A Transtheoretical Approach: Explaining, Predicting and Modifying Physical Activity and Fitness Suite Behaviour.

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Abstract

Physical activity is a behaviour that is under the control of the individual, despite this two thirds of men and three quarters of women in the UK report exercise levels that are related to increased risk of degenerative disease and mental health problems (DoH, 2004). A number of behavioural theories have been utilised in the quest to address this issue, through the design and implementation of interventions to augment the adoption and maintenance of exercise behaviours.

This thesis aimed to explore the psychological processes of exercise behaviours through the application of the Transtheoretical Model of behaviour change. This model was used to guide the design, execution and interpretation of longitudinal assessments of self change, stage-matched intervention mediated change and qualitative investigations of the lived experience through case by case analyses. A review of contemporary literature is included, which supports the efficacy of this model; particularly as it provides a useful framework for improving our understanding of how to intervene with individuals at all levels of exercise behaviour to facilitate long-term adherence. Three studies were undertaken in order to answer the questions generated by the review of literature.

The results indicate that behavioural Processes of Change may be more useful in promoting positive Stage of Change movements in less active stages than was previously recommended. In addition, it appears that women are at greater risk of relapse than men when no intervention is occurring. The interventions designed and distributed matched to Stage of Change were found to be more effective in promoting positive change than none matched conditions. More importantly, the interventions reversed the relapse trend mentioned previously as women were more likely to improve Stage of Change than men on receipt of matched interventions. In addition, novel findings were reported in relation to structured activity, different Processes of Change were identified as efficacious indicating the need for different interventions in these settings. The case by case analysis supported the findings of the quantitative
studies for the utility of behavioural Processes of Change in less active individuals. Furthermore, two additions to the Transtheoretical Model were suggested from the qualitative analysis in particular self presentational and goal theories are highlighted. Finally, the importance of re-validating the instruments used to assess this theory in exercise research should be stressed due to the perceived motivational aspects described by interviewees on completing the items.
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Candidate Declaration:

I the candidate certify that the work submitted herein has not been accepted in substance for any degree or award and is not being submitted concurrently for any degree or other award.

Signature of Candidate: 

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Qualification: PhD by Research

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Chapter 1

Introduction
1.0 Introduction

Consistently observed increases in the incidence of degenerative disease and mental health problems have been convincingly related to the increasingly sedentary lifestyles prevalent in contemporary Western society (DeVries & Housch, 1994; Department of Health, 2004). Whilst many aspects of life have improved greatly due to advances in technology, the 'take it easy' cultural outcome of these changes has impacted upon our physical activity levels with day to day lifestyle activities (i.e. manual jobs; foot and bike travel; physically challenging housework) diminishing in magnitude substantially (DoH, 2004). As a result of the alterations in our activity levels and the increased incidence of inactive lifestyles, promoting the uptake and maintenance of active lifestyles now presents a "tremendous public health challenge" in the United Kingdom (DoH, 2004 p.iii).

Before further discussion of the benefits of physical activity and exercise, these two terms need defining. Caspersen, Powell and Christensen (1985) define physical activity as movement of the body produced by skeletal muscle whereby expanded energy varies from low to high and has a positive correlation with physical fitness. Exercise, whilst incorporating all of those factors, also includes planned, structured and repetitive bodily movements whose objective is to maintain or improve physical fitness (Caspersen et al, 1985). In general, exercise usually refers to more structured leisure pursuits such as aerobics, swimming and jogging (Biddle & Mutrie, 2001).

Exercise and/or physical activity is reported to have many benefits in both the physiological and psychological domains. Epidemiological evidence suggests that individuals who are physically active tend to live longer in comparison to their sedentary peers (Blair et al, 1989; Paffenbarger et al, 1986a) with an inverse dose response relationship between physical activity and all cause mortality having been established (Lee & Skerrett, 2001). The diseases prevented and
treated by increases in physical activity are generally chronic and persistent; as a result for physical activity to be of benefit it needs to be contemporary and recurrent (Wannamethee & Shaper, 2001). The case for physical activity has been building since the 1950's with large scale surveys indicating that increased levels of activity reduced risk of cardiovascular disease (Morris et al, 1953; Taylor et al, 1962). The protective effects of physical activity on Coronary Heart Disease (CHD) risk were attributed directly during the 1970's (Paffenbarger and co-workers 1979, 1975, and 1977). More recently the literature has consistently supported a dose-response relationship where physical activity is inversely and causally related to incidence of CHD (Berlin & Colditz, 1990; Eklund et al, 1988; Lie et al. 1985; Powell, Thompson, Casperson & Kendrick, 1987; Slattery & Jacobs, 1987).

In England cardiovascular diseases (CHD and Stroke) cause more than 200,000 deaths per year which is attributable to 39% of all deaths in men and women (National Centre for Health Outcome Development. 2003). This death rate from CHD and other circulatory diseases is higher than the European Union average (ONS, 2003; WHO, 2003). As a result the UK government have made the reduction of CHD incidence a priority due to the likeliness of fatality and its preventable nature (DoH, 2000). Whilst there are a number of changeable risk factors with regard to CHD i.e. smoking, hypertension and high cholesterol; the incidence in the general population is higher for physical inactivity (greater than double: DoH, 2004) than any of these other risk factors alone. Thus, the relative risk from physical inactivity is greater.

From a public health perspective if the inactive and low active (those below the recommended level) can increase their levels of habitual activity to meet the moderate physical activity level message of 'accumulating 30 minutes of moderate intensity (3-6 METS\(^1\)) physical activity on five or more days per week'

\(^1\) METS: Metabolic Equivalent. 1 MET = a person's metabolic rate at rest; 2METS = a doubling of the resting metabolic rate.
the population could achieve a 10% reduction in CHD risk (McPherson, Bitten & Chauser, 2002). In addition, when comparing those who reach or exceed the moderate message described above to those below it (i.e. those who do not undertake 30 minutes of moderate physical activity five or more times per week); there is also a 27% reduction in risk of stroke incidence or mortality in the sufficiently active group (Lee et al, 2003). With regard to specific CHD risk factors such as blood pressure (Whelton et al, 2002; Kelley & Tran, 1995); blood lipid ratios (Durstine et al, 2001) and insulin resistance (Ryan, 2000; Wallace et al, 1997) all are affected positively if physical activity meets or exceeds the recommended level. What must be considered is that whilst exercise adoption reduces risk immediately, the effect is transient and the benefit is only there if activity is current, thus for on-going amelioration of risk sufficient levels of physical activity must be maintained throughout the life span (Paffenbarger, Wing & Hyde, 1978). In addition to CHD risk, other diseases are also affected positively by achieving and maintaining physical activity at sufficient levels, this includes a 33-50% reduction in risk of type two diabetes (Lynch et al, 1996; Manson et al, 1992); and a minimisation of bone loss in old age (Vuori, 2001). Physical activity also has preventative and therapeutic effects on anxiety, phobias, panic attacks and stress disorders (O’Connor et al, 2000). Furthermore, physical activity at the recommended level also has a beneficial effect on certain cancers; in particular a 40-50% reduced risk of colon cancer independent of diet and BMI (Slattery & Potter, 2002); a dose response relationship between physical activity and reduction in breast cancer risk (Drake, 2001; Friedenriech et al, 2001) and endometrial cancer risk (Friedenriech, 2001; Thune & Furberg, 2001).

The benefits of physical activity are now well documented and the positive relationships between physical activity and the amelioration of the health problems highlighted above; have been reported consistently (Biddle et al. 2001). In the UK the direct and indirect costs of physical inactivity have been estimated at £8.2 billion per year (Game Plan, 2002) with approximately 2.5% of total national health care costs in western societies being incurred through inactivity
(Katzmarzyk, Gledhill & Shephard, 2000). In the UK if the number of people insufficiently active for health gains could be reduced by 5% the likely saving would be £300 million per year (Game Plan, 2002). In England two thirds of men and three quarters of women undertake less physical activity than the recommended accumulation of 30 minutes of moderate activity on five or more days per week (approx 33% adults are active enough: Health Survey of England, 1998). These figures are repeated in Scotland where 72% of women and 59% of men are not active enough (approx 35% adults are active enough) for health (Scottish Health Survey, 1998). In Wales only 30% of adults are active enough to gain benefits (Climbing Higher, 2004). Overall in the UK mainland according to the above statistics approximately 33% of adults are sufficiently active to gain preventative health benefits for the degenerative diseases discussed previously. When compared with other countries the implications for the nation’s health are clear. In Finland 70% of the adult population meet recommendations for active lifestyles (National Public Health Institute, 2001) as do 57% of adults in Australia (Bauman, Bellow, Vita, Brown & Owen, 2002).

The UK strategy for physical activity and sport proposes the use of a twin track approach in line with both of the above nations’ ethos regarding active living. The mass participation culture of Finland alongside the elite sport and drive for excellence in Australia have been adopted in order to enable the motivation of the UK population and bring about a cultural shift with regard to sport and physical activity, helping more of the UK population to become and remain physically active (Game Plan, 2002). Specific strategies have been devised and adopted in Scotland (particularly the mass participation message) and Wales (twin track approach) with targets regarding outputs being set independently (Climbing Higher, 2004; Game Plan, 2002; Scottish Physical Activity Strategy, 2003). In England the target is for 70% of the population to be undertaking and maintaining sufficient physical activity by 2020 with an interim target of 50% by 2010 (Game Plan, 2002). Scotland’s targets are more conservative with an aim of a 1% increase per annum with the long term aim of 50% of the adult
population being sufficiently active by 2022 (Scottish Physical Activity Strategy (SPAS), 2003). Similarly in Wales a 1% increase per annum in the number active enough for health benefits over the next twenty years (target 50% by 2024; Climbing Higher, 2004) has been set. It has been noted within these strategies that it is "important to keep the focus and priority on getting people active and on preventing people from reducing the amount of activity they do" (SPAS, 2003 p.13). Thus, there is a need to devise strategies to improve both adoption and maintenance of activity.

All individuals have various motives for engaging in and maintaining physical activity with a five stage social marketing approach matching the motivational content of interventions to the individuals' specific stage of readiness to engage in or maintain physical activity behaviour being suggested (Game Plan, 2002). Evidence indicates that stage matched/tailored programs are more effective in promoting and supporting behaviour change (SPAS, 2003); with interventions that are based on theories of behaviour change that include cognitive and behavioural factors being associated with longer term behaviour changes in community base settings (Hillsdon, Foster, Naidoo & Crombie, 2004). Whilst physical activity has environmental, social and psychological determinants, the above recommendations point towards the need to use psychological theories of behaviour change for the tailoring of interventions from an individual’s perspective.

Exercise psychology, in particular the research area that examines exercise as a motivational issue, has been developing since the early 80s. Research in this area has been reported widely and advanced immeasurably with developments from atheoretical descriptive models into more theory based dichotomous models and more recently onto process/dynamic models (Marcus & colleagues 1992, 1994; Dishman, 1988a; Sonstroem, 1988; Sallis & Hovell, 1990). The development of this field will be discussed fully in the following chapter, however, numerous theories of behaviour change have been developed and tested within
the exercise/physical activity field aimed at explaining and predicting the adoption and maintenance of physical activity; with particular reference to the recommendations above. However, the Transtheoretical Model of behaviour change may be able to offer a suitable framework to further advance the development of efficacious interventions to reach the population activity targets described.

The Transtheoretical Model (TTM) incorporates a temporal stage matching construct delineating between varying levels of motivational readiness that allows the tailoring of interventions to promote uptake and maintenance of activity. Whilst there are numerous other theories and models that can be used to "guide the design, execution and interpretation of research" (Buckworth & Dishman, 2002 p.211) within physical activity; the TTM has received increasing support within the literature and is currently being used in primary care settings as a basis for intervention (Ashworth, 1997). Whilst theory driven research is often not accepted by decision-makers and incorporated into health care provision (Oxman, Thompson, Davies & Haynes, 1995); this does not seem to be the case here, however, the limitation of this is the lack of testing of the model longitudinally, and, as a whole particularly in relation to physical activity, which is something that needs to be addressed to further strengthen the evidence base and to provide an evolving insight into the potential of this model for intervention design and implementation.

Subsequent chapters will discuss the evolution of adherence to physical activity research and the current issues, in particular surrounding the model selected as the framework for investigation. Experimental chapters will examine the Transtheoretical Model and the contribution its core constructs have with regard to physical activity uptake and maintenance; furthermore, the utility of interventions designed using the Transtheoretical Model will be tested empirically. In addition, the perceptions of individuals with regard to physical activity at different temporal stages of the Transtheoretical Model will be
examined on a case by case basis from a post positivist stance. Finally the concluding chapter will summarise the findings of both the quantitative and qualitative elements of the research and formulate recommendations for the future.

Statement of the Problem
Despite the known benefits, adherence to regular physical activity that is beneficial to health is low. Understanding and facilitating improvements in exercise uptake and maintenance is crucial from a public health perspective particularly for those people who are inactive. The Transtheoretical Model of behaviour change has had some success in facilitating activity uptake in various populations; however the model is rarely tested in its entirety and prospectively (Marshall & Biddle, 2001).

Delimitations
- Stages of Change algorithm (Marcus and Simkin, 1993)
- Processes of Change Questionnaire (Marcus, Rossi, Selby, Niaura, Abrams 1992a)
- Decisional Balance Questionnaire (Marcus, Rakowski & Rossi, 1992b).
- Self Efficacy Questionnaire (Marcus, Selby, Niaura & Rossi, 1992c).
- All subjects were volunteers initially targeted from a convenience sample.
- The study involved self reported physical and fitness suite activity.

Assumptions
- The questionnaires utilised are a valid method to assess exercise behaviour and the Transtheoretical Model component constructs.
- The researcher was consistent in the administration of the questionnaires and interventions.
- Participants understood and answered the questionnaires in line with the definitions selected by the researcher.
Participants were candid and honest when completing the questionnaires.
Participants adhered to the researcher’s advice and guidance provided in the interventions.

Limitations
- Physical activity and fitness suite activity levels were collected via self report methods, therefore, the definitions and interpretations by the participants may have differed from the researcher.
- Processes of Change, Decisional Balance and Self Efficacy measures were collected via self report methods, therefore, the definitions and interpretations by the participants may have differed from the researcher.
- Subjects were a volunteer convenience sample and are assumed to be representative of the general population.

Aims
The overall aim was to explore the role of the psychological processes involved in the behaviour change process in relation to criterion physical activity and fitness suite activity adoption and maintenance from both the quantitative and qualitative standpoint.

Objectives
- Identify through longitudinal assessments the Transtheoretical interconstruct relationships with regard to both physical activity/exercise and fitness suite/gym use that help to promote activity uptake; in order to assess the different requirements, if any, in each specific mode of activity.
- Compare stage matched interventions for activity promotion in both modes of activity described above versus mismatched and control conditions to assess the enhanced benefit of stage matched approaches.

\[2\] Criterion relates to the definitions of physical activity described in section 3.0.1 and fitness suite activity section 3.0.2 with this thesis.
Explore exercisers and non-exercisers through qualitative case by case analysis techniques to assess the subjective perceptions of individuals at different Stages of Change in relation to personal and societal physical activity.

The investigation design and direction were formulated from the review of literature presented in Chapter 2.
Chapter 2

Literature Review
2.0 Literature Review

Although the physiological and psychological benefits of exercise are well documented, these benefits will not be realised if those who could benefit do not exercise (Dishman, 1982). One of the fundamental problems in exercise science is not what the benefits are, but how to ensure that those wishing to gain them are able to do so. Whilst the criteria for fitness improvements from exercise are well documented (ACSM, 1990) and, more recently, the criteria for moderate activity level changes (Pate et al, 1995), the methods proposed to modify human behaviour in relation to adherence to exercise have no consensus in the literature.

Bandura (1982) identified three basic approaches to explaining human behaviour:

1) Situationist (environmental factors particularly antecedent stimuli and reinforcement without reference to psychological characteristics of the individual);
2) Person (psychological make up of individuals regardless of the environment); and
3) Interactionist (both personal and environmental factors affect behaviour) (in Wankel, Yardley & Graham, 1985). In general, adherence research has supported the interaction of personal and environmental factors i.e. self motivation, self efficacy, attitude to physical activity, social support and reinforcements; along with other factors such as behavioural (i.e. smoking), biological (i.e. percentage body fat) and programme factors (i.e. convenience, exercise intensity) (Martin & Dubbert, 1985); perceptions of autonomy, competence and relatedness (Tobin, 2003) and factors such as marital status, obesity, smoking, time and past behaviours along with environmental factors were identified in a recent review which included under-represented populations such as minorities, middle/older adults and the disabled (Trost, Owen, Bauman, Sallis & Brown, 2002). However, this area of research has tended to be atheoretical in nature (Dishman, 1988b) and looked descriptively at motives, barriers and characteristics of individuals and groups (Biddle & Nigg, 2000). Whilst an atheoretical approach is useful for plotting belief trends, generating research ideas and providing baseline group data in an attempt to identify target
populations (Biddle & Nigg, 2000), it does not provide explanations for why people do or do not undertake regular activity. In order to do this, more complete models utilising multivariate avenues are needed to develop an understanding of exercise participation; as true insight will only be gained through a theoretical approach (Biddle & Nigg, 2000; Sonstroem, 1988). This review will discuss a number of theoretical models identifying their usefulness in the exercise domain and will lead into a more in depth discussion of the model selected as the framework for the subsequent chapters.

2.0.1 Psychobiological Theory
Early models of exercise adherence were developed to enable exercise practitioners to target those most likely to discontinue an exercise programme. One model in this vein is the Psychobiological Model (Dishman & Gettman, 1980), which suggested that adherers and dropouts could be discriminated from each other on the basis of body fat, self motivation (measured by the Self Motivation Inventory; Dishman, Ickes & Morgan, 1980) and body weight. This model was generated specifically for the prediction of exercise behaviour and was thus not based on any prior model. The self motivational aspect is, however, dependent on the capacity for self reinforcement and the ability to delay gratification (Dishman & Gettman, 1980) whilst the biological standpoint emerged from the disability associated with disease and its implications with regard to medical compliance (Baeklund & Lundwall, 1975; Haynes et al, 1979). In particular, the influence of body composition was considered key due to its consistent implications in the medical compliance literature (Dishman, 1981). Self motivation was defined as a “generalised non-specific tendency to persist in the absence of extrinsic reinforcement and is largely independent of situational influence” (Dishman & Gettman, 1980 p.297). The Psychobiological Theory was developed in a 20 week prospective study of male participants (21 cardiac patients and 45 healthy non-risk subjects). The predictor variables of percentage body fat, body weight and self motivation assessed at programme initiation accurately predicted 78.8% of the participants as adherers or drop outs at
programme termination. Compared with drop outs the adherers tended to be leaner, lighter and more self motivated. Ward and Morgan’s (1984) study of the psychobiological model included 100 men and women over 32 weeks. The subjects were tested at weeks 10, 20 and 32. With the use of a discriminant analysis they were able to accurately classify (as adherers or dropouts) 76% of subjects at week 10 and 75% of subjects at weeks 20 and 32. However, only 25% of the drop outs were classified correctly; furthermore, the nature of the discriminating variables changed at each testing point, supporting the belief that adherence is a ‘process’ rather than an ‘all or none’ phenomenon (Sonstroem, 1988). In addition, Ward and Morgan (1984) discovered that the factors influencing adherence differed between the sexes. The most notable issue with regard to this model is that it was developed and validated on a small homogenous sample (66 men) which has compromised any confidence in its generalisability; a factor upheld by the above results. The use of this model seems to have been restricted due to its limited validity in diverse populations. Furthermore, the progression of adherence research began to extend into the systematic testing of social learning theories developed outside of the exercise psychology field.

2.0.2 Locus of Control

Social Learning Theory is based upon the individual’s expectations as a result of prior reinforcements and the beliefs developed from these consequences, along with the value given by the individual to the expected reinforcements. Thus, it is a value-expectancy approach to motivation (Biddle & Mutrie, 2001). Rotter (1966) postulated that the probability for behaviour to arise is diminished when the control of reinforcement is believed to be external. Thus, Locus of Control (LOC) is the extent people perceive that behaviour is within their control or contingent on other factors. Internal controllers feel they can control the outcomes in their lives and External controllers feel their destiny is controlled by chance or powerful others (Rotter, 1966). Sonstroem and Walker (1973) identified that college males with positive attitudes toward exercise and perceived internal control were fitter
and more physically active than the remainder of the male college population. Dishman and Gettman (1980), using a uni-dimensional health LOC, found no significant discrimination between adherers and dropouts in a 20 week prospective study. They did however, find that externals with low health fitness attitude scores were less likely to adhere than internals with high health/fitness attitude scores. Collectively there is weak support for LOC in exercise research; this may have been due to inadequate/inappropriate instruments, a weak methodology or because an exercise specific LOC (EXLOC) may be required (Biddle & Nigg, 2000; Biddle & Mutrie, 2001). Long and McCready (1985) utilised such a scale (EXLOC) along with attitudes to assess adherence to a programme. They found that low, moderate and high attendees showed no difference in LOC or attitudes. In addition, when attempting to predict attendance no LOC variables were found. One result of note however, is that all of their participants exhibited very high internal control scores (i.e. feel they can control their life's outcomes) either adding credence to the possibility that fitness/exercise external controllers are rare or highlighting poor sampling. Overall, however, there is not a great deal of support for LOC in the physical activity domain although this may be due to methodological and/or theoretical issues (Biddle & Mutrie, 2001).

2.1 Attitude-Behaviour Models
Other models utilised in exercise adherence research include those conceptualised by the heading of Attitude-Behaviour Models. Several different theories and models will be discussed with the intention of highlighting the positive and negative of each theory. This will be followed by a discussion of the Transtheoretical Model in order to explain why it is selected as the basis for this research.

To date the range of models/theories developed is highly diverse with some identifying interaction of determinants and their influence on behaviour whilst others look at predicting factors for initiation, continuance or avoidance of
behaviours. The main area of discussion will be those models which predict
behaviour from a combination of attitudes and beliefs.

2.1.1 The Health Belief Model (HBM)
This model evolved from research conducted in the 1950's by the U.S public
health service. It is an attitude based model of decision making developed from
'field theory' (Lewin, 1947) where motivation and behaviour are again analysed
from an expectancy-value perspective. Lewin's theory hypothesises that
behaviour is influenced by environmental and individual characteristics and that
we exist in a 'life space' of positive and negative regions where forces attract and
repel us. At the core of the HBM is illness avoidance and it is this that motivates
our health behaviours (Biddle & Mutrie, 2001). The HBM was developed in an
attempt to explain the reasons why people did/did not undertake various singular
health behaviours such as attendance at clinics and screening sessions aimed at
detecting symptomatic disease (Rosenstock, 1974). It was later utilised for other
situations, for instance compliance with advice and treatment. In the HBM it is
recognised that demographic, personal and structural factors are able to facilitate
health behaviours; their influence however, does not have a direct impact on
health actions but works through the effect these factors have on an individual's
perceptions and health motivations (Becker et al, 1977). The model
encompasses four major factors (also see figure 2.1.1.1 below):

i) perceived susceptibility to disease
ii) perceived severity of disease consequences
iii) perceived benefits of health action
iv) perceived barriers to health action (Becker & Maiman, 1975
p.21).

Thus, the likelihood of an individual selecting a specific behaviour is dependent
upon the individual's perceptions of the reality of the threat of disease/illness to
their health. This is viewed in terms of their likelihood of contracting the disease and to what extent the disease/illness would affect their current health status. In addition to this, behavioural uptake would be dependent upon the strength of their belief that the health action would lower the threat to their health along with the perception of the likelihood of overcoming the obstacles in adoption of the new behaviour (Sonstroem, 1988).

Figure 2.1.1.1 Health Belief Model outline adapted from Becker and Maiman (1975) p.21

This model is focused on the specific intent of explaining health behaviour at the level of individual decision making; in health care studies this model is reasonably successful in predicting behaviour and has been used as a framework for research into various health-related behaviours (Harrison, Mullen & Green, 1992, Janz & Becker, 1984). Janz and Becker (1984) found substantial support across 46 studies with perceived barriers being the most frequent predictor of behaviour (fewer barriers increased likelihood of adoption of behaviour) and perceived severity the lowest predictor (severity of the threat makes little difference to the adoption of the positive behaviour). Harrison et al (1992) undertook a meta-analysis of 234 studies; unfortunately aspects of the model utilised varied greatly and effect sizes, although significant, were only
small with stronger designs (prospective) showing less significance than retrospective studies. In exercise research the “HBM has found relatively little application in attempts to augment physical activity among sedentary individuals” (Godin & Shephard, 1990 p.106). The model has been criticised in relation to exercise research in two ways:

1) it was developed to predict a single instance of specific behaviour whereas exercise is an ongoing process (Sonstroem, 1987);
2) The model is based on motivation of illness avoidance whereas exercise is derived from a broader range of motives such as feelings related to well-being and enjoyment rather than health concerns (Dishman, 1985).

Lindsay-Reed and Osborn (1980) tested 124 sedentary male fire fighters. Those who exhibited higher adherence to an exercise programme identified with beliefs connected with reduced disease/illness susceptibility. However, convictions of susceptibility were not factors in exercise participation. In studies on the general population, Biddle and Ashford (1988) assessed the knowledge, attitudes and health beliefs of the active and inactive in relation to cardiovascular disease. The non-exercisers perceived themselves as being highly susceptible to ill health, however, the exercising population deemed themselves as having low susceptibility to ill health. In addition, they exhibited higher health motivations and intention to exercise along with placing more value on exercise than the non-exercising population.

Both of these studies contradict the HBM and, rather than showing that those who feel susceptible to disease/illness are more likely to assume positive health behaviours such as exercise, it is these individuals who are likely to perpetuate inactivity. Thus, the perceptions of vulnerability to ill health and specifically heart disease appear related to inactivity as opposed to positive health behaviours
Therefore, a third criticism of the model in relation to exercise and possibly other behaviours which require a health action as a preventative measure may be:

3) The HBM was developed to assess reasons for non-attendance at screening, thus, the avoidance of ill health as opposed to the attainment of positive health behaviours. This may preclude its usefulness in areas of positive health behaviour adoption.

In summary, despite this model's popularity in health behaviour research numerous authors have suggested the model has various limitations within the field of exercise adoption and maintenance (Biddle & Nigg, 2000; Dishman, 1985; Povey, 1997; Sonstroem, 1987).

2.1.2 Social Cognitive Theory (SCT)
Participation or avoidance of behaviour is determined by a combination of individual, behavioural and environmental factors. Of particular interest are three factors 1) the development of new healthy behaviours, 2) the necessity of developing the appropriate skills/aids to facilitate change, 3) enhancement of cognitions, especially the promotion of self-efficacy (Bunton, Murphy & Bennett, 1991). This stimulus response model includes cognitions as the mediating variable with perceptions, thoughts and feelings interacting to influence the individuals' behaviour. Social Learning Theory is again the concept from which this theory originates. In this instance cognitions are viewed in the schema of social interaction with behaviour explaining action, motivation and emotions (Buckworth & Dishman, 2002). The individual undertakes the behaviour as a response to self reflection (anticipation and planning) and self regulation (behaviour modification) through the evaluation of the discrepancy between the target behaviour and the current behaviour. Self Efficacy (SE) is a key aspect as it relates to the belief in the individual's ability to meet the demands of the
planned task prescribed by the discrepancy evaluation. With regard to exercise research it is the Self Efficacy aspect which has been studied most extensively; the assumption is that SE is the cognitive mechanism which mediates all behaviour change (Buckworth & Dishman, 2002). Perceived SE is "peoples' judgements of their capabilities to organise and execute courses of action required to attain designated types of performance; it is concerned not with skills one has but judgements of what one can do with whatever skills one possesses" (Bandura, 1986 p.391). In other words, a situation-specific confidence that one can carry out a desired behaviour/action. The SCT suggests that attempts to increase exercise behaviour will be influenced by:

a) self judgement of expected benefits (outcome expectations)

b) perceived abilities to exercise regularly (efficacy expectations)

(Biddle & Mutrie, 2001; Godin & Shephard, 1990).

There are four sources of efficacy information:

1. Performance attainment is the most powerful as efficacy is improved through successful performance (Bandura, 1986).

2. Modelling is viewed as important as it is "not always possible to gauge your success without some form of reference point" (Bandura, 1986 p.400) especially in a novel situation.

3. Verbal persuasion perceptions of SE may be dependent on the source of the persuasion (Biddle & Mutrie, 2001).

4. Emotion/Physiological arousal which relates to how the individual interprets internal states such as heart rate (Bandura, 1997).

