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Why don't stage-based activity promotion interventions work?

J. Adams[1,2] and M. White[1]

Abstract

Despite the well-described benefits of regular physical activity, around 70% of adults in the UK fail to meet current activity recommendations. Interventions based on the Transtheoretical, or Stages of Change, Model of behaviour change have been proposed as one potentially effective method of promoting physical activity levels. However, two recent reviews have found little evidence that individualized stage-based activity promotion interventions are any more effective than control conditions in promoting long-term adherence to increased levels of physical activity. Possible reasons for this are: that exercise behaviour is a more complex group of behaviours than currently recognized; that many algorithms for determining current stage of activity change have not been validated; that exercise behaviour is determined by a number of factors not addressed by stage-based interventions; that the stages of change model encourages focus on stage progression which is not always associated with behaviour change; and that truly stage-based interventions are highly complex requiring more than one level of development and evaluation—a challenge that has not yet been met. Thus, stage-based activity promotion interventions may simplify exercise behaviour beyond what is useful for practitioners and health promoters. Paradoxically, stage-based activity promotion interventions that have been developed to date may have failed to appreciate the true complexity of the task.

[1]School of Population and Health Sciences, University of Newcastle upon Tyne, Newcastle upon Tyne NE2 4HH, UK
[2]Correspondence to: J. Adams;
E-mail: j.m.adams@ncl.ac.uk

Introduction

Despite the well-described benefits of regular physical activity, around 70% of adults in the UK fail to meet current recommendations that 'every adult should accumulate 30 minutes of moderate intensity physical activity on most, preferably, all days of the week' (Turner-Warwick *et al*., 1991; The Sports Council and The Health Education Authority, 1992). In order to redress this, various methods to promote increased levels of physical activity have been explored, including individualized interventions based on the Transtheoretical Model (TTM) of behavioural change—also commonly referred to as the Stages of Change model (Prochaska and DiClemente, 1982). Although such interventions were initially greeted with much encouragement and enthusiasm (Dishman, 1991; NIH Consensus Development Panel on Physical Activity and Cardiovascular Health, 1996), two recent reviews have concluded that individualized stage-based activity promotion interventions are of limited effectiveness in promoting long-term adherence to increased activity levels (Riemsma *et al*., 2002; Adams and White, 2003). This paper briefly describes the TTM and the two recent reviews of stage-based activity promotion interventions, before focusing on possible reasons for the apparent failure of stage-based interventions in this area.

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The TTM of behaviour change

The TTM was first described in 1982 (Prochaska and DiClemente, 1982). Viewing behaviour change as a process, rather than a single event, it proposes that individuals pass through five main stages as their behaviour changes from 'unhealthy' to 'healthy' (Table I). In addition to these five stages, the model incorporates 10 social and psychological processes of change which are thought to be important in the transition through the stages (Table II). The stages and processes of change are generally presented in pictorial form as a circle to illustrate the proposition that individuals can move backwards as well as forwards through the stages (Figure 1).

In terms of intervention development, the TTM proposes that different interventions may be required for different individuals depending on their current stage of behaviour change. Furthermore, the model proposes that these stage-specific interventions should be based on the processes of change identified by the model as important to the particular stage transition desired.

Stage-based approaches to behaviour change have received widespread approval. Suggested benefits of using the TTM include the apparent face validity of the model, the proposed applicability of the model to a wide range of health-related behaviours and the practical utility of the model (Davidson, 1992; Ashworth, 1997; Whitehead, 1997).

Substantial work has now used the TTM both to describe and help individuals alter a wide variety of behaviours including cigarette smoking, problem drinking, irregular physical activity, low fruit and

Table I. *The stages of change as applied to exercise behaviour [adapted from (Marshall and Biddle, 2001)]*

Stage of exercise change	Description
Precontemplation	no regular exercise with no intention to change current behaviour
Contemplation	no regular exercise but some intention to change behaviour in next 6 months
Preparation	irregular exercise with intention to become more regularly active in next 6 months
Action	regular exercise maintained for less than 6 months
Maintenance	regular exercise maintained for more than 6 months

