and processes of change.

Criticism of conclusions?

The authors state that due to the cross-sectional nature of the data it is uncertain whether changes in process use actually facilitate or inhibit stage progression. Few studies are available that make process-specific predictions at each stage of change.

Evidence of effect in sub-groups?

Younger samples (< 25 years) had fewer individuals in precontemplation (3%) but more in preparation (31%) and action (18%) than other age groups. Samples of seniors (55+) had the most individuals in maintenance (46%).

Strengths/weaknesses of the evidence

None stated. Heterogeneity of the studies in terms of study design and stage of change measures.

Results generalisable to the UK?

Yes, includes UK studies

Recommendations for future research

Further studies that simply stage participants or examine cross-sectional differences between core constructs of the TTM are of limited use. Future research should examine the moderators and mediators of stage transition.

Cost-effectiveness data None stated

Policy implications None stated

Implications for practice

The authors state that the timing of the “balance point” between behavioural change pros and cons per se is of limited clinical value because the point at which the pros of change begin to outweigh the cons has not shown to be a consistent temporal marker of actual behaviour change in the physical activity domain.

Comments Rating score 2-A

Reference ID 538	Data extracted by NC	Date of extraction 24.4.06
Author(s) Riemsma R P et al	Year 2002	
Title A Systematic Review of the Effectiveness of Interventions Based on a Stages-of-Change Approach to Promote Individual Behaviour Change		
Source Health Technology Assessment		
Type of study Systematic review		
Research question(s) What is the effectiveness of interventions using a stage-based approach in bringing about positive changes in health-related behaviour?		
Databases/sources searched AMED, ASSIA, BIOSIS, BEI, BLC, BNI, CAB-Health, CINAHL, CL, CPI, DARE, DH-Data, DA, EconLIT, EMBASE, EPPI, ERIC, HEBS, HealthPromis, UD, HEED, HELMIS, HTA, ISTEP, IBSS, KF, MANTIS, MEDLINE, MHA, NHS EED, NRR, PSYCLIT, SCI, SIGLE, SSCI, SA; and ancestry		
Years searched From inception to May 2000		
Inclusion criteria RCTs evaluating interventions, that aimed to influence individual health behaviour, used within a stages-of change approach were eligible for inclusion. Only studies that reported health-related behaviour change such as smoking cessation, reduced alcohol consumption or dietary intake and stage movement were included. The target population included individuals whose behaviour could be modified, primarily in order to prevent the onset, or progression, of disease. There was no limitation of study by country of origin, language or date.		
Exclusion criteria Not stated		
Number of studies 37		
Number of participants 41,676		
Method of analysis Narrative synthesis		
What data extracted? The data extracted included: author, date, country and language, stage of change information and any other information relating to the theoretical basis of the intervention, intervention details, participants - including details of how participants were classified into the stages of change, and the validity and reliability of the measures used, details of the study design, results - behaviour change, stage movement, physiological changes, intermediate outcomes, documentation of the way an intervention operates in practice and cost-effectiveness. Health-related behaviour change such as smoking cessation, reduced alcohol consumption or dietary intake was the primary outcome measure. Secondary outcomes included: assessment of stage movement; health-related outcomes such as blood pressure, serum cholesterol levels and body weight; intermediate outcomes such as beliefs, attitudes and self-efficacy; patient satisfaction; any adverse effects resulting from the intervention; as well as data assessing the cost-effectiveness of behaviour change interventions. Necessary outcomes for trial inclusion included behaviour change or stage movement.		
Results 3 studies evaluated interventions aimed at prevention (2 for alcohol consumption and 1 for cigarette smoking). In 13 trials the interventions were aimed at smoking cessation, 7 studies were evaluated interventions aimed at the promotion of physical activity, and 5 studies evaluated interventions aimed at dietary change. 6 trials evaluated interventions aimed at multiple lifestyles changes. 2 studies evaluated interventions aimed at the promotion of screening mammography, and 1 study evaluated an intervention aimed at the promotion of treatment adherence. Quality assessment was carried out using		

an existing quality assessment tool (NHS Centre for Reviews and Dissemination 2001) rating the methodological quality of the studies and the quality of the implementation. Methodological quality of the trials was mixed, and ranged from 2 to 11 out of the 13 quality items. The main problems were lack of detail on the methods used to produce true randomisation; lack of blinding of participants, outcome assessors and care providers; and failure to use intention to treat analysis. The main issue with the quality of the implementation was lack of information on the validity of the instrument used to assess an individual's stage of change. In 1 of the 13 trials aimed at smoking cessation the results could not be compared to a non-stage based intervention, because only stage-based interventions were included. In 4 of the remaining 12 smoking cessation trials, significant differences favouring the intervention group for scores on quit rates were found; in 3 of these the comparator was a usual care control group and in 1 a non-stage based intervention. 1 study showed mixed outcomes. In the remaining 7 smoking cessation trials no significant differences between groups in behavioural change outcomes were found. 1 of the 7 trials aimed at the promotion of physical activity did not report any data on behaviour change. 3 trials found no significant differences between groups in behavioural change outcomes. 2 trials showed mixed effects, and 1 trials mainly showed significant effects in favour of the stage based intervention. 2 of the 5 trials aimed at dietary change reported significant effects in favour of the stage-based intervention; in 1 trial this was in comparison to a non-stage based intervention and in the other to a usual care control group. 2 trials showed mixed effects and in 1 trial no significant differences between groups in behavioural change outcomes were found. 3 of the 6 studies aimed at multiple lifestyles changes showed no differences between groups for any outcomes included. 2 studies showed mixed effects, and 1 study showed positive effects for all outcomes included: smoking cessation, fat intake and physical activity. 1 of the 2 trials aimed at the promotion of screening mammography found no significant differences between groups for nearly all outcomes. The other trial showed a significant difference in favour of the stage based intervention. The trial aimed at the promotion of treatment adherence showed significant results in favour of the stage based intervention. 2 out of 3 trials aimed at prevention showed no significant differences between groups for any measure of behaviour change. The other trial showed mixed outcomes.

Conclusions

Overall, there appears to be little evidence to suggest that stage based interventions are more effective compared to non-stage based interventions. Similarly there is little evidence that stage based interventions are more effective when compared to no intervention or usual care. Out of 37 trials 17 showed no significant differences between groups, 8 trials showed mixed effects, and 10 trials showed effects in favour of the stage based intervention(s). 1 trial presented no data on behavioural outcomes, and another included stage based interventions only. 20 trials compared a stage based intervention with an non-stage based intervention, 10 trials reported no significant differences between groups, 5 reported mixed effects and 5 reported significant effects in favour of the stage based intervention. The authors conclude that there does not seem to be any relationship between the methodological quality of the study, the targeted behaviour or quality of the implementation and effectiveness of the stage based intervention.

Criticism of conclusions?

The methodological quality of the included studies was mixed and there was little consistency on the types of interventions employed once participants were classified into stages and little knowledge about the types of interventions needed once people were classified.

Evidence of effect in sub-groups?

Studies with low income participants tended not to report effects favouring the stage based intervention. Other study characteristics, such as number of respondents, age and sex of respondents, year of publication, setting and verification of outcome measures, seemed to have little relationship with the effectiveness of the stage based intervention.

Strengths/weaknesses of the evidence

Few studies mentioned validation of the stages of change instrument, often the description of the intervention was so limited according to the authors that it was unclear whether the intervention was properly stage based.

Results generalisable to the UK?

Yes, 7 of the studies were UK based.

Recommendations for future research

There is a need for well-designed and appropriately implemented RCTs that are characterised by tailored interventions derived from accurate stage measurement, and which involve frequent reassessment of readiness to change in order to permit evolving, stage-specific interventions.

Cost-effectiveness data

4 of the studies included an economic evaluation. Two were related to smoking cessation, in the first, the costs of motivational consulting were calculated as the costs of training plus the costs of longer consultations. The marginal costs per quitter were assessed and costs were compared for other outcomes. The marginal cost per quitter was estimated at £450.64. In the other trial, advice to stop smoking given by pharmacy personnel trained in the stage of change model was compared with advice to stop smoking given by personnel who had not had this training. The total costs of the intervention were estimated at £14,915.76, while the total costs for the control group were estimated at £14,121.13. The incremental cost-effectiveness ratios for the intervention were estimated at £300 per quitter and £83 per life year. In one of the multiple lifestyle changes categorised studies it was stated that the actual cost of the intervention were assessed and would be used to compute cost-effectiveness, defined as the cost per unit of behaviour and organisational change. However these data were not reported. The last study to include an economic evaluation was a mammography screening and treatment adherence categorised study. The cost analysis was based on a separate non-randomised trial in which a multiple outcall strategy promoting screening mammography was compared with strategies involving a single outcall alone, an advance card plus single outcall, and no intervention. However the effectiveness data the effectiveness data for the 3 comparison groups came from the randomised trial included in this review. Although the multiple outcall intervention was more costly to deliver (US \$14.84 per participant compared with about US \$7 for the single outcall interventions) it cost considerably less per participant converted from non-adherent to adherent. When 40% of the population is non-adherent at the baseline, the costs of delivering the programme to 1000 participants would be US \$5768, \$6868 and \$10,088 for the single outcall, and multiple outcall interventions, respectively. The cost per participant who changes were US \$288, \$390 and \$154 respectively.

Policy implications

Policy makers need to recognise that this approach has a status which appears to be unwarranted when it is evaluated in a systematic way.

Implications for practice

Practitioners need to recognise that this approach has a status which appears to be unwarranted when it is evaluated in a systematic way.

Comments Rating score 1++A

Reference ID 539	Data extracted by NC	Date of extraction 18.4.06
Author(s) Riemsma R P et al	Year 2003	
Title Systematic Review of the Effectiveness of Stage Based Interventions to Promote Smoking Cessation		
Source British Medical Journal		
Type of study Systematic review		
Research question(s) What is the effectiveness of interventions using a stage based approach in bringing about positive changes in smoking behaviour?		
Databases/sources searched 35 electronic databases, catalogues and internet resources. Bibliographies of retrieved references were scanned for other relevant publications.		
Years searched From inception to July 2002		
Inclusion criteria RCTs evaluating the effectiveness of stage based interventions in influencing smoking behaviour - such as actual behaviour change or movement through different stages.		
Exclusion criteria No restrictions were applied to participants other than they had to be smokers, and there were no restrictions on language or publication date.		
Number of studies 23		
Number of participants Not stated. 4 studies had <100, 8 had 101-500, 4 had 501-1000 and 7 had >1000		
Method of analysis Narrative synthesis		
What data extracted? Extracted data included smoking behaviour, movement through stages, adverse effects and cost effectiveness.		
Results Each trial was assessed for the methodological quality and the quality of the implementation of the intervention. The methodological quality of the studies was assessed on a 13 item criteria score. The methodological quality of the studies varied from 2 to 12 points on their criteria score. The main limitations were: lack of blinding of participants, outcome assessors, or care providers; lack of details about methods of randomisation and concealment of allocation; failure to report a sample size calculation, point estimates, and measures of variability; poor follow up; and no intention to treat analysis. The main problem with the quality of the implementation was the lack of information about the validity of the instruments used to assess stage of change. 8 trials found statistically significant differences in cessation rate in favour of the intervention group. In 12 trials no statistically significant differences between groups in smoking behaviour after the intervention was found. In 3 studies the findings were inconclusive. Only 10 trials reported movement through stages as an outcome.		
Conclusions Stage based interventions in smoking cessation were found to have only limited evidence for their effectiveness.		
Criticism of conclusions? The authors were not able to pool the studies as they were too heterogeneous for interventions, participants, settings, and outcomes.		

Evidence of effect in sub-groups? None
Strengths/weaknesses of the evidence The effectiveness of any stage based intervention depends on accurate classification of a participant's particular stage of change. However only 2 of the studies used a previously validated instrument.
Results generalisable to the UK? Non-UK studies but likely to apply to UK settings
Recommendations for future research Methodologically sound and theoretically consistent intervention studies are required to assess adequately the efficacy of stage based approaches to changing smoking behaviour.
Cost-effectiveness data 2 trials included an economic evaluation. In a 1999 study evaluating the effects of motivational consulting delivered by GPs, the marginal cost per person who quit was estimated at £450.65. In another 1999 study in which pharmacists tailored advice on smoking cessation, the incremental cost effectiveness ratio for the intervention was estimated at £300 per person.
Policy implications None stated
Implications for practice Limited evidence exists for the effectiveness of stage based interventions when compared with non-stage based or no interventions in changing smoking behaviour.
Comments The approaches reviewed are stage based but no reference is made to the TTM. Rating score 1-B

Reference ID 1474	Data extracted by NC	Date of extraction 19.4.06
Author(s) Sheeran P & Taylor S	Year 1999	
Title Predicting Intentions to Use Condoms: A Meta-Analysis and Comparison of the Theories of Reasoned Action and Planned Behaviour		
Source Journal of Applied Social Psychology		
Type of study Systematic review (meta analysis)		
Research question(s) What is the relationship between intentions to use condoms and 23 predictor variables (3 background factors: gender, age and number of sexual partners; 1 personality factor: assertiveness; 11 variables derived from the HBM: perceived vulnerability, worry about HIV/AIDS, perceived severity, perceived benefits, perceived condom effectiveness, perceived barriers, condom attractiveness, interpersonal consequences of condom use, purchase embarrassment, cues to action; and 5 variables derived from the TRA and TPB: attitudes, subjective norms, descriptive norms, sexual partner norms, and self-efficacy) employed in studies?		
Databases/sources searched PSYCLIT, Social Science Citation Index and MEDLINE		
Years searched Jan 1981-Jan 1997		
Inclusion criteria 1) Studies had to include at least one predictor variable and a measure of intention to use condoms. 2) A bivariate statistical relationship between a predictor variable and intentions to use condoms had to be retrievable from studies.		
Exclusion criteria Studies which did not disaggregate intended condom use from general safer sex intentions were excluded.		
Number of studies 56 (67 samples)		
Number of participants 25,398		
Method of analysis Meta-analysis		
What data extracted? Data were extracted on the study characteristics, the sample sizes, age and gender, as well as the variables.		
Results The effect size estimate employed was the weighted average of the sample correlations, r^+ . Homogeneity analyses were conducted using the chi-squared statistic. Cohen (1992) guidelines for assessing the size of sample-weighted average correlations were used to interpret the findings ($r^+ = .10$ is small, $r^+ = .30$ is medium and $r^+ = .50$ is large). Background and personality variables had small average correlations with intentions to use condoms. Gender had a small positive correlation with behavioural intentions, indicating that women were more likely to use condoms than men. Age was negatively correlated with intentions. Younger people were more likely to intend to use condoms than were older people. Number of sexual partners and assertiveness both had positive correlations with intention. 10% of studies investigated knowledge of HIV/AIDS. A small to medium positive correlation obtained, indicating that participants with greater knowledge had greater intention to use condoms than less knowledgeable participants. Average correlations for other components of the HBM were also small to medium in magnitude. The perceived effectiveness of condoms in preventing infection with HIV/AIDS had a small correlation with intentions to use one. Perceived barriers had a small to medium negative correlation with intentions indicating that greater perceived barriers to use were associated with less intention to use condoms. The average correlations for cues to action and		

<p>previous experience of an STD were both non-significant, although exposure to STD/AIDS education campaigns had a small positive correlation with behavioural intentions. Almost half of all studies included in the review measured attitudes toward condom use, and this variable had a highly reliable positive average correlation with behavioural intentions. Subjective norms were measured in the same number of studies and had a similar effect size. Positive attitudes and supportive subjective norms were both associated with greater intentions to use condoms. Self-efficacy/PBC had a medium effect size. Greater perceived confidence in or control over performing the behaviour was associated with stronger intentions to use condoms.</p>
<p>Conclusions The most important findings were that background, personality, and HBM variables generally had small associations with intentions to use condoms. Variables specified by the TRA and TPB on the other hand had medium to strong average correlations with condom use intentions, indicating that these models provide an empirically validated framework for predicting and understanding motivation to use condoms. Knowledge of HIV/AIDS and perceptions of the threat of disease operationalised in terms of perceived seriousness had only modest associations with motivation. Similarly background and personality factors had small effect sizes. These findings indicate that perception of the behaviour (condom use) rather than perceptions of the disease have the greatest impact on condom use motivation.</p>
<p>Criticism of conclusions? The authors point out that they were not able to compare the average correlations for subjective, descriptive and sexual partner norms because of the considerable overlap in the particular studies which measured these variables.</p>
<p>Evidence of effect in sub-groups? Refer to results</p>
<p>Strengths/weaknesses of the evidence Meta-analysis does not determine whether a particular variable has a significant relationship after the effects of other variables have been controlled. In this study the authors state that it would have been useful to determine whether past behaviour and self-efficacy/PBC influence intentions over and above the effects of attitudes and subjective norms.</p>
<p>Results generalisable to the UK? Yes, includes UK studies, 25% of the overall sample involved Western European participants</p>
<p>Recommendations for future research Future research is recommended that examines whether TPB variables are capable of breaking the link between past behaviour and intentions to use condoms in the future.</p>
<p>Cost-effectiveness data None stated</p>
<p>Policy implications None stated</p>
<p>Implications for practice None stated</p>
<p>Comments Rating score 2-A</p>

Reference ID 607	Data extracted by NC	Date of extraction 27.4.06
Author(s) Spencer L et al	Year 2002	
Title Applying the Transtheoretical Model to Tobacco Cessation and Prevention: A Review of Literature		
Source American Journal of Health Promotion		
Type of study Systematic review		
Research question(s) How is the validity of the TTM as applied to tobacco supported by research? How does the TTM describe special populations regarding tobacco use? What is the nature of evidence supporting the use of stage-matched tobacco interventions?		
Databases/sources searched PSYCINFO, MEDLINE, Current Contents, ERIC, CINAHL and Pro-Quest Nursing, and hand searching		
Years searched To 1 March 2001 (no starting date provided)		
Inclusion criteria All English, original, research articles on the TTM as it relates to tobacco use published in peer-reviewed journals prior to 1 March 2001 were included.		
Exclusion criteria Commentaries, editorials and books were not included		
Number of studies 148 articles including 54 validation studies, 73 population studies and 37 interventions		
Number of participants Approximately 355,076 (in paper articles duplicated across categories)		
Method of analysis Narrative synthesis		
What data extracted? The reviewed articles were categorised according to purpose using: construct validation, population, and intervention. Data extracted included: authors, study design category, purpose, subject characteristics, methods, variables measured, findings and implications.		
Results The research design of individual studies was rated from grade A - well designed controlled trials to grade E - expert opinion and the internal validity of individual intervention studies was also rated from good- meets all criteria for internal validity, to fair - does not meet all criteria, and poor - one or more fatal flaws, results may not be valid. The overall criteria, for rating the body of literature ranged through 5 stages from conclusive - many well designed experimental and quasi-experimental studies, to weak - studies supporting a cause and effect relationship between an intervention and outcome are poorly designed, non-experimental or lack proper operationalisation. The rating criteria for construct validity addressed the theoretical derivation of the construct, reliability of the construct, analysis of group differences and changes over time, generalisability across contexts and comparison to rival theories. Overall, the evidence in support of the TTM as applied to tobacco use was strong, with supportive studies being more numerous and of a better design than non-supportive studies. Using established criteria the construct validity of the entire body of literature was rated as good. However notable concerns exist about the staging construct. A majority of stage matched intervention studies provided positive results and were of better quality than those not supportive of stage matched interventions. Thus, the authors rated the body of literature using stage matched interventions as acceptable and the body of literature using non-stage matched interventions as suggestive. Population studies indicated that TTM constructs are applicable to a wide variety of general and special populations both in and outside of the US, although a few exceptions exists.		