Stanley and Maddux (1986), using the SCT, concluded that intention to participate in an exercise programme was influenced by both perceived personal ability and expected outcomes. Wurtele and Maddux (1987) identified that undergraduate women with higher expectations of their ability to adopt exercise
indicated stronger intentions to do so. Sallis et al (1989a) found that the strongest correlate with exercise behaviour in adults was Self Efficacy (SE) expressed as confidence in their ability to exercise in specific situations. The experimental evidence linking increased SE with an increase in physical activity was originally limited to heart (Ewart et al, 1983; Thomas, 1993) and lung (Gormley et al, 1993; Kaplan et al, 1984) patients in whom a reduced confidence in relation to physical exertion would be expected as a response to medical limitations or fear of exertion (Biddle & Mutrie, 2001; Dishman, 1994). However, it has since been utilised in various areas of health promotion in non patient groups in exercise (Hofstetter et al, 1991; McAuley, 1992; Sallis et al, 1992a/b), and weightloss (Rodgers & Brawley, 1993; Weinberg et al, 1984). In a review of SE literature it was suggested that "by summing up direct and indirect effects, it can be stated that the total effect of self-efficacy on health behaviours exceeds the effects of any single variable" (Schwarzer, 1992 p.223), thus showing that SE is a powerful behavioural determinant in many studies and its utilisation in many theories of health behaviour is warranted (Schwarzer, 1992). This strength as a predictor of health behaviour has led many theorists to include the construct of SE in their own models of behaviour, for example the theory of planned behaviour (Ajzen, 1988) and stage models of behaviour change i.e. the Transtheoretical Model (Prochaska & DiClemente, 1986). However, whilst the research to date has tended to emphasise the influence of the cognitive-perceptual (individual) dimension of the model it needs to be noted that Bandura (1986) acknowledged the effect of the social environment. The central concept of the original theory is a 'bi-directional' influence between the individual and the environment with behaviour change resulting from interactive effects of the person, social environment and behaviour itself (Buckworth & Dishman, 2002). Within the exercise psychology field the cognitive-motivational feature of the theory has prompted the greatest amount of study to date. As a result of this lack of full model testing, the results of SCT research in the adherence literature is limited as other factors are essential in order to study this theory in full (Clark & Becker,
1998). Therefore, with the systematic testing of the theory lacking, further research into the SCT is warranted (King et al, 1989).

2.1.3 Theory of Reasoned Action

The basic assumption of this theory is, again, an expectancy – value interaction (Biddle & Mutrie, 2001). Information and beliefs regarding expectations of the target behaviour and the values placed on the expectations culminate in rational decision making by individuals about their behaviour. The predictive factor revolves around intention with decision making fuelling intention which is postulated as the proximal determinant of behaviour (Biddle & Mutrie, 2001; Dishman & Buckworth, 2002). The Theory of Reasoned Action (TRA), is focused on the intention to perform or not perform the behaviour in question, where the intent to adopt a behaviour is due to:

   i) an individual's personal attitude towards performing the behaviour
   ii) the influence of social factors on performing the behaviour.  
      (Fishbein & Ajzen, 1975)

In a similar way to the HBM, sociodemographic variables operate mainly through their influences on the determinants of behavioural intention, with intention resulting in the behaviour if the opportunity to act is available (Clark & Becker, 1998). This model attempts to identify factors which lead to a greater knowledge of how to bring about a behavioural change (Bunton et al, 1991).

Figure 2.1.3.1 Outline of Theory of Reasoned Action adapted from Ajzen & Fishbein (1980)
TRA has been utilised widely in health behaviour studies (Van den Putte, 1993). In two studies the TRA was successfully predictive of actual physical activity in relation to reported behavioural intention. Both of these studies identified attitudes as the dominant predictor when compared to the normative component although this component did hold some predictive value (Godin & Shephard, 1986; Riddle, 1980). Two further studies identified attitude as the only predictor of intention, however, other factors (i.e. current or prior exercise habits, age, educational attainment and socio economic status) when added to the model improved the prediction of intent (Godin, Cox & Shephard, 1983; Godin & Shephard, 1985). In another study, again the attitude and normative components explained exercise intention variance although in this instance subjective norms had a stronger influence than attitude. However, these factors only accounted for 5.5% of the variance whilst the addition of body weight to the model increased the predictive ability by 15% (Pender & Pender, 1986). Thus, the TRA has been found useful in understanding the decision making process underlying exercise behaviour; however, it lacks descriptive ability in relation to the process of behaviour change (Biddle & Mutrie, 2001; Godin & Shephard, 1990). Furthermore, the inconsistent results of the assumed determinants of intention, attitude and subjective norm, along with the enhanced prediction of the model on the addition of external variables indicates a need for a more complete description of exercise behaviour (Biddle & Mutrie, 2001; Willis & Campbell, 1994). Ajzen (1985) commented that the TRA was particularly useful in describing behaviour of total volitional control, but, as most behaviours exist on a continuum from total control to volitional control the barriers to behaviour adoption needed to be accounted for as these other factors may prevent it from being totally volitional. Thus, the Theory of Planned Behaviour (TPB) was developed. The addition of control is related to the internal and external factors out of the control of the individual and the extent to which they impact on an individual's behaviour performance attempts (Willis & Campbell, 1994).
2.1.4 Theory of Planned Behaviour

The TPB extends the TRA by including perceived behavioural control (PBC) or the perception of control the individual has over the behaviour in question. Both personal and external factors influence the perception of control. These factors include knowledge, time and opportunity. The overall attitude with respect to attempting behaviour is a consequence of the subjective estimate of goal attainment which is a function of facilitation or inhibition of performance by personal and external factors (Clark & Becker, 1998). It is suggested that PBC influences the individual's intentions and behaviour. Thus, as control over the behaviour is perceived to increase then the intentions to undertake the behaviour and actual engagement in the behaviour increases.

Support for TPB was shown in a review of literature with a significantly improved prediction of behaviour (approx 8%) when compared with the TRA (Godin, 1994). In a meta-analysis of the exercise literature 31 studies were scrutinised. Intention was shown to exhibit a large effect on behaviour with this intention, once developed, increasing the likelihood of the exercise behaviour occurring. With regard to the development of intention, attitude was found to achieve two times the effect of subjective norms (Hausenblas, Carron & Mack, 1997). This confirms previous narrative reviews (Biddle & Mutrie, 1991; Godin, 1993). In addition, PBC
had substantial effects on both intention and behaviour leading to the proposition that individuals who, whilst desiring exercise, have perceived insurmountable barriers and are unlikely to engage in activity irrespective of their attitudes or social influences (Biddle & Nigg, 2000). To summarise, attempts to perform a behaviour are dependent on variables which identify "beliefs about the likely consequence of success or failure, the perceived probabilities of success and failure, normative beliefs regarding important referents and motivation to comply with these referents" (Ajzen, 1985 p.36). In general, TPB gains much support in the literature (Biddle & Mutrie, 1991; Hausenblas et al, 1997), however, Godin (1994) states that these two theories (TRA/TPB), whilst providing a basis for understanding the factors initiating exercise behaviour, have no element which proposes how that behaviour can be sustained. As with other attitude-behaviour models, TRA and TPB operate mainly in terms of predisposing factors. Thus, whilst useful for defining the optimum content of promotional packages for adoption of physical activity they do not identify those factors which encourage maintenance of behaviour.

2.2 Stage Models of Behaviour Change

"Participation in structured exercise or active living through habitual physical activity is a complex behavioural phenomenon and certainly needs good theoretical research for us to make sense of it" (Biddle & Mutrie, 2001 p.131). However, the theoretical models discussed so far utilise static designs focussing on future behaviour as predicted from a set of pre-screening methods. The next step is to examine dynamic models which focus on the process of behaviour change as opposed to the motivational factors leading to the adoption of a new behaviour. The assumption that intention is sufficient to predict behaviour adoption and maintenance is somewhat naïve and it is an assumption that stage models do not make.
2.2.1 'Natural History' Model

During a review of the determinants of exercise Sallis and Hovell (1990) proposed a 'natural history' model (Figure 2.2.1.1) which identified three important phases in exercise adherence:

1. Sedentary $\rightarrow$ Adoption
2. Adoption $\rightarrow$ Maintenance/Dropout

Figure 2.2.1.1 Natural History of Exercise Model; Sallis and Hovell (1990) p.320

This model was simply proposed as a device for focusing on the dynamic process of exercise and also as a reminder that "those who study determinants of exercise behaviour must carefully define which transition they are studying, because determinants are likely to be different at each transition point" (Sallis & Hovell, 1990 p.310). In an attempt to analyse this model Biddle (1992) identified five phases:

1. Adoption of behaviour
2. Maintenance of behaviour
3. Cessation of behaviour (action $\rightarrow$ dropout)
4. Cessation of behaviour (maintenance $\rightarrow$ dropout)
5. Resumption of behaviour
Adoption
Whilst many factors have been associated with the process of exercise adoption (SE, attitudes, intentions), the study of determinants of adoption lacks a theoretical focus (Biddle & Mutrie, 2001). Indeed the determinants of different types of exercise may be quite different (Sallis & Hovell, 1990). Therefore, although many factors have been linked with the adoption process, exactly what is it that is specific to adoption which causes the actual change? To date, the research on this area is limited. However, it does seem rational to suggest that factors associated with beliefs, attitudes, self-efficacy and social support, in addition to barrier perceptions are somewhat substantiated as discussed previously, which agrees with Biddle and Mutrie (2001). Furthermore, these factors are certainly consistent with the 'how' processes utilised in the Transtheoretical Model to facilitate movement from a sedentary lifestyle to an active one (Prochaska et al, 1994b).

Maintenance
This area is far more extensively researched and can be discussed with reference to psychological reinforcement for exercise and self-regulation (Biddle & Mutrie, 2001). Reinforcement is often linked with enjoyment whilst another field of importance is the outcome research on psychological variables. The mental health benefits can not only be viewed as outcomes but also potential determinants or "reinforcers of subsequent exercise" (Biddle & Mutrie, 2001 p.142). Indeed, early research into the determinants of exercise behaviour identified that concerns about health were less important to the maintenance of activity than were feelings related to enjoyment and wellbeing (Dishman, Sallis & Orenstein, 1985). Again, some consistency is found with the Transtheoretical model where it has been identified that those within the action/maintenance stages are more liable to support the benefits (PROS) of exercise as opposed to the costs (CONS) (Prochaska, 1994). In fact, decisional balance has been described in some ways as a "conscious exercise in self regulation" (Biddle & Mutrie, 2001 p.143).
**Ceasing Exercise**

There has been a great deal of study in the area of exercise dropout, especially in the early days of adherence research (Dishman, 1988). However, this is a controversial area where much criticism has been levied. The main area of concern lies in the fact that these studies of dropout have had a poor methodology in that once a participant had dropped out of a programme he/she was presumed to revert to a sedentary existence. However, if accurate follow ups had been undertaken it might have been found that drop out had occurred within that specific exercise modality and the participants were in fact exercising elsewhere (Biddle & Mutrie, 2001).

**Resuming Exercise**

This area is completely neglected by theoreticians and over a decade ago it was stated that “research into determinants of resumption is desperately needed” (Sallis & Hovell, 1990 p.315). One area mooted as a possible starting point for attempting to identify determinants of resumption is relapse prevention. However, whilst having been somewhat successful in exercise research (King & Fredericksen, 1984), questions have been raised about how adequately it assesses those determinants important for resuming exercise following cessation as opposed to addressing areas of concern in an attempt to avoid the need for exercise resumption (Biddle & Mutrie, 2001).

In summary, whilst some efforts have been made to further identify important determinants to the four phases of the Natural History Model there is still much work to be done. Particular areas of importance seem to be the adoption phase which requires more theoretically driven research; the dropout phase which needs a great deal of work as much of the research in this area is methodologically flawed, and the resumption phase which, again, is theoretically poor. At present this model is not particularly helpful for intervention design per se; it is, however, useful as a means of directing investigators to the important
phases that exercise adoption and maintenance behaviours encompass. However, if this model is more thoroughly investigated, as suggested, and more rigorous determinants and relationships can be identified then it has the potential to be utilised for intervention research. In addition, since both "cognitive and behavioural models have much to offer it seems reasonable to assume that our best bet for effective interventions to improve adherence will be strategies that combine these elements" (Clark & Becker, 1998 p.21-22) such as the Transtheoretical model of intentional behaviour change.

2.2.2 Transtheoretical Model
The model which attempts to encompass factors that increase the likelihood of initiation and maintenance of behaviour change is the Transtheoretical Model (TTM), proposed by Prochaska (1979). He recognised that although common psychotherapeutic systems could be applied to the same complex clinical case and convincingly explain and treat the individual, each separate system had its shortcomings. None of the systems he analysed "consistently demonstrated in empirical research a superior ability to predict how people would respond to the therapy or a superior ability to help people change" (Prochaska, 1994 p.453). Many of the systems he studied more closely considered what to change rather than how to change (Processes of Change). Thus, the process of integration of a field that had fragmented into more than 300 theories began (Prochaska, 1979; Prochaska, Johnson & Lee, 1998). Below is a summary table (Table 2.2.2.1) of a number of change processes along with the relevant theories that utilise them. This table highlights the similarity of the processes of change used in different methods of psychotherapy.
Table 2.2.2.1  Example of a number of Processes of Change and the relevant Psychotherapy system in which they are utilised (Adapted from Table 14.1 Prochaska, 1979 p. 459)

<table>
<thead>
<tr>
<th>Process of Change</th>
<th>System of Psychotherapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consciousness Raising</td>
<td>Psychoanalysis, Alderian Therapy, Gestalt Therapy</td>
</tr>
<tr>
<td>Dramatic Relief / Catharsis</td>
<td>Gestalt Therapy, Implosive Therapy, Psychoanalysis</td>
</tr>
<tr>
<td>Social Liberation</td>
<td>Alderian Therapy, Structural Therapy, Feminist Therapy</td>
</tr>
<tr>
<td>Counter Conditioning</td>
<td>Behavioural Therapy, Cognitive Therapy, Multimodal Therapy</td>
</tr>
<tr>
<td>Stimulus Control</td>
<td>Self-Control Therapy, Behavioural Therapy, Multimodal Therapy</td>
</tr>
<tr>
<td>Self Liberation</td>
<td>Existential Therapy, Bowenian Therapy, Logotherapy</td>
</tr>
</tbody>
</table>

The TTM is based upon four core constructs about the nature of interventions which may best facilitate behaviour change (Prochaska et al, 1998); these being Stages of Change, Processes of Change, Decisional Balance (PROS and CONS) and situation specific confidence (Self Efficacy).

The TTM or Stage of Change (SOC) approach is currently extremely popular in psychotherapy along with other areas of health and exercise, with the term Transtheoretical being used to highlight the wide framework of the SOC model especially in reference to its diverse theoretical underpinnings highlighted above. There are five Stages of Change identifying varying readiness of individuals to engage / are engaged in a new behaviour. Exercise specific definitions of these can be seen in Table 2.2.2.3 (p.27). This stage construct is important as it is the key organising construct of the model and represents the temporal dimension of change. In the past change has regularly been explained as a dichotomous event e.g. exercising/not exercising, however, the TTM defines change as a process which covers the full range of change from initial awareness of a problem through to a point where the problem no longer exists (Prochaska et al, 1998; Velicer, Prochaska, Fava, Norman & Redding, 1998). This temporal aspect of the TTM suggests when change is likely to occur based upon attitudes, intentions and behaviour with the crossover between preparation and action indicating what would have previously been the “event” to denote behaviour change; figure 2.2.2.
depicts the temporal crossover described above. The temporal component is related to intention from precontemplation to preparation and the passage of time from action to maintenance/termination.

Figure 2.2.2. The temporal dimension as the basis for Stages of Change (Velicer et al, 1998 p.218)

The stages concept is of importance as it focuses on both actual and intended behaviour (Marcus et al, 1994). A great deal of criticism has been aimed at this temporal aspect of the Transtheoretical Model. This will be discussed below prior to further discussions of the model and the research conducted within its framework.

Initially, stage progression was proposed to be linear in nature. Davison (1992) and Sutton (1996) levied criticism at the assumption of the categorised stages and the lack of evidence of such a linear relationship. Bandura (1997) also argues that the Stage of Change component is problematic in that they are arbitrarily divided categories rather than stages which occur along a continuum of change. The alteration in intentions and passage of time aspects of some proposed stage transitions do not coincide with alterations in psychological state and are therefore not qualitatively different (Bandura, 1997; Davison, 1992).
Prochaska and Velicer (1997b), in response, argue that the SOC component of the model was a concept 'empirically discovered' in the early research examining the processes of change used by self changers and that the SOC construct was simply an organisational construct that does not indicate how to change but simply identifies when different strategies may be needed to help facilitate change and is thus useful as a means to match resources (POC) to a person's current phase in the continuous change process. A study utilising over 1400 interviews with adults supported these qualitative differences in smokers in pre-quit stages (Kraft, Sutton & McCready Reynolds, 1999).

Subsequent research has also proposed that the pattern of change was cyclical rather than linear in nature indicating that a number of attempts to change may be made involving regression to an earlier stage followed by another bout of stage progression before maintenance or termination occurs (Marcus & Simkin, 1994). In fact, in an earlier paper, Prochaska et al (1992) suggested that for some, recycling may assist in the reinforcement of behaviour change in the long term, possibly through the improvement in knowledge their mistakes afford them. However, they stress that “much more research is needed to better distinguish those who benefit from recycling from those who end up spinning their wheels” (Prochaska et al, 1992 p.115).

Orderly progression or lack of it has also been an issue raised with some concern in that stages cannot be skipped and that in a genuine stage theory once qualitative transformations have taken place a true stage progression does not allow recycling (Prochaska, 1997). This argument however is stated to be a conclusion based on the “mistaken assumption that there are universal criteria for stage theories” (Prochaska & Velicer, 1997b p.11) despite the concept of regression, the idea that people can and do return to earlier stages of functioning, being a common term used to represent these reversals (Prochaska & Velicer, 1997c). This is a matter supported from a practical standpoint with recycling validating “the practitioners observation that with behaviour change
there is no such thing as failure. Sometimes we leap, sometimes we crawl, and sometimes we slip back. However, as long as we can contemplate or visualize positive change, there is a strong likelihood change will occur" (Samuelson, 1997 p.13). A further criticism of this model is that it is basically a description of dispositional states and does not describe the nature, aetiology or development of behaviour and is, therefore, atheoretical in nature (Davison 1992). Furthermore, Bandura (1997) challenges its claims of transtheoreticality due to the difficulty of integration of theoretically opposed fields, asking how can theories offering contradictory prescriptions on how people change be integrated into one theory of behaviour change. Goldfried (1980) suggested however, that psychotherapists were typically limited by the theoretical frameworks they work within and are blind to alternative ideas and potential solutions, and there is in fact little evidence to suggest the superiority of one school or technique over another (Lambert, 1986). The need for integration was pointed out by Goldfried (1980; 1982) and the TTM was developed to unravel the divergence in the field of psychotherapy to enable synthesis of effective interventions from diverse schools of thought.

In response to Bandura, Prochaska and Velicer (1997b) indicate that the challenge of trying to establish an integrative model is that traditional boundaries have to be crossed and the qualitative evidence suggests self changers self select to use processes that so called experts consider incompatible during the change process. Furthermore, Prochaska et al (1992) insist that the model is not atheoretical in nature, as it reflects motivational, social learning and relapse theories and the Processes of Change (POC), Decisional Balance (DB) and Self Efficacy (SE) constructs are derived from a wide range of psychosocial theories. It is in this sense that the model is 'Transtheoretical'.

Finally another issue that has emerged is that of the predictive utility of the TTM from an SOC standpoint. Farkas et al (1996) argued that Stages of Change were unable to improve on the predictive power of addiction variables such as number
of cigarettes smoked and that these variables were in fact able to predict smoking cessation more accurately than did SOC. In response, Prochaska and Velicer (1996) indicate that the failure to test the whole model rather than merely its organisational construct negates their findings; particularly as it is the Self Efficacy and Decisional Balance constructs that are the predictors of change as a result of POC utilisation being mediated through them (Prochaska et al., 1994). Indeed, it is this misinterpretation of the Stages of Change construct as an indicator or predictor of the likelihood of change, rather than as a variable which is part of a theory that includes systematic inter-variable relationships providing a framework to understand behaviour change or lack of it, that has led to misleading conclusions (Prochaska & DiClemente, 1991; Prochaska & Velicer, 1997d). Thus, it is the understanding of stage movements or lack of them that is crucial to the importance of the utility of the TTM in behaviour change research as opposed to the prediction of future behaviour. In other words, the TTM shows us how to help change occur rather than predicting whether change will occur and be sustained and in order to do this the model needs to be examined in its entirety.

The TTM also includes a "series of intermediate/outcome measures" (Velicer et al, 1998, p.219). Evaluation of outcomes is a key concept in various models of behaviour, for example, TRA (Ajzen & Fishbein, 1980) and TPB (Ajzen, 1985). Both have outcome evaluations as influential factors on attitude. However, these theories, whilst including this component only view the outcome measures in a univariate/discrete manner (Velicer et al, 1998). The TTM includes outcome evaluation measures in the form of Decisional Balance (DB). This construct reflects the relative weighting of the PROS and CONS of change. Janis and Mann (1977) developed the ‘Decisional Balance Sheet’ which enveloped eight categories of importance (four positive and four negative). These eight categories are highlighted in Table 2.2.2.2.
Table 2.2.2.2 *Eight category headings for 'Decisional Balance Sheet' adapted from Janis & Mann, (1977)*

<table>
<thead>
<tr>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefits to self</td>
<td>Costs to self</td>
</tr>
<tr>
<td>Benefits to others</td>
<td>Costs to others</td>
</tr>
<tr>
<td>Approval of self</td>
<td>Disapproval of self</td>
</tr>
<tr>
<td>Approval of others</td>
<td>Disapproval of others</td>
</tr>
</tbody>
</table>

During the evolutionary testing of the TTM a much simpler two factor structure has been determined (Velicer, DiClemente, Prochaska & Brandenburg, 1985); a structure which has been consistently identified in a series of studies investigating 12 problem behaviours (Prochaska et al, 1994a). This measure is proposed to indicate intermediate changes in attitude through all SOC even when only intention or duration of behaviour has intimated a stage transition as opposed to the 'event' discussed previously (Velicer et al, 1998).

This scale involves the weighting of PROS and CONS; from mathematical analyses identifying both strong and weak principles of progression from precontemplation (PC) to action (AX). The strong principle states that progression from PC → AX is a function of one standard deviation increase in the PROS of the behaviour in question. The weak principle identifies the progression from PC→ AX is a function of ½ standard deviation reduction in CONS of the problem behaviour (Prochaska, 1994). Thus, the PROS must increase two times more than the CONS must decrease to facilitate behavioural change. This, perhaps, indicates that emphasis should be placed upon increasing the PROS in an intervention situation.

The Stages of Change construct identifies an individual's current behavioural status, whilst DB identifies the individual's attitude to changing their current behaviour. Table 2.2.2.3 describes the five Stages of Change.
Table 2.2.2.3 Exercise specific stages of change. (Marcus et al, 1992(a) p.424).

<table>
<thead>
<tr>
<th>Stage of Change</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precontemplation</td>
<td>Not regularly physically active and do not intend to be so in the next 6 months</td>
</tr>
<tr>
<td>Contemplation</td>
<td>Not regularly physically active but am thinking about starting to do so in the next 6 months</td>
</tr>
<tr>
<td>Preparation</td>
<td>Physically active but not enough to meet the requirements*</td>
</tr>
<tr>
<td>Action</td>
<td>Regularly physically active but only began in the last 6 months</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Regularly physically active and have been so for longer than 6 months.</td>
</tr>
</tbody>
</table>

*Physical activity requirements: Exercise or sport (aerobics/football/swimming) 2-3 times per week for greater than 20 minutes; or general activity (cycle/walk) 4-5 times per week for greater than 30 minutes

The Stages of Change as described previously are the temporal aspect of the Transtheoretical Model and the five separate stages indicate the point at which different Processes of Chance are proposed to intercede to increase the likelihood of change occurring. The Processes of Change are a major dimension in the TTM, which enable us to understand 'how' shifts in behaviour occur. Prochaska and DiClemente (1983) identified that successful self-changers employ different Processes of Change at each Stage of Change, with POC being the strategies and techniques people utilise to support them through SOC movements. They are the covert and overt factors that have been identified as common themes/activities within several theories of psychotherapy and are the construct of the model which denotes the psychotherapeutic variables individuals need to apply for stage progression to occur (Prochaska et al, 1998; Rakowski, 1996). They are probably the most complex (Rakowski, 1996) and least studied (Courneya & Bobick, 2001) aspect of the TTM. The important factor in their use is that Processes of Change translate into the skills/tasks that people need to have matched to their Stage of Change in order to bring about change, with SOC denoting the different POC strategies required dependent on the individual's current intentional/behavioural status. To date, there are ten POC which have received the most empirical support with a simple two-domain higher order construct being evident (Marcus et al, 1992a) which have been termed
Experiential (Cognitive) and Behavioural. Table 2.2.2.4 defines the exercise specific Processes of Change below with an indication of the two higher order constructs included. These exercise specific definitions are devised directly from the definitions for the processes of change developed in the early smoking cessation research of Prochaska and DiClemente (1982; 1983).

Table 2.2.2.4 Processes of Change (Marcus et al, 1992(a) p.425)

<table>
<thead>
<tr>
<th>Process of Change</th>
<th>Definition</th>
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</thead>
<tbody>
<tr>
<td>Consciousness Raising*</td>
<td>Efforts by the individual to seek new information and to gain understanding and feedback about the problem.</td>
</tr>
<tr>
<td>Dramatic Relief*</td>
<td>Emotional or affective aspects of change, often involving intense emotional experiences related to lack of activity.</td>
</tr>
<tr>
<td>Environmental Re-</td>
<td>Consideration and assessment by the individual of how the problem affects the physical and social environment.</td>
</tr>
<tr>
<td>evaluation*</td>
<td></td>
</tr>
<tr>
<td>Social Liberation*</td>
<td>Awareness, availability, and acceptance by the individual of alternative, problem-free lifestyles in society.</td>
</tr>
<tr>
<td>Self Re-evaluation*</td>
<td>Emotional and Cognitive reappraisal of values by the individual with respect to the problem behaviour.</td>
</tr>
<tr>
<td>Helping Relationships**</td>
<td>Trusting, accepting and utilising the support of caring others during attempts to change the problem behaviour.</td>
</tr>
<tr>
<td>Stimulus Control**</td>
<td>Control of situations and other cases that trigger the problem behaviour.</td>
</tr>
<tr>
<td>Counter-Conditioning**</td>
<td>Substitution of alternative behaviours for the problem behaviour.</td>
</tr>
<tr>
<td>Self Liberation**</td>
<td>The individual's choice and commitment to change the problem behaviour, including the belief that one can change.</td>
</tr>
<tr>
<td>Reinforcement Management**</td>
<td>Changing the contingencies that control or maintain the problem behaviour.</td>
</tr>
</tbody>
</table>

* Cognitive Processes ** Behavioural Processes.

The cognitive POC relate to consideration of changing behaviour and how the behaviour change may impact upon the individual's environment and personal health along with re-appraisal of the value of the new behaviour and its impact on
and acceptance within society. The behavioural POC relate more to the belief that change is possible and the identification of actions, environments and persons who may help perpetuate this belief and help to support the individual during and following change.

Processes of Change are crucial factors within the TTM with the major hypothesis being that to bring about positive change different POC need to be emphasised at different stages. In addition, the cognitive processes are proposed to be most useful in the earlier SOC when the major shift is in intention to undertake the behaviour i.e. the decision making process; whilst behavioural processes are proposed as more useful in the latter stages when the specified behaviour has occurred.