Table II. *The process of change as applied to exercise behaviour [adapted from (Velicer* et al., *1998)]*

Process of exercise change	Alternate label	Examples
Consciousness raising	increasing awareness	I recall information people have given me on how to take more exercise
Dramatic relief	emotional arousal	I react emotionally to warnings about sedentary behaviour
Environmental re-evaluation	social re-appraisal	I consider the view that my sedentary behaviour may be harmful to the environment (through increased car use)
Social liberation	environmental opportunities	I find society changing in ways that make it easier to be active
Self-re-evaluation	self-re-appraisal	my sedentary behaviour makes me feel disappointed in myself
Stimulus control	re-engineering	I make my home more conducive to physical activity
Helping relationships	supporting	I have someone who listens when I need to talk about activity
Counter conditioning	substituting	I find that being active is a good substitute for being sedentary
Reinforcement management	rewarding	I reward myself when I am active
Self-liberation	committing	I make commitments to be active

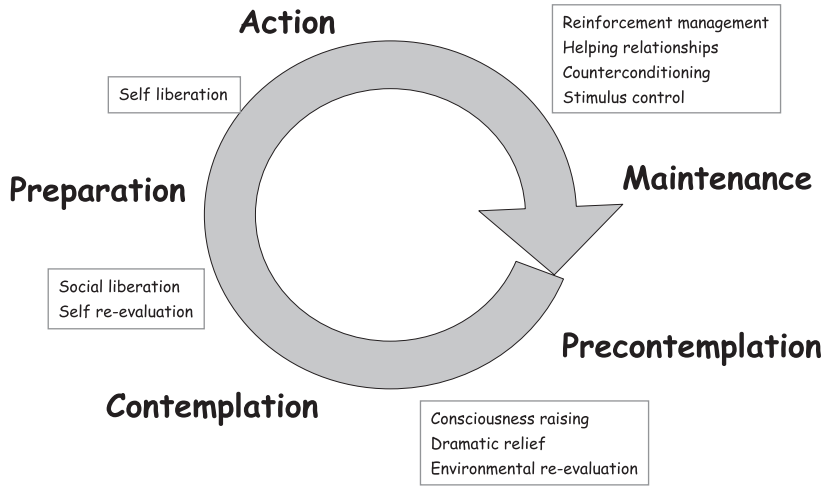

Fig. 1. The TTM of behaviour change with stages identified in bold and process in boxes [reprinted with permission from (Adams and White, 2003)].

vegetable consumption, and poor stress management (Prochaska *et al*., 1992; Riemsma *et al*., 2002).

Do stage-based interventions to promote physical activity work?

A number of studies have now used stage-based interventions explicitly based on the TTM to attempt to promote physical activity. Adams and White (Adams and White, 2003) conducted a non-systematic, critical review to investigate whether or not there was evidence that stage-based activity promotion interventions were effective, in terms of improvement in activity levels. The review found 26 papers describing 16 interventions programmes. Seven of these involved counselling only, four involved written material only, and the remaining five used a combination of both verbal counselling and written materials. Overall, 11 out of 15 (73%) studies which followed-up participants for less than 6 months found that stage-based interventions were more effective than control conditions. However, only two of seven (29%) of studies which followed-up participants for more than 6 months found that stage-based interventions were more effective than control conditions. As such, it was concluded that: 'stage-based activity promotion programmes are effective in promoting adoption of physical activity in the short term [e.g. less than 6 months]. Evidence on longer term adherence [e.g. over longer than 6 months] is limited but currently disappointing'. Another important conclusion to be derived from this review is that most research in this area is based on relatively short interventions and follow-up. The effects of more sustained interventions with longer-term follow-up are not yet clearly established.

A further systematic review of the effectiveness of stage-based interventions in all areas of behaviour change found similar results in relation to physical activity (Riemsma *et al*., 2002). This wide-reaching review of randomized controlled trials identified seven trials of activity promotion intervention based on the TTM. Three of these seven studies found that the stage-based intervention had a significantly greater effect on activity behaviour change than control conditions involving either usual care or activity promotion information. However, none of these studies reported effects that lasted more than 12 weeks. There is, therefore, substantial reason to believe that stage-based activity promotion interventions, which have been

evaluated to date, are no more effective than control conditions in promoting long-term adherence to increased activity levels.