<p>Conclusions</p> <p>Evidence of the validity of the TTM as it applies to tobacco use is strong and growing, however it is not conclusive. 8 different staging mechanisms were identified, raising the question of which are most valid and reliable. Interventions tailored to a smoker's stage were successful more often than non-tailored interventions in promoting forward stage movement. Based on their rating criteria the authors conclude that the construct validity of the TTM is good.</p>
<p>Criticism of conclusions?</p> <p>The authors state that although they used a systematic framework for analysing and rating study designs and outcomes, ultimately it was based on their judgements. They also state that they could have unintentionally overlooked some studies.</p>
<p>Evidence of effect in sub-groups?</p> <p>The TTM appears to apply to young people who smoke as it does to adults, however they may be less likely to use the experimental/cognitive processes of change than the behavioural ones. Studies of the TTM, tobacco use and gender differences, age differences, racial differences, pregnancy and income level provided mixed results, with few suggesting differences in TTM constructs based on these demographic variables. Of each of these subject groups, pregnant smokers were studied most often. Although TTM constructs applied to them as it did the general population there were few differences.</p>
<p>Strengths/weaknesses of the evidence</p> <p>A criticism of the stages of change construct is that it might not represent true stages that can be discreetly categorised, where forward movement from one stage is caused by different variables than those that cause forward movement from another stage. This also leads to another question as to whether stages are better measured by a continuous scale than a categorical measure.</p>
<p>Results generalisable to the UK?</p> <p>Yes, includes UK studies</p>
<p>Recommendations for future research</p> <p>The authors state that stage distribution is well-documented for US populations, however more research is needed for non-US populations, for special populations and on other TTM constructs. More research is needed on the staging of smokers, subgroups within stages and differences in how the model is applied in mass public health interventions vs. individualised counselling interventions. Clarification of how the processes of change are operationalised in studies that measure them is also needed. More research is needed to validate the measurement of stage membership, better descriptions of how the processes of change are operationalised are needed, research should focus on the application of the TTM in individualised interventions through the use of case study methods, and meta-analyses of studies evaluating TTM based tobacco cessation programs would offer a quantitative assessment of the literature.</p>
<p>Cost-effectiveness data None stated</p>
<p>Policy implications None stated</p>
<p>Implications for practice</p> <p>Practitioners need to be aware that the TTM is continuing to evolve, those using it should be aware of new developments in the model as they occur.</p>
<p>Comments</p> <p>The outcome measures used in each study are stated and each uses a method of assessing the individual's stage of change (8 staging mechanisms were identified). Some of the studies also included objective measures such as saliva samples.</p> <p>Rating score 2+A</p>

Reference ID 1576	Data extracted by NC	Date of extraction 19.4.06
Author(s) van Sluijs E M F et al	Year 2004	
Title Stage-Based Lifestyle Interventions in Primary Care. Are they Effective?		
Source American Journal of Preventive Medicine		
Type of study Systematic review		
Research question(s) What is the effect of stages of change based interventions in primary care on smoking, physical activity and dietary behaviour?		
Databases/sources searched MEDLINE, PSYCINFO and EMBASE		
Years searched From inception to July 2002		
<p>Inclusion criteria</p> <ol style="list-style-type: none"> 1) RCT/CT, 2) Intervention initiated in primary care, and 3) Intervention aimed at changing smoking, physical activity, or dietary behaviour, and stages of change based outcomes, and 4) Behavioural outcomes. <p>Every medical setting providing directly accessible health care to the general population was defined as primary care. The advice did not have to be verbal but could have been computerised or given as written material. Studies were included if it could be established that a comparison was made between an intervention group, which received a TTM based behavioural intervention, and a no intervention or usual care group.</p> <p>Exclusion criteria Restricted to published trials that investigated the effectiveness of lifestyle advice initiated from primary care and that was based on the stages of change construct. Studies were excluded when the intervention involved additional aids e.g. nicotine gum or free tickets to a sporting facility. The intervention had to concentrate on at least one of the chosen three lifestyle behaviours (smoking, nutrition, and physical activity) and should have been given to an adult population (older than 18 years). The selection was not restricted to language.</p>		
Number of studies 29		
Number of participants 6,474		
Method of analysis Narrative synthesis		
<p>What data extracted?</p> <p>Data extracted on the randomisation procedure, baseline characteristics, loss to follow up, blinding, timing of the measurements, length of the follow up, and on the statistical analyses. Data were also extracted on the effectiveness to assess the levels of evidence, the number of included patients and the number of patients positively changing their behaviour, as well as data on the number and mean age of the included participants, main inclusion criteria, the effect of the intervention on both behaviour and on the stage of change, and details about the specific intervention.</p>		
<p>Results</p> <p>Two methods for assessing the effectiveness of the interventions were used, namely a best evidence synthesis and odds ratios. Odds ratios were calculated to compare the odds of the intervention group positively changing behaviour at follow up with those of the control group. A rating system for the levels of evidence, based on previously used best evidence syntheses was used to determine the effectiveness on the main behavioural outcome measure and on stages of change. The quality assessment scale was developed by combining previously used scales. Methodological quality was assessed in four dimensions: quality of the study design (randomisation and control conditions);</p>		

<p>research population (research groups comparable at commencement of the intervention and dropout described and acceptable); quality of the measurements (if the person conducting the measurements was blinded to group assignment, respondent blinded to group assignment, timing of measurements comparable for the different research groups, and if the length of the follow-up is described and acceptable); and quality of the analysis (intention to treat analysis and control for potential confounders). Possible score on each item was positive, negative or unknown (insufficiently described), which could lead to a perfect score of 10 (9 for CTs). The methodological quality of the studies overall was good, with quality scores attained ranging from 4 to 10 for the RCTs and 4 to 8 for the CTs. Only 7 studies (4 RCTs and 3 CTs) were of low quality (score of 5 or less). Of the 13 studies promoting physical activity, 8 were high quality RCTs, 2 were CTs of high quality and 2 RCTs and 2 CTs were of low quality.</p> <p>These studies found no evidence of changes in the stages of change at short, medium and long-term follow up. Short term characterised as less than 6 months, medium term (6 months) and long term (longer than 6 months). In terms of the level of physical activity as the outcome results were inconsistent, with no evidence for effect at short, medium or long-term follow up. Of the 14 studies aimed at smoking cessation interventions 9 were high quality RCTs, 2 CTs of high quality and 1 low quality CT. In terms of changes in the stages of change there was no evidence for effect at short and long-term follow up, and limited evidence for an effect at medium-term follow up. Using quitting smoking as the outcome there was no evidence for effect at short, medium or long-term follow up. Of the 5 studies aimed at dietary interventions they were all rated as high quality RCTs. There was limited evidence of change in the stages of change for fat intake, at short-term follow up and no evidence at medium and long-term follow up. However there was strong evidence for an effect of a stage based intervention on fat intake at short-term and long-term follow up, but no evidence for an effect at medium-term follow up.</p>
<p>Conclusions</p> <p>No evidence was found for an effect on the level of physical activity, there was limited to no evidence for an effect of the stage based smoking cessation interventions on quit rates and on stages of change. However the studies on dietary behaviour paint a positive picture for the effect of stage based interventions on dietary behaviour or more specifically on fat intake. The authors conclude that there is strong evidence for an effect at short and long-term follow up.</p>
<p>Criticism of conclusions?</p> <p>The authors point out that it is possible that they did not identify all trials published. Additionally, they state that there is no worldwide accepted definition of primary care and that the organisation of primary care differs. They also state that the items in their evidence hierarchy (4 levels) are to some extent arbitrary as there is no consensus on which criteria should be used for assessing methodological quality of RCTs and CTs. Because of the heterogeneity of the interventions and outcome measures used the authors decided not to calculate and compare effect sizes. Although they established that all the interventions were based on the TTM model the extent to which this was the case was not systematically assessed and included in the conclusions, therefore a conclusion as to whether the interventions more accurately based on the TTM model produce better results could not be drawn.</p>
<p>Evidence of effect in sub-groups? None</p>
<p>Strengths/weaknesses of the evidence</p> <p>The authors highlight the criticisms in the literature of the stages of change as basis for interventions: questions on the internal validity of the model and the transition stages of change model from cessation activities to initiation activities, as well as misclassifications in self-report of stages of change for physical activity and dietary behaviour. They also acknowledge that the reduction of a complex behaviour to a small aspect such as reducing dietary fat intake instead of on the general concept of healthy eating, might explain some of the observed differences in effect.</p>
<p>Results generalisable to the UK?</p> <p>Non-UK studies but likely to apply to UK settings</p>
<p>Recommendations for future research None stated</p>
<p>Cost-effectiveness data None stated</p>

Policy implications None stated

Implications for practice

The stages of change model enables the primary care practitioner to obtain important information for behaviour change in a short period of time, and they conclude that it seems to be a logical basis for behaviour change intervention.

Comments

The outcome measures used in each study are stated varying between studies from assessment of the stage of change and level of physical activity to the number of sessions of exercise in the past 4 weeks.
Rating score 2++B

4. How effective has each model been shown to be at predicting changes in knowledge, attitudes and/or behaviour in these areas?

Reference ID 6	Data extracted by NC	Date of extraction 20.4.06
Author(s) Adams J & White M		Year 2003
Title Are Activity Promotion Interventions Based on the Transtheoretical Model Effective? A Critical Review		
Source British Journal of Sports Medicine		
Type of study Systematic review		
Research question(s) Are activity promotion interventions based on the transtheoretical model effective?		
Databases/sources searched MEDLINE and PSYCINFO		
Years searched 1982-2001		
Inclusion criteria 1) An intervention explicitly based on the TTM that aimed to promote physical activity levels 2) Study participants were adults and living within the community 3) Some assessment of physical activity levels both before and after the intervention Exclusion criteria Non English language studies		
Number of studies 26 papers documenting 16 intervention programmes		
Number of participants 7,465		
Method of analysis Narrative synthesis		
What data extracted? Nature of sample completing the study, the study country, the study design, details of the experimental intervention, the control conditions if applicable, the follow-up period and the study results.		
Results The review extracted the results given for the studies under review and then stated whether the interventions had been effective (any evidence of superiority of TTM based intervention compared with control in terms of stage progression or activity levels using a significance level of $p < 0.05$) over the short-term (over 6 months or less) and long-term (more than 6 months). The TTM based activity promotion programmes reviewed generally found some short-term benefit in terms of activity levels to stage of activity change. Longer-term effects seemed to be harder to achieve and therefore the authors question the overall benefit of these programmes. One of the studies highlighted that the intervention was most effective in people originally in the contemplation stage of activity change. A number of studies reported an intervention effect on stage of activity change without a concurrent effect on actual activity levels.		
Conclusions 73% of short term studies reported a positive effect of TTM based interventions over control conditions, whereas only 29% of long term studies did.		
Criticism of conclusions? The review may not include all reports published in this area. There is significant heterogeneity in the		

programmes reviewed in terms of the intervention design, recruitment methods, participants recruited, outcome measures, length of follow up and results reported. This highlights the many different ways in which the TTM can be interpreted for intervention design.

Evidence of effect in sub-groups? None

Strengths/weaknesses of the evidence

One of the studies was uncontrolled, and there were high levels of sample attrition within the studies. A number of the studies reviewed reported that despite initial recruitment of representative samples, the subjects who completed all follow-up measurements were primarily white, middle class, female and regularly active. Long-term studies are much less likely to be performed. Less than half of the studies reviewed carried out follow up beyond 6 months. There were numerous different methods of measuring physical activity used within the studies, none of which the authors claim were necessarily valid, all measuring slightly different constructs.

Results generalisable to the UK?

Yes, includes 7 studies based in the UK

Recommendations for future research

Future work according to the authors should focus on: comparative work to determine the most effective TTM based activity promotion interventions, careful design and evaluation of interventions to confirm that people in each stage of activity change receive a tailored and effective intervention, innovative strategies to recruit and retain candidates who are hard to reach, including people in all stages of activity change, measuring physical activity as well as stage of activity change and focusing on activity more than stage of change as an outcome measure, achieving adherence as well as adoption of increased activity levels and following up participants long enough to confirm this, investigating the effects of brief measurement interventions, developing standardised measures of physical activity and stage of activity change, ensuring treatment fidelity, assessing whether TTM based activity promotion counselling is any more effective than well delivered generic counselling, exploring whether a group of staged interventions allocated on the basis of the stage of activity change are any more effective than random allocation of the same group of interventions, and acknowledging the complexities of physical activity behaviour and incorporating this into interventions and outcome measures.

Cost-effectiveness data None stated

Policy implications None stated

Implications for practice

The authors suggest that a brief measurement intervention can have some effect and should perhaps be exploited in future intervention development.

Comments

Type of outcome measures (self-report or objective) used within the studies not stated
Rating score 2-A

Reference ID 12	Data extracted by NC	Date of extraction 20.4.06
Author(s) Albarracin D et al	Year 2001	
Title Theories of Reasoned Action and Planned Behaviour as Models of Condom Use: A Meta-Analysis		
Source Psychological Bulletin		
Type of study Systematic review (meta analysis)		
Research question(s) Can condom use behaviour be modelled on the basis of the theories of reasoned action and planned behaviour?		
Databases/sources searched PSYCLIT, Social Science Citation Index and the Educational Resources Information Center		
Years searched Not stated (reports that were available by June 1996 were considered for inclusion)		
<p>Inclusion criteria</p> <ol style="list-style-type: none"> 1) Studies that directly involved condom use 2) Studies that had a measure of either intention or behaviour or both. Composite measures of either intention or behaviour were accepted only when they concerned alternative condom use behaviours e.g. the average of intentions to use condoms with occasional and steady partners. 3) Eligible studies measured both attitudinal and normative factors 4) Eligible studies testing the theory of planned behaviour also included a measure of perceived behavioural control (PBC). They considered that a study measured PBC if it measured the extent to which a) participants can use condoms if they want to do so, b) using condoms is up to them and/or c) using condoms is easy or difficult 5) The presence of adequate statistics, associations between at least 2 of the cognitive and behavioural variables were required. Although studies did not always report complete correlation matrices, they were included if they reported the correlations or regressions coefficients among the factors that pertain to the relations in the theories of reasoned action and planned behaviour <p>Exclusion criteria If composite measures (refer to inclusion criteria) included factors other than condom use e.g. average of using a condom and engaging in a conversation about sexual history, the study was excluded.</p>		
Number of studies 42 papers containing 96 data sets		
Number of participants 22,594		
Method of analysis Meta-analysis		
<p>What data extracted?</p> <p>Each study was coded along several dimensions that described the the behaviour and population in question. Behavioural factors included: type of sex (e.g. vaginal), type of partner (e.g. steady). Population factors included: mean age of sample, percentage of males in each sample, risk level (e.g. higher risk including men who have sex with men, clients of STD clinics, injecting drug users, female sex partners of injecting drug users, sex workers, and multiple partnered homosexuals). From the studies correlations involving future behaviour, intentions, direct attitudes, direct norms, indirect attitudes, indirect norms and past behaviour were retrieved. The data-sets were divided on this basis where possible.</p>		
<p>Results</p> <p>Reported correlations were retrieved or derived from reports of multiple coefficients. In order to identify the relative contribution of attitudes, norms, and perceived behavioural control, the authors regressed intentions on attitudes, norms and perceived behavioural control. Even when regression coefficients could not be used to retrieve correlations, they were used to calculate average regression weights as reported in the studies. The weighted mean correlation between intention and future</p>		

behaviour was .45. The weighted mean correlation between behaviour and PBC was .24. Past behaviour was found to have a very small direct influence on future behaviour. Although attitudes were found to have direct influences on behaviour, they did not contribute over and above the impact of intentions. The multiple correlation coefficients when regressing intentions on attitudes and norms was .70, and the correlation between attitudes and indirect, belief based attitudes was .56.