This hypothesis makes intuitive sense; however, does it actually help us to move closer to understanding how to intervene in order to bring about change? Initial analyses using this model for process by stage interactions identified that adjacent stages had specific processes which were being used at similar levels; this was interpreted as signifying that these processes were the relevant ones for emphasis to bring about movements from the lower to higher stage (Marcus et al, 1992a; Prochaska & DiClemente, 1983; Prochaska & Marcus, 1994). Whilst this interpretation has intuitive appeal it is problematic in that it may actually signify that the stages in question are not distinct, supporting criticism discussed earlier (Davison, 1992; Sutton, 1996). Further to this, if there are some processes which are used significantly more in some stages as opposed to others it is incorrect to assume that it is these processes which need to be emphasised to bring about stage progression as it is impossible to identify whether this difference is positive or negative in relation to movement (Marshall & Biddle, 2001; Sutton, 1996). These problems are only exacerbated by the fact that the majority of research to date is cross-sectional in nature. This indicates that longitudinal studies are required assessing actual changes in and between variables. Until this is carried out it can still be said that “there is no strong evidence that using
particular processes in particular stages promotes movement to subsequent stages" (Sutton, 1996 p.203). Thus, longitudinal designs looking at both positive and negative relationships between changes in process utilisation and changes in stage categorisation are required.

Further to Stages of Change, Decisional Balance and Processes of Change; Self Efficacy (or Temptation to not undertake the health behaviour) is a fundamental variable in the TTM (Marcus et al, 1994; Velicer et al, 1998). Self Efficacy (SE) conceptualises a person's perceived ability to perform a task both on a personal and environmental basis. The TTM employs an overall confidence score to assess an individual's SE. In this context it represents the situation specific confidence that a person may have to resist high-risk situations without performing the problem behaviour i.e. sedentary living. It is represented by a temptation measure or a self efficacy construct (Velicer et al, 1998). A situational temptation measure (DiClemente, 1981; DiClemente, 1986; Velicer, DiClemente, Rossi & Prochaska, 1990) indicates the strength of the compulsion to undertake behaviour during high-risk situations i.e. in relation to exercise when it's raining. It is the opposite of self efficacy and the "same set of items can be used to measure both, using different response formats" (Velicer et al, 1998 p.221). "The temptation/self efficacy trade-off can be viewed as a barometer of how confident the individual is in their ability to employ the Processes of Change" (Rakowski, 1996 p.214) and is sensitive to shifts involved in movement in the latter stages especially as predictors of relapse (Velicer et al, 1998).

The previous pages have highlighted some of the arguments for and against the TTM in addition to describing its four key constructs and their inter-relationships. What must be remembered is that the behaviour of the human organism is modified by many determinants, which may or may not be integral factors within the TTM. What is certainly true is that the utilisation of this model provides a valid framework enabling us to further our knowledge and improve our understanding of how to intervene with an individual. Indeed, it has been argued that this model
validates practitioner observations and can be applied efficiently in clinical practice (Rakowski, 1996; Samuelson, 1997), undoubtedly an aim of all behaviour change models. Research to date has looked at many behaviours which will improve health including smoking cessation, increased condom use, weight control, dietary fat reduction, mammography screening and exercise acquisition (Prochaska, 1994). Four distinct areas have been identified within this body of work:

1. Theory – this relates to the definition of the basic model constructs along with highlighting specific construct relationships.

2. Operationalisation – developing measures for each construct.


4. Intervention – developing and testing interventions

Adapted from Velicer et al, 1998 p.224.
Theory

The initial theory was formalised from an integration of diverse fields of psychotherapy culminating in the four core constructs discussed above (Prochaska, 1979). The model has been successfully applied to various behaviours and it was suggested it be applied to exercise behaviour in an attempt to make the shift from predictive to dynamic transition models (Sonstroem, 1988). The key relationships described earlier were adopted for exercise behaviour with exercise specific definitions being developed (see Table 2.2.2.3 Marcus et al, 1992a). From this point, suitable exercise specific measures were in need of development. Table 2.2.2.5 below details a number of key studies using the Transtheoretical Model to aid smoking cessation (A legend explaining abbreviations used is included at the foot of this page). These studies are the foundation of the theorising of the TTM in the exercise domain (DiClemente & Prochaska, 1982; DiClemente et al, 1991; Prochaska & DiClemente, 1982).

Legend

<table>
<thead>
<tr>
<th>SOC</th>
<th>Stages of Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>POC</td>
<td>Processes of Change</td>
</tr>
<tr>
<td>DB</td>
<td>Decisional Balance</td>
</tr>
<tr>
<td>SE</td>
<td>Self Efficacy</td>
</tr>
<tr>
<td>PC</td>
<td>Precontemplation</td>
</tr>
<tr>
<td>C</td>
<td>Contemplation</td>
</tr>
<tr>
<td>PR</td>
<td>Preparation</td>
</tr>
<tr>
<td>AX</td>
<td>Action</td>
</tr>
<tr>
<td>MN</td>
<td>Maintenance</td>
</tr>
<tr>
<td>SCQ</td>
<td>Stage of Change Questionnaire</td>
</tr>
<tr>
<td>PCQ</td>
<td>Processes of Change Questionnaire</td>
</tr>
<tr>
<td>DBQ</td>
<td>Decisional Balance Questionnaire</td>
</tr>
<tr>
<td>SEQ</td>
<td>Self Efficacy Questionnaire</td>
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</table>

<table>
<thead>
<tr>
<th>CR</th>
<th>Consciousness Raising</th>
</tr>
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<tbody>
<tr>
<td>DR</td>
<td>Dramatic Relief</td>
</tr>
<tr>
<td>ER</td>
<td>Environmental Re-evaluation</td>
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<tr>
<td>SR</td>
<td>Self Re-evaluation</td>
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<tr>
<td>SO</td>
<td>Social Re-evaluation</td>
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<tr>
<td>CC</td>
<td>Counter Conditioning</td>
</tr>
<tr>
<td>HR</td>
<td>Helping Relationships</td>
</tr>
<tr>
<td>RM</td>
<td>Reinforcement Management</td>
</tr>
<tr>
<td>SL</td>
<td>Self Liberation</td>
</tr>
<tr>
<td>SC</td>
<td>Stimulus Control</td>
</tr>
<tr>
<td>PROS</td>
<td>Benefits of behaviour change</td>
</tr>
<tr>
<td>CONS</td>
<td>Costs of behaviour change</td>
</tr>
<tr>
<td>Author (year)</td>
<td>Behaviour Assessed</td>
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<tr>
<td>--------------------------------------------------</td>
<td>--------------------</td>
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<tr>
<td>Prochaska &amp; DiClemente (1982) In: Prochaska (1984)</td>
<td>Smoking</td>
</tr>
<tr>
<td>DiClemente &amp; Prochaska (1982)</td>
<td>Smoking</td>
</tr>
<tr>
<td>Author (year)</td>
<td>Behaviour Assessed</td>
</tr>
<tr>
<td>----------------------</td>
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</tr>
<tr>
<td>DiClemente et al (1991)</td>
<td>Smoking</td>
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</table>
Operationalisation

The studies in Table 2.2.2.5 are the basis of the TTM development, however it is worthy of note that none of these studies indicate causal relationships between POC and stage movement. The above described studies highlight relevant relationships and have the potential to inform intervention design in the area of smoking cessation, however, the statistics used do not allow causal relationships to be estimated. Furthermore, Table 2.2.2.5 shows smoking cessation studies only. In addition to the self selection bias and reliance on self report which are issues with the predominance of the studies reported within this literature review there are a number of other matters that need highlighting. Despite the strength of the qualitative development of the Stage of Change construct and its ordering of change processes as a consequence of "when in the change process" the participants were talking about (Prochaska & DiClemente, 1982 p.460) the retrospective design has issues with regard to recall. Furthermore, the prospective design used in a subsequent empirical study only assessed SOC, quit attempts and abstinence longitudinally and failed to assess POC other than at baseline and as with other studies it only assessed pre-action SOC thus the model was not tested in its entirety. Table 2.2.2.6 below indicates the development of the TTM in the exercise domain and the operationalisation of the TTM with exercise/physical activity specific definitions and measures.

Stages of Change measurement is vital as this is the key element in organising the core constructs so that cognitive and/or behavioural transitions can be identified. Various algorithms have been devised within the exercise/physical activity domain utilising multiple measures including true/false and yes/no dichotomies; ordered categorical items and ladders, plus, continuous likert scale measures (Cardinal, 1995a; 1995b; 1997; Cardinal et al, 1998; Loughlan & Mutrie, 1995; Marcus, Selby, Niaura and Rossi, 1992b; Marcus & Simkin, 1994; Marcus et al, 1994a; Mutrie & Caddell, 1994; Wyse et al, 1995). The Stages of Change are the most common tool for operationalising the TTM and are thus an extremely important aspect of TTM research as they are the single measure by
which behaviour change is assessed (Richard-Reed, Velicer, Prochaska, Rossi & Marcus, 1997). Study designs have utilised both cross-sectional and longitudinal surveys with validation of SOC being assessed via comparison of SOC distribution to other tools. These include physical activity recall questionnaires (Cardinal, 1995a, 1995b, 1997; Marcus & Simkin, 1993; Marcus et al, 1994), physiological measures (Cardinal 1995a, 1997; Lowther et al, 1999; Wyse et al, 1995), and qualitative interview data (Mutrie & Caddell, 1994). In general, these studies support the usefulness of the SOC construct in its ability to differentiate between all proposed Stages of Change in relation to physical activity (PA). A retrospective study was taken to assess 20,475 participants accumulated from three studies (Richard-Reeds et al, 1997). In total eight staging algorithms were compared which differed on description of stages, definitions of physical activity/exercise and response formats. Methods of assessment included both difference (MANOVA) and frequency measures. The authors concluded that alterations to the descriptions of stages and definitions of exercise were required as it has major consequences on the staging of subjects. They suggested that in order for subjects to be staged accurately and consistently through self-classification there was a need for a) well defined stage descriptions including complete definitions of the behavioural criterion, b) easily understood measurement criteria and c) simple yes/no or five choice response formats to provide the most valid and reliable algorithm measures. Once these criteria are met then appropriate stage-matched interventions can be delivered; until SOC algorithms are valid and reliable then utilisation of stage-matched designs may be jeopardised (Richard-Reeds et al, 1997). A recent meta-analysis suggests the use of the validated 5 item algorithm of Marcus and Simkin (1993) as the most appropriate at this time (Marshall & Biddle, 2001).

Further construct measures developed include the Process of Change Questionnaire (PCQ) (Marcus et al, 1992a). In total 1,172 employees from a worksite sample were assessed cross-sectionally. The original questionnaire comprised 65 items; following testing 25 items were deleted and one excluded
through administrative error culminating in a 39 item PCQ instrument. The problems associated with this instrument may be related to the fact that it was developed on a self-selected worksite with cross validation on another population not being carried out. Whilst this instrument has received some criticism relating to its validity in relation to different populations (Gorley & Gordon, 1995) it is currently the most applicable tool in the exercise field.

Self efficacy measures are readily available. Marcus et al (1992b) validated a TTM specific questionnaire (SEQ) which was found to reliably differentiate between SOC in two studies accumulating 1,592 participants. Decisional Balance, as previously discussed, was developed from the work of Janis and Mann (1977). Sechrist et al (1987), using a 65 item questionnaire, on a four point likert scale, identified a two factor solution (barriers and benefits) for the reasons behind exercise participation; from this a 43 item DB scale was developed. A similar two factor solution (PROS and CONS) was identified from a 40 item scale, and, as a result, a 16 item DB instrument was developed (Marcus, Rakowski & Rossi, 1992c).
Table 2.2.2.6 Studies from the exercise literature identifying the Operationalisation of TTM constructs for use in behaviour change research.

<table>
<thead>
<tr>
<th>Author (year)</th>
<th>Behaviour Assessed</th>
<th>Participant Description</th>
<th>Constructs Examined</th>
<th>SOC Breakdown</th>
<th>Instrument Validity / Reliability Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marcus et al 1992a</td>
<td>Exercise (ACSM guidelines; 3 or more sessions each week for at least 20 minutes per session)</td>
<td>1,172 Male and Female exercisers and non-exercisers from a worksite sample.</td>
<td>SOC and POC Development and testing of PCQ (Processes of Change Questionnaire)</td>
<td>PC 21.9%</td>
<td>A 39 item questionnaire, which assesses 10 subscales assessed on a likert scale was developed. Internal consistency (alpha) co-efficients ranging from 0.69 – 0.89 across the 10 subscales were reported. One item was excluded from the dramatic relief subscale due to an administrative error. This was included in subsequent versions of the PCQ.</td>
</tr>
<tr>
<td>Marcus et al, 1992b</td>
<td>Exercise (ACSM guidelines; 3 or more sessions each week for at least 20 minutes per session)</td>
<td>20 Male and Female exercisers and non-exercisers from a worksite sample. (Study III)</td>
<td>SOC and SE Reliability testing of SEQ (Self Efficacy Questionnaire) and SCQ (Stages of Change Questionnaire)</td>
<td>Not reported.</td>
<td>Test-retest (product moment) for the self efficacy scale over a two week period was .90. The kappa index of reliability for the SCQ over a two week period was .78. Fleiss (1981) states that a kappa above .75 indicates strong agreement.</td>
</tr>
<tr>
<td><strong>Author (year)</strong></td>
<td><strong>Behaviour Assessed</strong></td>
<td><strong>Constructs Examined</strong></td>
<td><strong>Participant Description</strong></td>
<td><strong>SOC Breakdown</strong></td>
<td><strong>Key Findings</strong></td>
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<tr>
<td>Marcus et al, 1992c</td>
<td>Exercise (ACSM guidelines; 3 or more sessions each week for at least 20 minutes per session)</td>
<td>SOC and DBQ development and testing of DBQ (Decisional Balance Questionnaire)</td>
<td>778 Male and Female exercisers and non-exercisers from a worksite sample.</td>
<td>PC 22.4% C 28.3% PR 17.8% AX 8.7% MN 22.8%</td>
<td>A 6 item PROS and 10 item CONS DBQ was developed through a principal component analysis with a varimax rotation. Retained components were determined by the scree method (Cattell, 1966). A component was interpreted as salient if there was a component loading of .50 or greater. Internal consistency co-efficient of 0.95 (PROS) and 0.79 (CONS) were reported. Analysis of variance identified that the DBQ was significantly associated with SOC.</td>
</tr>
<tr>
<td>Marcus &amp; Simkin, 1993</td>
<td>Exercise (ACSM guidelines; 3 or more sessions each week for at least 20 minutes per session)</td>
<td>SOC and 7-day recall</td>
<td>235 Male and Female exercisers and non-exercisers from a worksite sample.</td>
<td>PC 3% C 8% PR 30% AX 9% MN 44%</td>
<td>The 7-day recall questionnaire test-retest reliability data have been found fairly stable for light (r=.65), hard (r=.31), very hard active (r=.61) and hours of sleep (r=.74); (Sallis et al, 1985). Scores on the 7-day recall significantly differentiated employees amongst stages. Few participants found difficulty in staging themselves as the questionnaire used a 5 response tick box format with a well defined criterion that was deemed time efficient and easy to complete.</td>
</tr>
<tr>
<td>Loughlan &amp; Mutrie, 1995</td>
<td>Exercise / Physical Activity (Accumulative message, Pate et al, 1995)</td>
<td>SOC (inc. definition to encapsulate accumulative message)</td>
<td>510 Male and Female exercisers and non-exercisers from a worksite sample.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Author (year)</td>
<td>Behaviour Assessed</td>
<td>Participant Description</td>
<td>Constructs Examined</td>
<td>SOC Breakdown</td>
<td>Key Findings</td>
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<tr>
<td>Richard-Reeds et al, 1997</td>
<td>Low, moderate and vigorous intensity exercise.</td>
<td>20,475 Male and Female exercisers and non-exercisers from 8 worksite samples.</td>
<td>SOC (8 staging algorithms using different descriptions of TTM stage were compared)</td>
<td>Varied across studies based on staging algorithm (inc. some collapsing of stages)</td>
<td>Algorithms using longer more complete descriptions of the target behaviour resulted in proportionally more allocated to PC and C.</td>
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<td></td>
<td>Shorter definitions resulted in more allocated to PR and AX.</td>
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<td></td>
<td></td>
<td>The definition needs to be explicit to enable accurate self-staging.</td>
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<td></td>
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<td></td>
<td>Either a 5 choice or dichotomous (yes/no) response format was deemed most effective for accurate staging of participants.</td>
</tr>
</tbody>
</table>
Empirical Testing

The above studies (described in Table 2.2.2.6) highlight the need to operationalise and empirically evaluate the theory to support or refute its applicability to the problem behaviour in question. The measures described above were adopted within the research to be undertaken within this thesis as the most suitable that were available at the onset of data collection; however, there are a number of issues that need to be mentioned. The studies by Marcus and colleagues (1992a, 1992b, 1992c, 1993) were undertaken on worksite volunteers; furthermore, the subjects were predominantly white and female with the lowest average age of study participants being 37.2 years. In addition, various methods of staging were used in the validation studies (i.e. algorithm and ladders).

Additionally, in the SCQ validation studies (Marcus & Simkin, 1993) the test-retest only took place on 20 subjects and the concurrent validity assessments using the 7 day physical activity recall questionnaire, whilst identifying the expected relationships for the different behaviour levels, those self selected as sedentary reported an average of 214.3 minutes of moderate (3 - 4.9 METS, which includes household chores) activity per week which approximates to 30 minutes of activity per day (equivalent to the moderate message for health improvements (Pate et al, 1995)). However, despite this the SOC algorithm validated continues to receive support in the literature (Marshall & Biddle, 2001) and highlights the need to ensure that the behaviour being measured is described as fully as possible to allow effective self staging. Lowther et al (1999) validated a Scottish Physical Activity Questionnaire which showed reliability and concurrent validity with a Stage of Change measure that included the moderate message as a criterion value. This questionnaire was also able to record a significant relationship with an objective measure of physical activity (Caltrac). The definition utilised within the SOC instrument (Loughlan & Mutrie, 1995) was adopted within this thesis as a suitable explanation of criterion behaviour in order to allow participants to self
stage accurately. Once developed, in order to examine the TTM, the above construct measures now need further testing to assess whether the theoretical relationships of the constructs, as measured by the tools described, can be verified in the field (Velicer et al, 1998).

Numerous studies have involved the systematic testing of the relationship between the four core constructs of the TTM in relation to physical activity. Some studies examined population prevalence of SOC only (Booth et al, 1993; Courneya, 1995; Pinto & Marcus, 1995), whilst others looked at relationships between two or three constructs such as SOC/POC (Goldberg et al, 1996; Marcus et al, 1992a; Marcus et al, 1996); SOC/DB (Marcus et al, 1992c) and DB/SE/SOC where Marcus et al (1994a) identified that level of exercise (assessed through seven day recall) could be predicted by SOC, SE and DB. In addition, SE was strongly related to behavioural intention and thus a good indicator of current and future exercise activity. Furthermore, PROS (a subcomponent of Decisional Balance) or, the perception that exercise will make me feel healthier/better was positively associated with readiness to exercise. Further research showed that women with higher self efficacy felt more ready to exercise and actually engaged in more activity than those with lower self efficacy (Marcus et al, 1994b).

More recently, the Stages and Processes of Change have been used to track behaviour over a seven month period to identify key processes associated with exercise behaviour (Woods et al, 1999a). Participants numbered 830 (male and female) and were assessed using SOC and POC. The results identified that physical activity reflected the general population and, after seven months there was a significant difference in the proportion of subjects in each SOC with the number in contemplation reducing significantly and the number in action increasing significantly. This study identified that different SOC's used different POC's, which again supports the need for sequential tailoring of intervention to stages of exercise. However, what must be noted is that all of these subjects
were higher education students who had ample and cost effective access to recreation facilities on campus and the patterns evident may not be replicated in a community sample. To date only three studies have examined all four TTM constructs simultaneously. Gorley and Gordon (1995) assessed 1,058 seniors; eight of the TTM components (PROS, CONS, SE and five POC) emerged as significant discriminators between SOC. In a sample of 819 adolescents, again all three independent components of the TTM exhibited relationships with SOC (Nigg & Courneya, 1998). Bock et al (1998) assessed 216 adults and the relationships between the three independent constructs and SOC were significant.

All of these studies indicate that stage-matched intervention development should be a focus of the future as variables which have potential for utilisation in behavioural interventions can be distinguished by the temporal SOC component of TTM. In addition, the three studies that assess all four constructs together show support for the use of the TTM in our understanding of physical activity behaviour across different populations. However, we do need to proceed with caution as most of the studies cited above are cross-sectional in nature, thus limiting their applicability in predicting how changes in independent variables may effect stage movement be it positive or negative. It is therefore apparent that longitudinal studies of all TTM constructs in a single study are warranted before any inferences of causality can be made. Table 2.2.2.7 below summarises the studies discussed above with principal findings of inter-construct relationships being highlighted.
Table 2.2.2.7 Studies depicting empirical testing of the exercise specific TTM measures and important findings.

<table>
<thead>
<tr>
<th>Author (year)</th>
<th>Behaviour Assessed</th>
<th>Participant Description</th>
<th>Constructs Examined</th>
<th>SOC Breakdown</th>
<th>Key Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marcus et al 1992a</td>
<td>Exercise (ACSM guidelines; 3 or more sessions each week for at least 20 minutes per session)</td>
<td>1,172 Male and Female exercisers and non-exercisers from a worksite sample. (Study I)</td>
<td>SOC and POC Development and testing of PCQ (Processes of Change Questionnaire)</td>
<td>PC 21.9%</td>
<td>All POC used less in PC than other SOC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Cross-sectional study</td>
<td>C 29.7%</td>
<td>Experiential POC peak in AX then decrease. This is one stage later than found in smoking cessation research.</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PR 8.5%</td>
<td>Behavioural POC peak in AX as with smoking, however, in exercise they level off in MN whilst they decrease in MN for smoking.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AX 9.9%</td>
<td>CC, RM, and SL are used significantly more from C → PR.</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MN 30%</td>
<td>All behavioural POC are used significantly less in PR than AX.</td>
</tr>
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<td></td>
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<td></td>
<td>There are no significant differences in POC use between AX and MN.</td>
</tr>
<tr>
<td>Marcus et al, 1992b</td>
<td>Exercise (ACSM guidelines session)</td>
<td>1,063 Male and Female exercisers and non-exercisers from a worksite sample. (Study I)</td>
<td>SOC and SE Development of SCQ (Stage of Change Question) and SEQ (Self Efficacy Questionnaire)</td>
<td>PC 8%</td>
<td>Reliably differentiated between most stage pairings, however, a four stage model doesn’t adequately describe exercise behaviour.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>C 21.1%</td>
<td>Preparation stage needs to be added to model.</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PR not measured</td>
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<tr>
<td>Author (year)</td>
<td>Behaviour Assessed</td>
<td>Participant Description</td>
<td>Constructs Examined</td>
<td>SOC Breakdown</td>
<td>Key Findings</td>
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<tr>
<td>Marcus et al, 1992b</td>
<td>Exercise (ACSM guidelines)</td>
<td>429 Male and Female exercisers and non-exercisers from a worksite sample. (Study II)</td>
<td>SOC and SE Refined SCQ and SEQ</td>
<td>PC 7.3%</td>
<td>Five stage model reliably differentiated between all stages (p&lt;0.01).</td>
</tr>
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<td></td>
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<td></td>
<td>C 23.1%</td>
<td>All relationships between adjacent pairs exhibited the expected relationships which were significant in all but the C→PR relationship.</td>
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<td></td>
<td>PR 30.4%</td>
<td>Cross-sectional study only.</td>
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<td></td>
<td>AX 16.6%</td>
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<td></td>
<td></td>
<td></td>
<td>MN 22.6%</td>
<td></td>
</tr>
<tr>
<td>Marcus et al, 1992c</td>
<td>Exercise (ACSM 1990)</td>
<td>778 Male and Female exercisers and non-exercisers from a worksite sample.</td>
<td>SOC and DB Development and testing of DBQ (Decisional Balance Questionnaire)</td>
<td>PC 7%</td>
<td>PROS need to increase and CONS need to decrease for positive behaviour change to occur.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>C 34%</td>
<td>Support for DB construct in intervention design, however, study is only cross sectional in nature.</td>
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<td>PR 25%</td>
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<td></td>
<td></td>
<td></td>
<td>AX 14%</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>MN 20%</td>
<td></td>
</tr>
<tr>
<td>Marcus et al, 1994a</td>
<td>Exercise (ACSM 1990)</td>
<td>698 Male and Female exercisers and non-exercisers from four worksite samples.</td>
<td>SOC, DB, SE 7-day recall. (Longitudinal – 6 months)</td>
<td>Not reported</td>
<td>Variance in SOC was explained by SE and DB (approx 43%).</td>
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<td>SOC explains approx 24% of the variance between vigorous and moderate activity</td>
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<td></td>
<td>The path of the SE and DB constructs to exercise was mediated by SOC.</td>
</tr>
<tr>
<td>Author (year)</td>
<td>Behaviour Assessed</td>
<td>Participant Description</td>
<td>Constructs Examined</td>
<td>SOC Breakdown</td>
<td>Key Findings</td>
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<tr>
<td>Marcus et al, 1994b</td>
<td>Exercise</td>
<td>431 women at a worksite sample</td>
<td>SOC, DB and SE</td>
<td>PC 8.2%, C 30.4%, PR 3.9%, AX 12.4%, MN 15.1%</td>
<td>SE was significantly related to SOC. DB was significantly associated with SOC in the expected direction. Women with children under 18 years of age had a significantly lower SOC. Walking was the most frequently endorsed activity for those in lower SOC with more vigorous activities increasing as SOC increased. This has implications for intervention design. Generalisability for SOC and DB across different behaviours was supported. Smoking, condom use, safe sex, weight control, making follow-up appointments, Radon testing and Cocaine use all crossover (i.e. PROS are higher than CONS) in Contemplation. Exercise crossover in Preparation Sunscreen use, delinquent behaviour, reducing fat intake, mammography screening all cross over in Action.</td>
</tr>
<tr>
<td>Prochaska et al, 1994</td>
<td>Smoking, Condom use, Cocaine use, Sunscreen use, Weight Control, Reduction in dietary Fat intake, Exercise, Mammography Screening, Safer Sex, Making follow-up appointments, Radon testing and educing delinquent behaviour.</td>
<td>SOC and DB Cross-sectional study</td>
<td>N/A</td>
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<tr>
<td>Author (year)</td>
<td>Behaviour Assessed</td>
<td>Participant Description</td>
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<tr>
<td>Prochaska 1994</td>
<td>As above</td>
<td>Various age groups and settings</td>
<td>SOC and DB</td>
<td>N/A</td>
<td>The strong principle identifies that progression from PC to AX is a function of 1 standard deviation increase in PROS of the required behaviour. The weak principle identifies that progression from PC to AX is a function of ½ standard deviation decrease in CONS of the required behaviour.</td>
</tr>
<tr>
<td>Pinto and Marcus, 1995</td>
<td>Exercise</td>
<td>217 Male and Female College Students</td>
<td>SOC and activity preferences</td>
<td>PC/C 18% PR 28% AX 54%</td>
<td>Walking is not a popular activity choice in this age group. There were sex differences evident in activity preferences (women – aerobics; men – weight lifting). No gender or age differences in SOC. 46% inactive, highlighting a need for interventions targeting this age group.</td>
</tr>
<tr>
<td>Courneya, 1995</td>
<td>Exercise</td>
<td>270 male and Female 60+ members of a community facility</td>
<td>SOC and Perceived severity from the (HBM/FMT theory)</td>
<td>PC 10% C 10% PR 17% AX 6% MN 58%</td>
<td>High percentage in MN maybe consequence of facility used. Perceived severity (influenced by visibility of disease) was associated with either considering activity (PC→C) or increasing activity (PR→ AX). Perhaps applicable to this population due to age range evident.</td>
</tr>
<tr>
<td>Author (year)</td>
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</tr>
<tr>
<td>Gorley and Gordon, 1995</td>
<td>Exercise</td>
<td>598 Male and Female Seniors Community sample (50-65 years)</td>
<td>SOC, POC, DB, SE</td>
<td>PC 14.5%</td>
<td>All POC used least in PC</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>Cross-sectional</td>
<td>C 9.5%</td>
<td>Two significant cognitive POC relationships identified with (CR and SR) use of these processes being equal between C -&gt; PR then increasing from PR -&gt; AX -&gt; MN.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Study</td>
<td>PR 30%</td>
<td>Three significant behavioural POC relationships with use increasing from C -&gt; PR -&gt; AX (CC &amp; SL) and, PR -&gt; AX -&gt; MN(SC).</td>
</tr>
<tr>
<td></td>
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<td>AX 9%</td>
<td>Expected DB and SE relationships supported.</td>
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<td></td>
<td>MN 37%</td>
<td>Reduced dietary fat and improved health eating profile were both significantly associated with exercise SOC.</td>
</tr>
<tr>
<td>Bock et al, 1998</td>
<td>Exercise</td>
<td>194 Male and Female Community Sample</td>
<td>SOC, POC, DB, SE</td>
<td>PC 1%</td>
<td>No relationship between exercise SOC and smoking.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Cross-sectional</td>
<td>C 58%</td>
<td>Relationships between constructs similar to previous thus supporting utility of TTM in this age group.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Study</td>
<td>PR 32%</td>
<td>All constructs (13 - 10 POC, SE and 2 DB) exhibited significant relationships with SOC.</td>
</tr>
<tr>
<td>Nigg and Courneya, 1998</td>
<td>Exercise</td>
<td>819 male and Female Adolescents from a School based sample.</td>
<td>SOC, POC, DB, SE</td>
<td>PC 2.1%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Cross sectional</td>
<td>C 4.2%</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Study</td>
<td>PR 28.7%</td>
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<td></td>
<td></td>
<td>AX 15.7%</td>
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<td>MN 49.3%</td>
<td></td>
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<tr>
<td>Author (year)</td>
<td>Behaviour Assessed</td>
<td>Participant Description</td>
<td>Constructs Examined</td>
<td>SOC Breakdown</td>
<td>Key Findings</td>
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<tr>
<td>Cardinal 1997</td>
<td>Exercise ACSM 1990</td>
<td>66 Women from a worksite sample (Age 18-50 years)</td>
<td>SOC</td>
<td>C 39.4%</td>
<td>Those in PR are no more likely to progress to AX over 7 months than those in C.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Longitudinal design</td>
<td>PR 60.6%</td>
<td>SOC at baseline is the strongest predictor of SOC at 7 months compared to BMI and educational level.</td>
</tr>
<tr>
<td></td>
<td>Exercise ACSM/CDC 1995</td>
<td>1,058 Male and Female first year university students.</td>
<td>SOC, POC</td>
<td>PC 4%</td>
<td>Women are less likely to be regularly active than men.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Longitudinal design</td>
<td>C 23%</td>
<td>In PC five POC are important in stage movements (SL, DR, SO, SR, RM). In C seven POC are implicated in SOC movements (CR, DR, SL, ER, HR, SC, CC).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PR 26%</td>
<td>In PR seven POC are involved in SOC movements (SL, DR, ER, HR, SC, SR, RM).</td>
</tr>
</tbody>
</table>
**Interventions**

Overall the proposed relationships for TTM constructs are supported from the cross-sectional data described above (Table 2.2.2.7), however, the limited number of prospective designs precludes explicit inter-construct relationships to be fully expressed. Besides this other issues were evident, a number of the studies collapsed stages; only studied a limited number of stages or had preparation missing from the Stages of Change (Cardinal, 1997; Pinto & Marcus, 1994; Prochaska et al, 1994) or were testing inter-construct relationships whilst an intervention was occurring (Woods et al, 1999). However, despite this or even in spite of this the studies in the previous section have highlighted and verified some of the relationships between TTM constructs in physical activity. The final step in the application of the TTM in exercise behaviour change research is the development and testing of interventions.