Why don't stage-based interventions to promote physical activity work?

There are a number of reasons why stage-based activity promotion interventions may be less effective than originally proposed:

- Exercise behaviour is a complex of different behaviours, not a single behaviour such as cigarette smoking.
- Determining current stage of change is crucial to intervention delivery, yet few validated algorithms are used.
- Exercise behaviour is influenced by numerous external factors not considered by the TTM.
- The TTM suggests that stage progression is a significant outcome, but this is not always associated with behaviour change.
- Stage-based interventions are highly complex and may require more than one level of development and evaluation.

Exercise behaviour is a complex of different behaviours, not a single behaviour

There is emerging evidence that exercise behaviour is not a single, simple behaviour. Marttila *et al.* identified five different categories of physical activity—occupational activities, lifestyle and commuting activities, fitness activities to maintain health, and sports activities undertaken as part of, or in preparation for, competition (Marttila *et al.*, 1998). The same team then recruited an age-stratified, population-based sample of more than 1500 Finnish adults and collected data on their stage of change for two specific types of exercise behaviour—outdoor aerobic exercise and everyday commuting activity (Miilunpalo *et al.*, 2000). The results of their analysis show that whilst there was a fairly similar distribution of the stages of change for the two behaviours, the congruence of activity levels in the two different areas was fairly low—averaging less than 50%. For example, only 46% of individuals who engaged in regular outdoor aerobic exercise also engaged in regular everyday commuting exercise (Miilunpalo *et al.*, 2000). This suggests that exercise behaviour is rather more complex than implied by current stage-based activity promotion interventions which generally assume that individuals are in a single, overall, stage for physical activity—rather than possibly in a number of different stages of change depending on what specific sort of activity is considered. By over simplifying physical activity behaviour in this way and failing to recognize that activity behaviour involves a complex of activity-specific behaviours, investigators may be failing to recognize the true complexity, and specificity, of interventions required to promote activity.

Determining stage of change is crucial, yet few validated algorithms exist

Identifying an individual's stage of exercise change is a fundamental step in applying stage-based interventions. Numerous different tools have been used to categories individuals into one of the five stages of exercise change including self-complete questionnaires (Calfras *et al.*, 1996, 1997; Long *et al.*, 1996) and more informal interview techniques (Harland *et al.*, 1999). However, few of these staging methods have been validated to confirm that they accurately place individuals in the correct stage of activity change. This problem is further complicated by the complexity of activity behaviour, mentioned above, which means that it may be impossible to place individuals in an overall stage of activity change. In addition, investigators often adapt and change previously validated staging algorithms for their own use, rendering them of unknown validity. Unless investigators can confirm that they are able to accurately identify participants' stage of activity change, their ability to deliver stage-specific interventions and accurately evaluate the effect of these on stage of activity change becomes questionable and of limited utility (Ashworth, 1997; Bunton *et al.*, 2000; Riemsma *et al.*, 2002).

Exercise behaviour is influenced by factors not considered by the TTM

The TTM focuses entirely, and intentionally, on the influence of personal motivation on behaviour change (Velicer *et al*., 1998). However, there is abundant evidence that other external and social factors—such as age, gender and socioeconomic position—influence exercise behaviour, motivation to participate in physical activity and stage of activity change (Booth *et al*., 1993, Potvin *et al*., 1997; Chinn *et al*., 1999; Kearney *et al*., 1999; Bull *et al*., 2001). By ignoring the numerous influences on exercise behaviour, and stage of change, other than personal motivation, and failing to address the pathways by which these act, the TTM implies that these are irrelevant in terms of behaviour change. As such, the model simplifies true behaviour patterns beyond the realms of what may be helpful for both understanding and intervention development.