Conclusions

The review indicates that the theories of reasoned action and planned behaviour are successful predictors of condom use. They found that people are more likely to use condoms if they have previously formed the corresponding intentions. These intentions to use condoms appear to derive from attitudes, subjective norms, and PBC. These attitudes and norms in turn appear to derive from outcome and normative beliefs. On the basis of the standardised root mean residual results, there were 2 samples for which the models did not fit well. The first sample was teenagers, which may suggest that the models fail to represent condom use amongst this population. The other sample was the lower risk populations (categorised as those individuals not defined as within the higher risk groups (i.e. men who had sex with men, clients of STD clinics, injecting drug users, sex workers and multiple partnered heterosexuals) and samples for whom the authors of the studies provided no information).

Criticism of conclusions?

The authors highlight the limitations of the review: the validity of condom use reports, potential effects of measurement unreliability, and effect heterogeneity. The heterogeneity of the correlations summarised across the works that provided effect sizes indicates the presence of behavioural, personal, situational or measurement factors that have the potential to increase some correlations and decrease others. No comments made of the quality of the reviewed studies.

Evidence of effect in sub-groups? Refer to conclusion

Strengths/weaknesses of the evidence

The review assumes that self-reported behaviours are accurate reflections of a person's actions.

Results generalisable to the UK?

Non-UK studies but likely to apply to UK settings, 9% of the studies performed in Europe

Recommendations for future research

The authors state that appropriately conducted baseline research will always provide the most valid information for guiding the development of interventions.

Cost-effectiveness data None stated

Policy implications None stated

Implications for practice

The authors state that, to the extent that condom use can be predicted successfully, practitioners ought to be able to improve the efficacy of interventions for targeted communities and individuals. The authors cite examples of the 2 theories inspiring a number of preventive efforts such as the CDC's AIDS Community Demonstration Projects. In addition to attempts to induce favourable attitudes and supporting social norms, interventions could be used to increase behavioural control among participants according to the authors.

Comments

Heterogeneity of the correlations extracted.
Rating score 2-B

Reference ID 26	Data extracted by NC	Date of extraction 19.4.06
Author(s) Armitage C J & Conner M		Year 2001
Title Efficacy of the Theory of Planned Behaviour: A Meta-Analytic Review		
Source British Journal of Social Psychology		
Type of study Systematic review (meta analysis)		
Research question(s) 1) What is the overall efficacy of the TPB? 2) What is the predictive validity of the TPB in relation to observed or self-reported behaviour? 3) What are the differences in the conceptualisation of intentions, and the evidence for discriminant validity between the constructs? 4) What is the role of the PBC as opposed to self-efficacy or perceived control over behaviour, and the proposed intention-PBC interaction? 5) What effect does measurement adequacy as a moderator of the subjective norm-intention relationship have, given that this construct has been found to be the weakest predictor in both the TRA and TPB?		
Databases/sources searched Ancestry and descendency, abstracting services, online computer searches, and browsing		
Years searched Up to the end of 1997 (no starting date provided)		
Inclusion criteria Not stated		
Exclusion criteria Unpublished studies		
Number of studies 161 papers containing 185 studies		
Number of participants Not stated		
Method of analysis Meta-analysis		
What data extracted? Data were extracted on 3 types of perceived behavioural control (PBC) measure: self-efficacy, PBC and perceived control over behaviour. Desires, intentions and self-predictions were coded according to the criteria discussed in Bagozzi (1992). Studies were also coded for measurements of the subjective norm component. These fell into 6 categories: multiple-item scale, single-item, general social pressure multiplied by motivation to comply, normative beliefs as direct predictors of intention, social support and unspecified.		
Results Of the 161 papers containing 185 independent empirical tests of the TPB, 44 contained prospective self-reported behaviour measures and 19 prospective measures of behaviour that were independently rated or were objective. Analyses were based on bivariate correlations. Across all behaviours the average multiple correlation of intention and PBC with behaviour, accounting for 27% of the variance. Overall PBC adds an average 2% to prediction of behaviour, over and above intention. The averaging multiple correlation of attitude, subjective norm and PBC with intention accounts for 39% of the variance. The PBC-intention correlation independently accounts for 6% of the variance. The TPB accounts for significant proportions of the variance in prospective measures of both observed (20%) and self-reported (31%) behaviour. The multiple correlation of attitude, subjective norm and PBC with desire was significantly stronger than with either intention, self-prediction or the mixed measure. The role of PBC differed depending on whether desire, self-prediction or intention was the dependent variable. For self-prediction, PBC contributed an additional 7% of variance over and above attitude and subjective norm. Position, intentions and self-predictions were stronger predictors of behaviour		

than desires when PBC was included as a predictor. PBC contributed more unique variance to prediction of behaviour when a measure of desire was used (6%) than when either intention (1%) or self-prediction (2%) was included. Thus, PBC is a less important determinant of behaviour when measures of intention or self-prediction are employed.

Conclusions

The authors conclude that the analysis provides evidence supporting their use of TPB for predicting intention and behaviour, although the prediction of self-reported behaviour is superior to observed behaviour. There is some evidence for discriminant validity between desire, intention and self-prediction and for a distinction between self-efficacy and perceived control over behaviour. The review found ($r^2 = .27$) for the multiple correlation of intention and PBC with behaviour. Self-efficacy and PBC were significantly more strongly correlated with both intention and behaviour than was perceived control over behaviour.

Criticism of conclusions?

The results for each of the studies are not tabulated, therefore correlation between studies is not possible, rather the results are grouped via relationships (e.g. PBC-behaviour correlation)

Evidence of effect in sub-groups? None

Strengths/weaknesses of the evidence

No defined inclusion criteria and the number of participants within the individual studies or across the studies is not stated.

Results generalisable to the UK?

Yes, includes UK studies

Recommendations for future research

Further research is recommended that more fully evaluates the impact of different operationalisations of perceived control on intention and behaviour. Further exploration of the nature and antecedents of the PBC construct is required. Work is required to test the sufficiency of additional variables on different types of norms (such as personal, descriptive and injunctive norms) by testing them against adequate measures of the subjective norm.

Cost-effectiveness data None stated

Policy implications None stated

Implications for practice None stated

Comments

Heterogeneity of the studies with the types of behaviour assessed in the various studies not stated.
Rating score 2-A

Reference ID 67	Data extracted by NC	Date of extraction 21.4.06
Author(s) Blue C L	Year 1995	
Title The Predictive Capacity of the Theory of Reasoned Action and the Theory of Planned Behavior in Exercise Research: An Integrated Literature Review		
Source Research in Nursing and Health		
Type of study Systematic review		
Research question(s) What is the predictive capacity of the theories of reasoned action and planned behaviour with respect to exercise?		
Databases/sources searched MEDLINE, CINAHL, Sport and Leisure Index, Sociology of leisure and Sport Abstracts, Physical Fitness/Sports Medicine, Psychological Abstracts and ancestry		
Years searched 1980 - to present (article received for publication 1993)		
Inclusion criteria All published studies employing the theory derived measures for constructs within the TRA and TPB framework with respect to exercise behaviour were included in the review		
Exclusion criteria Not stated		
Number of studies 23		
Number of participants 5,014		
Method of analysis Narrative synthesis		
What data extracted? Author, year and purpose of study, sample size and characteristics, sampling method, type of research design, measurement of the theory constructs, reliability of the measurement tools, threats to validity, definition of exercise variables, and variance explained by the constructs.		
Results The sample for the TRA studies (16) included healthy adults, school age children, pregnant women, persons with cardiovascular disease and disabled persons. The sample sizes ranged from 56 to 698. In no study was the use of a statistical technique to determine sample size or statistical power reported. Cross-sectional survey designs were used most frequently. A quasi-experimental design was used in only one TRA study. 20 of the TRA and TPB studies reported either internal consistency or test-retest reliability of the measures used (instruments). 7 TRA and 1 TPB studies used intention to perform exercise as the dependent variable, and 11 TRA and 4 TPB studies used exercise behaviour as the dependent variable. The authors state that consistent with TRA and TPB, intention was predictive of a person's performance of a specific behaviour in most of the studies. In the majority, behaviour was measured from 2 weeks to 2 months after intention was measured. These differences in time-frames did not appear to affect the intention-behaviour correlations. However in the Mullen et al study (1987) intention was only a weak predictor of behaviour after 8 months. Only 17.9% of the variance in behaviour was explained by intention. In general, the higher correlations between intention to exercise and exercise behaviour were found in studies where intention was measured by likeliness or probability. 7 studies used the TPB with subjects in a variety of settings. All used similar items for a direct measure of perceived control. The findings of these 7 studies are mixed. However the results suggest that for studies of exercise behaviour the TPB may be superior to the TRA in that the TPB has more predictive qualities for exercise intention and does not make the assumption that control for exercise behaviour rests solely in the individual.		
Conclusions The TRA and TPB provided a theoretical structure for examining exercise behaviour in a number of settings and populations. In most of the studies correlations of subjective norm with behavioural intention were not significant. When this relationship was significant, the normative correlation was		

lower than the attitude-intention correlation. This was consistent with the TRA and TPB models that postulate that some intentions (behaviours) are likely to be under attitudinal control and therefore predicted by attitude, whereas intentions to perform other behaviours are likely to be under normative control and be predicted by subjective norm. It appears that the influence of social pressure on exercise intentions as defined by the TRA and TPB is small. Where the intention-behaviour component of the model was measured, intention was significantly predictive of exercise behaviour in all but one study. The addition of PBC significantly increased the prediction of intention to exercise, but there were mixed results in the prediction of exercise behaviours. These differences in studies may be a result of the early development of measures of control beliefs and PBC. In addition PBC influences behaviour directly when perceptions of control reflect actual control.

Criticism of conclusions?

Comparisons between the studies reviewed was limited by the wide variety of ways in which exercise was defined. The authors cite threats to validity contained within the studies. These were selection bias as volunteers for exercise studies may be individuals who are more health conscious and have higher levels of income and education than the general population, attrition bias, problems related to the measurement of exercise by self-report, the social desirability with respect to exercise, and seasonal variations occurring in physical activity levels.

Evidence of effect in sub-groups? None

Strengths/weaknesses of the evidence

Heterogeneity of the reviewed studies in relation to their methodological aspects from samples, to measurement of the concepts, research designs, and the measurement of exercise.

Results generalisable to the UK?

Non-UK studies but likely to apply to UK settings

Recommendations for future research

Future studies might examine the effectiveness of targeted programs with respect to the adoption and maintenance of exercise. The authors also provide recommendations for future studies regarding study design and construct measurement.

Cost-effectiveness data None stated

Policy implications None stated

Implications for practice

The TRA and the TPB are useful in identifying psychological determinants of self-reported exercise behaviour and could be useful for developing community and individual exercise programs. Based on the results of the studies reviewed exercise programs would be more efficient when components that would encourage positive beliefs for the individual are included in the program design. Exercise programs that offer a positive experience would enhance intention to exercise, which in turn influences exercise behaviour.

Comments

Type of outcome measures (self-report or objective) used within each of the studies not stated.
Rating score 2-B

Reference ID 924	Data extracted by NC	Date of extraction 27.4.06
Author(s) Downs D S & Hausenblas H A	Year 2005	
Title Elicitation Studies and the Theory of Planned Behavior: A Systematic Review of Exercise Beliefs		
Source Psychology and Sport Exercise		
Type of study Systematic review		
Research question(s) What are the salient behavioural, normative and control beliefs for exercise elicitation studies? What is the strength of the associations among behavioural beliefs-attitude, normative beliefs-subjective norm, and control beliefs-perceived behavioural control; and hierarchical multiple regression, path analysis, or structural equation modelling findings of the beliefs for predicting attitude, subjective norm, and perceived behavioural control? Is there an association between the study methods used to elicit beliefs and the main theory of planned behaviour study participants?		
Databases/sources searched PSYCLIT, MEDLINE, SPORTdiscuss, Dissertation Abstracts Online, and hand searching of specific journals (American Journal of Health Promotion, British Journal of Social Psychology, Canadian Journal of Applied Sport Psychology, European Journal of Social Psychology, Health Psychology, International Journal of Sport Psychology, Journal of Applied Social Psychology, Journal of Applied Sport Psychology, Journal of Behavioral Medicine, Journal of Health Psychology, Journal of Leisure Research, Journal of Personality and Social Psychology, Journal of Sport & Exercise Psychology, Journal of Sport behavior, Medicine and Science in Sports and Exercise, Perceptual and Motor Skills, Preventive Medicine, Research Quarterly for Exercise and Sport, and the Sport Psychologist).		
Years searched PSYCLIT (1975 to the present - article submitted for publication 2002), MEDLINE (1975 to present), SPORTdiscuss (1975 to present), Dissertation Abstracts Online (1975 to present)		
Inclusion criteria 1) If a study examined at least 2 of the TPB constructs (i.e. beliefs, attitude, subjective norm, perceived behavioural control, intention) and leisure time or exercise behaviour, and/or 2) It conducted an exercise elicitation study (i.e. examining people's behavioural, normative, or control beliefs)		
Exclusion criteria Not stated		
Number of studies 47		
Number of participants Not stated, greater than 9,494		
Method of analysis Narrative synthesis		
What data extracted? The study year, publication format, participant characteristics (number of participants, type of population, M age or age range, sex, race, and socioeconomic status), number and type of elicited behavioural, normative and control beliefs.		
Results The procedures of Hedges (1981) and Hedges & Olkin (1985) were used to calculate the effect size. Because effect sizes are positively biased in small sample sizes, each effect size was multiplied by a correction factor to obtain an estimate of the effect size (Hedges). A mean effect size and variance was calculated by weighing each effect size by the reciprocal variance (Hedges & Olkin). Most of the studies were published (70.2%) and conducted in the 1990s (59.6%). For the main TPB study characteristics, the majority of the studies included male and female participants, and the participants were community adults (26.1%), undergraduate students (23.9%), worksite employees (15.2%), patients (13%), older adults (10.9%) and other (10.9%). Most of the studies did not report the participant's ethnicity or socioeconomic status. However in the studies that did report these characteristics Caucasian middle to upper class adults were the most frequently studied. In regard to		

the elicitation study characteristics, most of the studies examined men and women (61.7%) and included community adults (25.5%), undergraduates students (23.4%), worksite employees (14.9%), older adults (12.8%) patients (12.8%) and other (10.6%). The majority of the studies elicited behavioural beliefs (n=40) and the average number of beliefs reported per study was 7. The most salient advantages of exercise were: improves physical and psychological health (100%), controls weight (73.7%), improves daily functioning (68.4%), increases energy (57.9%) and relieves stress and promotes relaxation (47.4%). The majority of the studies elicited normative beliefs (n=38). The most salient referents were: family members (100%), friends (90%) and healthcare professionals (90%). More than half of the studies elicited control beliefs, the most frequently reported were: health issues, inconvenience, lacking motivation and energy, time and lacking social support. Large associations were found for: behavioural beliefs and attitudes (M effect size 1.36), normative beliefs and subjective norm (M effect size 1.20) and control beliefs and perceived behavioural control (M effect size 1.04).

Conclusions

In general, the authors found that: people have a variety of beliefs about exercise; large associations were found among the beliefs and attitude, subjective norm, and perceived behavioural control; and few studies reported the predictive contributions of beliefs and the demographic characteristics of their elicitation study participants. Consistent with other researchers' conclusions the most salient behavioural advantage of exercise was that it improves people's physical and psychological health. In addition, the most common behavioural disadvantages were experiencing health problems such as pain, soreness and illness. These findings indicate that people have a variety of positive and negative behavioural beliefs about exercise. Second, the most frequently reported normative influences were from family and friends, also consistent with previous research. Third, the most common control beliefs obstructing exercise were: health issues, inconvenience/lack of access to exercise facilities, lacking motivation and energy, and lacking social support. Fourth, the most salient control beliefs facilitating exercise behaviour were convenience, pleasure and social support. Fifth, the magnitude of the effect between behavioural beliefs and attitude, normative beliefs and subjective norm, and control beliefs and PBC were large. Behavioural beliefs explained 54% of the variance in attitude, normative beliefs explained 56% of the variance in the subjective norm, and control beliefs explained 34% of the variance in PBC.

Criticism of conclusions?

None stated. Heterogeneity of studies examined and methods used.

Evidence of effect in sub-groups? None

Strengths/weaknesses of the evidence

Because of the lack of information provided for elicitation studies the authors were unable to examine the elicitation study methods. 92% of the studies did not report sufficient information for the participant characteristics, and 55% of the studies did not report adequate details to determine the measures and procedures used to elicit the beliefs.

Results generalisable to the UK?

Non-UK studies but likely to apply to UK settings

Recommendations for future research

Researchers are encouraged to: conduct elicitation studies, consider Ajzen and Fishbein's 1980 guidelines for elicitation studies; examine the associations among behavioural beliefs and attitude, normative beliefs and subjective norm, and control beliefs and PBC; obtain correspondence between the elicitation and main TPB study participants; and report more detail regarding the elicitation study participants, measures and procedures.

Cost-effectiveness data None stated

Policy implications None stated

Implications for practice

Practitioners may use the study findings when designing exercise programs with specific populations to target these beliefs. Intervention specialists are encouraged to emphasise the advantages of exercise, while also developing strategies for helping people to overcome perceived barriers.