Several studies have utilised the TTM as a foundation for designing and applying stage-matched interventions. Marcus et al (1992b) undertook a six week intervention study using written materials targeted at specific stages of readiness for exercise; 30% of contemplators and 60% of preparers had moved into action. In addition, 30% of contemplators had moved into preparation post intervention. Cardinal and Sachs (1995) compared ‘structured’, ‘lifestyle’ and control groups over a seven month period postal delivered stage-matched intervention in a female (n=113) cohort. Only the lifestyle group significantly improved their SOC and adherence levels, possibly indicating it is easier to incorporate lifestyle changes than structured exercise into daily life.

Marcus et al (1997a) used a physician delivered exercise counselling intervention over six weeks in a two group design (experimental and control). However, no significant differences were evident between groups (Marcus et al, 1997). In a group of 58 women ‘structured’ versus ‘lifestyle’ stage-matched interventions were explored over a 24 week period with both groups exhibiting significant changes in amount of PA and CHD risk (Dallow & Anderson, 2004). A stage
matched versus action oriented approach (n=1559) over a three month period showed differences in SOC movement; participants receiving stage-matched interventions were more likely to increase and less likely to regress in SOC when compared to action-oriented intervention participants (Marcus et al, 1998).

Woods et al (2000) undertook a stage matched mail delivered self instructional intervention (n=459) over 19 months. The stages targeted were precontemplation and contemplation. There were two groups (experimental and control); following intervention significantly more of the experimental group than the control group reported leading a physically active lifestyle. Further to this a binary logistic regression analysis was performed, which revealed that SE was a useful predictor of the shift in SOC. However, POC use for SOC improvers was not significantly different between groups. This may be expected as POC is SOC linked and all improvers were in the same initial stages of change. The studies highlighted above are summarised in Table 2.2.2.8 below.
<table>
<thead>
<tr>
<th>Author (year)</th>
<th>Study design/length</th>
<th>Interventions Examined</th>
<th>Participant Description</th>
<th>Key Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marcus et al, 1992d</td>
<td>Pre-test post test</td>
<td>Mail delivered matched self help interventions for C, PR and AX were used.</td>
<td>610 Males and Females from a community sample.</td>
<td>Participants were significantly more active at follow-up. 62% (C) and 61% (PR) were more active at 6 weeks. Support for postal delivered stage matched interventions was achieved, however, there was no control group.</td>
</tr>
<tr>
<td>Marcus et al, 1997</td>
<td>Quasi-experimental</td>
<td>Two groups (intervention and control) received physician delivered counselling on physical activity.</td>
<td>117 males and Females from a convenience sample.</td>
<td>No significant effects were found.</td>
</tr>
<tr>
<td>Cardinal and Sachs, 1995</td>
<td>Randomised Controlled trial</td>
<td>3 Group (Structured and Lifestyle - TTM design and Fitness - control groups) design</td>
<td>113 Females</td>
<td>Only the lifestyle groups significantly increased SOC at 7 months. Implication for intervention design is that lifestyle exercise may be more easily incorporated into day to day life.</td>
</tr>
<tr>
<td>Author (year)</td>
<td>Study design/length</td>
<td>Participant Description</td>
<td>Interventions Examined</td>
<td>Key Findings</td>
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<tr>
<td>Marcus et al, 1998</td>
<td>Randomised Control Trial 3 months</td>
<td>235 Male and Females from a community sample</td>
<td>Stage matched versus action oriented (control) postal interventions</td>
<td>Stage matched interventions resulted in improved uptake and adherence to lifestyle activity.</td>
</tr>
<tr>
<td>Woods et al, 2000</td>
<td>Randomised Control Trial 19 months</td>
<td>Male and Female university students</td>
<td>Stage matched versus no intervention (control) for those in PC and C. Mail delivered self help materials.</td>
<td>Significantly more in stage matched group improved physical activity level. SE was a useful predictor of SOC progression. POC use between improvers was not significantly different between groups.</td>
</tr>
<tr>
<td>Peterson and Aldana, 1999</td>
<td>Randomised Control Trial 6 weeks</td>
<td>527 Males and Females from a worksite sample.</td>
<td>3 Group design. 2 (stage matched, generic) received self help material via internal mail. 1 group acted as a control (no intervention)</td>
<td>Both intervention groups increased their activity levels (stage matched 13%; generic 1%). The control group exhibited a reduction (8%) in activity levels. All differences were significant. Stage matched materials supported as the most efficient means of delivering short term improvements in activity levels.</td>
</tr>
<tr>
<td>Author (year)</td>
<td>Study design/length</td>
<td>Participant Description</td>
<td>Interventions Examined</td>
<td>Key Findings</td>
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<tr>
<td>Titze et al, 2001</td>
<td>Quasi-experimental</td>
<td>370 Males and females from 6 worksite samples. (Samples stratified due to differences at baseline between worksites)</td>
<td>TTM based interventions that included lunch time led exercise opportunities, exercise counselling, action days and lectures.</td>
<td>In low activity sites there were increased levels for both the intervention group (21.1%) and the control group (8.1%). Thus, a 13% increase in PA for intervention versus controls at comparable baseline worksites.</td>
</tr>
<tr>
<td></td>
<td>4 months</td>
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<td>SOC movement was positive at both intervention and control offices but significantly so for the intervention groups.</td>
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<td>At the high activity sites there was a decrease in activity of 2.1% for the intervention groups.</td>
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<td>Stage matched interventions were supported as an improved method for increasing physical activity in a low active sample.</td>
</tr>
<tr>
<td>Jones et al, 2001</td>
<td>Post-test survey design 2 week follow up.</td>
<td>54 Male and Female seniors. Community Sample</td>
<td>Educational print intervention based on TTM (no control group)</td>
<td>96% increase in those considering exercise and 44% increase in those undertaking exercise two weeks following intervention.</td>
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<td>Lack of control group and short follow-up problematic; but good preliminary results for an intervention in this age group.</td>
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<tr>
<td>Author (year)</td>
<td>Study design</td>
<td>Participant Description</td>
<td>Interventions Examined</td>
<td>Key Findings</td>
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</table>
| Dallow and Anderson, 2003 | Randomised Control Trial 48 weeks | 58 Obese sedentary women. 25-60 years; BMI > 30 | 2 groups 1) intervention (24 week theory based intervention for lifestyle activity and 2) usual care (structured exercise class) | At week 24 64% of the intervention group reported increased activity to AX/MN, with concomitant improvements in fitness.  
At week 24 57% of usual care group reported increased activity to AX/MN but no fitness improvements were evident suggesting over-reporting.  
At week 48 maintenance of increased exercise was reported in the lifestyle intervention group only.  
Evidence that 24 week theory based interventions have a long-term effect on increasing physical activity in obese women. |
Whilst Table 2.2.2.8 does not report an exhaustive list of intervention studies it indicates that there is a lack of interventions targeting all Stages of Change over greater than six months which is the theoretical behaviour change cut-off point on which the TTM is based. Only three of the studies cited are longer than 6 months in length, two of which concentrate on the inactive portion of society only.

In summary, all the studies discussed above highlight the potential appropriateness of stage matched interventions which, when compared with either no intervention control groups or action-oriented / usual care groups, generally exhibit a greater adoption, and in some instances, maintenance of activity with the exception of Marcus et al (1997). This disparity in findings may be something peculiar to the population selected (seniors) as there has been some criticism levied at the current TTM scales in relation to this population (Gordon & Gorley, 1995). However, it may also be a function of something as simple as the study length (six weeks). In addition, Peterson and Aldana (2001) found that those classed as higher active at baseline exhibited a reduction in activity level following stage matched interventions at their worksite; again perhaps this is something peculiar to this sample, however, the lack of testing on higher SOC is an obvious gap in the literature.

In general, there is evidence to support the use of stage-matched designs in promoting physical activity uptake and adherence. Adams and White (2004), however, disagree; they state that "individualized stage-based interventions are of limited effectiveness in promoting long-term adherence" (p.237). In their review they identified that, in studies of less that six months follow up, in 73% of the cases; stage based interventions were more effective than control conditions. However, when studies of more than six months follow up were assessed, stage based interventions were only more effective in 29% of cases. Whilst this does not seem altogether promising it must be argued that any change is better than none and that all change must start somewhere. This sentiment is supported by Brug and Kremer (2004) in that initial or short-term change must occur before
long-term change can; and if stage matched interventions are better in the short
term than other conditions then this is support in favour of the Transtheoretical
Model. Indeed, it is impossible to uncover what helps to promote or prevent long-
term behaviour change without some initial short-term change occurring which
needs to be prolonged.

Another issue raised by Adams and White (2004) is an issue with regard to stage
progression. They argue that whilst stage progression is classified as a
significant outcome it is not always associated with behaviour change and a
focus on stage progression may be problematic. They feel that unless an
intervention is shown to promote actual behaviour change despite SOC
progression it cannot be seen as effective. Sheeran (2002) does not agree and
contends that a lack of intention inevitably leads to a lack of behaviour. As a
result early stage progressions are important factors for the likelihood of
subsequent change. This is a sentiment supported by Samuelson (1997) who
suggests we move away from the medical model that places sole value on
outcomes and definitive results i.e. action oriented approaches only interested in
those who make a measurable behaviour change. Whilst he agrees that strong
programmes aimed at action are a requirement as this is the ultimate goal there
is also the need for comprehensive strategies to engender attitudinal shifts or
changes in intention "from never to now" (p.14); in other words the progression
from precontemplation through contemplation and preparation to action.

In summary, caution must be exercised in making conclusions based upon all the
discussed studies due to the lack of agreement in physical activity definitions
especially as the cited studies can be found to chronologically straddle the
accumulative physical activity message (Pate et al., 1995). Furthermore, other
facts which need to be mentioned include the self selection bias of study
volunteers along with the questionable validity of utilising self recall
questionnaires to support SOC data. Additionally, the question of cultural process
in knowledge transmission and expectation has yet to be considered. Bunton et
al (1991), suggest that adults "select, reject and actively adapt any incoming information or forms of persuasion" (p.157) which is a frustrating factor in education and reform. What’s more, expectancy may impact upon the effect of the intervention through cognitive beliefs about the benefit/success of the intervention being imparted by experimenter expectancy in delivery of the intervention (Czajkowski, Chesney & Smith, 1998).

Whilst the problems discussed do highlight some areas of concern, the TTM does seem to aid in the understanding of how changes in behaviour may occur in physical activity by helping to stage-match interventions to target audiences. The model currently lacks longitudinal studies, specifically studies examining the relationship between all four core constructs and how changes in these variables relate to and interact with each other over time. Studies to assess these gaps in the literature are required to initially focus on changes in all four constructs as a naturally occurring phenomenon (no intervention) succeeded by follow-up interventions examining stage matched, mis-matched and control group differences in all five stages of change. It is important to assess all SOC as it has been suggested that there is no termination stage in physical activity behaviour (Marcus & Prochaska, 1994) and, whilst the non-exercising proportion of society are in most need of intervention there is no long term validity in promoting uptake in these groups if we have no means of encouraging sustainment of behaviour once it reaches criterion.

To recap, the shortcomings in the research to date point towards the requirement for full descriptions of criterion behaviour to aid the participant in self-categorising correctly. In addition, a requirement of future research is longitudinal analysis of both non-experimental (no intervention) and experimental research (stage matched versus mis-matched interventions) for all four core TTM constructs. This research should also emphasise the examination of construct relationships over time as the predominance of cross-sectional studies in the literature does not allow certainty as to the actual concomitant SOC by POC/DB/SE relationships. In
other words, are stage movements a consequence of construct changes or do construct changes occur as a result of stage movements?

Subsequent to the initiation of this research a number of important studies have been published which further support the gaps this research aims to fill. Marshall and Biddle (2001) undertook a meta-analysis of the TTM literature in the exercise domain. They analysed 80 usable samples (n=68,580) from 18 countries. From this a number of crucial issues emerged. Whilst in general the TTM was supported, future research needed to move away from the weak cross-sectional designs prevalent to look at the moderators and mediators of SOC transitions through longitudinal prospective designs. In particular, experimental studies of stage matched and mis-matched interventions were highlighted. Furthermore, there is a need for a consistent response format to stage people with the 5 item dichotomous algorithm (Marcus and Simkin, 1993) suggested. In addition, as the 10 POC in the model emerged from psychotherapy change systems used to treat addictive behaviours, there is a need to examine the relevance of the POC in the exercise domain. A narrative review (Spencer, Pagell, Hellion & Adams, 2002) of the smoking TTM literature also identified similar needs. It was suggested that qualitative studies were an important next step. This approach would allow the assessment of how POC operate at different SOC in exercise adoption and maintenance; particularly as the proposed POC x SOC relationships are historically based on self-changer interviews in smoking cessation research (DiClemente & Prochaska, 1982). As has been identified earlier in this review there are a number of differences between construct relationships in the exercise adoption and smoking cessation literature; this approach may allow a more specific analysis of these differences. In a longitudinal study of exercise self-changers over a 12 month period (n=638), Plotnikoff, Hotz, Birkett and Courneya (2001) tested SOC transitions over time with a number of findings highlighting the need for further analysis of self change. In general their results did not support predictions of the model. Those who remained stable in Action / Maintenance exhibited higher experiential POC use than regressors; whilst those in lower SOC
transitions (PC→ C), where these experiential POC are proposed to be most important, found only behavioural POC were salient for SOC progression. This study culminated in a number of suggestions. There was a further need to examine TTM in longitudinal designs to test the core construct relationships and this needed to be undertaken from the public health perspective of moderate-lifestyle activity levels (Plotnikoff et al, 2001).

In summary and based upon current research directions; this study will attempt to answer a number of questions that are evidently still unanswered. What are the concurrent SOC x POC, DB, SE relationships with reference to two types of behaviour 1) Exercise / Physical Activity (including the accumulative message, (Pate et al, 1995)? 2) Highly structured Activity (Gym / Fitness Suite)? 3) How effective are stage matched interventions compared with mis-matched interventions when both are developed on TTM theory? The need to trial interventions matched to baseline stage against those not matched to baseline stage (mis-matched) are important as a means to identify that it is the systematic matching of the specific key strategies of change (POC) to the relevant stage (SOC) that is the critical factor in the utility of the interventions rather than it being a consequence of using psychotherapeutic change processes (POC) as the basis for intervention per se. Finally, it is also important to assess how the individuals’ attitudes and beliefs with reference to physical activity relate to the Transtheoretical Model, particularly the Processes of Change assessed via qualitative study. Failing to consider other relevant external factors that may influence changes in behaviour, and how they may add to the Transtheoretical Model is to over simplify behaviour change. In addition, as the SOC construct and its relationship to change processes emerged from qualitative research in smoking cessation there is a need to evaluate whether these qualitatively assessed relationships hold true in the exercise domain. Below is a flow chart (Figure 2.2.3) indicating the studies that have been undertaken to explore these gaps in the research; following this the hypotheses generated to test these questions are described.
Figure 2.2.3 *Flow Chart to identify the stages in recruitment of participants.*

**Stage 1** *Participant Recruitment*

**Responders**

Observation 1 Participants were recruited via a convenience sample of students at registration and through e-mail and postal requests for volunteers from University staff and residents of the University locality. They were informed there would be follow-up questionnaires to complete.

**Non Responders**

A random selection of non-responders to the call for volunteers for the intervention study were contacted and asked to take part in semi-structured interviews about the reasons why people maybe physically active.

**Stage 2** *Intervention Study Recruitment*

Observation 2 All responders to the baseline questionnaire were contacted and asked to volunteer for an intervention study at this time point they were also asked to complete the follow-up questionnaire to baseline. They were informed there would be two further questionnaires to complete.

**Stage 3** *Intervention Study (Midpoint follow-up)*

Observation 3 All responders to the intervention study call for volunteers were contacted and asked to complete the first follow-up questionnaire for the intervention study (all questionnaires to date were identical).

**Stage 4** *Intervention Study (Endpoint follow-up)*

Observation 4 All responders to the intervention study midpoint were contacted and asked to complete the final questionnaire for the intervention study (this questionnaire was identical to all previous except it included an extra section asking for the participants opinions on the study they had been involved in and the information and materials they had received).

Non responders to the Midpoint and Endpoint data collections were not contacted further following the standard follow-up procedures described within the chapter.
It is hypothesised that:

1. Results from cross-sectional difference testing of the four core constructs of the Transtheoretical Model will support previous findings and indicate representativeness of the participant cohort. Thus Processes of Change use, Self Efficacy and the perceived benefits (PROS) of activity will increase as Stage of Change increases and the perceived disadvantages (CONS) of activity will decrease as Stage of Change increases in a similar pattern to previous studies.

2. Results from cross-sectional and longitudinal regression analyses will not support the cross sectional relationships identified either within previous research or, within this study (Study 1). This will identify that, incorrect assumptions regarding interventions may have been used as a result of the predominance of cross sectional difference testing research in past research. As a result new or modified recommendations will be generated to increase likelihood of Stage of Change progressions for physical activity uptake and maintenance.

3. The predictors of SOC categorisation and movement from both cross-sectional and longitudinal data analysis will differ as a consequence of exercise definition this will inform the need for further testing of intervention methods and or content for different exercise modalities; particularly in structured settings (Study 1).

4. Matched intervention conditions (Matched A and B) will cause significantly greater positive movements in Stage of Change than mismatched or control conditions.

5. Matched A intervention conditions (Matched to physical activity SOC) will increase physical activity significantly more than other conditions.
6. Matched B intervention conditions (Matched to fitness suite SOC) will increase fitness suite activity significantly more than other conditions.

7. All intervention conditions (Matched A, B and Mismatched) will exhibit significantly more positive Stage of Change movements when compared with the control condition. This will be indicative of the potential for expectation effects (such as the Hawthorne effect) from receipt of motivationally oriented materials even without specific matching to current Stage of Change.

8. The matched interventions will have a greater effect on Stage of Change progression than will any individual variable either categorical (Age group, Sex, Employment status) or Transtheoretical (Processes of Change (10), Decisional Balance (2), Self Efficacy). This will indicate that the combined effect of the intervention variables has a greater effect on Stage of Change than either demographic or Transtheoretical variables individually.

No hypothesis was formulated with regard to the qualitative element of the thesis due to its exploratory nature. The original theory emerged from qualitative assessments of smoking self quitters and the construct framework was developed based upon the stories of these self changers and their parallels with common psychotherapeutic systems and processes (DiClemente & Prochaska, 1982). The theory within the physical activity/exercise domain has utilised this early research for the development of empirical measures but has not examined exercisers stories across all of the Stages of Change. Furthermore, the researcher who was also the interviewer believed that pre-conceived notions of the results may add an experimenter bias to the interviews.
Chapter 3

Longitudinal analysis of Transtheoretical Model core construct relationships in relation to physical activity and fitness suite utilisation
3.0 Introduction

The Transtheoretical Model is an important theoretical advance in the understanding of when and how people change their health behaviours, including physical activity. Stages of Change (SOC) is the most popular or at least the most regularly researched construct. It reflects the temporal dimension of the behaviour in question. The strength of this construct is that it highlights the dynamic nature of behaviour change and distinguishes when 'meaningful change has occurred' (Prochaska et al, 1992). The Processes of Change (POC) are the 'how' part of the equation and consist of strategies and techniques people use to change their behaviour (Prochaska & Marcus, 1994). Decisional Balance (DB) and Self Efficacy (SE) are also key constructs and help to explain why health behaviour change occurs, with SE representing confidence in performing the new behaviour and DB relating to the costs and benefits of changing the behaviour.

The Processes of Change, Decisional Balance and Self Efficacy have all received strong empirical support in the exercise domain in terms of discriminating amongst Stages of Change (Richards-Reeds et al, 1997). The Transtheoretical Model (TTM) proposes that the use of specific POC when matched to SOC will bring about beneficial changes in behaviour. However, traditionally the stage by process relationship and thus, subsequent intervention design has been based upon the relationship between the independent constructs, for example the level of POC use between SOC through difference tests. These types of studies have found that different POC are emphasized at different SOC leading to the conclusion that it is these POC that require systematic targeting for stage matched interventions (Marcus et al, 1992a; Nigg & Courneya, 1998). This concept, however, fails to look at how changes in POC use may be able to predict stage changes, and, as such, how determination of SOC indicates which POC need to be targeted. In order to do this a longitudinal analysis using regression techniques has to be completed. Further to this, as discussed previously, there are a limited number of studies that have used all
core constructs of the TTM in one analysis and have thus tested the model in its entirety (Courneya & Bobick, 2000).

Another factor that needs further development is the definition of the behaviour in question. The use of different definitions can have a major impact upon the distribution of participants throughout the SOC and subsequently on the stage matched materials these individuals would be furnished with. Furthermore, there is a need to identify particular modalities, which may be deserving of specific attention due to the populations' compliance to such modalities. In particular the area of structured activity, for example fitness suite/gym attendance, has not been studied. In light of the increased availability of this type of facility, along with the increased inclusion of behaviour change modules, particularly Stages of Change in training courses for personal trainers and GP referral schemes, it is an area deserving study as there is a need to ensure that interventions employed are relevant to not only the population but the setting in which they will be utilised. Richard-Reed et al (1997) recommended that a certain set of criteria need to be met in order to form a definition of the physical activity in question:

- a well defined description of SOC;
- a detailed definition of criterion behaviour in order that it is easy for participants to stage themselves and;
- Yes/No or True/False type questions.

With these criteria in mind the Stages of Change algorithm developed by Marcus and Simkin (1993) was utilised for staging purposes with the two definitions below relating to criterion behaviour.

3.0.1 Definition for Physical Activity (PA)
Exercise or sport (aerobics/football/swimming) 2-3 times per week for greater than 20 minutes; or general activity (cycle/walk) 4-5 times per week for greater than 30 minutes. (Loughlan & Mutrie, 1995; Woods et al, 1999a).
3.0.2 Definition for Fitness Suite Activity (FS)
Regularly physically active in a fitness suite / gym 3 or more times per week for greater than 20 minutes per session.

3.0.3 Rationale for the Fitness Suite definition.
The University Sport Centre recommends three 20 minute sessions per week during induction/accreditation. In addition, the university offers short circuit sheets in the fitness suite for everyone to access (levels 2-7) which are aimed at eliciting a heart rate within the training zone for between 22 and 25 minutes dependent on the level selected (see appendix A-1 for example).

3.0.4 Aims of the study
In order to assess the impact of POC, DB and SE use on SOC movements a longitudinal study was conducted with two observation points. No intervention occurred during these two collection points. The study aimed to explore the TTM core construct relationships whilst no intervention was occurring in an attempt to identify the cognitive and behavioural processes being used, which relate to progression and regression of SOC. In addition, a need to compare regression results to previous cross-sectional data was identified. Furthermore, assessment of the effect that exercise definition can have on the data was needed. A number of objectives were formulated from these aims.

3.0.5 Objectives
1. Identify relationships between key constructs of the TTM through difference testing and regression techniques;

2. Compare identified predictor relationships with the relationships proposed by difference testing;

3. Identify differences and similarities between physical activity and fitness suite use with respect to the TTM constructs.
3.0.6 It is hypothesised that:

1. Results from cross-sectional difference testing of the four core constructs of the Transtheoretical Model will support previous findings and indicate representativeness of the participant cohort. Thus Processes of Change use, Self Efficacy and the perceived benefits (PROS) of activity will increase as Stage of Change increases and the perceived disadvantages (CONS) of activity will decrease as Stage of Change increases in a similar pattern to previous studies (Gorley & Gordon, 1995; Marcus et al, 1992a; Marcus et al, 1992b; Nigg & Courneya, 1995; Woods et al, 1999a).

2. Results from cross-sectional and longitudinal regression analyses will not support the cross sectional relationships identified either within previous research or within this study (Study 1). This will identify that incorrect assumptions regarding interventions may have been used as a result of the predominance of cross sectional difference testing research in past research. As a result new or modified recommendations will be generated to increase likelihood of Stage of Change progressions for physical activity uptake and maintenance.

3. The predictors of SOC categorisation and movement from both cross-sectional and longitudinal data analysis will differ as a consequence of exercise definition. This will inform the need for further testing of intervention methods and/or content for different exercise modalities, particularly in structured settings (Study 1).

3.1 Method

Participant Eligibility

There were a number of criteria for eligibility in the study:
a. All first year students enrolling onto courses a minimum of three years in study duration at the university were candidates for inclusion in the study;

b. All staff members and residents of the university locality (a village on the outskirts of the City of Newport where residential addresses could be easily delineated by postcodes) were all candidates for inclusion due to the availability of access to the Universities' fitness facility where objective monitoring of fitness suite use was to take place;

c. Exclusions were made if any of the following criteria were evident (i) they indicated membership of a private gym other than the university's fitness facility (no objective measures of attendance) (ii) insufficient contact details for follow-up (iii) incomplete questionnaire at any of the data collections (iv) unwillingness to complete the follow-up questionnaires.

i. Baseline

Baseline data collection occurred at university registration. First year students were asked to complete a four page questionnaire which included all four key constructs of the TTM whilst queuing at several stations to matriculate. Queuing time was ample to complete the full questionnaire (10-15 minutes). Completion of the questionnaire was voluntary and they were informed that it was in order to understand the reasons why people do or do not exercise. Questionnaires were collected on exit from the registration area. They were also informed verbally at this stage that they would be asked to complete a follow-up questionnaire in the future and to indicate whether they would be happy to do this. Apart from at this initial data collection no contact other than via mail/e-mail was made between the researcher and participants as a means to reduce likelihood of bias.