The TTM suggests that stage progression is a significant outcome, but this is not always associated with behaviour change

By disaggregating behaviour change into a series of stages, the TTM refocuses outcome attention on stage progression, rather than on actual behavioural levels (Ashworth, 1997; Whitelaw *et al*., 2000). However, as Table I identifies, positive stage progression is not always accompanied by increased activity levels—particularly, progression from precontemplation to contemplation or action to maintenance. Thus, whilst an intervention may lead to substantial stage progression, this will not necessarily be equated with actual increases in exercise levels. This is illustrated by an evaluation of Project PACE—a stage-based activity promotion programme (Patrick *et al*., 1994). In this evaluation, there was a significant difference between individuals in the control and intervention groups in terms of change in PACE score (a measure of stage of change), but this was not accompanied by significant differences in any of the measures of activity used (Norris *et al*., 2000).

The TTM suggests that the psychological alterations that occur alongside stage progression are an important element in behaviour change. However, it is not clear that stage progression will necessarily lead to behaviour change in future. Furthermore, the ultimate goal of any activity promotion intervention must be to improve activity levels. By focusing on stage progression rather than activity promotion, stage-based interventions introduce an intermediate outcome which moves the focus of the intervention away from the ultimate goal of activity promotion. Unless interventions can be shown to be associated with behaviour change, they cannot be seen as effective in terms of activity promotion—irrespective of their effect on stage progression.

Truly stage-based interventions are highly complex and may require more than one level of development and evaluation

Finally, it is unclear whether any investigators, to date, have managed to develop and evaluate a truly staged intervention. A stage-based activity promotion intervention generally comprises of five different interventions—one for each stage of change. Conventionally, evaluation of these interventions involve trialing all five interventions, as a single programme, in comparison to control conditions with sample sizes and power calculations based on this single level of evaluation. This approach, however, means that the effectiveness of each stage-specific intervention cannot be accurately determined. A more thorough approach to development and evaluation may require two, or more, levels of evaluation where each stage-specific intervention is trialed against control conditions in the target group. Only once all five stage-specific interventions have been shown to be effective in the appropriate target groups should a programme of five stage-based interventions be evaluated as a whole. Furthermore, it is possible that a third stage of evaluation may be necessary which involves assessing the effectiveness of the whole programme of five interventions, when appropriately delivered according to pre-intervention stage of activity change, versus random assignment of

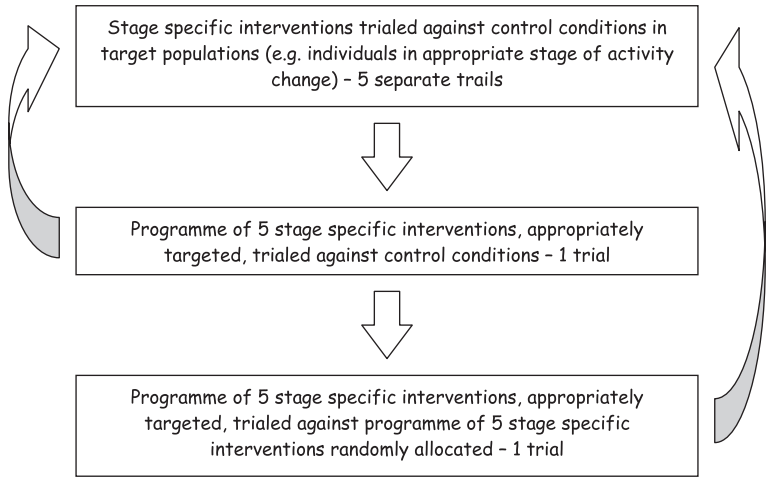

Fig. 2. A three-stage approach to the development and evaluation of a stage-based activity promotion intervention.

the interventions to individuals without consideration of pre-intervention stage of activity change (see Figure 2) (Adams and White, 2003). Such an approach would obviously require substantial time and resources, but may be the only way to do justice to the TTM.

Conclusions

The TTM has attracted substantial attention in the health promotion field, and has been widely applied to the investigation and promotion of exercise behaviour. However, there is little evidence, to date, that individualized stage-based exercise promotion interventions are successful in improving exercise levels over the long term. The TTM may simplify exercise behaviour beyond what is useful for practitioners and health promoters. Paradoxically, interventions based on the TTM that have been developed and evaluated to date may have failed to appreciate the true complexity of the task.

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