Comments

Rating score 2-B

Reference ID 1019	Data extracted by NC	Date of extraction 28.4.06
Author(s) Ferguson E	Year 1996	
Title Predictors of Future Behaviour: A Review of the Psychological Literature on Blood Donation		
Source British Journal of Health Psychology		
Type of study Systematic review		
Research question(s) What are the relative efficacies of different theoretical models at predicting future behaviours in relation to blood donations		
Databases/sources searched PSYCLIT, and ancestry		
Years searched Not stated		
Inclusion criteria Studies were selected only if they were published articles, if they measured actual donations over time, assessed an identifiable theory, and contained identifiable information on the effect size, p-value and N.		
Exclusion criteria None stated		
Number of studies 16		
Number of participants Not stated		
Method of analysis Narrative synthesis		
What data extracted? Theory, time scale, donor group, effect size, p values and country of study.		
Results A meta-analytic review of some of the studies revealed that the intentionality construct accounted for 19.3% of the variance, subjective norm 1.4%, attitudes 7.5%, role merger 3.6% and waiting time 17.4%. Intentionality, from the theory of planned/reasoned action, emerged as the best predictor of future donor behaviour, but appeared to offer little in the way of suggesting interventions. The predictive power of intentionality reduced as the time interval between its measurement and the recording of actual donor behaviour increased. A number of organisational factors (e.g. waiting time) were identified as important and good predictors of future behaviour. Further, the stage-like nature of blood donor behaviour is highlighted.		
Conclusions The TTM of behaviour change is introduced both as a viable alternative to theories like reasoned action and a conceptual framework for organising interventions. The TTM is seen as applicable to the blood donation situation as it captures something of the stages of blood donation. It is also argued that other theoretical perspectives (e.g. self-efficacy) need to be examined in this context. From the data available it appears that intentions account for a sizable proportion of the explained variance in donor behaviour (19%). However organisational factors account for 17% of the explained variance. Non-psychological variables, therefore provide a predictive status and, unlike intentionality are open to easier manipulation.		
Criticism of conclusions? Lack of methodological clarity such as the number of studies examined and their sample sizes.		
Evidence of effect in sub-groups? None		
Strengths/weaknesses of the evidence Heterogeneity across the studies despite the same health-related behaviour being examined. The		

timescales were also widely variable from 2 days to 2 years.
Results generalisable to the UK? Yes, 2 studies based in the UK
Recommendations for future research Organisational factors deserve further further investigation in this area and other areas of applied psychology. For advances in blood donor research future studies need to address 2 issues: 1) The inclusion of the donor career in their analyses and 2) The application of other theoretical perspectives (i.e. TTM, stress theory and self-efficacy theory).
Cost-effectiveness data None stated
Policy implications None stated
Implications for practice Beneficial factors have been identified and these include: heightened intentionality, heightened social norms, observing positive role models, persuasive communications, offering non-financial incentives and education. Possible interventions related to the transtheoretical stages are suggested: education for the pre-contemplative stage, modelling and education for the contemplative stage, increased intentionality, social norms for the preparation stage, non-financial incentives (and some organisational factors may be important e.g. signposting) in the action stage and non-financial rewards, persuasive communications and reminder letters (as well as some of the organisational factors which may be of importance e.g. convenience) in the maintenance stage.
Comments Rating score 2-A

Reference ID 275	Data extracted by NC	Date of extraction 21.4.06
Author(s) Godin G & Kok G	Year 1996	
Title The Theory of Planned Behavior: A Review of Its Applications to Health-Related Behaviors		
Source American Journal of Health Promotion		
Type of study Systematic review		
Research question(s) What is the efficacy of Ajzen's theory of planned behaviour in explaining and predicting health-related behaviours?		
Databases/sources searched Current Contents (Social and Behavioral Sciences and Clinical Medicine)		
Years searched 1985 - to date (article submitted for publication 1995)		
<p>Inclusion criteria All studies considered were those that provided the basic information on the following variables: intention, attitude toward the action, subjective (social) norm and PBC. Regarding PBC studies were included as long as such control was assessed in one of the following manners: according to Ajzen or Ajzen & Madden specifications (i.e. PBC or sum of perceived barriers), according to Triandis (i.e. facilitating conditions or perceived constraints), according to Bandura (i.e. self-efficacy).</p> <p>Exclusion criteria Studies that applied the TPB in other domains than health. Cross-sectional studies that reported prediction of current behaviour instead of intention were not included as prediction of current behaviour does not respect the causal associations underlying the theory.</p>		
Number of studies 56		
Number of participants Not stated		
Method of analysis Narrative synthesis		
<p>What data extracted?</p> <p>The following aspects of the studies were scrutinised: the strength of the association between each of the theoretical constructs with intention and behaviour, the explained variation in intention and behaviour, the impotence of PBC to explain a significant proportion of variance in intention and behaviour, the contribution of other theoretical constructs to explain intention and predict behaviour, and the influence of how PBC was assessed on the relationships between the variables.</p>		
<p>Results</p> <p>The 58 behavioural applications contained within the 56 studies were classified via behavioural categories: addictive, automobile, clinical and screening, eating, exercising, HIV/AIDS and oral hygiene. The information extracted and scrutinised was: correlation coefficients, standardised regression coefficients, multiple r^2, change in r^2 attributed to PBC, and any other statistical strategies providing a test of the theory. 46.4% of the studies provided data on the prediction of the behaviour. 56 publications reported a total of 87 applications regarding intention. Among these 87 applications, 57 reported the correlation coefficients. The overall average correlations between intention and attitude, subjective norm and PBC were .46, .34, and .46 respectively. The r^2 value was available in 76 of the 87 applications. Overall, the average explained variance in intention was 40.9% varying from 32% (eating behaviours) to 46.8% (oral hygiene behaviours). PBC was found significant in 65 of 76 analyses reported in the publications, whereas attitude and subjective norm were found significant, respectively, in 62 and 36 of these applications. For studies that reported a significant additional contribution of PBC, above attitude and subjective norm, the average added r^2 was 13.1%, this value varied from 5% (eating behaviour) to 24.3% (oral hygiene behaviours). 26 studies provided information on 40 applications predicting future behaviour. Among these 40 applications only 26 presented information on correlation coefficients. The overall average correlations between behaviour and intention and PBC were .46 and .39 respectively. The r^2 value was</p>		

available 35 of the 40 applications. Overall the average explained variance in behaviour was 34%, varying from 15.6% (clinical and screening behaviours) to 42.3% (HIV/AIDS related behaviours). Among 41 applications providing information on the added contribution of PBC, above intention, there was an almost perfect split between the applications where PBC reached or did not reach the significance level.

Conclusions

The averaged r^2 for intention and behaviour were .41 and .34 respectively. In the domain of health about a third of the variations in behaviour can be explained by the combined effect of intention and PBC. Intention however remains the most important variable, 66.2% of the explained variance is attributed to intention.

Criticism of conclusions?

Limitations in making inferences for the studies given the low number of published articles reporting data on behavioural prediction (longitudinal studies), addictive (19.7% of the 40.7% explained variance) and clinical and screening (7% of the 15.6% explained variance) behaviours are categories where PBC carries more weight than intention.

Evidence of effect in sub-groups? None

Strengths/weaknesses of the evidence

The theory seems to perform quite well across behavioural categories with respect to explaining intention. For, the prediction of behaviour however its efficiency varies. For example the r^2 was quite low for clinical and screening behaviours whereas much higher values were observed for addictive and HIV/AIDS related behavioural categories. Several of the studies reviewed reported that variables not included in the TPB contributed to explain significant portion of variance in intention and in a few cases, in behaviour. In this regard the following 2 variables seem to be important: personal norm, assessed as self-identity or role identity, and moral norm or personal normative beliefs. The authors observe that numerous methods were used to assess the constructs of the theory, sometimes generating confusion in the interpretation of findings.

Results generalisable to the UK?

Non-UK studies but likely to apply to UK settings

Recommendations for future research

Appropriate procedures to guide the development of research instruments especially in the health domain are urgent. Role beliefs and feelings of personal responsibility should be added to the TPPB for studying health-related behaviours.

Cost-effectiveness data None stated

Policy implications None stated

Implications for practice None stated

Comments

Rating score 2-B

Reference ID 1095	Data extracted by NC	Date of extraction 20.4.06
Author(s) Hagger M S et al	Year 2002	
Title A Meta-Analytic Review of the Theories of Reasoned Action and Planned Behavior in Physical Activity: Predictive Validity and the Contribution of Additional Variables		
Source Journal of Sport and Exercise Psychology		
Type of study Systematic review (meta analysis)		
Research question(s) What are the relations between behaviour, intentions, attitudes, subjective norms, perceived behavioural control, self-efficacy and past behaviour across studies using the theories of reasoned action and planned behaviour in a physical activity context?		
Databases/sources searched ATLANTES, HERACLES, MEDLINE EXPRESS, PSYCINFO, SPORT discuss, and Social Science Citation Index, and a manual search of Dissertation Abstracts International and Psychological Abstracts		
Years searched ATLANTES (1980-1996), HERACLES (1975-1997), MEDLINE EXPRESS (1980-2001), PSYCINFO (1977-2001), SPORT discuss (1975-2001) and Web of Social Science Citation Index (1980-2001)		
Inclusion criteria Studies that defined the target behaviour as physical activity, either as leisure time physical activity or more formal forms such as sports training or exercise, and reporting at least one correlation between constructs derived from the TRA or TPB.		
Exclusion criteria Some studies were rejected because they did not report the necessary correlations between the TRA/TPB variables or were qualitative in nature.		
Number of studies 72		
Number of participants 21,916		
Method of analysis Meta-analysis		
What data extracted? The number of study participants, the composition of the sample, the A-I correlation, A-I strength, mean age, age category, time frame for past behaviour measure and the proximity.		
Results The measure of effect size adopted was the average correlation coefficient across the studies corrected for statistical artifacts. The meta-analytic strategy reported by Hunter & Schmidt (1990) was used to correct the intercorrelations between the TRA/TPB variables and past behaviour for sampling and measurement error. The strongest association found was between attitude and intention, followed by the intention-behaviour, PBC-intention, and the subjective norm-intention relationships. Moderate to strong, positive-corrected average correlations between self-efficacy and the TRB variables were demonstrated. Strong associations were also observed between the TRA/TPB variables and past behaviour, except for the subjective norms/past behaviour relationship. In relation to the TRA, intentions significantly predicted behaviour, attitudes were the strongest significant predictor of intention, while subjective norms had a small but significant influence on intentions. Attitude accounted for much of the social influences on intention. In relation to the TPB, attitude and PBC were the best predictors of intentions. The contribution of PBC to behaviour was significant. Self-efficacy was a significant predictor of physical activity intention and behaviour. Overall the TRA model constructs explained 37.27% of the variance in intentions and 26.04% of the variance in behaviour. The TPB model accounted for more variance in intention than the TRA (44.5%). When the second version of the TPB including the PBC variable was analysed this version accounted for slightly more variance in behaviour (27.41%) compared with the first version. When self-efficacy was included the model accounted for 50.30% of the variance in intention and 29.10% of the variance in behaviour.		

<p>Furthermore when past behaviours were included, the model constructs accounted for the greatest amount of variance in intentions (60.18%) and behaviour (46.71%).</p>
<p>Conclusions The review suggests that people's attitudes, and to a lesser extent PBC and self-efficacy seem to be key influences in forming intentions to participate in physical activity. The authors conclude that the substantial independent contributions made by PBC and self-efficacy to the explanation of intention and behaviour suggests that the TPB augmented by self-efficacy seems to provide a comprehensive account of the social-cognitive influences on physical activity motivation and participation.</p>
<p>Criticism of conclusions? Limitations of the review are not specifically addressed e.g. issues of heterogeneity and the quality of the reviewed studies</p>
<p>Evidence of effect in sub-groups? When examining age as a moderator of the TPB relationships, the authors found “older samples” (no age range provided) had a significantly stronger relationship between intentions and behaviour than younger samples (age <25 years). This suggests that the “older samples” may be more likely to translate their intentions to participate in physical activity into actual behaviour.</p>
<p>Strengths/weaknesses of the evidence The review has controlled for artifacts and demonstrated that while past behavioural effects do attenuate the TPB relationships, current cognitions, particularly control and self-efficacy, are the most important predictors physical activity behaviour.</p>
<p>Results generalisable to the UK? Non-UK studies but likely to apply to UK settings</p>
<p>Recommendations for future research Future studies in the physical activity domain adopting the TPB as a framework would do well according to the authors to account for past physical activity behaviour in their analyses in order to examine the unique influences of conscious social cognitions on intentions and behaviour.</p>
<p>Cost-effectiveness data None stated</p>
<p>Policy implications None stated</p>
<p>Implications for practice Interventions based on the enhancement of attitudes toward physical activity may lead to a concomitant increase in physical activity behaviour.</p>
<p>Comments Type of outcome measures (self-report or objective) used within the studies not stated. Rating score 2-B</p>

Reference ID 1101	Data extracted by NC	Date of extraction 28.4.06
Author(s) Hardeman W et al	Year 2002	
Title Application of the Theory of Planned Behaviour in Behaviour Change Interventions: A Systematic Review		
Source Psychology and Health		
Type of study Systematic review		
Research question(s) How often and in what way has the TPB been applied to interventions aimed at behaviour change and/or their evaluation? What methods have been used to alter components of the model? How many interventions have been effective in changing targeted TPB components, intention and behaviour? Were any changes in intention and behaviour mediated by TPB components?		
Databases/sources searched MEDLINE, PSYCLIT, EMBASE, Cochrane Library, and Current Contents		
Years searched MEDLINE (1966-May1999), PSYCLIT (1887-March 1999), EMBASE (1980-February1999), Cochrane Library, and Current Contents (13.4.98-5.4.99)		
Inclusion criteria Published studies with an explicit application of the TPB or revised TRA to an intervention and/or its evaluation. Studies in which the TPB was used alongside other theories and models as long as the TPB was explicitly mentioned.		
Exclusion criteria Studies that only used other models were excluded. Studies that measured a mix of components of the TPB and other theories, without explicit mention of the TPB. Studies in which self-efficacy was measured alongside the TRA were excluded if the authors did not report that they used self-efficacy as a proxy measure of PBC.		
Number of studies 30		
Number of participants Not stated, greater than 12,957		
Method of analysis Descriptive review		
What data extracted? Target behaviour, characteristics of participants, study design, use of the TPB, intervention package, targeted TPB components, change in targeted components, change in intention and behaviour, and mediation of change by TPB components.		
Results Effect sizes were calculated using mean scores in experimental and control groups at follow-up, divided by the standard deviation in the control group (Hedges & Olkin 1985). 21 interventions targeted health-related behaviours, including infants' sugar intake, smoking cessation, exercise, testicular self-examination, and drink driving. The remaining interventions involved signing up for a chemistry course, working in projects and job seeking. Most interventions targeted school and university students. Participants were mixed sex, unless the intervention focused on a sex-specific health issue. Groups selected by risk adverse outcomes of their behaviour included adults with a low fruit and vegetable consumption, intravenous drug users and crack smokers, inner-city African American adolescents, participants of a weight loss programme, adults with gingivitis and unemployed people. 9 interventions were short and consisted of an audio-taped, audiotaped/printed, printed, audiovisual, or videotaped message or single instruction. All but one of these interventions were applied among students. The 15 longer interventions comprised exercise classes, an educational session and a series of educational sessions. The duration was less than a month in 5 studies, and between 1 and 6 months in 9 studies. Evaluation studies of 14 interventions had a RCT design, and 7 were non-randomised trials. 1 study was longitudinal, and 2 were surveys. In all interventions TPB components were measured but only 1 measured the full range of components. The descriptions of the interventions were limited. As a result, some behaviour change methods were either not described or not classifiable. Evaluation		

studies of 13 interventions reported on change in behavioural intention, with 6 showing some positive effect. Of the 6 effect sizes could be calculated for 4 studies, and they were small to moderate in 2 studies and large in the other 2. 4 studies reported no change in the intervention group compared to the control. Evaluation studies of 13 interventions reported on change in behaviour. 7 reported at least 1 positive change in the intervention group compared to the control group. Effect sizes were very small in one study, small to moderate in 2, moderate to large in 1, and large in 1. Effect sizes based on proportions, calculable for 3 studies ranged from 3.7% to 50%. With the studies that used the TPB to develop the intervention (12), 4 found positive changes in behaviour, with effect sizes very small in 1 study, small to moderate in 1 and moderate to large in another.

Conclusions

The TPB was mainly used to measure process and outcome variables and to predict intention and behaviour, and less commonly to develop the intervention. Behaviour change methods were mostly persuasion and information, with increasing skills, goal setting, and rehearsal of skills used less often. When reported, half of the interventions were effective in changing intention, and two thirds in changing behaviour, with generally small effect sizes, where calculable. Effectiveness was unrelated to use of the theory to develop intentions. Evidence about mediation of effects by TPB components was sparse. The TPB may have potential for developing behaviour change interventions, but more comprehensive studies are needed that compare the utility of the TPB with other social cognition models and behavioural techniques.

Criticism of conclusions?

The authors highlight the fact that they did not search the grey literature as a limitation of their review. It was according to the authors sometimes difficult to judge whether the TPB was applied to an intervention.

Evidence of effect in sub-groups? None

Strengths/weaknesses of the evidence

Intervention drop-out rates were reported within the studies were significant (up to 75% in some). Great heterogeneity across the studies. About one third of the studies did not report on the reliability of the measured components, and more than half measured behaviour by self-report. Studies were often of poor design, more precise estimations of effectiveness of interventions could be made if studies had a RCT design, longer follow-up period, intention to treat analysis, and used standardised, reliable measures of constructs and more objective measures of behaviour. It would aid interpretation if authors reported recruitment and dropout rates, to provide insight into the feasibility and acceptability of the intervention, and the generalisability of findings.

Results generalisable to the UK?