Further recruitment (staff and members of the university locality) occurred via e-mail and a postal call for volunteers (see Appendix B-1 and B-2). Completed
questionnaires could be returned either via e-mail or in a pre-paid envelope to the researcher. No contact other than via mail/e-mail was made between the researcher and these participants as a means to reduce bias. A closing date was included (21 days) and two reminders emphasising the study's importance with regard to preventative health care research were sent out one week and two weeks following the original call for volunteers. Twenty one days following the call for volunteers, data collection was terminated.

The participants came from a convenience sample based upon available access to a specific facility; despite attempts to recruit participants from a cross section of groups, students made up 83.1% of the original cohort. Furthermore, the university locality is not within a socially disadvantaged area (according to the Welsh Index of Deprivation, 2000) despite Newport having a number of the most deprived wards in Wales for health and education, thus this study is unlikely to capture information on disadvantaged groups. Consequently the findings of this study do not address issues or results that can be specifically extrapolated to clinical or socially disadvantaged groups; however the results are expected to be indicative of variable relationships in the general population.

3.1.1 Follow-up Questionnaire

Identical questionnaires to baseline were forwarded for comparative purposes. They were distributed to the original cohort of questionnaire completers (n=308) via mail and e-mail with a letter (Appendix C-1) requesting volunteers for an interventions study which would involve the completion of a further two questionnaires. Included with the follow-up questionnaire was informed consent which had to be signed and returned in the envelope provided or downloaded and returned via internal mail to the researcher (Appendix C-2). The follow-up questionnaires were distributed 12 months after baseline. As with the original call for volunteers one week and two week reminders were forwarded emphasising
the importance of the study. Twenty one days following the call for follow-up questionnaires, data collection was terminated.

3.1.2 Instruments
Demographic data on age, sex, and employment status were assessed at baseline in addition to the measures described below. It should be identified at this point that the measures utilised (described below) were developed and validated on American worksite samples, however the utility of these measures has previously been reported in various other countries including the U.K with similar results (Gorley & Gordon, 1995; Woods et al, 1999a).

Stage of Change was assessed using the Stages of Change Questionnaire (SCQ). Marcus, et al (1992b) developed the SCQ through the modification of an existing instrument, previously developed for smoking cessation. A kappa index reliability of 0.78 over a 2-week period, and a significant association with 7-day Physical Activity recall demonstrates validity and appropriateness of the questionnaire (Marcus & Simkin, 1993).

Processes of Change were assessed through the Processes of Change Questionnaire (PCQ), developed by Marcus et al (1992a). It is a 40-item questionnaire, which assesses 10 subscales (10 processes). Participants respond to all questions on a 5 point likert scale ranging from 1=never to 5=repeatedly. Internal consistency (alpha) co-efficients ranging from 0.69 – 0.89 across the 10 subscales were reported (Marcus et al, 1992a).

Self Efficacy was assessed via the Self Efficacy Questionnaire (SEQ). Developed by Marcus, Selby, Niaura and Rossi (1992) it is a 5 item questionnaire with a 5 point likert scale (1=not at all confident, 5=very confident), which assesses a person’s confidence of ability to continue exercising despite adverse conditions. A test-retest reliability of 0.90 over 2 weeks was reported (Marcus et al, 1992b).
Decisional Balance was assessed with the Decisional Balance Questionnaire (DBQ; Marcus, Rakowski & Rossi, 1992). It consists of 16 items on a 5-point likert scale (1= not at all important, 5= extremely important). The questions assess how important each item is to a person's decision to exercise. They are scored onto two sub-scales, PROS (positive reasons to exercise n=10) and CONS (negative aspects of exercise n=6). Internal consistency co-efficient of 0.95 (PROS) and 0.79 (CONS) have been reported (Marcus et al, 1992c).

This trial was designed to answer a number of questions as described above (sections 3.0.5 and 3.0.6) with the overall outcome to be a useful insight into the use of the Transtheoretical Model as a framework for preventative intervention to increase health and fitness related physical activity in the general population of the UK.

3.2 Data Analysis
The primary outcome in this trial is the identification of cause-effect relationships between alterations in the Processes of Change, Self Efficacy and Decisional Balance variables (cause) and movements in Stage of Change (effect) over a twelve month time span; categorical variables such as age, status and age group were also included. The primary endpoint with regard to the longitudinal analysis of interconstruct relationships is to identify those variables that increase the likelihood of positive Stage of Change movements to alter the individuals' readiness to engage in or improved likelihood of uptake and maintenance of physical activity/exercise at the criterion levels (section 3.0.1) for improving health and/or fitness.

Secondary outcomes in this trial include the identification of the representativeness of the trial cohort when compared with previous research, and the assessment of differences in the intervention needs in a structured setting (i.e. gym / fitness suite). Cross sectional analyses were completed to
identify the similarity between this sample and previous research in similar UK cohorts (Woods et al, 1999a), and those from other countries, settings and age groups (Gorley & Gordon, 1995; Marcus et al, 1992 a, b, c; Nigg & Courneya, 1998). In addition, the predictor variables from interconstruct relationships in fitness suite/gym use were identified. Finally, differences between cohort subgroups (gender, employment status, age group) were assessed and reported upon.

3.2.1 Statistics
A number of statistical tests were selected for analysis of the data set. The principle analysis used paired t-tests and Ordinal Logistic Regression to assess the data set between observations one and two. For the regression analysis change variables were calculated for each SOC, POC, DB variable and SE by subtracting observation 1 values from observation 2 values. These new change variables were analysed through logistic regression. Five regressions were completed and in each test the analysis was filtered using the select cases function in order that change variables were analysed for each separate SOC (i.e. select cases - SOCPA1 = 1) based upon SOC at observation 1.

Originally it had been anticipated that MANOVA statistics would be utilised. However, the normality of the data was not shown thus non-parametric statistics were selected. Non-parametric Kruskal Wallis ANOVA’s were employed to assess the cross-sectional effect of SOC on POC, DB and SE variables. Any significant effects found were further investigated via a series of adjacent SOC Mann Whitney tests to determine where the effect lay. The possibility of multiplicity was an issue with the numerous methods used to test the data cross-sectionally in this section; however, the lack of normality precluded other methods of post hoc testing.

In a further cross-sectional analysis where all variables could be entered simultaneously assessment of adjacent SOC Binary Logistic regression were
undertaken to analyse the determinants of SOC from POC, DB, SE, sex, age group and status. This analysis was not solely reporting on what the differences between different Stages of Change were but on which variables increased the likelihood of being within a certain Stage of Change based upon the cross-sectional data.

Finally, cross-tabulations with chi square statistics were utilised to determine association between Stages of Change (SOC), sex and employment status. Following this, independent t-tests were used to assess the differences between use of Processes of Change (POC), Decisional Balance (DB) variables and Self Efficacy (SE) based upon both sex and employment status. These tests were selected to analyse any differences in the data as a result of these subgroups which may have implications for intervention design.

There are two sections within the results. Part One relates to data either resulting from analysis using the Physical Activity (PA) definition for SOC classification or solely looking at sex and status differences. Part Two includes the results obtained when utilising the Fitness Suite (FS) definition for SOC classification.

3.3 Results
Of the original eligible cohort of 308 participants a 56% response rate (n=172) was obtained for the second data collection. This was made up of 114 females (66.3%) and 58 males (33.7%); 103 students (59.9%) and 69 employed (41.1%).

Below is a flow chart indicating the participant numbers in the study undertaken, along with exclusions and follow-up attrition.
Assessed for Eligibility (n = 325)

Excluded (n = 17)
Reason (Section 3.1):
(i) n = 2
(ii) n = 4
(iii) n = 3
(iv) n = 7
(v) not resident in locality n = 1

Lost to Follow-up (n = 136)

Included in analysis (n = 172)
3.3.1 Part One

3.3.1.1 Cross-tabulations

Stage of Change (PA)

Subjects were classified into one of five stages at both observation points.

Table 1: Stage of Change (Physical Activity) classification at both observation points.

<table>
<thead>
<tr>
<th>Stage of Change</th>
<th>Observation 1</th>
<th>Observation 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=</td>
<td>%</td>
</tr>
<tr>
<td>Precontemplation (PC)</td>
<td>12</td>
<td>7</td>
</tr>
<tr>
<td>Contemplation (C)</td>
<td>45</td>
<td>26.1</td>
</tr>
<tr>
<td>Preparation (PR)</td>
<td>43</td>
<td>25</td>
</tr>
<tr>
<td>Action (AX)</td>
<td>11</td>
<td>6.4</td>
</tr>
<tr>
<td>Maintenance (MN)</td>
<td>61</td>
<td>35.5</td>
</tr>
</tbody>
</table>

Table 2: Sex by Stage of Change (Physical Activity) cross-tabulation observation 1 (Ob1)

<table>
<thead>
<tr>
<th></th>
<th>PC</th>
<th>C</th>
<th>PR</th>
<th>AX</th>
<th>MN</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>7</td>
<td>32</td>
<td>32</td>
<td>6</td>
<td>37</td>
<td>114</td>
</tr>
<tr>
<td>Male</td>
<td>5</td>
<td>13</td>
<td>11</td>
<td>5</td>
<td>24</td>
<td>58</td>
</tr>
</tbody>
</table>

Table 3: Sex by Stage of Change (Physical Activity) cross-tabulation observation 2 (Ob2)

<table>
<thead>
<tr>
<th></th>
<th>PC</th>
<th>C</th>
<th>PR</th>
<th>AX</th>
<th>MN</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>6</td>
<td>37</td>
<td>28</td>
<td>9</td>
<td>34</td>
<td>114</td>
</tr>
<tr>
<td>Male</td>
<td>7</td>
<td>11</td>
<td>9</td>
<td>6</td>
<td>25</td>
<td>58</td>
</tr>
</tbody>
</table>
There are no significant associations between sex and SOC at either observation 1 or 2 however data show that at both observations a greater percentage of men (Ob1- n=29, 50%; Ob2- n=31, 53.5%) maintained levels of physical activity that would benefit health and/or fitness when compared with women (Ob1 and Ob2 - n= 43, 37.7%). Furthermore, the percentage of women (Ob1 – n=39, 34.2%; Ob2 – n=43, 37.7%) who took no physical activity at all had increased by 3.5%; whilst in men the percentage of those taking no activity had been maintained (Ob1 and Ob2 – n=18, 31%).

Table 4: Status by Stage of Change (PA) cross-tabulation observation 1

<table>
<thead>
<tr>
<th></th>
<th>PC</th>
<th>C</th>
<th>PR</th>
<th>AX</th>
<th>MN</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student</td>
<td>6</td>
<td>37</td>
<td>26</td>
<td>4</td>
<td>30</td>
<td>103</td>
</tr>
<tr>
<td>Employed</td>
<td>6</td>
<td>8</td>
<td>17</td>
<td>7</td>
<td>31</td>
<td>69</td>
</tr>
</tbody>
</table>

At observation 1 there is a statistical association between SOC and employment status ($\chi^2 = 15.283$ df(4); $p<.05$). A much higher percentage of employed participants ($n=38$, 55%) were gaining sufficient physical activity for health and/or fitness benefits compared with student participants ($n=34$, 33%); whilst a higher percentage of students ($n=43$, 41.8%) were classified as sedentary compared with employed participants ($n=14$, 20.4%).
Table 5: Status by Stage of Change (PA) cross-tabulation observation 2

<table>
<thead>
<tr>
<th></th>
<th>PC</th>
<th>C</th>
<th>PR</th>
<th>AX</th>
<th>MN</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student</td>
<td>5</td>
<td>32</td>
<td>24</td>
<td>13</td>
<td>29</td>
<td>103</td>
</tr>
<tr>
<td>Employed</td>
<td>8</td>
<td>16</td>
<td>13</td>
<td>2</td>
<td>30</td>
<td>69</td>
</tr>
</tbody>
</table>

At observation 2 again there is a statistical association between SOC and employment status ($\chi^2 = 11.092$ df(4); $p<.05$), however, the differences evident at observation 1 can no longer be seen with both the student and the employed population exhibiting similar levels of activity to gain benefits (Students $n=42$, 40.8% and Employed $n=32$, 46.4%) and sedentary (Students $n=37$, 36% and Employed $n=24$, 34.8%) behaviour.

3.3.1.2 Independent t-tests

Table 6: Sex by POC independent t-test observation 1

<table>
<thead>
<tr>
<th></th>
<th>CR*</th>
<th>DR*</th>
<th>ER*</th>
<th>SR*</th>
<th>SO*</th>
<th>CC</th>
<th>HR*</th>
<th>RM*</th>
<th>SL</th>
<th>SC</th>
<th>PRO*</th>
<th>CON*</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>2.7</td>
<td>2.6</td>
<td>2.4</td>
<td>3.4</td>
<td>2.7</td>
<td>3.1</td>
<td>2.2</td>
<td>2.8</td>
<td>3.3</td>
<td>1.9</td>
<td>3.8</td>
<td>2.7</td>
<td>2.8</td>
</tr>
<tr>
<td>Male</td>
<td>2.1</td>
<td>2.3</td>
<td>2.1</td>
<td>2.9</td>
<td>2.3</td>
<td>3.1</td>
<td>1.8</td>
<td>2.4</td>
<td>3.2</td>
<td>1.7</td>
<td>3.3</td>
<td>2.3</td>
<td>3.0</td>
</tr>
</tbody>
</table>

A number of sex differences ($p<.05^*$) are evident at baseline with women using CR ($t_{(170)}=4.0$); DR ($t_{(170)}=2.1$); ER ($t_{(170)}=2.3$); SR ($t_{(170)}=3.5$); SO ($t_{(137.7)}=3.1$); HR ($t_{(145.9)}=3.4$) and RM ($t_{(170)}=3.0$) significantly more than men. In addition, whilst they perceive physical activity as significantly more beneficial than men, they also identify significantly more with the costs of changing their physical activity levels.
Table 7: Sex by POC independent t-test observation 2

<table>
<thead>
<tr>
<th></th>
<th>CR</th>
<th>DR</th>
<th>ER*</th>
<th>SR*</th>
<th>SO*</th>
<th>CC</th>
<th>HR*</th>
<th>RM*</th>
<th>SL</th>
<th>SC</th>
<th>PRO*</th>
<th>CON</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>2.6</td>
<td>2.5</td>
<td>2.6</td>
<td>3.6</td>
<td>2.6</td>
<td>3.3</td>
<td>2.2</td>
<td>2.9</td>
<td>3.3</td>
<td>1.9</td>
<td>3.8</td>
<td>2.4</td>
<td>2.7</td>
</tr>
<tr>
<td>Male</td>
<td>2.8</td>
<td>2.4</td>
<td>2.3</td>
<td>3.1</td>
<td>2.3</td>
<td>3.0</td>
<td>1.8</td>
<td>2.4</td>
<td>3.1</td>
<td>1.9</td>
<td>3.3</td>
<td>2.3</td>
<td>3.1</td>
</tr>
</tbody>
</table>

Again at observation 2 there are a number of significant sex by POC differences. As in Ob1 women use ER (t(98.7)=2.4); SR (t(170)=3.2); SO (t(170)=2.5); HR (t(170)=3.0) and RM (t(170)=3.6) significantly more than men. In addition, they again perceive physical activity as having more benefits than men (t(170)=3.0), however they are no longer significantly different in their views on the cost of physical activity. Furthermore, at observation 2 men have a significantly higher SE (t(170)=-2.7) for physical activity.

Table 8: Status by POC independent t-test observation 1

<table>
<thead>
<tr>
<th></th>
<th>CR</th>
<th>DR</th>
<th>ER</th>
<th>SR</th>
<th>SO</th>
<th>CC*</th>
<th>HR</th>
<th>RM</th>
<th>SL</th>
<th>SC</th>
<th>PRO*</th>
<th>CON*</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student</td>
<td>2.4</td>
<td>2.4</td>
<td>2.3</td>
<td>3.2</td>
<td>2.5</td>
<td>2.9</td>
<td>2.0</td>
<td>2.7</td>
<td>3.2</td>
<td>1.9</td>
<td>3.5</td>
<td>2.4</td>
<td>2.8</td>
</tr>
<tr>
<td>Employed</td>
<td>2.6</td>
<td>2.6</td>
<td>2.4</td>
<td>3.4</td>
<td>2.5</td>
<td>3.3</td>
<td>2.2</td>
<td>2.8</td>
<td>3.4</td>
<td>1.9</td>
<td>3.8</td>
<td>2.7</td>
<td>3.0</td>
</tr>
</tbody>
</table>

There are three significant differences between students and the employed. The employed use CC (t(170)=-2.3) significantly more than students and perceive physical activity as being more beneficial than students (t(170)=2.2). However, they also view exercise as having more costs than do students (t(170)=2.6).

Table 9: Status by POC independent t-test observation 2

<table>
<thead>
<tr>
<th></th>
<th>CR</th>
<th>DR</th>
<th>ER</th>
<th>SR</th>
<th>SO</th>
<th>CC*</th>
<th>HR</th>
<th>RM</th>
<th>SL</th>
<th>SC</th>
<th>PRO</th>
<th>CON</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student</td>
<td>2.4</td>
<td>2.4</td>
<td>2.5</td>
<td>3.4</td>
<td>2.4</td>
<td>2.9</td>
<td>2.0</td>
<td>2.7</td>
<td>3.1</td>
<td>1.9</td>
<td>3.5</td>
<td>2.5</td>
<td>2.7</td>
</tr>
<tr>
<td>Employed</td>
<td>3.0</td>
<td>2.6</td>
<td>2.5</td>
<td>3.4</td>
<td>2.6</td>
<td>3.6</td>
<td>2.2</td>
<td>2.8</td>
<td>3.4</td>
<td>2.0</td>
<td>3.7</td>
<td>2.3</td>
<td>3.0</td>
</tr>
</tbody>
</table>

At observation 2 there is only one significant difference with the employed using higher levels of CC (t(170)=-2.3) than students.
3.3.1.3 Analysis of Variance

Kruskal Wallis (Non parametric ANOVA) with Mann Whitney follow up comparisons.

Table 10: Stage of Change (PA) by Processes of Change, Benefits (PROS) Costs (CONS) and Self Efficacy at observation 1.

<table>
<thead>
<tr>
<th></th>
<th>PC</th>
<th>C</th>
<th>PR</th>
<th>AX</th>
<th>MN</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR*</td>
<td>1.8</td>
<td>2.2</td>
<td>2.7</td>
<td>2.6</td>
<td>2.6</td>
</tr>
<tr>
<td>DR</td>
<td>2.0</td>
<td>2.5</td>
<td>2.6</td>
<td>2.6</td>
<td>2.5</td>
</tr>
<tr>
<td>ER</td>
<td>1.7</td>
<td>2.3</td>
<td>2.5</td>
<td>2.6</td>
<td>2.3</td>
</tr>
<tr>
<td>SR*</td>
<td>2.2</td>
<td>3.2</td>
<td>3.5</td>
<td>3.4</td>
<td>3.3</td>
</tr>
<tr>
<td>SO</td>
<td>2.0</td>
<td>2.5</td>
<td>2.6</td>
<td>2.7</td>
<td>2.6</td>
</tr>
<tr>
<td>CC*</td>
<td>1.8</td>
<td>2.4</td>
<td>3.1</td>
<td>3.5</td>
<td>3.8</td>
</tr>
<tr>
<td>HR</td>
<td>1.8</td>
<td>1.8</td>
<td>2.1</td>
<td>2.6</td>
<td>2.3</td>
</tr>
<tr>
<td>RM</td>
<td>1.9</td>
<td>2.4</td>
<td>2.6</td>
<td>3.0</td>
<td>3.1</td>
</tr>
<tr>
<td>SL*</td>
<td>2.2</td>
<td>2.9</td>
<td>3.3</td>
<td>3.8</td>
<td>3.7</td>
</tr>
<tr>
<td>SC*</td>
<td>1.6</td>
<td>1.9</td>
<td>2.3</td>
<td>2.1</td>
<td>2.2</td>
</tr>
<tr>
<td>PROS*</td>
<td>2.7</td>
<td>3.6</td>
<td>3.8</td>
<td>4.0</td>
<td>3.6</td>
</tr>
<tr>
<td>CONS</td>
<td>2.5</td>
<td>2.7</td>
<td>2.7</td>
<td>2.5</td>
<td>2.3</td>
</tr>
<tr>
<td>SE*</td>
<td>1.7</td>
<td>2.6</td>
<td>2.8</td>
<td>3.0</td>
<td>3.2</td>
</tr>
</tbody>
</table>

The ten POC, two DB variables and SE were analysed through Kruskal Wallis non-parametric analysis of variance. Follow up comparisons for each variable were conducted (Mann Whitney p<.05*) on adjacent SOC to assess whether the significant differences lay between adjacent SOC. Mann Whitney tests letters denote significant differences between adjacent SOC. a= PC and C; b= C and PR; c= PR and AX; d= AX and MN. Differences between non-adjacent SOC were not highlighted.

Consciousness Raising exhibits a significant difference between contemplation and preparation with preparation showing a significantly greater use of this POC.
For Self Re-evaluation the difference lay between precontemplation and contemplation again with those in the higher SOC using significantly more of this POC. In relation to Counter Conditioning, two significant adjacent SOC differences were highlighted; those in contemplation use significantly more Counter Conditioning than those in precontemplation, whereas those in preparation use Counter Conditioning significantly more than those in contemplation. In relation to Helping Relationships and Reinforcement Management, whilst exhibiting significant between SOC differences, these differences did not lie between two adjacent stages. In relation to Self Liberation again a similar pattern to Counter Conditioning emerges where contemplation has significantly greater use than precontemplation yet those in preparation use Self Liberation significantly more than those in contemplation. With Stimulus Control, again a higher SOC uses the POC significantly more than a lower SOC (preparation versus contemplation). Finally, PROS of exercise and Self Efficacy for exercise both show significant differences between precontemplation and contemplation and in both cases contemplation exhibits higher scores than precontemplation.

In all cases there are no significant differences between adjacent SOC once exercise has occurred and is being maintained (preparation versus action or, action versus maintenance).
Kruskal Wallis (Non parametric ANOVA) with Mann Whitney follow up comparisons

Table 11: Stage of Change (PA) by Processes of Change, Benefits (PROS) Costs (CONS) and Self Efficacy at observation 2.

<table>
<thead>
<tr>
<th>CR</th>
<th>PC</th>
<th>C</th>
<th>PR</th>
<th>AX</th>
<th>MN</th>
</tr>
</thead>
<tbody>
<tr>
<td>DR</td>
<td>2.3</td>
<td>2.6</td>
<td>2.4</td>
<td>2.4</td>
<td>2.5</td>
</tr>
<tr>
<td>ER</td>
<td>2.1</td>
<td>2.6</td>
<td>2.5</td>
<td>2.6</td>
<td>2.5</td>
</tr>
<tr>
<td>SR</td>
<td>2.6</td>
<td>3.5</td>
<td>3.5</td>
<td>3.7</td>
<td>3.3</td>
</tr>
<tr>
<td>SO</td>
<td>2.5</td>
<td>2.5</td>
<td>2.3</td>
<td>2.7</td>
<td>2.6</td>
</tr>
<tr>
<td>CC*</td>
<td>2.0</td>
<td>2.9</td>
<td>3.0</td>
<td>3.5</td>
<td>3.7</td>
</tr>
<tr>
<td>HR</td>
<td>1.8</td>
<td>1.9</td>
<td>2.0</td>
<td>2.2</td>
<td>2.3</td>
</tr>
<tr>
<td>RM</td>
<td>2.3</td>
<td>2.6</td>
<td>2.7</td>
<td>2.9</td>
<td>3.0</td>
</tr>
<tr>
<td>SL*</td>
<td>2.6</td>
<td>2.9</td>
<td>3.4</td>
<td>3.4</td>
<td>3.5</td>
</tr>
<tr>
<td>SC</td>
<td>1.7</td>
<td>1.8</td>
<td>1.9</td>
<td>1.9</td>
<td>2.1</td>
</tr>
<tr>
<td>PROS</td>
<td>3.1</td>
<td>3.5</td>
<td>3.8</td>
<td>3.8</td>
<td>3.7</td>
</tr>
<tr>
<td>CONS</td>
<td>2.4</td>
<td>2.6</td>
<td>2.4</td>
<td>2.3</td>
<td>2.2</td>
</tr>
<tr>
<td>SE*</td>
<td>2.5</td>
<td>2.4</td>
<td>2.7</td>
<td>2.9</td>
<td>3.6</td>
</tr>
</tbody>
</table>

Mann Whitney

An identical analysis to that described above was performed on the observation 2 cross-sectional data. Mann Whitney tests letters denote significant differences between adjacent SOC. a= PC and C; b= C and PR; c= PR and AX; d= AX and MN. Differences between non-adjacent SOC were not highlighted.

When compared with the Ob1 results Counter Conditioning, Self Liberation, and Self Efficacy again exhibit significant differences between SOC; however the nature of these relationships has changed. Preparation again shows significantly higher use of Counter Conditioning and Self Liberation compared with contemplation, but, there is no longer a significantly greater use of these POC in contemplation compared with precontemplation. Further to this Self Efficacy now
exhibits adjacent SOC differences between contemplation and preparation plus action and maintenance with the latter SOC being significantly greater in both cases.

3.3.1.4 Logistic Regression

The dependant variable was Stage of Change (Physical Activity) with both categorical factors (Age Group, Status, Sex and Reason) and continuous co-variates (Consciousness Raising, Dramatic Relief, Environmental Re-evaluation, Self Re-evaluation, Social Liberation, Counter Conditioning, Helping Relationships, Reinforcement Management Self Liberation, Stimulus Control, PROS, CONS and Self Efficacy) being regressed onto the Stages of Change. Backward elimination was the method of model simplification.

Binary Logistic Regression

Binary Logistic Regressions have been undertaken to assess POC utilisation, along with DB variable and SE scores between adjacent Stages of Change in an attempt to provide insight into which of these variables may facilitate SOC movement. This assessment was carried out in a cross-sectional analysis in an attempt to enable comparison of results to difference test results. Logistic regression also allowed inclusion of categorical variables as previous significant differences in relation to POC use indicate that they may have a part to play in SOC classification.

Precontemplation vs. Contemplation

Table 12: Determinants of Stage of Change categorisation at observation 1

<table>
<thead>
<tr>
<th>OB 1</th>
<th>Variable</th>
<th>B</th>
<th>Odds Ratio</th>
<th>Lower</th>
<th>Higher</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5% CI</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>95% CI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Constant</td>
<td>-6.427</td>
<td>.002</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>STATUS (1)</td>
<td>1.152</td>
<td>3.164</td>
<td>1.012</td>
<td>4.416</td>
</tr>
<tr>
<td></td>
<td>SE</td>
<td>.275</td>
<td>1.316</td>
<td>1.065</td>
<td>1.626</td>
</tr>
<tr>
<td></td>
<td>SR</td>
<td>.306</td>
<td>1.358</td>
<td>1.002</td>
<td>1.912</td>
</tr>
<tr>
<td></td>
<td>ER</td>
<td>.489</td>
<td>1.631</td>
<td>1.148</td>
<td>2.318</td>
</tr>
<tr>
<td></td>
<td>Constant</td>
<td>-6.427</td>
<td>.002</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The overall fit of the classification\(^3\) of the model predicts Stage of Change membership 91.1 % correctly.

At observation 1 the data indicate that Environmental Re-evaluation, Self Re-evaluation, Self Efficacy and being employed have a positive effect on SOC categorisation.

Table 13: Determinants of Stage of Change categorisation at observation 2.

<table>
<thead>
<tr>
<th>OB 2</th>
<th>Variable</th>
<th>B</th>
<th>Odds Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SEX (1)</td>
<td>-.823</td>
<td>.439</td>
<td>.043 .832</td>
</tr>
<tr>
<td></td>
<td>SR</td>
<td>.402</td>
<td>1.494</td>
<td>1.092 1.923</td>
</tr>
<tr>
<td></td>
<td>RM</td>
<td>-.225</td>
<td>.799</td>
<td>.625 .921</td>
</tr>
<tr>
<td></td>
<td>Status (1)</td>
<td>.639</td>
<td>1.894</td>
<td>1.010 2.623</td>
</tr>
<tr>
<td></td>
<td>Constant</td>
<td>-2.166</td>
<td>1.004</td>
<td></td>
</tr>
</tbody>
</table>

The overall fit of the classification of the model predicts Stage of Change membership 80.3 % correctly.

Observation 2 analysis indicates that if Reinforcement Management is increased there is a negative effect on SOC categorisation alongside the increased likelihood of belonging to precontemplation if you are female. However, being Self Re-evaluation and being a student improve the likelihood of being in contemplation as opposed to precontemplation.

**Contemplation vs. Preparation**

Table 14: Determinants of Stage of Change categorisation at observation 1.

<table>
<thead>
<tr>
<th>OB 1</th>
<th>Variable</th>
<th>B</th>
<th>Odds Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CC</td>
<td>.320</td>
<td>1.377</td>
<td>1.154 1.642</td>
</tr>
<tr>
<td></td>
<td>Status (1)</td>
<td>-1.315</td>
<td>.269</td>
<td>.083 .867</td>
</tr>
<tr>
<td></td>
<td>SE</td>
<td>-0.81</td>
<td>.922</td>
<td>.838 .979</td>
</tr>
<tr>
<td></td>
<td>Constant</td>
<td>-1.661</td>
<td>.190</td>
<td></td>
</tr>
</tbody>
</table>

The classification table for this model indicates that the variables above will enable correct prediction of Stage of Change membership 73.3 % of the time.

\(^3\) The classification information relates to the overall percentage of correct predictions from the final model when using all variables in the table.
Whilst an increase in Counter Conditioning activity will increase the likelihood of being in preparation, being a student and increasing Self Efficacy has a negative effect on the likelihood of being in preparation.

Table 15: Determinants of Stage of Change categorisation at observation 2.

<table>
<thead>
<tr>
<th>OB 2</th>
<th>Variable</th>
<th>B</th>
<th>Odds Ratio</th>
<th>Lower</th>
<th>Higher</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DR</td>
<td>-.198</td>
<td>.820</td>
<td>.690</td>
<td>.975</td>
</tr>
<tr>
<td></td>
<td>SL</td>
<td>.289</td>
<td>1.335</td>
<td>1.109</td>
<td>1.607</td>
</tr>
<tr>
<td></td>
<td>Constant</td>
<td>-1.942</td>
<td>.143</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The overall fit of the classification of the model predicts Stage of Change membership 63.9% correctly.

Increasing Dramatic Relief has a negative effect on the likelihood of being in preparation versus contemplation however, increasing Self Liberation increases the likelihood of being in preparation compared with contemplation at observation 2.

Preparation vs. Action

Table 16: Determinants of Stage of Change categorisation at observation 1.

<table>
<thead>
<tr>
<th>OB 1</th>
<th>Variable</th>
<th>B</th>
<th>Odds Ratio</th>
<th>Lower</th>
<th>Higher</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DR</td>
<td>-.292</td>
<td>.746</td>
<td>.537</td>
<td>1.037</td>
</tr>
<tr>
<td></td>
<td>SR</td>
<td>-.428</td>
<td>.652</td>
<td>.412</td>
<td>1.032</td>
</tr>
<tr>
<td></td>
<td>SO</td>
<td>.331</td>
<td>1.392</td>
<td>1.048</td>
<td>2.044</td>
</tr>
<tr>
<td></td>
<td>CC</td>
<td>.388</td>
<td>1.474</td>
<td>1.027</td>
<td>2.114</td>
</tr>
<tr>
<td></td>
<td>PRO</td>
<td>.806</td>
<td>1.239</td>
<td>1.126</td>
<td>2.450</td>
</tr>
<tr>
<td></td>
<td>CON</td>
<td>-.097</td>
<td>.908</td>
<td>.015</td>
<td>.989</td>
</tr>
<tr>
<td></td>
<td>SEX (1)</td>
<td>-2.131</td>
<td>.119</td>
<td>.001</td>
<td>.230</td>
</tr>
<tr>
<td></td>
<td>Status (1)</td>
<td>-2.385</td>
<td>.092</td>
<td>.011</td>
<td>.799</td>
</tr>
<tr>
<td></td>
<td>Constant</td>
<td>-9.043</td>
<td>.001</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The classification table for this model indicates that the variable below will enable correct prediction of Stage of Change membership 88.7% of the time.
During observation 1 a large number of variables affected the likelihood of categorisation in either preparation or action. *Self Re-evaluation, Dramatic Relief (omitted due to CI crossing zero)* Thus, being female and a student will reduce the likelihood of being in action. Increasing Social Liberation, Counter Conditioning and viewing exercise as having numerous benefits will have a positive effect on the likelihood of being in action compared with preparation at observation 1. Whilst being a student and female along with increasing CONS will increase likelihood of being in the lower SOC.

Table 17: Determinants of Stage of Change categorisation at observation 2.

<table>
<thead>
<tr>
<th>OB 2</th>
<th>Variable</th>
<th>B</th>
<th>Odds Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Lower</td>
<td>Higher</td>
</tr>
<tr>
<td>CR</td>
<td>-.293</td>
<td>.746</td>
<td>.550</td>
<td>.813</td>
</tr>
<tr>
<td>SO</td>
<td>.287</td>
<td>1.333</td>
<td>1.014</td>
<td>1.752</td>
</tr>
<tr>
<td>Constant</td>
<td>-.963</td>
<td>.382</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The overall fit of the classification of the model predicts Stage of Change membership 74% correctly.

At the point of the second observation only two variables had a significant effect on determination of categorisation in either preparation or action. Consciousness Raising had a negative effect thus; increasing this POC will result in an increased likelihood of being in the preparation SOC. Social Liberation, however, had a positive effect with an increase in use of this POC promoting the likelihood of being in the action SOC.

Action vs. Maintenance

Table 18: Determinants of Stage of Change categorisation at observation 1.

<table>
<thead>
<tr>
<th>OB 1</th>
<th>Variable</th>
<th>B</th>
<th>Odds Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Lower</td>
<td>Higher</td>
</tr>
<tr>
<td>CC</td>
<td>.175</td>
<td>1.191</td>
<td>1.043</td>
<td>1.503</td>
</tr>
<tr>
<td>PRO</td>
<td>-.050</td>
<td>.951</td>
<td>.882</td>
<td>.976</td>
</tr>
<tr>
<td>Constant</td>
<td>.913</td>
<td>2.491</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3.3.1.5 Longitudinal analysis:
The cross-sectional analyses carried out in the previous sections, whilst providing an insight into the relationships between the core constructs of the transtheoretical model, do not enable inferences to be made with regard to direction of causality when increasing or decreasing POC, DB or SE variables. The following analyses will attempt to identify relationships which have occurred over time and thus, potentially, indicate causal relationships between POC, DB variable and SE changes and alterations in SOC.

Paired t-tests and Ordinal Logistic Regression were utilised to assess the data sets between observations one and two. The t-tests analysed the differences between POC, DB variables and SE at cross-sectional observations one and two. The logistic regression analysis examined the re-calculated change variables. Five tests were completed and in each regression, the analysis was filtered using the select cases function. P criterion was set at $P<.10$ to reduce the likelihood of excluding important variables (Bendel & Affifi, 1977).

3.3.1.5.1 Paired t-tests

Table 20: Processes of Change t-test over time.

<table>
<thead>
<tr>
<th></th>
<th>CR</th>
<th>DR</th>
<th>ER*</th>
<th>SR*</th>
<th>SO</th>
<th>CC</th>
<th>HR</th>
<th>RM</th>
<th>SL</th>
<th>SC</th>
<th>PRO</th>
<th>CON*</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ob1</td>
<td>2.5</td>
<td>2.5</td>
<td>2.3</td>
<td>3.3</td>
<td>2.5</td>
<td>3.1</td>
<td>2.1</td>
<td>2.7</td>
<td>3.3</td>
<td>1.9</td>
<td>3.6</td>
<td>2.5</td>
<td>2.9</td>
</tr>
<tr>
<td>Ob2</td>
<td>2.7</td>
<td>2.5</td>
<td>2.5</td>
<td>3.4</td>
<td>2.5</td>
<td>3.2</td>
<td>2.1</td>
<td>2.8</td>
<td>3.2</td>
<td>1.9</td>
<td>3.6</td>
<td>2.4</td>
<td>2.9</td>
</tr>
</tbody>
</table>

There were three variables which differed significantly between the two observation points these were ER ($t_{170} = -2.4$) and SR ($t_{170} = -2.1$) with an increase in both variables occurring between observation 1 and two. In addition, the perceived costs of exercise lowered significantly between observation 1 and two.
3.3.1.5 Longitudinal analysis:
The cross-sectional analyses carried out in the previous sections, whilst providing an insight into the relationships between the core constructs of the transtheoretical model, do not enable inferences to be made with regard to direction of causality when increasing or decreasing POC, DB or SE variables. The following analyses will attempt to identify relationships which have occurred over time and thus, potentially, indicate causal relationships between POC, DB variable and SE changes and alterations in SOC.

Paired t-tests and Ordinal Logistic Regression were utilised to assess the data sets between observations one and two. The t-tests analysed the differences between POC, DB variables and SE at cross-sectional observations one and two. The logistic regression analysis examined the re-calculated change variables. Five tests were completed and in each regression, the analysis was filtered using the select cases function. P criterion was set at P<.10 to reduce the likelihood of excluding important variables (Bendel & Afifi, 1977).

3.3.1.5.1 Paired t-tests
Table 20: Processes of Change t-test over time.

<table>
<thead>
<tr>
<th>CR</th>
<th>DR</th>
<th>ER*</th>
<th>SR*</th>
<th>SO</th>
<th>CC</th>
<th>HR</th>
<th>RM</th>
<th>SL</th>
<th>SC</th>
<th>PRO</th>
<th>CON*</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ob1</td>
<td>2.5</td>
<td>2.5</td>
<td>2.3</td>
<td>3.3</td>
<td>2.5</td>
<td>3.1</td>
<td>2.1</td>
<td>2.7</td>
<td>3.3</td>
<td>1.9</td>
<td>3.6</td>
<td>2.5</td>
</tr>
<tr>
<td>Ob2</td>
<td>2.7</td>
<td>2.5</td>
<td>2.5</td>
<td>3.4</td>
<td>2.5</td>
<td>3.2</td>
<td>2.1</td>
<td>2.8</td>
<td>3.2</td>
<td>1.9</td>
<td>3.6</td>
<td>2.4</td>
</tr>
</tbody>
</table>

There were three variables which differed significantly between the two observation points these were ER (t_{(170)} =-2.4) and SR (t_{(170)}=-2.1) with an increase in both variables occurring between observation 1 and two. In addition, the perceived costs of exercise lowered significantly between observation 1 and two.
<table>
<thead>
<tr>
<th>SOC Observation 2</th>
<th>SOC - Observation 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PC</td>
</tr>
<tr>
<td>Precontemplation</td>
<td>5</td>
</tr>
<tr>
<td>Contemplation</td>
<td>4</td>
</tr>
<tr>
<td>Preparation</td>
<td>2</td>
</tr>
<tr>
<td>Action</td>
<td>0</td>
</tr>
<tr>
<td>Maintenance</td>
<td>1</td>
</tr>
</tbody>
</table>

41.7% in PC at observation 1 are still in PC at observation 2 and 46.7% of those in contemplation at observation 1 are still in contemplation at observation 2. In relation to preparation, 39.5% of those in this SOC at observation 1 have increased their physical activity bouts to a high enough level to gain health and/or fitness benefits. However, 34.8% whilst gaining some physical activity still do not reach levels recommended for health and/or fitness benefits. Further still, 25.6% of those in preparation at baseline have now regressed to a sedentary SOC, although all of those who have regressed do intend to increase their physical activity levels.

With reference to those in the higher SOC at baseline, of those in action, 36.4% have maintained their activity level and are now in the maintenance stage of change. However, this leaves 63.6% of those in action at baseline now in lower SOC although more than half of these individuals are still gaining some physical activity. When assessing those in maintenance at baseline, 57.4% were still maintaining activity levels enough to gain health and/or fitness benefits and a further 9.8% were in the action SOC and so may have regressed but are once again benefiting from a level of activity that will have positive health/fitness outcomes. However, 21.3% had regressed to SOC that are sedentary with 3.3% indicating that they had no intention to begin exercising within the next six months.
3.3.1.5.2 Ordinal Logistic Regression of Change Variables

Table 22: Ordinal Logistic Regression (Select Cases - SOCPA Observation 1=1)

N= 12

Model Fitting Information (a)

<table>
<thead>
<tr>
<th>Model</th>
<th>-2 LL</th>
<th>Chi Square</th>
<th>df</th>
<th>sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>40.543</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final</td>
<td>10.863</td>
<td>29.680</td>
<td>5</td>
<td>.000</td>
</tr>
</tbody>
</table>

Goodness of Fit (b)

<table>
<thead>
<tr>
<th></th>
<th>Chi Square</th>
<th>df</th>
<th>sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson</td>
<td>17.603</td>
<td>28</td>
<td>1.000</td>
</tr>
<tr>
<td>Deviance</td>
<td>10.863</td>
<td>28</td>
<td>1.000</td>
</tr>
</tbody>
</table>

Pseudo R-Square (c)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cox and Snell</td>
<td>.716</td>
</tr>
<tr>
<td>Nagelkerke</td>
<td>.865</td>
</tr>
<tr>
<td>McFadden</td>
<td>.663</td>
</tr>
</tbody>
</table>

Parameter Estimates (d)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Sig</th>
<th>Lower</th>
<th>Higher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Δ HR</td>
<td>1.652</td>
<td>.096</td>
<td>-.651</td>
<td>7.951</td>
</tr>
<tr>
<td>Δ SO</td>
<td>-1.504</td>
<td>.068</td>
<td>-7.269</td>
<td>.261</td>
</tr>
</tbody>
</table>

Movement out of precontemplation is associated negatively\(^4\) with Social Liberation and positively with Helping Relationships. Thus, as the use of HR increases and SO reduces there is an increased likelihood of moving out of precontemplation. Nagelkerke \(R^2\) indicates that this model predicts SOC movements correctly over 80% of the time.

\(^4\) Negative Stage of Change movement refers to either regression or stagnation.
Table 23: Ordinal Logistic Regression (Select Cases - SOCPA Observation 1=2)

N=45

Model Fitting Information (a)

<table>
<thead>
<tr>
<th>Model</th>
<th>-2 LL</th>
<th>Chi Square</th>
<th>df</th>
<th>sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>127.312</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final</td>
<td>91.889</td>
<td>15.423</td>
<td>3</td>
<td>.001</td>
</tr>
</tbody>
</table>

Goodness of Fit (b)

<table>
<thead>
<tr>
<th></th>
<th>Chi Square</th>
<th>df</th>
<th>sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson</td>
<td>151.606</td>
<td>173</td>
<td>.882</td>
</tr>
<tr>
<td>Deviance</td>
<td>91.889</td>
<td>173</td>
<td>1.000</td>
</tr>
</tbody>
</table>

Pseudo R-Square (c)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cox and Snell</td>
<td>.745</td>
</tr>
<tr>
<td>Nagelkerke</td>
<td>.669</td>
</tr>
<tr>
<td>McFadden</td>
<td>.605</td>
</tr>
</tbody>
</table>

Parameter Estimates (d)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Sig</th>
<th>Lower</th>
<th>Higher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Δ CC</td>
<td>.470</td>
<td>.089</td>
<td>.011</td>
<td>.751</td>
</tr>
<tr>
<td>Δ HR</td>
<td>.147</td>
<td>.021</td>
<td>.022</td>
<td>.272</td>
</tr>
<tr>
<td>Δ SC</td>
<td>.196</td>
<td>.004</td>
<td>.030</td>
<td>.362</td>
</tr>
<tr>
<td>Δ CON</td>
<td>.095</td>
<td>.068</td>
<td>.006</td>
<td>.113</td>
</tr>
<tr>
<td>Δ SR</td>
<td>-.871</td>
<td>.010</td>
<td>-.452</td>
<td>-.986</td>
</tr>
</tbody>
</table>

Three variables are related to movements in stage from a base of contemplation. Increasing Counter Conditioning, Helping Relationships, Stimulus Control all have a positive effect on SOC movement. Self re-evaluation was indicated as having a strong enough negative effect on SOC movement at this SOC to be significantly associated with SOC movements.
Table 24: Ordinal Logistic Regression (Select Cases - SOCPA Observation 1=3)

N= 43

Model Fitting Information (a)

<table>
<thead>
<tr>
<th>Model</th>
<th>-2 LL</th>
<th>Chi Square</th>
<th>df</th>
<th>sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>111.689</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final</td>
<td>89.285</td>
<td>22.404</td>
<td>4</td>
<td>.000</td>
</tr>
</tbody>
</table>

Goodness of Fit (b)

<table>
<thead>
<tr>
<th></th>
<th>Chi Square</th>
<th>df</th>
<th>sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson</td>
<td>109.184</td>
<td>122</td>
<td>.790</td>
</tr>
<tr>
<td>Deviance</td>
<td>89.285</td>
<td>122</td>
<td>.989</td>
</tr>
</tbody>
</table>

Pseudo R-Square (c)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cox and Snell</td>
<td>.579</td>
</tr>
<tr>
<td>Nagelkerke</td>
<td>.644</td>
</tr>
<tr>
<td>McFadden</td>
<td>.597</td>
</tr>
</tbody>
</table>

Parameter Estimates (d)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Sig</th>
<th>Lower</th>
<th>Higher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Δ SR</td>
<td>-.143</td>
<td>.047</td>
<td>-.283</td>
<td>-.002</td>
</tr>
<tr>
<td>Δ CC</td>
<td>.233</td>
<td>.000</td>
<td>.108</td>
<td>.358</td>
</tr>
<tr>
<td>Sex (1)</td>
<td>-1.031</td>
<td>.024</td>
<td>-1.926</td>
<td>-.136</td>
</tr>
</tbody>
</table>

Counter Conditioning has a positive effect on the likelihood of moving out of preparation. However, both Self re-evaluation and being female increase the likelihood of negative SOC movements. Nagelkerke R2 indicates we can be sure that the model predicts correctly greater than 60% of the time.
Table 25: Ordinal Logistic Regression (Select Cases - SOCPA Observation 1=4)

N=11

Model Fitting Information (a)

<table>
<thead>
<tr>
<th>Model</th>
<th>-2 LL</th>
<th>Chi Square</th>
<th>df</th>
<th>sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>41.123</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final</td>
<td>13.323</td>
<td>27.800</td>
<td>3</td>
<td>.002</td>
</tr>
</tbody>
</table>

Goodness of Fit (b)

<table>
<thead>
<tr>
<th></th>
<th>Chi Square</th>
<th>df</th>
<th>sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson</td>
<td>11.366</td>
<td>27</td>
<td>.996</td>
</tr>
<tr>
<td>Deviance</td>
<td>13.323</td>
<td>27</td>
<td>.987</td>
</tr>
</tbody>
</table>

Pseudo R-Square (c)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cox and Snell</td>
<td>.765</td>
</tr>
<tr>
<td>Nagelkerke</td>
<td>.851</td>
</tr>
<tr>
<td>McFadden</td>
<td>.821</td>
</tr>
</tbody>
</table>

Parameter Estimates (d)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Sig</th>
<th>Lower</th>
<th>Higher</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Delta$ RM</td>
<td>-.347</td>
<td>.031</td>
<td>-.662</td>
<td>-.032</td>
</tr>
<tr>
<td>$\Delta$ HR</td>
<td>.331</td>
<td>.026</td>
<td>.040</td>
<td>.623</td>
</tr>
<tr>
<td>$\Delta$ SL</td>
<td>.643</td>
<td>.037</td>
<td>.040</td>
<td>1.245</td>
</tr>
</tbody>
</table>

Both Helping Relationships and Self Liberation when increased have a positive effect on movement out of action. However, increasing Reinforcement Management has a negative effect on movement out of action. Nagelkerke R2 indicates that the model predicts correctly greater than 80% of the time.
Table 26: Ordinal Logistic Regression (Select Cases - SOCPA Observation 1=5)

N= 61

Model Fitting Information (a)

<table>
<thead>
<tr>
<th>Model</th>
<th>-2 LL</th>
<th>Chi Square</th>
<th>df</th>
<th>sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>158.383</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final</td>
<td>137.170</td>
<td>21.213</td>
<td>4</td>
<td>.024</td>
</tr>
</tbody>
</table>

Goodness of Fit (b)

<table>
<thead>
<tr>
<th></th>
<th>Chi Square</th>
<th>df</th>
<th>sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson</td>
<td>124.564</td>
<td>203</td>
<td>.741</td>
</tr>
<tr>
<td>Deviance</td>
<td>137.170</td>
<td>203</td>
<td>.845</td>
</tr>
</tbody>
</table>

Pseudo R-Square (c)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cox and Snell</td>
<td>.645</td>
</tr>
<tr>
<td>Nagelkerke</td>
<td>.742</td>
</tr>
<tr>
<td>McFadden</td>
<td>.629</td>
</tr>
</tbody>
</table>

Parameter Estimates (d)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Sig</th>
<th>Lower</th>
<th>Higher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Δ ER</td>
<td>.157</td>
<td>.021</td>
<td>.024</td>
<td>.291</td>
</tr>
<tr>
<td>Δ SO</td>
<td>-.200</td>
<td>.009</td>
<td>-.350</td>
<td>-.050</td>
</tr>
<tr>
<td>Δ CC</td>
<td>.203</td>
<td>.016</td>
<td>.038</td>
<td>.367</td>
</tr>
<tr>
<td>Δ SL</td>
<td>-.179</td>
<td>.031</td>
<td>-.341</td>
<td>-.017</td>
</tr>
</tbody>
</table>

Both Social and Self Liberation when utilised more often increase the likelihood of failing to maintain levels of physical activity required for health and/or fitness benefits. However, Environmental Re-evaluation and Counter Conditioning increase the likelihood of maintaining physical activity levels.
3.3.2 Part Two (Fitness Suite)

The definition used to define criterion behaviour for Fitness Suite / Gym use was "Physically active in a gym/fitness suite three or more times per week for greater than 20 minutes per session"

3.3.2.1 Cross-tabulations

Stage of Change Fitness Suite (FS)
Subjects were classified into one of five stages at both observation points.

Table 27: Stage of Change (FS) classification at both observation points.

<table>
<thead>
<tr>
<th>Stage of Change</th>
<th>Observation 1</th>
<th>Observation 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>N=</td>
<td>%</td>
<td>N=</td>
</tr>
<tr>
<td>Precontemplation</td>
<td>32</td>
<td>18.6</td>
</tr>
<tr>
<td>Contemplation</td>
<td>76</td>
<td>44.2</td>
</tr>
<tr>
<td>Preparation</td>
<td>30</td>
<td>17.4</td>
</tr>
<tr>
<td>Action</td>
<td>6</td>
<td>3.5</td>
</tr>
<tr>
<td>Maintenance</td>
<td>25</td>
<td>14.5</td>
</tr>
</tbody>
</table>

Table 28: Sex by Stage of Change (FS) cross-tabulation observation 1

<table>
<thead>
<tr>
<th></th>
<th>PC</th>
<th>C</th>
<th>PR</th>
<th>AX</th>
<th>MN</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>16</td>
<td>58</td>
<td>22</td>
<td>4</td>
<td>14</td>
<td>114</td>
</tr>
<tr>
<td>Male</td>
<td>16</td>
<td>21</td>
<td>8</td>
<td>2</td>
<td>11</td>
<td>58</td>
</tr>
</tbody>
</table>

Table 29: Sex by Stage of Change (FS) cross-tabulation observation 2

<table>
<thead>
<tr>
<th></th>
<th>PC</th>
<th>C</th>
<th>PR</th>
<th>AX</th>
<th>MN</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>20</td>
<td>48</td>
<td>26</td>
<td>11</td>
<td>9</td>
<td>114</td>
</tr>
<tr>
<td>Male</td>
<td>14</td>
<td>19</td>
<td>9</td>
<td>2</td>
<td>14</td>
<td>58</td>
</tr>
</tbody>
</table>
There are no significant associations between sex and SOC at observation 1. However, observation 2 data show a significant association between sex and fitness suite SOC. At observation 2, 59.6% of women and 56.9% of men do not use a fitness suite/gym facility at all; whilst 22.8% and 15.5% of women and men (respectively) use this type of facility sporadically. In relation to levels of activity which would constitute that eliciting health/fitness benefits from this mode of activity, only 17.1% of women versus 27.6% of men meet requirements.

Table 30: Status by Stage of Change (FS) cross-tabulation observation 1

<table>
<thead>
<tr>
<th></th>
<th>PC</th>
<th>C</th>
<th>PR</th>
<th>AX</th>
<th>MN</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student</td>
<td>21</td>
<td>54</td>
<td>13</td>
<td>4</td>
<td>11</td>
<td>103</td>
</tr>
<tr>
<td>Employed</td>
<td>11</td>
<td>25</td>
<td>17</td>
<td>2</td>
<td>14</td>
<td>69</td>
</tr>
</tbody>
</table>

Table 31: Status by Stage of Change (FS) cross-tabulation observation 2

<table>
<thead>
<tr>
<th></th>
<th>PC</th>
<th>C</th>
<th>PR</th>
<th>AX</th>
<th>MN</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student</td>
<td>23</td>
<td>42</td>
<td>17</td>
<td>7</td>
<td>14</td>
<td>103</td>
</tr>
<tr>
<td>Employed</td>
<td>11</td>
<td>25</td>
<td>18</td>
<td>6</td>
<td>9</td>
<td>69</td>
</tr>
</tbody>
</table>

There were no significant associations between employment status and fitness suite SOC however some trends are evident. At observation 1 72.8% of the students surveyed did not gain any physical activity in a fitness suite/gym environment; at observation 2 this had reduced to 63.1%. At observation 1 47.8% of the employed survey respondents were active in a gym/fitness suite facility; this level was maintained at observation 2.
3.3.2.2 Analysis of Variance
Kruskal Wallis (Non parametric ANOVA) with Mann Whitney follow up comparisons.

Table 32: Stage of Change (FS) by Processes of Change, Benefits (PROS) Costs (CONS) and Self Efficacy observation 1.

<table>
<thead>
<tr>
<th></th>
<th>PC</th>
<th>C</th>
<th>PR</th>
<th>AX</th>
<th>MN</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR*</td>
<td>2.2</td>
<td>2.3</td>
<td>2.8</td>
<td>2.7</td>
<td>2.8</td>
</tr>
<tr>
<td>DR</td>
<td>2.4</td>
<td>2.6</td>
<td>2.4</td>
<td>3.2</td>
<td>2.3</td>
</tr>
<tr>
<td>ER*</td>
<td>2.2</td>
<td>2.4</td>
<td>2.3</td>
<td>2.9</td>
<td>2.2</td>
</tr>
<tr>
<td>SR*</td>
<td>2.8</td>
<td>3.3</td>
<td>3.4</td>
<td>3.8</td>
<td>3.2</td>
</tr>
<tr>
<td>SO*</td>
<td>2.4</td>
<td>2.6</td>
<td>2.5</td>
<td>2.9</td>
<td>2.5</td>
</tr>
<tr>
<td>CC*</td>
<td>2.6</td>
<td>3.0</td>
<td>3.5</td>
<td>2.7</td>
<td>3.6</td>
</tr>
<tr>
<td>HR*</td>
<td>1.8</td>
<td>2.0</td>
<td>2.2</td>
<td>2.4</td>
<td>2.3</td>
</tr>
<tr>
<td>RM*</td>
<td>2.2</td>
<td>2.7</td>
<td>3.1</td>
<td>2.9</td>
<td>2.9</td>
</tr>
<tr>
<td>SL*</td>
<td>2.7</td>
<td>3.2</td>
<td>3.6</td>
<td>3.5</td>
<td>3.9</td>
</tr>
<tr>
<td>SC</td>
<td>1.7</td>
<td>1.8</td>
<td>2.0</td>
<td>2.2</td>
<td>1.9</td>
</tr>
<tr>
<td>PROS*</td>
<td>3.2</td>
<td>3.7</td>
<td>3.8</td>
<td>4.0</td>
<td>3.5</td>
</tr>
<tr>
<td>CONS*</td>
<td>2.3</td>
<td>2.7</td>
<td>2.5</td>
<td>3.0</td>
<td>2.3</td>
</tr>
<tr>
<td>SE*</td>
<td>2.6</td>
<td>2.7</td>
<td>3.0</td>
<td>2.7</td>
<td>3.7</td>
</tr>
</tbody>
</table>

Mann Whitney tests letters denote significant differences between adjacent SOC. 
\(a\) = PC and C; \(b\) = C and PR; \(c\) = PR and AX; \(d\) = AX and MN. Differences between non-adjacent SOC were not highlighted.