Yes, includes 5 studies based in the UK

Recommendations for future research

Well designed studies that evaluate carefully developed interventions, specifically targeting TPB components and measuring the effect on cognitions as well as behaviour, are needed to provide evidence about the utility of the TPB in this area. Studies are required that have a RCT design, longer follow-up period, intention to treat analysis, and used standardised, reliable measures of constructs and more objective measures of behaviour. It would aid interpretation if authors reported recruitment and dropout rates, to provide insight into the feasibility and acceptability of the intervention, and the generalisability of findings.

Cost-effectiveness data None stated

Policy implications None stated

Implications for practice

The TPB may have potential for developing behaviour change interventions, but more comprehensive studies are needed that compare the utility of the TPB with other social cognition models and behavioural techniques.

Comments

Type of outcome measures (self-report or objective) used within the studies not stated.

Rating score 2-A

Reference ID 300	Data extracted by NC	Date of extraction 18.4.06
Author(s) Harrison J A, Mullen P D & Green L W		Year 1992
Title A Meta-Analysis of Studies of the Health Belief Model with Adults		
Source Health Education Research		
Type of study Systematic review (meta analysis)		
Research question(s) What is the predictive validity of the HBM?		
Databases/sources searched MEDLINE, PSYCINFO and Sociological Abstracts		
Years searched Medline from 1966, PSYCINFO from 1967 and Sociological Abstracts from 1968, all to mid 1987		
Inclusion criteria Articles encompassing 4 dimensions of the HBM: susceptibility, severity, benefits and costs. They required each study to relate to a health behaviour.		
Exclusion criteria Unpublished studies or those that did not purport to test the HBM, instead measuring a single variable that could be interpreted as an HBM dimension. Excluded studies with children, references to dissertation abstracts, studies of health behaviours unrelated to the HBM, review and theoretical papers without original data. Therefore they excluded papers that did not measure all 4 major dimensions of the HBM, if they did not allow for a clear separation of the individual dimensions, did not use the HBM as a predictor, were duplicates of other publications, or reanalysed data from another article.		
Number of studies 16		
Number of participants 3,515		
Method of analysis Meta-analysis		
What data extracted? Study design, number of participants, Likert type scale if used, reliability data of HBM variables, dependent variable (i.e. health-related behaviour) and effect sizes in Pearson product-moment correlations (r). Summaries of the formats for the scales measuring the 4 dimensions of the 16 studies, together with information regarding reliability, sample size, study design and the type of dependent variable.		
Results Average effect sizes were calculated across all the studies and for subgroups of studies by study design and by category of dependent variable (screening, risk reduction and adherence to medical regimen). Each subgroup was tested for homogeneity, via differences in effect size. The reviewed studies related to the dependent variables of: use of child safety restraints in a car, flu vaccination, wives' social support of husbands' cholesterol lowering pill-taking, weight loss, doctor visit for symptoms, testicular self-examination, faecal occult blood test, asymptomatic VD examination, haemodialysis, diabetes, high blood pressure pill taking and blood pressure pill count. The mean effect sizes ranged from 0.01 to 0.30. Thus, the variance accounted for ranged from 0.001 to 0.09. The effect sizes for the 4 dimensions varied over the various combinations of studies (all, screening, risk reduction, adherence to medical regimen, prospective and retrospective). Using a 2 tailed test for the difference between r's, significant differences were found between prospective and retrospective studies for severity ($P < 0.02$), benefits ($P < 0.001$) and costs ($P < 0.001$), with larger effect sizes for retrospective studies for benefits and costs and smaller effect sizes for severity. But, homogeneity was rejected for 15 of the 22 significant mean effects.		

<p>Conclusions The authors found “significant positive relationships between HBM dimensions and health behaviours”</p>
<p>Criticism of conclusions? The 4 dimensions are not looked at together, so it is possible that their predictive ability would be less than the sum of their independent dimensions, or alternatively, the interaction of the dimensions could cause a larger effect.</p>
<p>Evidence of effect in sub-groups? None</p>
<p>Strengths/weaknesses of the evidence Although all 16 studies used HBM names for their scales, it is possible that they actually measured different constructs. Heterogeneity of the studies: from use of child safety restraints in a car to flu vaccination and wives' social support of husbands' cholesterol lowering pill taking for example. Only 6 of the studies evaluate the same health related behaviour. The variance accounted for ranges from 0.1 to 9%.</p>
<p>Results generalisable to the UK? Non-UK studies but likely to apply to UK settings</p>
<p>Recommendations for future research Recommend review of the HBM literature using a panel of experts to judge the face validity of the instruments purporting to measure HBM dimensions.</p>
<p>Cost-effectiveness data None stated</p>
<p>Policy implications None stated</p>
<p>Implications for practice If there were scientifically sound studies that the HBM to have predictive validity, then experimental studies about people's beliefs relating to health behaviour would enable the design of interventions where changing beliefs could be one component of an overall intervention strategy.</p>
<p>Comments Type of outcome measures (self-report or objective) used within the studies not stated. Rating score 2-B</p>

Reference ID 1104	Data extracted by NC	Date of extraction 28.4.06
Author(s) Hausenblas H A et al	Year 1997	
Title Application of the Theories of Reasoned Action and Planned Behaviour: A Meta-Analysis		
Source Journal of Sport and Exercise Psychology		
Type of study Systematic review (meta-analysis)		
Research question(s) What is the utility of the TRA and the TPB for the explanation and prediction of exercise behaviour?		
Databases/sources searched PSYCLIT, MEDLINE, SPORTdiscuss, and Dissertation Abstracts, and hand searching.		
Years searched 1975 to the present - manuscript submitted Jan 1996		
Inclusion criteria 1) That the study focused on exercise 2) and incorporated at least 2 of the constructs contained in the TRA or TPB.		
Exclusion criteria Studies were excluded that failed to provide usable statistics to compute an effect size.		
Number of studies 31		
Number of participants 10,621		
Method of analysis Meta-analysis		
What data extracted? The characteristics of the study, the program of exercise, the participants, and the measures were extracted and coded for each article. Also extracted were: sample size, response rate, client selection, psychometrics, and theory tested. The program category included the duration of the treatment and its frequency. The participant category included gender, age, occupation, socioeconomic status, ethnicity, special population e.g. disabled or pregnant, and training status.		
Results Effect sizes were calculated using the techniques of Hedges (1981) and Hedges & Olkin (1985). 41.9% examined TPB and 58.1% examined the TRA. The psychometric properties of the scales were reported in 83.9% of the studies. That is 58.1% reported internal consistency values, 12.9% reported test-retest reliabilities, and 12.9% reported both. The majority of the studies were conducted in a university setting (50%), followed by corporations (6.5%), fitness clubs (6.5%), the community (16.1%) and home (16.1%). The majority of the participants were volunteers (64.5%) followed by target groups (22.6%) and random assignment (9.7%). The results showed that the distribution of effect sizes was homogeneous, nonetheless the relationships among the individual constructs of the TRA and TPB were further examined. Using Cohen's recommendations for interpretation of values, the majority of effect sizes were in the moderate to large range. No significant differences in the magnitude of effect size were observed between unpublished and published research for any of the principal relationships in TRA. The direct determinant of exercise behaviour according to the TRA is intention. A large effect size of 1.09 was found between intention and behaviour. According to TRA, the direct determinants of an intention to adopt exercise behaviour are the constructs of attitude and subjective norm. Attitude was over 2 times more useful as a predictor of intention to exercise than was subjective norm. In relation to the utility of PBC, PBC had a large relationship with both exercise behaviour (effect size= 1.01) and intention to exercise (effect size=0.97). No differences were observed between the magnitude of the effect size for the intention-proximal behaviour relationship and the intention-distal behaviour relationship (however there were a small number of studies that addressed this issue).		

<p>Conclusions</p> <p>The results provided strong general support for the validity of TRA and TPB. The effect size for the relationships a) between intention and exercise behaviour, attitude and intention, attitude and exercise behaviour, PBC and intention, and PBC and exercise behaviour was large; b) between subjective norm and intention was moderate; and c) between subjective norm and exercise behaviour was zero order. The results also supported the conclusions that a) TPB is superior to TRA in accounting for exercise behaviour, b) there is no difference in the ability to predict exercise behaviour from proximal and distal measures of intention, and c) expectation is a better predictor of exercise behaviour than intention.</p>
<p>Criticism of conclusions?</p> <p>The relatively small number of studies contributing to the computation of some of the effect sizes.</p>
<p>Evidence of effect in sub-groups?</p> <p>Only 9.7% of the studies reported on ethnicity, 19.4% on participant occupation, and 19.4% on socioeconomic status.</p>
<p>Strengths/weaknesses of the evidence</p> <p>The constructs within TRA and TPB are interrelated. The effect sizes reported are undoubtedly overestimate the magnitude of the overall relationships within these models according to the authors. Due to insufficient power neither a hierarchical regression nor a path analysis were computed.</p>
<p>Results generalisable to the UK?</p> <p>Non-UK studies but likely to apply to UK settings</p>
<p>Recommendations for future research</p> <p>Researchers should continue to examine the TPB in exercise behaviour with a view to determining potential moderator variables (e.g. age, gender and training status) that are related to physical activity levels. Also future studies should report elicitation studies and psychometric properties of the scales used. Future studies should examine the predictive power of an intention to exercise behaviour over time.</p>
<p>Cost-effectiveness data None stated</p>
<p>Policy implications None stated</p>
<p>Implications for practice</p> <p>The constructs embedded in the TPB have considerable utility in predicting and explaining exercise behaviour. A knowledge of TPB could help exercise practitioners understand the key elements associated with initiating and maintaining exercise behaviour. It could help them evaluate changes in exercise behaviour that occur as a result of planned interventions.</p>
<p>Comments</p> <p>Type of outcome measures (self-report or objective) used within the studies not stated. Rating score 2-B</p>

Reference ID 312	Data extracted by NC	Date of extraction 27.4.06
Author(s) Horowitz S M	Year 2003	
Title Applying the Transtheoretical Model to Pregnancy and STD Prevention: A Review of the Literature		
Source American Journal of Health Promotion		
Type of study Systematic review		
Research question(s) What is the quality of evidence supporting the use of tailored or stage-matched pregnancy and STD prevention programmes? What are the factors that influence stage distribution? How is the validity of the TTM and its constructs, as applied to pregnancy and STD prevention, supported by research?		
Databases/sources searched ASSI, BA, CJA, CINAHL, CC, CIJE, EI, ERIC, EM, FI, IM, MEDLINE, MEA, PSYCINFO, PA, RA, SSCI, SWA, SA and hand searching		
Years searched Up to 31 December 2001 (no starting date provided)		
Inclusion criteria All English, peer-reviewed, original articles on the TTM as it relates to pregnancy and STD prevention published prior to 31 December 2001 were included.		
Exclusion criteria Editorials, commentaries, theses/dissertations, unpublished studies, technical reports and books were not included.		
Number of studies 32		
Number of participants Not stated, greater than 16,841		
Method of analysis Narrative synthesis		
What data extracted? Articles were categorised as intervention, population or validation studies. Data extracted included purpose of study, sample size and characteristics, study design, measures used, intervention elements, findings and conclusions.		
Results The articles included 9 intervention studies, 11 population studies and 12 validation studies. Of the interventions studies the studies were categorised into sample type: adolescents/university students and adult at risk/special populations. In the adolescent group 5 studies assessed interventions, 2 focusing on clinical populations, 1 on low income African American girls, 2 on 10th graders and 1 on university students (one study used 2 different samples). The results were mixed and can be partially attributed to the content of the interventions, the duration of treatment period, the health status of the participants, data collection methodologies and sample size. In the adult sample group 3 studies described intervention programs targeted to adults with 2 studies addressing at-risk populations and 1 assessing a clinical population. Results were mixed, and in some cases difficult to interpret because of insufficient description. The population studies were categorised into young adult/university, clinical, and community/high risk/special populations. 2 studies fell into the young adult/university category, 4 into the clinical group and 5 into the third group of community/high risk/special populations. In the clinical samples there were diverse populations, making comparisons between studies difficult and in the last category gender, age partner type, self-efficacy, outcome expectancy, peer norms, and cohabitation were all factors in stage distribution. In the validation studies 75% of the studies dealt with individuals at high risk of HIV infection from unsafe sexual behaviours or injecting drug use. Condom use purpose, partner type, virgin status and perceived advantages/disadvantages of condom use helped explain stage distribution but HIV serostatus did not.		
Conclusions Age, partner type, gender, reasons for engaging in safer sex behaviours (i.e. pregnancy vs. disease		

prevention), self-efficacy, sexual assertiveness, and perceived advantages and disadvantages of condom use were related to stages of change. The use of TTM to reduce risk of pregnancy and STDs is a relatively new area of research but because of the wide-ranging differences in methodologies and samples, no strong conclusions about its effectiveness can be made. Of the 9 stage matched interventions, 5 supported a cause and effect relationship between tailored interventions and positive outcomes. When comparing the quality of those studies that supported tailored interventions to those that did not support them, the former appeared to have fewer threats to internal validity and more often used experimental or quasi-experimental designs. Self-efficacy and decisional balance constructs were related to stage of change. Greater self-efficacy and higher outcome expectancy of condom use were associated with progression to later stages. Horowitz declares that the internal consistency of TTM constructs has been satisfactorily supported in the research.

Criticism of conclusions?

The framework for analysing study designs and outcomes according to the author was ultimately subjective although it was systematic.

Evidence of effect in sub-groups?

Horowitz states that more research is needed on the measurement of stage membership for condom use adoption in diverse populations, for different types of sexual intercourse, and for main and other sexual partners. In the studies reviewed, different samples contained varying percentages of Caucasians, African Americans and Hispanics but no studies compared stage distribution or intervention effects specifically by race.

Strengths/weaknesses of the evidence

Although the majority of intervention studies reported a movement individuals toward action and maintenance stages for safer sex knowledge, self-efficacy and practices, no study provided data for all 5 stage distributions.

Results generalisable to the UK?

Non-UK studies but likely to apply to UK settings

Recommendations for future research

The author suggests that studies are required to validate the measurement of stage membership for condom use adoption in diverse populations, for different types of sexual intercourse, and for main and other sexual partners. There are also needs of standardisation of adoption stages and staging algorithms used in studies. Researchers must provide better descriptions of how the processes of change are operationalised. A meta-analysis of studies evaluating TTM based pregnancy and STD prevention programs to quantitatively assess the literature.

Cost-effectiveness data None stated

Policy implications None stated

Implications for practice

The author states that although knowledge of the TTM advances, practitioners need to recognise its limitations. Using peer leaders trained in STD and pregnancy risk reduction strategies could be an effective way to change knowledge, attitudes and behaviours in middle and high school students. Interventions must address sexual relationships and disease outcomes and target men and women's needs separately to be more effective.

Comments Rating score 2-B

Reference ID 3212	Data extracted by NC	Date of extraction 27.4.06
Author(s) Littell J H & Girvin H	Year 2002	
Title Stages of change: A Critique		
Source Behavior Modification		
Type of study Systematic review		
Research question(s) Do empirical studies of stages of change across a variety of problem behaviors and samples indicate that there are a set of discrete states with sequential transitions between them? What is the model's predictive validity and its utility in matching subjects to different types of treatment?		
Databases/sources searched PSYCINFO, PSYCNET, Social Work Abstracts, Lexis-Nexis, InfoTrac, and PubMed (MEDLINE)		
Years searched Not stated		
Inclusion criteria Not stated		
Exclusion criteria Articles that focused on the constructs (the decision balance, self-efficacy, temptations, and processes of change) as opposed to evidence on the stages of change or provided insufficient information on stage assessments were not included.		
Number of studies 87		
Number of participants 83,833		
Method of analysis Narrative synthesis		
What data extracted? Data extracted: study intervention/behaviour, sample characteristics, stage measure and stage examined.		
Results The behaviours reviewed focused on the following topics: smokign cessation, substance abuse, HIV risk reduction, and other behaviours (such as exercise acquisition, sunscreen use, weight control, fruit and vegetable consumption, diabetes related behaviours and 1 study examined 10 behaviours from seatbelt use to conducting cancer self-examinations). The empirical evidence indicates that the proposed stages of change are not discrete. Participants can be placed in mutually exclusive categories via algorithms, but as others have notes, these distinctions may be artificial. Analyses of stages of change scales indicate that most people agree with items that are thought to be reflect different stages. Some participants endorse items that reflect nonadjacent stages. With the exception of precontemplation, the stages do not emerge in any consistent manner in principal components, factor or cluster analysis across or within problem behaviors.		
Conclusions The assumption that there are common stages of change across a range of situations, problem behaviours, and populations is not borne out by empirical data. Nor is there consistent or convincing evidence of discrete stages of change in relation to specific problem behaviours such as substance abuse or cigarette smoking. The authors conclude that as with other stage models, its descriptions of people and processes are not particularly accurate or generalisable. Successful change processes may vary depending on the nature and complexity of the target behaviour, presence of other problems, external stressors and supports and cultural context. The search for a generic, underlying structure of behavioural change has led to unnecessary reductionism, reliance on a set of categories that do not reflect qualitatively different states, and adherence to assumptions about stage progression that have not been supported. There is little empirical evidence of sequential transitions between stages. Longitudinal studies have used single stage classifications at each observation point. More than 400		

patterns of stability and movement between stages have been reported but no studies have documented movement through the entire stage sequence. Associations between stage classifications and other variables have been reported, but it is not clear whether these might be better accounted for by continuous measures of readiness for change.

Criticism of conclusions?

Most of the recent work in this area is based on the assumption that discrete stages exist and have already been empirically validated, thus many researchers have moved on to examine and explain movement between stages.

Evidence of effect in sub-groups? None

Strengths/weaknesses of the evidence Refer to conclusions

Results generalisable to the UK?