At observation 1, Consciousness Raising, Environmental Re-evaluation, Self Re-evaluation, Social Liberation and Reinforcement Management POC use is significantly higher in contemplation versus precontemplation. In addition, both the perceived costs and benefits of changing sedentary behaviour are significantly greater in contemplation versus precontemplation. In preparation,
Counter Conditioning, Helping Relationships and PROS are significantly higher than in contemplation. Furthermore, Self Efficacy for exercise is significantly higher in preparation than contemplation. In action, Environmental Re-evaluation is used significantly more than in maintenance. Finally, in the case of Self Liberation there is a significant stage by stage increase from precontemplation to contemplation to preparation with a dip during action and peak usage occurring in maintenance.

Table 33: Stage of Change (FS) by Processes of Change, Benefits (PROS) Costs (CONS) and Self Efficacy observation 2.

<table>
<thead>
<tr>
<th></th>
<th>PC</th>
<th>C</th>
<th>PR</th>
<th>AX</th>
<th>MN</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR *</td>
<td>2.1</td>
<td>2.5</td>
<td>2.5</td>
<td>2.8</td>
<td>4.1</td>
</tr>
<tr>
<td>DR</td>
<td>2.2</td>
<td>2.6</td>
<td>2.4</td>
<td>3.0</td>
<td>2.5</td>
</tr>
<tr>
<td>ER *</td>
<td>2.1</td>
<td>2.7</td>
<td>2.5</td>
<td>2.9</td>
<td>2.3</td>
</tr>
<tr>
<td>SR *</td>
<td>2.7</td>
<td>3.5</td>
<td>3.5</td>
<td>4.2</td>
<td>3.5</td>
</tr>
<tr>
<td>SO *</td>
<td>2.4</td>
<td>2.5</td>
<td>2.5</td>
<td>3.2</td>
<td>2.3</td>
</tr>
<tr>
<td>CC *</td>
<td>2.4</td>
<td>3.1</td>
<td>3.5</td>
<td>4.1</td>
<td>3.8</td>
</tr>
<tr>
<td>HR *</td>
<td>1.8</td>
<td>2.1</td>
<td>2.1</td>
<td>2.8</td>
<td>2.0</td>
</tr>
<tr>
<td>RM *</td>
<td>2.2</td>
<td>2.7</td>
<td>2.9</td>
<td>3.4</td>
<td>3.0</td>
</tr>
<tr>
<td>SL *</td>
<td>2.6</td>
<td>3.0</td>
<td>3.4</td>
<td>4.1</td>
<td>4.0</td>
</tr>
<tr>
<td>SC</td>
<td>1.7</td>
<td>1.9</td>
<td>1.9</td>
<td>2.1</td>
<td>2.1</td>
</tr>
<tr>
<td>PROS *</td>
<td>2.9</td>
<td>3.7</td>
<td>3.8</td>
<td>4.4</td>
<td>3.8</td>
</tr>
<tr>
<td>CONS *</td>
<td>2.3</td>
<td>2.6</td>
<td>2.4</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>SE</td>
<td>2.6</td>
<td>2.6</td>
<td>2.9</td>
<td>3.4</td>
<td>3.7</td>
</tr>
</tbody>
</table>

Mann Whitney tests letters denote significant differences between adjacent SOC. a= PC and C; b= C and PR; c= PR and AX; d= AX and MN. Differences between non-adjacent SOC were not highlighted.
At observation 2 a number of trends emerge. In relation to Consciousness Raising, Environmental Re-evaluation, Self Re-evaluation, Reinforcement Management and the positive perception of the benefit of exercise all exhibit significantly greater use in contemplation than precontemplation. Similarly, Self Re-evaluation and Reinforcement Management exhibit higher use in action as opposed to maintenance fitness suite SOC. In a number of cases those in action SOC utilise processes of change (Social Liberation, Helping Relationships) significantly more than those in both preparation and maintenance. They also have significantly more positive perceptions of exercise. Finally, in the case of two POC (Counter Conditioning and Self Liberation) there is a significant stage by stage increase (PC<C<PR<AX) in use which peaks in action, whilst there is reduction in the use of these POC in maintenance it is not significant.

3.3.2.3 Logistic Regression

Binary Logistic Regression

Precontemplation vs. Contemplation

Table 34: Determinants of Stage of Change (FS) categorisation at observation 1

<table>
<thead>
<tr>
<th>OB 1</th>
<th>Variable</th>
<th>B</th>
<th>Odds Ratio</th>
<th>95% CI Lower</th>
<th>95% CI Higher</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ER</td>
<td>.163</td>
<td>1.117</td>
<td>1.017</td>
<td>1.632</td>
</tr>
<tr>
<td></td>
<td>PRO</td>
<td>.148</td>
<td>1.160</td>
<td>1.015</td>
<td>1.325</td>
</tr>
<tr>
<td></td>
<td>Constant</td>
<td>-2.036</td>
<td>.100</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The overall fit of the classification of the model predicts Stage of Change membership 72.2 % correctly.

Both increasing Social Liberation and having positive views on exercise will increase the likelihood of being in contemplation when compared with precontemplation at observation 1.
Table 35: Determinants of Stage of Change (FS) categorisation at observation 2

<table>
<thead>
<tr>
<th>OB 2</th>
<th>Variable</th>
<th>B</th>
<th>Odds Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lower</td>
</tr>
<tr>
<td>SR</td>
<td>.206</td>
<td>1.229</td>
<td></td>
<td>1.095</td>
</tr>
<tr>
<td>Constant</td>
<td>-1.846</td>
<td>158</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The overall fit of the classification of the model predicts Stage of Change membership 73 % correctly.

However, at observation 2 Self Re-evaluation has the greatest effect by promoting the likelihood of being in precontemplation if the individual lowers level of re-evaluation.

Contemplation vs. Preparation

Table 36: Determinants of Stage of Change (FS) categorisation at observation 1

<table>
<thead>
<tr>
<th>OB 1</th>
<th>Variable</th>
<th>B</th>
<th>Odds Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lower</td>
</tr>
<tr>
<td>Status (1)</td>
<td>-.848</td>
<td>.428</td>
<td></td>
<td>.158</td>
</tr>
<tr>
<td>HR</td>
<td>.226</td>
<td>1.253</td>
<td></td>
<td>1.071</td>
</tr>
<tr>
<td>SC</td>
<td>-.347</td>
<td>.707</td>
<td></td>
<td>.555</td>
</tr>
<tr>
<td>PRO</td>
<td>.208</td>
<td>1.231</td>
<td></td>
<td>1.046</td>
</tr>
<tr>
<td>CON</td>
<td>-.304</td>
<td>.689</td>
<td></td>
<td>.445</td>
</tr>
<tr>
<td>Constant</td>
<td>-2.426</td>
<td>.088</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The classification Table for this model indicates that the variable below will enable correct prediction of Stage of Change membership 77.4 % of the time.

A number of variables have significant effects on SOC categorisation between contemplation and preparation at observation 1, with being a student versus employed, increasing Stimulus Control and an enhanced perception of the costs of activity increasing the likelihood of being in contemplation. Increasing Helping Relationships and having higher perceptions of the benefits of exercise increase the likelihood of being in preparation.
Table 37: Determinants of Stage of Change (FS) categorisation at observation 2

<table>
<thead>
<tr>
<th>OB 2</th>
<th>Variable</th>
<th>B</th>
<th>Odds Ratio</th>
<th>Lower</th>
<th>Higher</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DR</td>
<td>-.157</td>
<td>.855</td>
<td>.728</td>
<td>.902</td>
</tr>
<tr>
<td></td>
<td>SL</td>
<td>.212</td>
<td>1.236</td>
<td>1.087</td>
<td>1.547</td>
</tr>
<tr>
<td></td>
<td>Constant</td>
<td>-3.290</td>
<td>.037</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The overall fit of the classification of the model predicts Stage of Change membership 76% correctly.

At observation 2 however, only Dramatic Relief and Self Liberation have significant effects on prediction of SOC membership. Increasing Dramatic Relief is negatively associated with preparation, whilst increasing Self Liberation increases the likelihood of being in preparation.

**Preparation vs. Action**

Table 38: Determinants of Stage of Change (FS) categorisation at observation 1

<table>
<thead>
<tr>
<th>OB 1</th>
<th>Variable</th>
<th>B</th>
<th>Odds Ratio</th>
<th>Lower</th>
<th>Higher</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SC</td>
<td>.783</td>
<td>.352</td>
<td>.228</td>
<td>.654</td>
</tr>
<tr>
<td></td>
<td>CON</td>
<td>.049</td>
<td>1.043</td>
<td>1.001</td>
<td>1.098</td>
</tr>
<tr>
<td></td>
<td>Constant</td>
<td>-.149</td>
<td>.862</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The classification Table for this model indicates that the variable below will enable correct prediction of Stage of Change membership 83.3% of the time.

At observation 1 Stimulus Control and increased perceptions of the cost of exercise are both positively associated with membership of the action category of fitness suite use. No negative relationships are indicated.
Table 39: Determinants of Stage of Change (FS) categorisation at observation 2

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Odds Ratio</th>
<th>Lower</th>
<th>Higher</th>
</tr>
</thead>
<tbody>
<tr>
<td>SO</td>
<td>.343</td>
<td>1.410</td>
<td>1.051</td>
<td>1.890</td>
</tr>
<tr>
<td>RM</td>
<td>.230</td>
<td>1.259</td>
<td>1.163</td>
<td>1.645</td>
</tr>
<tr>
<td>Constant</td>
<td>-7.765</td>
<td>.000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The overall fit of the classification of the model predicts Stage of Change membership 80.4 % correctly.

However, at observation 2 improvements in Social Liberation and Reinforcement Management are positively associated with categorisation in the action SOC.

Action vs. Maintenance

Table 40: Determinants of Stage of Change (FS) categorisation at observation 1

<table>
<thead>
<tr>
<th>OB 1</th>
<th>Variable</th>
<th>B</th>
<th>Wald</th>
<th>Exp (β)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No Significant Relationships observed.</td>
</tr>
</tbody>
</table>

Table 41: Determinants of Stage of Change (FS) categorisation at observation 2.

<table>
<thead>
<tr>
<th>OB 2</th>
<th>Variable</th>
<th>B</th>
<th>Odds Ratio</th>
<th>Lower</th>
<th>Higher</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR</td>
<td>.394</td>
<td>1.484</td>
<td>1.051</td>
<td>2.094</td>
<td></td>
</tr>
<tr>
<td>SR</td>
<td>-.301</td>
<td>.740</td>
<td>.536</td>
<td>.923</td>
<td></td>
</tr>
<tr>
<td>HR</td>
<td>-.306</td>
<td>.737</td>
<td>.566</td>
<td>.958</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>3.267</td>
<td>30.814</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The overall fit of the classification of the model predicts Stage of Change membership 72.2 % correctly.

Increasing the use of Self Re-evaluation and Helping Relationship POC are both associated with a reduced likelihood of being in maintenance compared with action. However, increasing awareness of physical activity is positively associated with an increased likelihood of maintaining high levels of fitness suite activity.
3.3.2.4 Longitudinal analysis:

Table 42: Observation 1 by Observation 2 cross-tabulation (Fitness Suite)

<table>
<thead>
<tr>
<th>SOC Observation 2</th>
<th>SOC - Observation 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PC</td>
</tr>
<tr>
<td>Precontemplation</td>
<td>15</td>
</tr>
<tr>
<td>Contemplation</td>
<td>13</td>
</tr>
<tr>
<td>Preparation</td>
<td>1</td>
</tr>
<tr>
<td>Action</td>
<td>1</td>
</tr>
<tr>
<td>Maintenance</td>
<td>2</td>
</tr>
</tbody>
</table>

From observation 1 to 2 there are number of movement patterns worthy of discussion. Thirty three percent of the cohort experienced no positive or negative movement between observations. However, 28% of the cohort regressed at least on SOC. With reference to positive stage movements 39% of the cohort increased their SOC for fitness suite use at least one SOC between the two observations.

The logistic regression analysed the re-calculated change variables. Five tests were completed and in each regression, the analysis was filtered using the select cases function.
Table 43: Ordinal Logistic Regression (Select Cases- SOCFS Observation 1=1)

No model was fitted due to an insignificant final model.

Table 44: Ordinal Logistic Regression (Select Cases - SOCFS Observation 1=2)

N= 79

Model Fitting Information (a)

<table>
<thead>
<tr>
<th>Model</th>
<th>-2 LL</th>
<th>Chi Square</th>
<th>df</th>
<th>sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>217.886</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final</td>
<td>196.223</td>
<td>21.663</td>
<td>3</td>
<td>.000</td>
</tr>
</tbody>
</table>

Goodness of Fit (b)

<table>
<thead>
<tr>
<th></th>
<th>Chi Square</th>
<th>df</th>
<th>sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson</td>
<td>225.421</td>
<td>217</td>
<td>.000</td>
</tr>
<tr>
<td>Deviance</td>
<td>196.223</td>
<td>217</td>
<td>1.000</td>
</tr>
</tbody>
</table>

Pseudo R-Square (c )

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cox and Snell</td>
<td>.240</td>
</tr>
<tr>
<td>Nagelkerke</td>
<td>.255</td>
</tr>
<tr>
<td>McFadden</td>
<td>.098</td>
</tr>
</tbody>
</table>

Parameter Estimates (d)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Sig</th>
<th>Lower</th>
<th>Higher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Δ CC</td>
<td>.093</td>
<td>.009</td>
<td>.023</td>
<td>.162</td>
</tr>
<tr>
<td>Δ SC</td>
<td>-.183</td>
<td>.002</td>
<td>-.297</td>
<td>-.068</td>
</tr>
<tr>
<td>Δ PRO</td>
<td>.100</td>
<td>.015</td>
<td>.019</td>
<td>.180</td>
</tr>
</tbody>
</table>

In relation to fitness suite usage, those in contemplation when increasing Stimulus Control would have an increased likelihood of regressing to a lower
SOC whilst increasing Counter Conditioning would lead to an increased likelihood that SOC would be improved. Further to this, improving an individual’s perception of exercise would further increase the likelihood of obtaining positive SOC progression. However, the naglekerke R² only indicates that the model predicts approximately 25% of the variance.

Table 45: Ordinal Logistic Regression (Select Cases- SOCFS Observation 1=3)  
N= 30

Model Fitting Information (a)

<table>
<thead>
<tr>
<th>Model</th>
<th>-2 LL</th>
<th>Chi Square</th>
<th>df</th>
<th>sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>77.422</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final</td>
<td>54.376</td>
<td>23.046</td>
<td>3</td>
<td>.003</td>
</tr>
</tbody>
</table>

Goodness of Fit (b)

<table>
<thead>
<tr>
<th></th>
<th>Chi Square</th>
<th>df</th>
<th>sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson</td>
<td>55.456</td>
<td>18</td>
<td>.000</td>
</tr>
<tr>
<td>Deviance</td>
<td>54.376</td>
<td>18</td>
<td>1.000</td>
</tr>
</tbody>
</table>

Pseudo R-Square (c)

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cox and Snell</td>
<td>.536</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nagelkerke</td>
<td>.580</td>
<td></td>
<td></td>
</tr>
<tr>
<td>McFadden</td>
<td>.298</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Parameter Estimates (d)

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Sig</th>
<th>Lower</th>
<th>Higher</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \Delta CC )</td>
<td>.268</td>
<td>.002</td>
<td>.097</td>
<td>.440</td>
</tr>
<tr>
<td>Status (1)</td>
<td>-1.391</td>
<td>.034</td>
<td>-2.678</td>
<td>-.103</td>
</tr>
</tbody>
</table>
Being a student reduces the likelihood of improving your fitness suite SOC when in preparation as opposed to an employed individual. Increasing Counter Conditioning helps increase the likelihood of making positive SOC progressions.

Table 46: Ordinal Logistic Regression (Select Cases- SOCFS Observation 1=4)  
N=6  
Model Fitting Information (a)  

<table>
<thead>
<tr>
<th>Model</th>
<th>-2 LL</th>
<th>Chi Square</th>
<th>df</th>
<th>sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final</td>
<td></td>
<td>COMPLETE SEPARATION OF THE DATA OCCURRED</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 47: Ordinal Logistic Regression (Select Cases- SOCFS Observation 1=5)  
N=25  
Model Fitting Information (a)  

<table>
<thead>
<tr>
<th>Model</th>
<th>-2 LL</th>
<th>Chi Square</th>
<th>df</th>
<th>sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>67.558</td>
<td>32.973</td>
<td>7</td>
<td>.000</td>
</tr>
<tr>
<td>Final</td>
<td>32.973</td>
<td>34.585</td>
<td>7</td>
<td>.000</td>
</tr>
</tbody>
</table>

Goodness of Fit (b)  

<table>
<thead>
<tr>
<th></th>
<th>Chi Square</th>
<th>df</th>
<th>sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson</td>
<td>39.274</td>
<td>54</td>
<td>.000</td>
</tr>
<tr>
<td>Deviance</td>
<td>32.973</td>
<td>54</td>
<td>.997</td>
</tr>
</tbody>
</table>

Pseudo R-Square (c)  

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cox and Snell</td>
<td>.819</td>
</tr>
<tr>
<td>Nagelkerke</td>
<td>.997</td>
</tr>
<tr>
<td>McFadden</td>
<td>.902</td>
</tr>
</tbody>
</table>

Parameter Estimates (d)  

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Sig</th>
<th>Lower</th>
<th>Higher</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \Delta ) CR</td>
<td>.165</td>
<td>.025</td>
<td>.017</td>
<td>.298</td>
</tr>
<tr>
<td>Sex (1)</td>
<td>-.208</td>
<td>.011</td>
<td>-.112</td>
<td>-.050</td>
</tr>
</tbody>
</table>
Increasing Consciousness Raising whilst in maintenance for fitness suite activity has a positive effect on maintaining high levels of activity. However, being female has a negative effect on maintaining high activity levels when compared to male respondents in the maintenance SOC for fitness suite activity.

3.4 Discussion
The UK government has recently identified physical activity improvements as a means to improve the nation’s health, however 63% of men and 75% of women do not meet the recommended minimum levels of 30 minutes of moderate activity at least five days per week (Lake, 2001). Following the publication in 2000 of the ‘National Service Framework (NSF) for Coronary Heart Disease’ it was made clear that health authorities, NHS trusts and primary care groups have a duty to implement local physical activity strategies (Ward, 2001). However, within physical activity research there is no consensus as to the strategies or interventions that can be used to increase the populations’ exercise levels. The Transtheoretical Model of behaviour change has been used here to assess the relationships between Stages of Change and a number of variables in relation to exercise behaviour change. The aim was to use the information to enable prediction of stage movement or maintenance through process of change alteration based upon self-change results from the population in question. This information would potentially be of use in the design of interventions to promote physical activity and fitness suite activity uptake and maintenance.

Throughout this discussion trends within the results section will be compared with previous research. Whilst not all relationships alluded to will be of statistical significance, the agreements found with respect to past studies are still worthy of consideration. Any minor inconsistencies found may be a consequence of differences in the age or gender distribution of the studies.
Representativeness

In common with previous research, precontemplators generally used all Processes of Change (POC) less often than other Stages of Change (SOC) (Courneya & Bobick, 2000, Marcus et al, 1992a, Nigg & Courneya, 1998, Woods, 2000). At baseline, all experiential POC were used more frequently in preparation as opposed to contemplation (significantly so in the case of Consciousness Raising), which is in agreement with Woods (2000). However, this trend does not continue in to the final data collection, with contemplation tending to exhibit the most frequent use of experiential POC. When examining past research it appears that the experiential processes have a tendency to be emphasised more readily within the lower two SOC as in observation 2, however they will still increase in their use but their proposed impact on stage movement will diminish as SOC increases (Prochaska, DiClemente & Norcross, 1992; Prochaska & Velicer, 1997). With reference to behavioural processes all are used more in preparation when compared with contemplation. This is again in agreement with previous work (Courneya & Bobick, 2000, Marcus et al, 1992a, Nigg & Courneya, 1998, Woods, 2000), significantly so in the cases of Counter Conditioning, Self Liberation, and Stimulus Control (observation 1) and Counter Conditioning and Self Liberation (observation 2). The reason for this is likely to be the increased need for behavioural strategies in order to maintain and further increase physical activity once the individual has begun to undertake small amounts of the positive behaviour (Prochaska et al, 1992; Prochaska & Velicer, 1997).

With reference to changes in process use between preparation and action trends indicate that the experiential processes of Environmental Re-evaluation (ER) and Social Liberation (SO) tend to be used more in action than in preparation as has been found previously (Courneya & Bobick, 2000, Marcus et al, 1992a, Nigg & Courneya, 1998, Woods, 2000). However, Consciousness Raising is used more in preparation. An increased use of Environmental Re-evaluation may be due to the individual now being able to realise the effect that their increased levels of physical activity has on those close to them having now reached a level of activity.
that is classified as being of benefit for health and/or fitness purposes. With reference to Social Liberation (SO) with increased activity there is a possibility of the acceptance of physical activity as a normal daily activity due to the increased availability of positive role models within their social world. The behavioural processes have a tendency to be used more than or equal to the preparation SOC when in action. This is as would be expected due to the increased magnitude of the target behaviour, it would be expected that there is a concomitant increase in the need for behavioural support (Courneya & Bobick, 2000, Marcus et al, 1992a, Nigg & Courneya, 1998, Woods, 2000).

In the final two stages of change the experiential processes tend to peak in action. This is probably due to the transition from action to maintenance being a consequence of time rather than any changes in actual behaviour (Sutton, 1996). These trends agree with those of past work (Courneya & Bobick, 2000 Marcus et al, 1992a, Nigg & Courneya, 1998, Woods, 2000). However, it seems behavioural POC are inclined to be used in maintenance more than in action within this study. Whilst not agreeing entirely with past research one element worthy of note is that in all past studies considered, and within this study, Counter Conditioning peaks in maintenance. Counter Conditioning relates to the “substitution of alternative behaviours for the problem behaviour” in this case a sedentary lifestyle (Marcus et al, 1992a p.387). It seems likely that this process would be in great demand during the transition from preparation to action to maintenance, and, therefore, invaluable to those in preparation and action. This study seems to suggest that in order to ensure the criterion behaviour is perpetuated then there is an on going need to devise alternative responses to the temptation of reverting to the problem behaviour of inactivity.

When considering the decisional balance (PROS and CONS) variables and Self Efficacy (SE) a number of trends appear. The PROS (perceived benefits of changing the behaviour) generally increase from precontemplation stage by stage and peak in action in agreement with Nigg and Courneya (1998), whilst
CONS (perceived costs of undertaking exercise) tend to peak in contemplation and diminish stage by stage to a value lower than that exhibited in precontemplation which is again in agreement with previous findings (Marcus et al., 1992b, Nigg & Courneya, 1998). Miller and Rollnick (1997) attributed non-movement from contemplation to ambivalence, which is "the co-existence of opposing attitudes or feelings" (American Heritage Dictionary, 2000). This could relate to the PROS and CONS of exercise; as the CONS diminish and the perceived benefits of activity are augmented, stage movement can occur. Self Efficacy, as in past research increases stage by stage to peak in maintenance (Marcus et al., 1992c). SE relates to the individual's confidence in performing the behaviour and is highly related to stage of change, which would probably be as a consequence of, in the initial stages, vicarious experiences and, in later stages, performance accomplishments.

These findings relate well to past research where results such as those discussed above have led to the conclusions that stage matched interventions based upon stage related differences would be more beneficial in aiding an individual to take up exercise than non-staged matched materials such as media based campaigns (Prochaska & Marcus, 1994). As a result H1 is accepted as the cohort displays representativeness to previous findings and cohorts. However, the nature of this analysis has led to SOC being analysed as the factor (independent variable) and POC, DB and SE as the dependent variables. This assumption fails to acknowledge that it is the POC which are the strategies and techniques proposed to initiate movements in SOC (Prochaska & Velicer, 1997c). Further to this, whilst numerous studies have examined the TTM, due to the dependence on difference testing, the predominance of researchers have not been able to separate the analysis of the core constructs for univariate testing (Marcus et al., 1992a, Marcus et al., 1992b, Marcus et al., 1992c; Nigg & Courneya, 1998). In response to this cross sectional binary logistic regressions were utilised in order that Stage of Change could be assessed as the dependent variable and processes of Change, Decisional Balance, Self Efficacy along with
categorical variables such as age group, sex and employment status could be assessed as the independent variables.

**Categorical Differences**

In addition to the examination of the TTM core constructs, and, as a consequence of variations and associations detected during cross-tabulation analysis, it was decided to run independent t-tests based upon sex and status. With reference to sex differences, women scored higher than men on all experiential POC at observation 1 and Environmental Re-evaluation, Self Re-evaluation and Social Liberation at observation 2. These results compare favourably with Woods (2000) and non-exercise specific findings of O'Connor, Carbonari and DiClemente (1996), which could indicate that women may be more aware of cognitive based interventions than men (Woods, 2000). Furthermore, women indicate a greater availability to Helping Relationships and Reinforcement Management; however, the cross-tabulations indicate that they may be less likely than men to act upon this increased cognitive and behavioural input as only 37.7% of women were gaining sufficient exercise for health/fitness benefits compared with 50% (O1) and 53.5% (O2) of men. Interestingly, women exhibit significantly higher PROS for exercise compared with men, but also higher CONS (significant O1), whilst men exhibit higher SE for exercise than women (significant O2). This may indicate that PROS, CONS and SE have a more pronounced effect on SOC than does POC utilisation.

When status is considered, the only significant differences evident in POC are that at both observations the employed utilise Counter Conditioning significantly more than students. With reference to PROS, CONS and SE, at observation 1 the employed exhibit significantly higher PROS and CONS for exercise. However, at observation 2 these significant differences are not evident. At baseline 55% of the employed gain enough exercise for health/fitness benefits however, at endpoint the percentage gaining enough exercise has fallen to 46.4%. As in the sex analysis both PROS and CONS are significant at
observation 1 yet the employed do not have a significantly higher SE, thus, the CONS at this observation may have negatively impacted upon the exercise activities of the employed (PROS may not be high enough to ameliorate the impact at this time point) to reduce their maintenance of previous levels of exercise. This causal relationship is however, only supposition and cannot be verified by these data due to its cross-sectional nature. However, it seems worthy of further testing as do the sex differences identified.

**Cross sectional relationships through regression analysis**

Binary logistic regression was employed in an attempt to identify determinants of adjacent stages as it allowed the inclusion of all TTM variables along with categorical variables such as sex and status. This allowed the assessment of the probability or, more precisely the odds of belonging to a specific SOC based upon differences detectable in the predictor variables (POC, DB, SE, sex, status). Courneya and Bobick (2000) utilised regression techniques to examine SOC by POC interactions. However, this study also included the Theory of Planned Behaviour in all regressions and failed to use all TTM variables. This said, it was a useful exploratory study and provided the opportunity for comparisons.

Through cross-sectional regression analysis a number of relationships were identified; some agreed with previous research whilst some relationships differed. Environmental Re-evaluation discriminated between precontemplation and contemplation with an increase in ER increasing the likelihood of being in contemplation (O2). This is in contrast to Courneya and Bobick (2000) who identified that ER discriminated between the last three stages; it did however, agree with difference testing research (Prochaska et al, 1992, Prochaska & Velicer, 1997c). Counter Conditioning (CC) exhibited two regression assessed relationships; it discriminated preparation from contemplation. Courneya and Bobick identified that CC discriminated between the middle three SOC. However, the second relationship highlighted showed that it helped to discriminate between action and maintenance which agreed with traditional difference testing results.
Courneya and Bobick, when discussing CC, postulated that it was "tantamount to a self report of behaviour" (p.54) and would be expected to correlate well with stages where actual differences in the amount of activity could be assessed. However, with reference to action and maintenance, Prochaska et al (1992a) highlighted the need for continued application of CC in maintenance, which is heavily supported by difference testing research where CC consistently peaks in the maintenance SOC (Marcus et al, 1992a; Nigg & Courneya, 1998; Woods, 2000).

Reinforcement Management (RM) has a positive relationship with action versus preparation (O1) which somewhat agrees with Courneya and Bobick (2000), who identified perceived behavioural control (PBC) with discriminating powers between the last three adjacent pairs. RM could relate to PBC in the fact that it has a control element "changing the contingencies that control or maintain the problem behaviour" (Marcus et al, 1992a p.387), however, unlike PBC which relates to perception of control, RM relates to overt actions such as rewarding oneself for undertaking the desired behaviour i.e. 30 minutes of moderate activity five times per week, thus, it would possibly not have an impact until criterion behaviour had been reached.