Non-UK studies but likely to apply to UK settings

Recommendations for future research

A continuous model of readiness for change would be more parsimonious according to the authors and possibly more easily integrated with related concepts from other theories. In the future, the authors argue that emphasis should be placed on understanding variations in patterns and processes of change that are associated with problem types, social settings, and cultural contexts. Research should focus on examining a variety of potential influences on cognitive and behavioural change.

Cost-effectiveness data None stated

Policy implications None stated

Implications for practice

According to the authors the stage model may have considerable heuristic value, its practical utility is limited by concerns about the validity of stage assessments. The model cannot have much practical utility for the design or allocation of treatment services if its basic tenets do not hold up which the authors criticise in their conclusion. They argue that it is time to seriously consider alternative conceptualisations of change processes. Rather than a progression through stages, change can come about swiftly, often as a result of life events or external pressures. The change process is likely to vary, depending on whether motivation for change is internal or external.

Comments

SoC was most commonly assessed with an algorithm (set of decision rules) based on yes or no answers to a few questions about current behaviour, future intentions, and in some studies past attempts to change (therefore SoC outcome measures used self-reports of intentions and behaviour).
Rating score 2-B

Reference ID 412	Data extracted by NC	Date of extraction 27.4.06
Author(s) Marshall S J & Biddle S J H		
Year 2001		
Title The Transtheoretical Model of Behavior Change: A Meta-Analysis of Applications to Physical Activity and Exercise		
Source Annals of Behavioral Medicine		
Type of study Systematic review (meta-analysis)		
Research question(s) What are the findings from empirical applications of the TTM in the physical activity domain?		
Databases/sources searched MEDLINE, PSYCLIT, Sports Discuss, UnCover and a manual search		
Years searched 1983-2000		
<p>Inclusion criteria Studies were included if they applied to, empirically, at least one of the core constructs of the TTM to physical activity, exercise behaviour or both (i.e. a staging algorithm with a concurrent physical activity measure, decisional balance, self-efficacy, processes of change). Studies that included other variables considered by expert review to represent a proxy measure of a core construct were also included. In particular, measures of PBC were used in the absence of self-efficacy measures, physical activity attitude measures were used in the absence of Pro scales and barriers to exercise measures were used in the absence of Con scales.</p> <p>Exclusion criteria Non-English language studies. Samples that included only a stage of change measure or used a continuous measure to stage participants were omitted from the meta-analysis.</p>		
Number of studies 71 published reports with 91 independent samples		
Number of participants 74,965		
Method of analysis Meta-analysis		
<p>What data extracted?</p> <p>Data extracted: sample, study design, setting, sampling method, recruitment method, publication status, gender, age, country, number of participants, criterion for action, stage of change measure, process of change measure, self efficacy measure and concurrent measure of physical activity.</p> <p>For study coding purposes, measures of exercise pros were grouped into 3 categories: behavioural belief measures (expectancy x value), benefits of exercise scales, and the Pros scale from the Decisional Balance Questionnaire. Exercise cons measures were grouped into 2 categories: barriers to exercise and the Cons scale from the Decisional Balance Questionnaire. Self-efficacy measures were grouped into 3 categories; Short-term Likert measures, long-item Likert measures, and perceived behavioural control items.</p>		
<p>Results</p> <p>All analyses were conducted using the effect size estimate Cohen's d with the adjustment computations proposed by Hunter & Schmidt. After the correction for sampling error, measurement error, and study weighting, 5 summary statistics were computed for each construct at each stage transition: mean sample weighted corrected effect size, mean sample size weighted total variance of corrected effect size, mean sample weighted error variance of corrected effect size, variance of population effect sizes, and standard deviation of population effect sizes. The homogeneity of mean corrected effect sizes for each construct at each stage transition was examined to determine if the variability in outcomes was greater than expected from sampling error and measurement error. Of the 71 published reports, 54 used a cross-sectional design, 6 were longitudinal, 10 were quasi experimental and 1 was a RCT. The proportion of individuals in each stage differed depending on the criteria used to define regular physical activity. Consistent with the predictions of the TTM, the level of physical activity increased</p>		

as individuals moved to a higher stage of change. As expected the largest effect was evident for preparation to action ($d=0.85$) the point at which individuals begin to meet an established criterion for physical activity. Effect estimates for self-efficacy across the stage transitions were all positive and significant, suggesting that confidence to be active increases with each stage of change, as proposed by the TTM. However in contrast to theoretical predictions the pattern of increase appeared nonlinear, with effects characterised as moderate (precontemplation to contemplation), small to moderate (contemplation to preparation), moderate (preparation to action), and moderate to large (action to maintenance). All effect estimates for behavioural pros were significant and positive suggesting that perceived benefits of change increase for every forward stage transition. Of the 40 effect sizes presented 25 are statistically different from zero. Across all processes of change the largest effects were evident from precontemplation to contemplation (d range = 0.55-1.18), then from preparation to action (d range = 0.27-0.72).

Conclusions

Three general conclusions are offered. First, existing data are unable to confirm whether physical activity behaviour change occurs in a series of stages that are qualitatively or along adjacent segments of an underlying continuum. Second, the growing number of studies that incorporate TTM concepts means that there is an increasing need to standardise and improve the reliability of measurement. Finally, the role of processes of change needs reexamining because the higher order constructs are not apparent in the physical activity domain and stage by process interactions are not evident. There are now sufficient data to confirm that stage membership is associated with different levels of physical activity, self-efficacy, pros and cons, and processes of change.

Criticism of conclusions?

The authors state that due to the cross-sectional nature of the data it is uncertain whether changes in process use actually facilitate or inhibit stage progression. Few studies are available that make process-specific predictions at each stage of change.

Evidence of effect in sub-groups?

Younger samples (< 25 years) had fewer individuals in precontemplation (3%) but more in preparation (31%) and action (18%) than other age groups. Samples of seniors (55+) had the most individuals in maintenance (46%).

Strengths/weaknesses of the evidence

None stated. Heterogeneity of the studies in terms of study design and stage of change measures.

Results generalisable to the UK?

Yes, includes UK studies

Recommendations for future research

Further studies that simply stage participants or examine cross-sectional differences between core constructs of the TTM are of limited use. Future research should examine the moderators and mediators of stage transition.

Cost-effectiveness data None stated

Policy implications None stated

Implications for practice

The authors state that the timing of the “balance point” between behavioural change pros and cons per se is of limited clinical value because the point at which the pros of change begin to outweigh the cons has not shown to be a consistent temporal marker of actual behaviour change in the physical activity domain.

Comments Rating score 2-A

Reference ID 538	Data extracted by NC	Date of extraction 24.4.06
Author(s) Riemsma R P et al	Year 2002	
Title A Systematic Review of the Effectiveness of Interventions Based on a Stages-of-Change Approach to Promote Individual Behaviour Change		
Source Health Technology Assessment		
Type of study Systematic review		
Research question(s) What is the effectiveness of interventions using a stage-based approach in bringing about positive changes in health-related behaviour?		
Databases/sources searched AMED, ASSIA, BIOSIS, BEI, BLC, BNI, CAB-Health, CINAHL, CL, CPI, DARE, DH-Data, DA, EconLIT, EMBASE, EPPI, ERIC, HEBS, HealthPromis, UD, HEED, HELMIS, HTA, ISTEP, IBSS, KF, MANTIS, MEDLINE, MHA, NHS EED, NRR, PSYCLIT, SCI, SIGLE, SSCI, SA; and ancestry		
Years searched From inception to May 2000		
Inclusion criteria RCTs evaluating interventions, that aimed to influence individual health behaviour, used within a stages-of change approach were eligible for inclusion. Only studies that reported health-related behaviour change such as smoking cessation, reduced alcohol consumption or dietary intake and stage movement were included. The target population included individuals whose behaviour could be modified, primarily in order to prevent the onset, or progression, of disease. There was no limitation of study by country of origin, language or date.		
Exclusion criteria Not stated		
Number of studies 37		
Number of participants 41,676		
Method of analysis Narrative synthesis		
What data extracted? The data extracted included: author, date, country and language, stage of change information and any other information relating to the theoretical basis of the intervention, intervention details, participants - including details of how participants were classified into the stages of change, and the validity and reliability of the measures used, details of the study design, results - behaviour change, stage movement, physiological changes, intermediate outcomes, documentation of the way an intervention operates in practice and cost-effectiveness. Health-related behaviour change such as smoking cessation, reduced alcohol consumption or dietary intake was the primary outcome measure. Secondary outcomes included: assessment of stage movement; health-related outcomes such as blood pressure, serum cholesterol levels and body weight; intermediate outcomes such as beliefs, attitudes and self-efficacy; patient satisfaction; any adverse effects resulting from the intervention; as well as data assessing the cost-effectiveness of behaviour change interventions. Necessary outcomes for trial inclusion included behaviour change or stage movement.		
Results 3 studies evaluated interventions aimed at prevention (2 for alcohol consumption and 1 for cigarette smoking). In 13 trials the interventions were aimed at smoking cessation, 7 studies were evaluated interventions aimed at the promotion of physical activity, and 5 studies evaluated interventions aimed at dietary change. 6 trials evaluated interventions aimed at multiple lifestyles changes. 2 studies evaluated interventions aimed at the promotion of screening mammography, and 1 study evaluated an intervention aimed at the promotion of treatment adherence. Quality assessment was carried out using an existing quality assessment tool (NHS Centre for Reviews and Dissemination 2001) rating the		

methodological quality of the studies and the quality of the implementation. Methodological quality of the trials was mixed, and ranged from 2 to 11 out of the 13 quality items. The main problems were lack of detail on the methods used to produce true randomisation; lack of blinding of participants, outcome assessors and care providers; and failure to use intention to treat analysis. The main issue with the quality of the implementation was lack of information on the validity of the instrument used to assess an individual's stage of change. In 1 of the 13 trials aimed at smoking cessation the results could not be compared to a non-stage based intervention, because only stage-based interventions were included. In 4 of the remaining 12 smoking cessation trials, significant differences favouring the intervention group for scores on quit rates were found; in 3 of these the comparator was a usual care control group and in 1 a non-stage based intervention. 1 study showed mixed outcomes. In the remaining 7 smoking cessation trials no significant differences between groups in behavioural change outcomes were found. 1 of the 7 trials aimed at the promotion of physical activity did not report any data on behaviour change. 3 trials found no significant differences between groups in behavioural change outcomes. 2 trials showed mixed effects, and 1 trials mainly showed significant effects in favour of the stage based intervention. 2 of the 5 trials aimed at dietary change reported significant effects in favour of the stage-based intervention; in 1 trial this was in comparison to a non-stage based intervention and in the other to a usual care control group. 2 trials showed mixed effects and in 1 trial no significant differences between groups in behavioural change outcomes were found. 3 of the 6 studies aimed at multiple lifestyles changes showed no differences between groups for any outcomes included. 2 studies showed mixed effects, and 1 study showed positive effects for all outcomes included: smoking cessation, fat intake and physical activity. 1 of the 2 trials aimed at the promotion of screening mammography found no significant differences between groups for nearly all outcomes. The other trial showed a significant difference in favour of the stage based intervention. The trial aimed at the promotion of treatment adherence showed significant results in favour of the stage based intervention. 2 out of 3 trials aimed at prevention showed no significant differences between groups for any measure of behaviour change. The other trial showed mixed outcomes.

Conclusions

Overall, there appears to be little evidence to suggest that stage based interventions are more effective compared to non-stage based interventions. Similarly there is little evidence that stage based interventions are more effective when compared to no intervention or usual care. Out of 37 trials 17 showed no significant differences between groups, 8 trials showed mixed effects, and 10 trials showed effects in favour of the stage based intervention(s). 1 trial presented no data on behavioural outcomes, and another included stage based interventions only. 20 trials compared a stage based intervention with an non-stage based intervention, 10 trials reported no significant differences between groups, 5 reported mixed effects and 5 reported significant effects in favour of the stage based intervention. The authors conclude that there does not seem to be any relationship between the methodological quality of the study, the targeted behaviour or quality of the implementation and effectiveness of the stage based intervention.

Criticism of conclusions?

The methodological quality of the included studies was mixed and there was little consistency on the types of interventions employed once participants were classified into stages and little knowledge about the types of interventions needed once people were classified.

Evidence of effect in sub-groups?

Studies with low income participants tended not to report effects favouring the stage based intervention. Other study characteristics, such as number of respondents, age and sex of respondents, year of publication, setting and verification of outcome measures, seemed to have little relationship with the effectiveness of the stage based intervention.

Strengths/weaknesses of the evidence

Few studies mentioned validation of the stages of change instrument, often the description of the intervention was so limited according to the authors that it was unclear whether the intervention was properly stage based.

Results generalisable to the UK?

Yes, 7 of the studies were UK based.

Recommendations for future research

There is a need for well-designed and appropriately implemented RCTs that are characterised by tailored interventions derived from accurate stage measurement, and which involve frequent reassessment of readiness to change in order to permit evolving, stage-specific interventions.

Cost-effectiveness data

4 of the studies included an economic evaluation. Two were related to smoking cessation, in the first, the costs of motivational consulting were calculated as the costs of training plus the costs of longer consultations. The marginal costs per quitter were assessed and costs were compared for other outcomes. The marginal cost per quitter was estimated at £450.64. In the other trial, advice to stop smoking given by pharmacy personnel trained in the stage of change model was compared with advice to stop smoking given by personnel who had not had this training. The total costs of the intervention were estimated at £14,915.76, while the total costs for the control group were estimated at £14,121.13. The incremental cost-effectiveness ratios for the intervention were estimated at £300 per quitter and £83 per life year. In one of the multiple lifestyle changes categorised studies it was stated that the actual cost of the intervention were assessed and would be used to compute cost-effectiveness, defined as the cost per unit of behaviour and organisational change. However these data were not reported. The last study to include an economic evaluation was a mammography screening and treatment adherence categorised study. The cost analysis was based on a separate non-randomised trial in which a multiple outcall strategy promoting screening mammography was compared with strategies involving a single outcall alone, an advance card plus single outcall, and no intervention. However the effectiveness data the effectiveness data for the 3 comparison groups came from the randomised trial included in this review. Although the multiple outcall intervention was more costly to deliver (US \$14.84 per participant compared with about US \$7 for the single outcall interventions) it cost considerably less per participant converted from non-adherent to adherent. When 40% of the population is non-adherent at the baseline, the costs of delivering the programme to 1000 participants would be US \$5768, \$6868 and \$10,088 for the single outcall, and multiple outcall interventions, respectively. The cost per participant who changes were US \$288, \$390 and \$154 respectively.

Policy implications

Policy makers need to recognise that this approach has a status which appears to be unwarranted when it is evaluated in a systematic way.

Implications for practice

Practitioners need to recognise that this approach has a status which appears to be unwarranted when it is evaluated in a systematic way.

Comments Rating score I++A

Reference ID 539	Data extracted by NC	Date of extraction 18.4.06
Author(s) Riemsma R P et al	Year 2003	
Title Systematic Review of the Effectiveness of Stage Based Interventions to Promote Smoking Cessation		
Source British Medical Journal		
Type of study Systematic review		
Research question(s) What is the effectiveness of interventions using a stage based approach in bringing about positive changes in smoking behaviour?		
Databases/sources searched 35 electronic databases, catalogues and internet resources. Bibliographies of retrieved references were scanned for other relevant publications.		
Years searched From inception to July 2002		
Inclusion criteria RCTs evaluating the effectiveness of stage based interventions in influencing smoking behaviour - such as actual behaviour change or movement through different stages.		
Exclusion criteria No restrictions were applied to participants other than they had to be smokers, and there were no restrictions on language or publication date.		
Number of studies 23		
Number of participants Not stated. 4 studies had <100, 8 had 101-500, 4 had 501-1000 and 7 had >1000		
Method of analysis Narrative synthesis		
What data extracted? Extracted data included smoking behaviour, movement through stages, adverse effects and cost effectiveness.		
Results Each trial was assessed for the methodological quality and the quality of the implementation of the intervention. The methodological quality of the studies was assessed on a 13 item criteria score. The methodological quality of the studies varied from 2 to 12 points on their criteria score. The main limitations were: lack of blinding of participants, outcome assessors, or care providers; lack of details about methods of randomisation and concealment of allocation; failure to report a sample size calculation, point estimates, and measures of variability; poor follow up; and no intention to treat analysis. The main problem with the quality of the implementation was the lack of information about the validity of the instruments used to assess stage of change. 8 trials found statistically significant differences in cessation rate in favour of the intervention group. In 12 trials no statistically significant differences between groups in smoking behaviour after the intervention was found. In 3 studies the findings were inconclusive. Only 10 trials reported movement through stages as an outcome.		
Conclusions Stage based interventions in smoking cessation were found to have only limited evidence for their effectiveness.		
Criticism of conclusions? The authors were not able to pool the studies as they were too heterogeneous for interventions, participants, settings, and outcomes.		
Evidence of effect in sub-groups? None		

Strengths/weaknesses of the evidence

The effectiveness of any stage based intervention depends on accurate classification of a participant's particular stage of change. However only 2 of the studies used a previously validated instrument.

Results generalisable to the UK?

Non-UK studies but likely to apply to UK settings

Recommendations for future research

Methodologically sound and theoretically consistent intervention studies are required to assess adequately the efficacy of stage based approaches to changing smoking behaviour.

Cost-effectiveness data

2 trials included an economic evaluation. In a 1999 study evaluating the effects of motivational consulting delivered by GPs, the marginal cost per person who quit was estimated at £450.65. In another 1999 study in which pharmacists tailored advice on smoking cessation, the incremental cost effectiveness ratio for the intervention was estimated at £300 per person.

Policy implications None stated

Implications for practice

Limited evidence exists for the effectiveness of stage based interventions when compared with non-stage based or no interventions in changing smoking behaviour.

Comments

The approaches reviewed are stage based but no reference is made to the TTM.
Rating score 1-B

Reference ID 1474	Data extracted by NC	Date of extraction 19.4.06
Author(s) Sheeran P & Taylor S	Year 1999	
Title Predicting Intentions to Use Condoms: A Meta-Analysis and Comparison of the Theories of Reasoned Action and Planned Behaviour		
Source Journal of Applied Social Psychology		
Type of study Systematic review (meta analysis)		
Research question(s) What is the relationship between intentions to use condoms and 23 predictor variables (3 background factors: gender, age and number of sexual partners; 1 personality factor: assertiveness; 11 variables derived from the HBM: perceived vulnerability, worry about HIV/AIDS, perceived severity, perceived benefits, perceived condom effectiveness, perceived barriers, condom attractiveness, interpersonal consequences of condom use, purchase embarrassment, cues to action; and 5 variables derived from the TRA and TPB: attitudes, subjective norms, descriptive norms, sexual partner norms, and self-efficacy) employed in studies?		
Databases/sources searched PSYCLIT, Social Science Citation Index and MEDLINE		
Years searched Jan 1981-Jan 1997		
Inclusion criteria 1) Studies had to include at least one predictor variable and a measure of intention to use condoms. 2) A bivariate statistical relationship between a predictor variable and intentions to use condoms had to be retrievable from studies.		
Exclusion criteria Studies which did not disaggregate intended condom use from general safer sex intentions were excluded.		
Number of studies 56 (67 samples)		
Number of participants 25,398		
Method of analysis Meta-analysis		
What data extracted? Data were extracted on the study characteristics, the sample sizes, age and gender, as well as the variables.		
Results The effect size estimate employed was the weighted average of the sample correlations, r^+ . Homogeneity analyses were conducted using the chi-squared statistic. Cohen (1992) guidelines for assessing the size of sample-weighted average correlations were used to interpret the findings ($r^+ = .10$ is small, $r^+ = .30$ is medium and $r^+ = .50$ is large). Background and personality variables had small average correlations with intentions to use condoms. Gender had a small positive correlation with behavioural intentions, indicating that women were more likely to use condoms than men. Age was negatively correlated with intentions. Younger people were more likely to intend to use condoms than were older people. Number of sexual partners and assertiveness both had positive correlations with intention. 10% of studies investigated knowledge of HIV/AIDS. A small to medium positive correlation obtained, indicating that participants with greater knowledge had greater intention to use condoms than less knowledgeable participants. Average correlations for other components of the HBM were also small to medium in magnitude. The perceived effectiveness of condoms in preventing infection with HIV/AIDS had a small correlation with intentions to use one. Perceived barriers had a small to medium negative correlation with intentions indicating that greater perceived barriers to use were associated with less intention to use condoms. The average correlations for cues to action and previous experience of an STD were both non-significant, although exposure to STD/AIDS education campaigns had a small positive correlation with behavioural intentions. Almost half of all studies		

included in the review measured attitudes toward condom use, and this variable had a highly reliable positive average correlation with behavioural intentions. Subjective norms were measured in the same number of studies and had a similar effect size. Positive attitudes and supportive subjective norms were both associated with greater intentions to use condoms. Self-efficacy/PBC had a medium effect size. Greater perceived confidence in or control over performing the behaviour was associated with stronger intentions to use condoms.

Conclusions

The most important findings were that background, personality, and HBM variables generally had small associations with intentions to use condoms. Variables specified by the TRA and TPB on the other hand had medium to strong average correlations with condom use intentions, indicating that these models provide an empirically validated framework for predicting and understanding motivation to use condoms. Knowledge of HIV/AIDS and perceptions of the threat of disease operationalised in terms of perceived seriousness had only modest associations with motivation. Similarly background and personality factors had small effect sizes. These findings indicate that perception of the behaviour (condom use) rather than perceptions of the disease have the greatest impact on condom use motivation.

Criticism of conclusions?

The authors point out that they were not able to compare the average correlations for subjective, descriptive and sexual partner norms because of the considerable overlap in the particular studies which measured these variables.

Evidence of effect in sub-groups? Refer to results

Strengths/weaknesses of the evidence

Meta-analysis does not determine whether a particular variable has a significant relationship after the effects of other variables have been controlled. In this study the authors state that it would have been useful to determine whether past behaviour and self-efficacy/PBC influence intentions over and above the effects of attitudes and subjective norms.

Results generalisable to the UK?

Yes, includes UK studies, 25% of the overall sample involved Western European participants

Recommendations for future research

Future research is recommended that examines whether TPB variables are capable of breaking the link between past behaviour and intentions to use condoms in the future.

Cost-effectiveness data None stated

Policy implications None stated

Implications for practice None stated

Comments Rating score 2-A

Reference ID 607	Data extracted by NC	Date of extraction 27.4.06
Author(s) Spencer L et al	Year 2002	
Title Applying the Transtheoretical Model to Tobacco Cessation and Prevention: A Review of Literature		
Source American Journal of Health Promotion		
Type of study Systematic review		
Research question(s) How is the validity of the TTM as applied to tobacco supported by research? How does the TTM describe special populations regarding tobacco use? What is the nature of evidence supporting the use of stage-matched tobacco interventions?		
Databases/sources searched PSYCINFO, MEDLINE, Current Contents, ERIC, CINAHL and Pro-Quest Nursing, and hand searching		
Years searched To 1 March 2001 (no starting date provided)		
Inclusion criteria All English, original, research articles on the TTM as it relates to tobacco use published in peer-reviewed journals prior to 1 March 2001 were included.		
Exclusion criteria Commentaries, editorials and books were not included		
Number of studies 148 articles including 54 validation studies, 73 population studies and 37 interventions		
Number of participants Approximately 355,076 (in paper articles duplicated across categories)		
Method of analysis Narrative synthesis		
What data extracted? The reviewed articles were categorised according to purpose using: construct validation, population, and intervention. Data extracted included: authors, study design category, purpose, subject characteristics, methods, variables measured, findings and implications.		
Results The research design of individual studies was rated from grade A - well designed controlled trials to grade E - expert opinion and the internal validity of individual intervention studies was also rated from good- meets all criteria for internal validity, to fair - does not meet all criteria, and poor - one or more fatal flaws, results may not be valid. The overall criteria, for rating the body of literature ranged through 5 stages from conclusive - many well designed experimental and quasi-experimental studies, to weak - studies supporting a cause and effect relationship between an intervention and outcome are poorly designed, non-experimental or lack proper operationalisation. The rating criteria for construct validity addressed the theoretical derivation of the construct, reliability of the construct, analysis of group differences and changes over time, generalisability across contexts and comparison to rival theories. Overall, the evidence in support of the TTM as applied to tobacco use was strong, with supportive studies being more numerous and of a better design than non-supportive studies. Using established criteria the construct validity of the entire body of literature was rated as good. However notable concerns exist about the staging construct. A majority of stage matched intervention studies provided positive results and were of better quality than those not supportive of stage matched interventions. Thus, the authors rated the body of literature using stage matched interventions as acceptable and the body of literature using non-stage matched interventions as suggestive. Population studies indicated that TTM constructs are applicable to a wide variety of general and special populations both in and outside of the US, although a few exceptions exists.		
Conclusions Evidence of the validity of the TTM as it applies to tobacco use is strong and growing, however it is not conclusive. 8 different staging mechanisms were identified, raising the question of which are most		

valid and reliable. Interventions tailored to a smoker's stage were successful more often than non-tailored interventions in promoting forward stage movement. Based on their rating criteria the authors conclude that the construct validity of the TTM is good.

Criticism of conclusions?

The authors state that although they used a systematic framework for analysing and rating study designs and outcomes, ultimately it was based on their judgements. They also state that they could have unintentionally overlooked some studies.

Evidence of effect in sub-groups?

The TTM appears to apply to young people who smoke as it does to adults, however they may be less likely to use the experimental/cognitive processes of change than the behavioural ones. Studies of the TTM, tobacco use and gender differences, age differences, racial differences, pregnancy and income level provided mixed results, with few suggesting differences in TTM constructs based on these demographic variables. Of each of these subject groups, pregnant smokers were studied most often. Although TTM constructs applied to them as it did the general population there were few differences.

Strengths/weaknesses of the evidence

A criticism of the stages of change construct is that it might not represent true stages that can be discreetly categorised, where forward movement from one stage is caused by different variables than those that cause forward movement from another stage. This also leads to another question as to whether stages are better measured by a continuous scale than a categorical measure.

Results generalisable to the UK?

Yes, includes UK studies

Recommendations for future research

The authors state that stage distribution is well-documented for US populations, however more research is needed for non-US populations, for special populations and on other TTM constructs. More research is needed on the staging of smokers, subgroups within stages and differences in how the model is applied in mass public health interventions vs. individualised counselling interventions. Clarification of how the processes of change are operationalised in studies that measure them is also needed. More research is needed to validate the measurement of stage membership, better descriptions of how the processes of change are operationalised are needed, research should focus on the application of the TTM in individualised interventions through the use of case study methods, and meta-analyses of studies evaluating TTM based tobacco cessation programs would offer a quantitative assessment of the literature.

Cost-effectiveness data None stated

Policy implications None stated

Implications for practice

Practitioners need to be aware that the TTM is continuing to evolve, those using it should be aware of new developments in the model as they occur.

Comments

The outcome measures used in each study are stated and each uses a method of assessing the individual's stage of change (8 staging mechanisms were identified). Some of the studies also included objective measures such as saliva samples.

Rating score 2+A

Reference ID 1576	Data extracted by NC	Date of extraction 19.4.06
Author(s) van Sluijs E M F et al	Year 2004	
Title Stage-Based Lifestyle Interventions in Primary Care. Are they Effective?		
Source American Journal of Preventive Medicine		
Type of study Systematic review		
Research question(s) What is the effect of stages of change based interventions in primary care on smoking, physical activity and dietary behaviour?		
Databases/sources searched MEDLINE, PSYCINFO and EMBASE		
Years searched From inception to July 2002		
<p>Inclusion criteria</p> <ol style="list-style-type: none"> 1) RCT/CT, 2) Intervention initiated in primary care, and 3) Intervention aimed at changing smoking, physical activity, or dietary behaviour, and stages of change based outcomes, and 4) Behavioural outcomes. <p>Every medical setting providing directly accessible health care to the general population was defined as primary care. The advice did not have to be verbal but could have been computerised or given as written material. Studies were included if it could be established that a comparison was made between an intervention group, which received a TTM based behavioural intervention, and a no intervention or usual care group.</p> <p>Exclusion criteria Restricted to published trials that investigated the effectiveness of lifestyle advice initiated from primary care and that was based on the stages of change construct. Studies were excluded when the intervention involved additional aids e.g. nicotine gum or free tickets to a sporting facility. The intervention had to concentrate on at least one of the chosen three lifestyle behaviours (smoking, nutrition, and physical activity) and should have been given to an adult population (older than 18 years). The selection was not restricted to language.</p>		
Number of studies 29		
Number of participants 6,474		
Method of analysis Narrative synthesis		
<p>What data extracted?</p> <p>Data extracted on the randomisation procedure, baseline characteristics, loss to follow up, blinding, timing of the measurements, length of the follow up, and on the statistical analyses. Data were also extracted on the effectiveness to assess the levels of evidence, the number of included patients and the number of patients positively changing their behaviour, as well as data on the number and mean age of the included participants, main inclusion criteria, the effect of the intervention on both behaviour and on the stage of change, and details about the specific intervention.</p>		
<p>Results</p> <p>Two methods for assessing the effectiveness of the interventions were used, namely a best evidence synthesis and odds ratios. Odds ratios were calculated to compare the odds of the intervention group positively changing behaviour at follow up with those of the control group. A rating system for the levels of evidence, based on previously used best evidence syntheses was used to determine the effectiveness on the main behavioural outcome measure and on stages of change. The quality assessment scale was developed by combining previously used scales. Methodological quality was assessed in four dimensions: quality of the study design (randomisation and control conditions); research population (research groups comparable at commencement of the intervention and dropout described and acceptable); quality of the measurements (if the person conducting the measurements</p>		

was blinded to group assignment, respondent blinded to group assignment, timing of measurements comparable for the different research groups, and if the length of the follow-up is described and acceptable); and quality of the analysis (intention to treat analysis and control for potential confounders). Possible score on each item was positive, negative or unknown (insufficiently described), which could lead to a perfect score of 10 (9 for CTs). The methodological quality of the studies overall was good, with quality scores attained ranging from 4 to 10 for the RCTs and 4 to 8 for the CTs. Only 7 studies (4 RCTs and 3 CTs) were of low quality (score of 5 or less). Of the 13 studies promoting physical activity, 8 were high quality RCTs, 2 were CTs of high quality and 2 RCTs and 2 CTs were of low quality.

These studies found no evidence of changes in the stages of change at short, medium and long-term follow up. Short term characterised as less than 6 months, medium term (6 months) and long term (longer than 6 months). In terms of the level of physical activity as the outcome results were inconsistent, with no evidence for effect at short, medium or long-term follow up. Of the 14 studies aimed at smoking cessation interventions 9 were high quality RCTs, 2 CTs of high quality and 1 low quality CT. In terms of changes in the stages of change there was no evidence for effect at short and long-term follow up, and limited evidence for an effect at medium-term follow up. Using quitting smoking as the outcome there was no evidence for effect at short, medium or long-term follow up. Of the 5 studies aimed at dietary interventions they were all rated as high quality RCTs. There was limited evidence of change in the stages of change for fat intake, at short-term follow up and no evidence at medium and long-term follow up. However there was strong evidence for an effect of a stage based intervention on fat intake at short-term and long-term follow up, but no evidence for an effect at medium-term follow up.

Conclusions

No evidence was found for an effect on the level of physical activity, there was limited to no evidence for an effect of the stage based smoking cessation interventions on quit rates and on stages of change. However the studies on dietary behaviour paint a positive picture for the effect of stage based interventions on dietary behaviour or more specifically on fat intake. The authors conclude that there is strong evidence for an effect at short and long-term follow up.

Criticism of conclusions?

The authors point out that it is possible that they did not identify all trials published. Additionally, they state that there is no worldwide accepted definition of primary care and that the organisation of primary care differs. They also state that the items in their evidence hierarchy (4 levels) are to some extent arbitrary as there is no consensus on which criteria should be used for assessing methodological quality of RCTs and CTs. Because of the heterogeneity of the interventions and outcome measures used the authors decided not to calculate and compare effect sizes. Although they established that all the interventions were based on the TTM model the extent to which this was the case was not systematically assessed and included in the conclusions, therefore a conclusion as to whether the interventions more accurately based on the TTM model produce better results could not be drawn.

Evidence of effect in sub-groups? None

Strengths/weaknesses of the evidence

The authors highlight the criticisms in the literature of the stages of change as basis for interventions: questions on the internal validity of the model and the transition stages of change model from cessation activities to initiation activities, as well as misclassifications in self-report of stages of change for physical activity and dietary behaviour. They also acknowledge that the reduction of a complex behaviour to a small aspect such as reducing dietary fat intake instead of on the general concept of healthy eating, might explain some of the observed differences in effect.

Results generalisable to the UK?

Non-UK studies but likely to apply to UK settings

Recommendations for future research None stated

Cost-effectiveness data None stated

Policy implications None stated

Implications for practice

The stages of change model enables the primary care practitioner to obtain important information for behaviour change in a short period of time, and they conclude that it seems to be a logical basis for behaviour change intervention.

Comments

The outcome measures used in each study are stated varying between studies from assessment of the stage of change and level of physical activity to the number of sessions of exercise in the past 4 weeks.
Rating score 2++B

Reference ID 3367	Data extracted by NC	Date of extraction 28.4.06
Author(s) Zimmerman R S & Vernberg D	Year 1994	
Title Models of Preventive Health Behavior: Compassion, Critique and Meta-Analysis		
Source Advances in Medical Sociology		
Type of study Systematic review (meta-analysis)		
Research question(s) How do the HBM, TRA and social cognitive theory (SCT) compare as predictive models of health-related behaviour?		
Databases/sources searched PSYCINFO, MEDLINE, Sociological Abstracts and ERIC		
Years searched 1980 to 1991		
Inclusion criteria Empirical articles that involved the models of interest in the context of a health-related behaviour.		
Exclusion criteria Articles were excluded if they did not assess health-related intentions, behaviour, or behaviour change as a dependent variable; did not describe the study sample at all; or if they referred to one of the models but did not conduct analyses with components of the model. Articles were also excluded if they did not focus on prevention but rather on utilisation behaviour for persons with a current health-related condition. Articles which centred on psychological conditions rather than physical health conditions were also excluded. Finally articles were excluded if they included only children or adolescents as participants.		
Number of studies 57		
Number of participants Not stated, sample sizes categorised: 33% 24-100, 32% 101-200, 17% 201-500, 11% 501-999 and 3% had 1000+ participants		
Method of analysis Meta-analysis		
What data extracted? The study design and sample, the variables used in the analysis, quality of measurement, type of construct, test of the model if conducted and the statistical test, and the value of the statistic. An unweighted summative scale was constructed to measure overall study quality based on 5 components: sample size, sampling method and population type, quality of measurement, bivariate or multivariate analysis, and cross-sectional or longitudinal design.		
Results Total study quality score could range from 1 to 17. Two thirds of the studies received scores of 8 or less, with a mean score of 7.95. 30 of the studies employed the HBM, 15 the TRA and another 15 the SCT (3 studies tested 2 of the models). 70% studied primary prevention as the dependent variable. About half of the studies collected data at 2 or more points whilst 88% conducted multivariate analyses. Less than one quarter used probability sampling methods and sampled the general population. The mean sample size was 260.8. For 60% of both the HBM and SCT papers, the dependent variable was discrete, rather than continuous in nature; for the TRA only 13% of the studies involved discrete behaviours. Susceptibility, severity, benefits, and barriers were all assessed in more than three-fourths of the HBM papers; general health motivation and cue to action were assessed in 10-20 % of the papers; and efficacy expectations were assessed in 2 out of the HBM papers. Attitudes toward behavior and subjective norms were assessed in all the TRA papers, behavioural intention in 87%. All the SCT papers assessed specific self-efficacy. Significance levels of the 3 models were compared (mean r^2 for HBM was 24, for the TRA it was 34.3 and for the SCT it was 34). 87% of the TRA studies found r^2 with $p < .01$, barely a majority of HBM studies found the same result; SCT was intermediate between the other 2 models in significant level. The mean r^2 was smaller for the HBM		

than for the other 2 models. A multiple regression analysis was conducted, with r^2 as the dependent variable. The only variable that entered the equation at $p < .05$ was study quality. The better quality studies regardless of theoretical model used predicted behaviour more poorly than poorer quality studies.

Conclusions

Overall the HBM was least powerful at predicting outcome variables, the TRA was most powerful, and SCT had intermediate power at predicting outcome variables, these differences however were not statistically significant. All 3 models even using a procedure that selected the one analysis per study with the highest r^2 , left 65% or more of the variance unexplained.

Criticism of conclusions?

Most studies did not measure and/or test all components of the respective model. The mean number of model components assessed was 3.53 for the HBM, 1.80 for the TRA and 1.73 for SCT. The number of studies is relatively small, leading to small power at detecting differences among the models. Also the TRA studies often predicted intention, rather than behaviour or behaviour change.

Evidence of effect in sub-groups? None

Strengths/weaknesses of the evidence

The authors state that results were often not carefully presented in the original study. As a result significance value of multivariate tests were not always presented. Thus, only a subsample of the studies can be used in many analyses. Also, multivariate tests of the models frequently included other, extramodel variables as independent variables without presenting enough information to estimate the proportion of variance accounted for by model variables per se. Thus, the r^2 for the models is on average likely to be an overestimate.

Results generalisable to the UK?

Non-UK studies but likely to apply to UK settings

Recommendations for future research

More TRA studies must assess behaviour or behaviour change if the theory is to have the sort of practical significance that the authors advocate. Further empirical comparisons of various models are required in different preventive health arenas (e.g. prenatal care behaviour, cancer prevention and safety belt use) taking into account more explicitly the social environment, before more refined model development can be pursued.

Cost-effectiveness data None stated

Policy implications None stated

Implications for practice None stated

Comments

Range of health related behaviours reviewed not stated. Outcome measures used within the individual studies also not stated.
Rating score 2+B

5. Have any changes in knowledge/attitudes/behaviours brought about in relation to use of these models been shown to effect health outcomes, expressed in terms of (population) morbidity and mortality?

Reference ID 1101	Data extracted by NC	Date of extraction 28.4.06
Author(s) Hardeman W et al	Year 2002	
Title Application of the Theory of Planned Behaviour in Behaviour Change Interventions: A Systematic Review		
Source Psychology and Health		
Type of study Systematic review		
Research question(s) How often and in what way has the TPB been applied to interventions aimed at behaviour change and/or their evaluation? What methods have been used to alter components of the model? How many interventions have been effective in changing targeted TPB components, intention and behaviour? Were any changes in intention and behaviour mediated by TPB components?		
Databases/sources searched MEDLINE, PSYCLIT, EMBASE, Cochrane Library, and Current Contents		
Years searched MEDLINE (1966-May1999), PSYCLIT (1887-March 1999), EMBASE (1980-February1999), Cochrane Library, and Current Contents (13.4.98-5.4.99)		
Inclusion criteria Published studies with an explicit application of the TPB or revised TRA to an intervention and/or its evaluation. Studies in which the TPB was used alongside other theories and models as long as the TPB was explicitly mentioned.		
Exclusion criteria Studies that only used other models were excluded. Studies that measured a mix of components of the TPB and other theories, without explicit mention of the TPB. Studies in which self-efficacy was measured alongside the TRA were excluded if the authors did not report that they used self-efficacy as a proxy measure of PBC.		
Number of studies 30		
Number of participants Not stated, greater than 12,957		
Method of analysis Descriptive review		
What data extracted? Target behaviour, characteristics of participants, study design, use of the TPB, intervention package, targeted TPB components, change in targeted components, change in intention and behaviour, and mediation of change by TPB components.		
Results Effect sizes were calculated using mean scores in experimental and control groups at follow-up, divided by the standard deviation in the control group (Hedges & Olkin 1985). 21 interventions targeted health-related behaviours, including infants' sugar intake, smoking cessation, exercise, testicular self-examination, and drink driving. The remaining interventions involved signing up for a chemistry course, working in projects and job seeking. Most interventions targeted school and university students. Participants were mixed sex, unless the intervention focused on a sex-specific health issue. Groups selected by risk adverse outcomes of their behaviour included adults with a low fruit and vegetable consumption, intravenous drug users and crack smokers, inner-city African American adolescents, participants of a weight loss programme, adults with gingivitis and unemployed people. 9 interventions were short and consisted of an audio-taped, audiotaped/printed, printed, audiovisual, or videotaped message or single instruction. All but one of these interventions were applied among		

students. The 15 longer interventions comprised exercise classes, an educational session and a series of educational sessions. The duration was less than a month in 5 studies, and between 1 and 6 months in 9 studies. Evaluation studies of 14 interventions had a RCT design, and 7 were non-randomised trials. 1 study was longitudinal, and 2 were surveys. In all interventions TPB components were measured but only 1 measured the full range of components. The descriptions of the interventions were limited. As a result, some behaviour change methods were either not described or not classifiable. Evaluation studies of 13 interventions reported on change in behavioural intention, with 6 showing some positive effect. Of the 6 effect sizes could be calculated for 4 studies, and they were small to moderate in 2 studies and large in the other 2. 4 studies reported no change in the intervention group compared to the control. Evaluation studies of 13 interventions reported on change in behaviour. 7 reported at least 1 positive change in the intervention group compared to the control group. Effect sizes were very small in one study, small to moderate in 2, moderate to large in 1, and large in 1. Effect sizes based on proportions, calculable for 3 studies ranged from 3.7% to 50%. With the studies that used the TPB to develop the intervention (12), 4 found positive changes in behaviour, with effect sizes very small in 1 study, small to moderate in 1 and moderate to large in another.

Conclusions

The TPB was mainly used to measure process and outcome variables and to predict intention and behaviour, and less commonly to develop the intervention. Behaviour change methods were mostly persuasion and information, with increasing skills, goal setting, and rehearsal of skills used less often. When reported, half of the interventions were effective in changing intention, and two thirds in changing behaviour, with generally small effect sizes, where calculable. Effectiveness was unrelated to use of the theory to develop intentions. Evidence about mediation of effects by TPB components was sparse. The TPB may have potential for developing behaviour change interventions, but more comprehensive studies are needed that compare the utility of the TPB with other social cognition models and behavioural techniques.

Criticism of conclusions?

The authors highlight the fact that they did not search the grey literature as a limitation of their review. It was according to the authors sometimes difficult to judge whether the TPB was applied to an intervention.

Evidence of effect in sub-groups? None

Strengths/weaknesses of the evidence

Intervention drop-out rates where reported within the studies were significant (up to 75% in some). Great heterogeneity across the studies. About one third of the studies did not report on the reliability of the measured components, and more than half measured behaviour by self-report. Studies were often of poor design, more precise estimations of effectiveness of interventions could be made if studies had a RCT design, longer follow-up period, intention to treat analysis, and used standardised, reliable measures of constructs and more objective measures of behaviour. It would aid interpretation if authors reported recruitment and dropout rates, to provide insight into the feasibility and acceptability of the intervention, and the generalisability of findings.

Results generalisable to the UK?

Yes, includes 5 studies based in the UK

Recommendations for future research

Well designed studies that evaluate carefully developed interventions, specifically targeting TPB components and measuring the effect on cognitions as well as behaviour, are needed to provide evidence about the utility of the TPB in this area. Studies are required that have a RCT design, longer follow-up period, intention to treat analysis, and used standardised, reliable measures of constructs and more objective measures of behaviour. It would aid interpretation if authors reported recruitment and dropout rates, to provide insight into the feasibility and acceptability of the intervention, and the generalisability of findings.

Cost-effectiveness data None stated

Policy implications None stated

Implications for practice

The TPB may have potential for developing behaviour change interventions, but more comprehensive studies are needed that compare the utility of the TPB with other social cognition models and behavioural techniques.

Comments

Type of outcome measures (self-report or objective) used within the studies not stated.

Rating score 2-A

Reference ID 539	Data extracted by NC	Date of extraction 18.4.06
Author(s) Riemsma R P et al	Year 2003	
Title Systematic Review of the Effectiveness of Stage Based Interventions to Promote Smoking Cessation		
Source British Medical Journal		
Type of study Systematic review		
Research question(s) What is the effectiveness of interventions using a stage based approach in bringing about positive changes in smoking behaviour?		
Databases/sources searched 35 electronic databases, catalogues and internet resources. Bibliographies of retrieved references were scanned for other relevant publications.		
Years searched From inception to July 2002		
Inclusion criteria RCTs evaluating the effectiveness of stage based interventions in influencing smoking behaviour - such as actual behaviour change or movement through different stages.		
Exclusion criteria No restrictions were applied to participants other than they had to be smokers, and there were no restrictions on language or publication date.		
Number of studies 23		
Number of participants Not stated. 4 studies had <100, 8 had 101-500, 4 had 501-1000 and 7 had >1000		
Method of analysis Narrative synthesis		
What data extracted? Extracted data included smoking behaviour, movement through stages, adverse effects and cost effectiveness.		
Results Each trial was assessed for the methodological quality and the quality of the implementation of the intervention. The methodological quality of the studies was assessed on a 13 item criteria score. The methodological quality of the studies varied from 2 to 12 points on their criteria score. The main limitations were: lack of blinding of participants, outcome assessors, or care providers; lack of details about methods of randomisation and concealment of allocation; failure to report a sample size calculation, point estimates, and measures of variability; poor follow up; and no intention to treat analysis. The main problem with the quality of the implementation was the lack of information about the validity of the instruments used to assess stage of change. 8 trials found statistically significant differences in cessation rate in favour of the intervention group. In 12 trials no statistically significant differences between groups in smoking behaviour after the intervention was found. In 3 studies the findings were inconclusive. Only 10 trials reported movement through stages as an outcome.		
Conclusions Stage based interventions in smoking cessation were found to have only limited evidence for their effectiveness.		
Criticism of conclusions? The authors were not able to pool the studies as they were too heterogeneous for interventions, participants, settings, and outcomes.		

Evidence of effect in sub-groups? None
Strengths/weaknesses of the evidence The effectiveness of any stage based intervention depends on accurate classification of a participant's particular stage of change. However only 2 of the studies used a previously validated instrument.
Results generalisable to the UK? Non-UK studies but likely to apply to UK settings
Recommendations for future research Methodologically sound and theoretically consistent intervention studies are required to assess adequately the efficacy of stage based approaches to changing smoking behaviour.
Cost-effectiveness data 2 trials included an economic evaluation. In a 1999 study evaluating the effects of motivational consulting delivered by GPs, the marginal cost per person who quit was estimated at £450.65. In another 1999 study in which pharmacists tailored advice on smoking cessation, the incremental cost effectiveness ratio for the intervention was estimated at £300 per person.
Policy implications None stated
Implications for practice Limited evidence exists for the effectiveness of stage based interventions when compared with non-stage based or no interventions in changing smoking behaviour.
Comments The approaches reviewed are stage based but no reference is made to the TTM. Rating score 1-B

APPENDIX 7: References of included systematic reviews and meta-analyses

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APPENDIX 8: References of included narrative reviews, articles and commentaries

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APPENDIX 9: References of excluded papers

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APPENDIX 10: References of articles not received within cut-off date (5pm, 27th April 2006)

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APPENDIX 11: Other examples of health behaviour change psychological models and concepts

Attribution theory: The origins of this theory are found in the work of Heider (1944), who argued that individuals are motivated to see their social world as predictable and controllable, with a need to understand causality. Kelley (1967) extended these ideas and proposed a defined attribution theory, suggesting that attributions about causality are structured according to causal schemata:

- Distinctiveness: the attribution about the cause of a behaviour is specific to the individual carrying out the behaviour
- Consensus: the attribution about the cause of a behaviour is shared by others
- Consistency over time: the same attribution about causality will be made at any other time
- Consistency over modality: the same attribution will be made in a different situation

Since its beginnings the theory has been developed with differentiations made between self-attributions (i.e. attributions about one's own behaviour) and other attributions (i.e. attributions made about the behaviour of others). Furthermore, the dimensions of attribution have been developed to include the following variables:

- Internal vs. external
- Stable vs. unstable
- Global vs. specific
- Controllable vs. uncontrollable

Health Action Process Approach (HAPA): Developed by Schwarzer (1992), who highlighted the need to include a temporal element in the understanding of beliefs and behaviour; and the importance of self-efficacy as a determinant of both behavioural intentions and self-reports of behaviour. The approach includes several elements from previous theories that predict behavioural intentions and behaviour. The main difference however between this approach and the other theories is distinction between a decision-making/motivational stage and an action maintenance stage. Thus, the approach adds a temporal and process factor to understanding the relationship between beliefs and behaviour and suggests that individuals initially decide whether or not to carry out a behaviour (motivation stage) and then make plans to initiate and maintain this behaviour (action phase).

Health locus of control: The internal vs. external dimension of attribution theory has been applied specifically to health in this concept. Individuals vary as to whether they regard events as within their control (internal locus of control) or as out with their control (external locus of control). Wallston and Wallston (1982) developed a measure of the health locus of control which can be used to evaluate whether particular individuals regard their own health as under their control, in the hands of fate, or alternatively under the control of others. The concept of health locus of control has been demonstrated to be related to whether individuals change their behaviour and to the type of communication style that they require from those delivering health messages.

Precede/Procede model: Developed by Green in the late 1960s and early 1970s the precede (predisposing, reinforcing, enabling, causes in, educational diagnosis and evaluation) model is a framework for the process of systematic development and

evaluation of health education programmes. The underlying premise is that health education is dependent upon voluntary cooperation and participation of the individual in a process which allows personal determination of behavioural practices, and that the degree of change in knowledge and health practice is directly related to the degree of active participation of the individual. The precede model includes 5 multidimensional phases:

1. Social diagnosis
2. Epidemiological diagnosis
3. Behavioural and environmental diagnosis
4. Education and organisational diagnosis
5. Administrative and policy diagnosis

As such it recognises that health and health behaviours have multiple causations which require evaluation in order to ensure appropriate intervention.

Proceed (policy, regulatory, organisational constructs in educational and environmental development) was added to the model in the late 1980s, in recognition of the need for health promotion interventions that go beyond traditional educational approaches to changing unhealthy behaviours. The administrative diagnosis is the final planning step to precede implementation. From there the proceed model promotes the plan or policy, regulates the environment, and organises the resources and services, as required by the plan or policy.

The proceed phases are:

6. Implementation
7. Process evaluation
8. Impact evaluation
9. Outcome evaluation

Protection Motivation Theory (PMT): Rogers (1975) developed this theory expanding the Health Belief Model to include other factors. The original theory claimed that health-related behaviours are a product of four components:

1. Self-efficacy
2. Response effectiveness
3. Severity
4. Vulnerability

The theory describes severity, vulnerability and fear as related to threat appraisal, and response effectiveness and self-efficacy as related to coping appraisal. According to the theory there are two sources of information:

1. Environmental (e.g. observational learning)
2. Intrapersonal (e.g. personal experience)

The information influences the components of the theory, which then cause an “adaptive” coping response (i.e. behavioural intention) or a “maladaptive” coping response (e.g. denial).

Self-regulatory model: Leventhal and Cameron’s (1987) self-regulatory model of illness behaviour is based upon problem solving models and suggests that illnesses are dealt with by individuals in the same way as other problems. The model assumes that given a problem or a change in the status quo, an individual will be motivated to solve the problem in order to return to “normality”. The stages of the model are:

1. Interpretation
2. Coping
3. Appraisal

The process is viewed as self-regulatory because the three stages of the model interrelate in order to maintain the status quo (i.e. they regulate the self).

Social Cognitive Theory (SCT): Bandura's (1986) social cognitive theory positions self-efficacy and outcome expectancies (related to situation and action) as central determinants of behaviour. Situation-outcome expectancies are based on the perception that some consequences are determined by the environment and are therefore divorced from personal control. Action-outcome expectancies are also related to the belief that one's actions are instrumental to a particular outcome. Self-efficacy relates to confidence in one's own ability to carry out a particular behaviour. Therefore the social cognitive theory predicts that behaviours are performed if one perceives control over the outcome, few external barriers, and confidence in one's own ability.

Unrealistic optimism: Weinstein (1983) has suggested that a reason why individuals practise unhealthy behaviours is due to inaccurate perceptions of risk and susceptibility i.e. their unrealistic optimism. In 1987 he described four cognitive factors that contribute to unrealistic optimism, suggesting that perception of risk is not a rational process:

1. Lack of personal experience with the problem
2. The belief that the problem is preventable by individual action
3. The belief that the problem has not yet appeared and will not appear in the future
4. The belief that the problem is infrequent

Weinstein has also argued that individuals show selective focus, therefore explaining why an individual's assessment of risk may go awry, causing them to be unrealistically optimistic.

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