Courneya and Bobick (2000) identified that intention identified with the first three adjacent stages (PC \(\rightarrow\) PR). With respect to this Table 15 shows that Self Liberation has a positive relationship with PR. Self Liberation (SL) relates to choice and commitment to change (Prochaska et al, 1988) and is thus akin to intention. Whilst this is a stage transition prior to that suggested by difference tests (Prochaska et al, 1992a; Prochaska & Velicer, 1997c), it does correlate well with the stage definition for contemplation (intention to change) and preparation (making small changes), as in preparation the commitment to change has been acknowledged by the individual actually undertaking some physical activity. Finally, Stimulus Control (SC) was identified by Courneya and Bobick (2000) as discriminating between action and maintenance, however, Table 16 shows that in the current study SC discriminates between preparation and action with an
increase in SC increasing the likelihood of being in action. Whilst this disagrees somewhat with Courneya and Bobick (2000) and the difference testing research (Prochaska et al, 1992a; Prochaska & Velicer, 1997c), when the definition of SC is examined it can be postulated that there may be a greater need to avoid situations and people who trigger sedentary behaviour between preparation and action than in the more stable stage transition of action and maintenance as this stage does not require the acquisition of new exercise behaviours.

One relationship identified through this analysis, which was evident at both observations and agreed not only with Courneya and Bobick (2000), but also Prochaska et al, (1992a) and Prochaska and Velicer, (1997c) was that of Self Re-evaluation (SR). This POC relates to the emotional and cognitive re-appraisal of values by the individual with respect to sedentary behaviour (Marcus et al, 1992a). Thus, it would seem to make intuitive sense that when comparing those in precontemplation with those in contemplation an increase in SR would increase the likelihood of being in contemplation as there would probably have been a need to re-evaluate the sedentary behaviour before the intention to begin physical activity could be formulated.

As discussed previously few studies have incorporated all TTM variables, indeed, the regression based study discussed does not incorporate the DB and SE variables. A number of relationships are evident from including these variables in the analysis. The PROS of exercise have a negative impact on two adjacent stage pairs (PC-C and AX-MN) with an increase in PROS at both of these points improving the likelihood of being in the lower of the adjacent stages. With reference to action and maintenance this relationship can probably be explained by the fact that PROS peak in action (Table 10). However, the negative relationships between precontemplation and contemplation, where an increase in PROS increase the likelihood of being in precontemplation, is not so easily accounted for, as PROS improve between these two SOC (Table 11), meaning that those in contemplation generally have higher PROS for exercise than those
in precontemplation. Prochaska (1994) identified that in order to move from precontemplation to action approximately one standard deviation of the PROS of a healthy behaviour had to occur (PC→AX =1SD ↑PROS\textsubscript{H} p.49), which is contradicted in the present study. However, Prochaska (1994) indicates that SR can be useful in increasing the perceived PROS of healthy behaviours and it may be that SR outweighs the effect of PROS as they are measured for this study although the perceived benefits of undertaking the new behaviour may actually be increasing. Furthermore, due to the high number of variables which have a significant effect on stage categorisation between these two adjacent stages (Table 13) there may be a number of interactions occurring which cannot be accounted for. Another identified relationship for PROS is seen alongside a concomitant CONS relationship (Table 16). Here the PROS and CONS exhibit their expected relationship (Prochaska, 1994) with an increase in PROS increasing the likelihood of being in a higher SOC whilst an increase in CONS increased the likelihood of being in a lower SOC.

Self Efficacy has previously been reported to be an extremely important variable in the adoption of health behaviours. Schwarzer (1992) suggested that "by summing up direct and indirect effects, it can be stated that the total effect of self-efficacy on health behaviours exceeds the effect of any single variable" (p.223). However, in this adjacent SOC analysis it only exhibits one significant relationship. SE is positively associated with an increase in likelihood of being in contemplation versus precontemplation, and is explained by the significant increase in SE between precontemplation and contemplation (Table 10).

The categorical variables incorporated in the analysis were sex and status. Sex was found to have two negative relationships (PC-C and PR-AX) with females being more likely to be found in the lower of the adjacent stages. The reasons for this, as with the t-test results earlier, are worthy of further study. The fact that women in this study seem to be less active yet have higher POC use (Tables 2, 3, 5 and 6) and when adjacent pairs are compared women show negative
relationships with the higher of the adjacent pairs are worrying statistics. However, it is outside the confines of this study to discuss this further other than to emphasise a need for more in-depth study in this area. With reference to status, students exhibit one positive (PC-C) and three negative (C-PR, PR-AX, AX-MN) adjacent stage relationships. Ergo, whilst students are more likely to think about exercising than the employed, when the decision to begin an exercise regime is made it is the employed that are more likely to make small changes, increase those changes to levels that will improve health/fitness and maintain that level for longer periods of time when compared with students.

The binary logistic analysis discussed herein, whilst allowing further insight into the TTM should only be viewed as having exploratory value; one limitation is again due to the cross sectional nature of the analysis, thus not allowing any causal relationships to be argued. In addition, the lack of parity of results between observations one and two could be indicative of the fact that whilst SOC do change from observation to observation the actual Processes of Change that individuals use are not highly changeable. In other words, people may be predisposed to using certain POC which do not change over time or as behaviour changes. This disparity could however, also be attributed to the reciprocal nature of the core constructs of the TTM and be a consequence of experiential processes being required to think about changing behaviour further on entry into a new SOC, whilst behavioural processes are used to actively change stage, with these relationships not being dependent on concurrent Stage of Change. This study cannot resolve this issue; however, the longitudinal data to be discussed later may provide some explanations regarding actual concomitant relationships of changes in SOC, POC, DB and SE. In summary, H2 is accepted with regard to differences found between a regression based cross sectional analysis of the Transtheoretical Model and difference testing methods. Further statistical analysis of longitudinal relationships have as yet to be reported on.
With regard to fitness suite/gym (FS) activity several relationships are worth highlighting from the cross-sectional information. With reference to sex, again it seems that women are less likely to be active than are men; whilst 39.9\% of the women surveyed attest to at least occasional FS activity only 17.1\% meet criterion. In men a similar level of activity in this type of facility is evident (43.1\%), however, a much greater proportion are active at or above criterion (27.6\%). Again it seems that women are in need of intervention more than are men. When examining the TTM constructs by SOC FS some similarities are comparable to previous research\(^5\). As in smoking and exercise research the 10 POC are used least in PC (Courneya & Bobick, 2000; Marcus et al, 1992a; Nigg & Courneya, 1998; Woods, 2000). With regard to contemplation, in both observations CR, ER and SR are significantly higher in those in contemplation versus precontemplation as are Reinforcement Management and PROS. The experiential results agree somewhat with past exercise studies (Marcus et al, 1992a; Nigg & Courneya, 1998; Woods, 2000) and, according to TTM construct relationships, the PROS should increase from PC→AX which is also evident, however the significant relationship identifying RM as important to increase intention to be active in this type of facility is unexpected. This may be due to a large number of people who are already active in non facility settings being in this SOC and it may aid the actual uptake of behaviour in gym settings if rewards are available for either joining or becoming active in this type of facility. With reference to Preparation, Helping Relationships and SE are important factors at observation 1 however this is not evident at the second observation indicating that these POC may have been important to those in that SOC at that time but that in general these factors are not particularly important.

Two interesting relationships are supported somewhat at observation 1, but more consistently at observation 2. In the case of both Self Liberation and Counter

\(^5\) SOCPA was not accounted for as a co-variante for statistical analysis; as in the real world setting it is likely that people presenting at a fitness facility may or may not gain physical activity from elsewhere as in this case. If TTM is going to be useful in this arena as a means for intervention it is important for the data to be as representative of a natural setting as possible.
Conditioning significant stage by stage increases in use of these POC occur from PC→C→PR→AX; this may indicate that these two POC are key in increasing intention to and actual uptake of exercise in a gym facility; however, again the disparity between the two observations casts doubt on this relationship. As these POC can be interpreted as relating to the intention to undertake (SL) and actual substitution of (CC), new behaviours then they would heuristically appeal as suitable target POC. This cannot be concluded here although further investigation would seem warranted. When examining the cross-sectional Binary Logistic regressions of adjacent stages the relationships highlighted above are not evident. In fact the lack of parity between the observations is again problematic. Plotnikoff et al., (2001) also found a lack of consistency between observations and as a result questioned the internal validity of the TTM despite the support from cross-sectional research. As has been discussed in chapter two there is a possibility that the POC identified from smoking cessation research may not be appropriate for exercise studies (Marshal & Biddle, 2001), which is something that may need to be clarified through qualitative research.

The results to this point, whilst providing further descriptive information for the TTM construct relationships, have not examined the TTM constructs for co-existing fluctuations. In an attempt to observe this, ordinal logistic regressions were undertaken with positive and negative stage movements being the dependant variable and both categorical (age group, status sex and reason for exercising/not exercising) and continuous (POC, SE, PROS and CONS) variables being regressed onto SOC in order to predict stage movements from either group attachment or continuous variable fluctuations.

Stage of Change movements were different dependent on the behaviour assessed. With regard to physical activity 27.9% regressed at least one stage, a similar percentage (28%) also regressed in Fitness Suite activity. However, the percentage of SOC progressors was approximately 10% greater for physical activity compared with FS activity over the course of this twelve month study.
(48.3% and 39% respectively). With reference to overall TTM construct results only ER, SR and CONS changed significantly over time. Environmental Re-evaluation and Self Re-evaluation both increased significantly from observation 1 to 2, whilst CONS reduced significantly during this time period. Partial explanation for this may lie in the high level of first year student participants who would naturally re-evaluate themselves and their environment in general and possibly specifically in relation to exercise over their first year of study. In addition, the greater uptake versus regression may also result in the POC changes observed.

As in physical activity above the cross sectional relationships in relation to fitness suite Stage of Change differ markedly from the difference testing relationships published in previous literature. In this instance it could simply be a product of the definition used for criterion behaviour, at this point H3 is accepted and will be tested further in a longitudinal manner.

**Cause – Effect assessments of Transtheoretical Model relationships along demographic information.**

With reference to the longitudinal regressions no results in precontemplators were available for FS behaviour; in relation to physical activity 58.3% made at least one stage progression during the study with helping relationships having a positive influence on stage movement and social liberation having a negative relationship with stage progression. With regard to Social Liberation the acceptance of physically active lifestyles seems to have a detrimental effect on SOC progression. The message with regard to physical activity and its body image benefits is currently featured heavily in advertising (i.e. Reebok “lose the beer belly” advert) and as such may have increased the perception that exercise is acceptable, yet these images may have a negative affect on likelihood to think about or take up exercise in a precontemplative group. With reference to Helping Relationships however, this POC has a positive effect on physical activity; social support is an often cited beneficial factor in developing and initiating exercise
behaviour which seems to be supported by this research (Coleman & Iso-Ahola, 1993; Klesges et al, 1990; Schooler, 1995).

With regard to Contemplation three behavioural POC exhibit positive relationships with SOC progression in physical activity. This is in agreement with Plotnikoff et al. (2001) who found that CC, HR and SC positively effect SOC progression for those in Contemplation. This may be expected as it would entail an overt change of behaviour from a sedentary to an exercising existence, thus behavioural POC are needed to support the actual changes in behaviour. In addition, increasing CONS has a positive relationship with SOC progression. One reason for this may be that as actual behaviour change occurs the individual becomes more aware of the effects of including physical activity (PA) into their lifestyle (i.e. time, cost, effort) but it does not have a negative effect on their activity particularly if the other relevant POC are increasing in parallel. A similar result to this was identified in decisional balance study which identified a process, termed 'emotional inoculation'. It was suggested that as someone becomes more aware of the negative consequences of a new behaviour then they become better able to cope with it as the negatives are anticipated in advance, particularly in relation to short-term consequences for long-term benefits (Nigg, Courneya & Estabrooks, 1997). With reference to negative POC only SR is indicated. Previously this POC has been identified as useful in progressing from Contemplation, particularly in relation to decisional balance (Prochaska et al, 1994). However, it seems that in this instance SR could result in negative SOC movements as it could be used as a means of prolonging time before activity occurs or even as a means to justify the individual's regression back into PC. With reference to FS activity, whilst CC exhibits a positive relationship (as in physical activity), SC has a negative effect on progression from Contemplation. Stimulus Control relates to the process of manipulating antecedents to the target behaviour such as environmental cues; it may be that those in FS contemplation are either using this POC incorrectly or are using it for other behaviours (i.e. other physical activity opportunities) and it is thus, an artefact when assessing FS
behaviour change. This is something that may need further study before conclusions can be made. Another positive predictor of SOC movement is PROS; this is an expected factor as it relates to increased perception of positive outcomes from the behaviour change.

When considering preparation both physical activity and fitness suite activity behaviour change are positively associated with CC. As discussed previously, Courneya and Bobick, (2000) stated that CC was “tantamount to a self report of behaviour” (p.54) and as the two stages where it is highlighted as beneficial both reflect increases in the target behaviours the suggestion by the above authors is supported for both PA and FS activity. With regard to other relationships evident in PA; Self Re-evaluation again exhibits a negative relationship; as in the previous stage transition this POC has previously been recommended as a target for intervention in this SOC. These two results identify the need for further investigations of this POC within the exercise domain; perhaps it is something peculiar to exercise and may lead to increased procrastination rather than action. Another negative relationship at the PR→AX stage transition for PA is sex. Women are more likely to regress than are men. This supports earlier cross-sectional findings and further highlights the need for examination of why women even once they have initiated some change, are more likely to drop out of exercise than are men. In FS behaviour a second relevant factor is status; it seems that being a student increases the likelihood of regressing from Preparation. Why this is so is unknown, however, it is possible that different social and educational pressures between students and the employed are at play, unfortunately this cannot be confirmed by these data.

In the Action stage there are no results available for FS. With regard to PA there was one negative and two positive relationships evident. Both Helping Relationships and Self Liberation exhibit positive effects on SOC progression in AX. These relationships have been identified previously in cross-sectional work with SL also being supported in a longitudinal study (Plontikoff et al, 2001). It
seems intuitive that in AX the individual who sustains activity has chosen and committed to the new behaviour and that they believe they can undertake the behaviour. In the past this POC has been implicated highly in behaviour change in both smoking cessation across all SOC movements (DiClemente et al., 1991) and the exercise literature from PC → AX (Gorely & Gordon, 1995). In this research it seems that SL is particularly relevant to the move from AX → MN and may be a requirement for the continuation of the behaviour until Maintenance is reached. With regard to HR, social support has been researched in the exercise literature for a considerable amount of time with such things as training partners, support from peers and family being implicated in increasing adherence to exercise (Coleman et al., 1991; Klesges et al., 1990; Schooler, 1995). This is supported here with specific reference to the ongoing behaviour changes that occur in Action.

One negative relationship identified was Reinforcement Management. This POC has previously been identified as important in helping individuals move from AX to MN (Prochaska et al., 1994), however, this relationship is refuted by the present research. One reason could be that rather than RM causing regression it is a lack of ability to use this POC to reinforce behaviour change that is the problem. Reasons for this could be either the lack of goal setting or the setting of inappropriate goals. Furthermore it could be a consequence of failing to reward oneself for reaching goals such as the target behaviour. These reasons cannot be inferred from these data and the factors can only be tested by qualitative research identifying how people may use these techniques when attempting exercise behaviour change.

In the final SOC analysis there are no similarities between the fitness suite behaviour and physical activity behaviour. In FS behaviour change both CR and sex are implicated. With regard to sex again it is women who are more likely to regress. Thus it seems that even after women have maintained criterion behaviour for six months or longer that they are still more likely to regress to
lower SOC. This is a worrying statistic and further research is needed to assess this phenomenon. With regard to CR this POC has previously been implicated in behaviour change in the later SOC (Plotnikoff et al, 2001). Within the FS environment CR opportunities are likely to be many and varied from information leaflet availability to advice from exercise professionals so it is no surprise that this POC is implicated in a positive relationship in the maintenance SOC for FS. With regard to physical activity four processes are implicated in the likelihood of remaining in this SOC. Social Liberation and Self Liberation both exhibit negative relationships with Maintenance whilst Environmental Re-evaluation and Counter Conditioning have positive relationships. It may be that those in MN, having already made the commitment to change (SL), are fully aware that their physical activity can be made a part of their lifestyle (SO) and thus, no longer actively make any behavioural changes opening themselves up to environmental and social cues for the past behaviour (Prochaska et al, 1994). This lack of countering triggers (CC) and inadequate evaluation of their environment where these triggers may reside (ER) may result in a comfort zone where regression is more likely (Prochaska et al, 1994). In response to these results both H2 and H3 are fully accepted and there is potential to generate new recommendations for intervention design these will be discussed in subsequent chapters (H2). Furthermore, it seems evident from the data presented that interventions in a structured setting require different interventions than the general physical activity message (H3).

**Summary**

A number of relationships have been examined and discussed in relation to both the uptake and maintenance of physical activity and fitness suite activity. In cross-sectional analysis these relationships are similar to previous cross-sectional findings in both physical activity and other health behaviour research. However, the longitudinal analysis has highlighted a number of departures from the previous literature. Whilst some reasons for this have been expressed here they cannot be substantiated by the quantitative data in this area to date. Indeed
to explain these results further and to test whether these relationships are as they appear, and also to further analyse the TTM relationship in real life settings, there is a need for qualitative research to provide as rich a description of how the TTM variables inter-relate in the adoption of and adherence to regular exercise.
Chapter 4

The Transtheoretical model as an adjunct to health promotion: The validity of stage-matched versus mismatched interventions for increasing general and structured physical activity in a randomised controlled trial
4.0 Introduction

Health is "a state of complete physical, mental and social well-being, and not merely the absence of disease and infirmity" (W.H.O, 1948). As such health could be portrayed as being on a continuum with health and death as the antipathies. Generally, prior to death comes disease, which may have had prolonged times of high-risk behaviours as its antecedent. It could, therefore, be argued that the dynamic state of health can be obtained through activities and habits, which are linked with disease prevention which are the opposite of the high-risk behaviours depicted in figure 4.1. One such habit is physical activity which can be linked positively with a number of diseases (Nieman, 1998).

![Diagram showing the relationship between health, disease, high-risk behaviours, and death.](image)

Figure 4.1 Morbidity and mortality with associated negative behaviours In Nieman D.C. The Exercise-Health Connection (1998) p.5
As discussed in the introductory chapter there is a well accepted link between physical activity and the "lifestyle diseases", with there being an ever increasing case for physical activity as a preventative measure in reducing morbidity and mortality from any number of these diseases. Inactivity has been classified as a high risk behaviour in relation to a number of specific health problems discussed previously.

However, whilst the links between physical activity and improvements in health are well-substantiated (DOH, 2004), the number actually partaking in this major positive health behaviour is still chronically low. As previously described the number of people gaining enough activity for health and/or fitness benefits in the U.K is alarmingly low particularly when compared to such nations as Finland and Australia (Gameplan, 2002) and despite the more recent recommendations focussing on lifestyle activity of moderate intensity (Pate et al, 1995), recent studies utilising this message still identify that between 35-55 % of people do not reach physical activity levels that are enough to gain either health and/ or fitness benefits (Courneya & Bobick, 2001; Loughlan & Mutrie, 1997; Marcus et al, 1996a; Woods, 2000).

When considering the high level of sedentary living in western societies coupled with the health benefits of physical activity it becomes clear that increasing and subsequently maintaining the nation's physical activity levels could have a major impact from a public health standpoint. With regard to this the U.K government has included increased physical activity levels as a target in its recent white paper "Saving Lives our Healthier Nation" (1998) and its strategic document "Game Plan" (2002). Whilst this is commendable it has been found that of those who do actually take up physical activity approximately 50% drop out within the first six months (Dishman, 1988), and with the benefits of physical activity only being viable if exercise behaviour is chronic (Paffenbarger, 1977), a major public
health challenge is faced by physical activity professionals. In essence there is a need for a two level intervention:

1. encourage the under active section of the population to take up or increase their physical activity levels to reach the criterion behaviour described in section 3.0.1
2. help those who are sufficiently active to maintain their current levels of activity.

In exercise psychology a number of theories have been applied to explain and predict the adoption and maintenance of physical activity. These models of exercise behaviour help to focus our attention on certain variables which have been postulated to help us explain and predict how change occurs and can be used to “guide the design, execution and interpretation of research” (Buckworth & Dishman, 2002 p.211). These theories represent human behaviour and are based on different assumptions; they are important as they allow us to discuss and arrange knowledge in a valid and routine manner. A number of theories have been discussed in chapter two with stage theories, specifically the Transtheoretical Model (TTM), selected as the springboard for testing and intervention design. This model has received increasing support in the literature and is currently being used in primary care settings as a basis for intervention (Ashworth, 1997). However, whilst a number of studies have shown promise with reference to intervention design based on the TTM (Marcus et al, 1992b; Marcus et al, 1996a; Nigg & Courneya, 1998; Titze et al, 2001; Woods, 2000) there has been a lack of research assessing interventions matched and mismatched for all Stages of Change and also for interventions in more structured settings which is an increasingly popular and available physical activity/exercise setting. As a result this study will look at the efficiency of stage matched interventions for all five Stages of Change in relation to both general and structured (fitness suite) activity. Stages of change were categorised based on the definitions described in the previous chapter (section 3.0.1 and 3.0.2).
4.0.1 Aims of the study

The study aimed to assess the effectiveness of simple low cost mail delivered stage matched interventions (design based on TTM theory) in relation to both general and structured activity Stage of Change when compared with mismatched and control conditions. The interventions were aimed at encouraging study participants to: consider, take-up, increase or adhere to general/structured activity with criterion behaviour defined previously. A number of objectives were formulated from these aims.

4.0.2 Objectives

1. Identify whether stage matched conditions are superior to mismatched or control conditions with respect to positive movements in Stage of Change.

2. Identify whether mismatched or control conditions increase the likelihood of Stage of Change regression when compared to matched conditions.

3. Identify whether simple cost effective postal delivered leaflets are an effective manner in which to deploy successful behavioural intervention in both general and structured activity.

4.0.3 It was hypothesised that:

1. Matched intervention conditions (Matched A and B) will cause significantly greater positive movements in Stage of Change than mismatched or control conditions.

2. Matched A intervention conditions (Matched to physical activity SOC) will increase physical activity significantly more than other conditions.
3. Matched B intervention conditions (Matched to fitness suite SOC) will increase fitness suite activity significantly more than other conditions.

4. All intervention conditions (Matched A, B and Mismatched) will exhibit significantly more positive Stage of Change movements when compared with the control condition. This will be indicative of the potential for expectation effects (such as the Hawthorne effect) from receipt of motivationally oriented materials even without specific matching to current Stage of Change.

5. The matched interventions will have a greater effect on Stage of Change progression than will any individual variable either categorical (Age group, Sex, Employment status) or Transtheoretical (Processes of Change (10), Decisional Balance (2), Self Efficacy). This will indicate that the combined effect of the intervention variables has a greater effect on Stage of Change than either demographic or Transtheoretical variables individually.

4.1 Method

Baseline data collection consisted of the 172 responders to the follow-up questionnaire described in section 3.1.2. All participants completed an informed consent, which they returned with the baseline questionnaire. The eligibility of participants was determined previously (described in the previous chapter).

4.1.1 Instruments

The instruments used were identical to those described in section 3.1.1 in the previous chapter. The returned questionnaire for the post test in the non intervention study were also treated as the baseline data sets for the intervention study.
4.1.2 Interventions

On return of the baseline questionnaire participants were randomly assigned to one of four conditions:

A. Control
B. Mismatched
C. Matched A (Physical Activity)
D. Matched B (Structured [Fitness Suite] Activity)

Randomisation was undertaken on receipt of the baseline questionnaire; the questionnaires were coded with ascending numbers as they arrived (starting with 00) and placed into a returns box. On closure of the data collection (21 days post questionnaire deployment), the questionnaires were randomly assigned to treatments based on the final two digits of the number coding using Appendix A1 (Thomas & Nelson, 2001 p.394-395) until all responders were stratified into one of four treatment groups.

i) 00 – 99 were stratified into the four groups
ii) 100 – 172 were then stratified into the four groups

This made four equal groups (n=43).

After randomisation, Stage of Change (SOC) was assessed for each participant. At this point a letter thanking all respondents for agreeing to take part in the study and reiterating the study’s importance in relation to the nation’s public health was forwarded. The letters to all intervention condition participants were slightly different to the control condition as they also included a paragraph directing them to the intervention leaflet for hints and tips on physical activity relevant to their current activity levels (deliberately mismatched for those in condition B).
Condition D also included some text affirming the benefits of indoor fitness facilities (safety, air conditioning etc.) along with information on the short circuits available for quick workouts, and the fun competitions and special offers currently running in the fitness suite.

Six weeks following the original letter a second letter was forwarded reminding them that they would receive another questionnaire, and, if in an experimental condition, including the same intervention as previously forwarded along with the next intervention in the sequence with a description of when this leaflet becomes useful (if the participants were not in maintenance). New information on up to date activities and special offers were also included for those in condition D.

Table 4.1.2.1: Table depicting information supplied to the four different conditions assessed during this study.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Letter</th>
<th>Intervention</th>
<th>Matched Intervention</th>
<th>Fitness Suite Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Control</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>B</td>
<td>Mismatched</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C</td>
<td>Matched A</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>D</td>
<td>Matched B</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

The interventions utilised within this study were designed based upon TTM and previous empirical findings through testing of this model (Cash, 1999; Marcus et al, 1992a; Marcus et al, 1992b; Prochaska, Norcross & DiClemente, 1994; Prochaska & Marcus, 1994; Health Scotland, 2001). A leaflet was designed

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6 This was the main text used for intervention design due to the suggested methods of operationalisation of the Processes of Change.
matched to the proposed needs of each separate SOC. All leaflets were similar in
design (Appendix D 1-5). An exercise psychology expert
reviewed each leaflet. A number of changes were made mainly in relation to the
biographies which begin each leaflet to make them more appropriate for the
target population.

Precontemplation (Aim: start thinking about change)
Included information on benefits of activity, questions to draw out the individual’s
perceived benefits of activity, attempts to encourage the individual to foster a
personal value for exercise and information on countering barriers.

Contemplation (Aim: start making some decisions to change and making small
changes).
Included tips/guidelines for activity, encouraged the individual to try activities they
have experience of and can fit into daily life including a walk round the block
there and then. Also, encouraged the individual to evaluate what is good about
exercise and of what benefit it will be to them personally.

Preparation (Aim: To increase their activity level to criterion)
Included information on how to set goals, how to enlist social support and how to
modify barriers. Also encouraged self-monitoring by logging activity.

Action (Aim: maintain current activity levels and prevent relapse)
Information and activities asked the individual to consider which situations to
avoid to stay exercising, to self-monitor and reward themselves; along with ways
to provide themselves with cues to be active.

Maintenance (Aim: maintain current activity levels and prevent relapse)
Encouraged re-evaluation of long-term goals, planning to cope with relapse,
renewing commitment to exercise and to help others to help themselves.
Examples of specific TTM variables and strategies introduced to help are given below.

Table 4.1.2.1 Examples of target variables and strategies encouraged within the study interventions

<table>
<thead>
<tr>
<th>SOC</th>
<th>TTM Variable</th>
<th>Description of strategy (asked participants to...).</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC</td>
<td>Reduce CONS</td>
<td>Barrier trouble shooting tips</td>
</tr>
<tr>
<td></td>
<td>DR</td>
<td>Consider the long-term consequences of inactivity to</td>
</tr>
<tr>
<td></td>
<td></td>
<td>themselves and their family</td>
</tr>
<tr>
<td>C</td>
<td>Increase PROS</td>
<td>Evaluate what is good about activity and how it could</td>
</tr>
<tr>
<td></td>
<td>and SR</td>
<td>be of value to them personally.</td>
</tr>
<tr>
<td></td>
<td>Increase SE</td>
<td>Try to fit in activities to their daily life especially</td>
</tr>
<tr>
<td></td>
<td></td>
<td>activities they already have experience of i.e. walking,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>stair climbing</td>
</tr>
<tr>
<td>PR</td>
<td>HR</td>
<td>Show a friend/partner their goals and enlist their</td>
</tr>
<tr>
<td></td>
<td>SR</td>
<td>encouragement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Write down and keep in a prominent place how they</td>
</tr>
<tr>
<td></td>
<td></td>
<td>will feel about themselves if they exercise more</td>
</tr>
<tr>
<td>AX</td>
<td>SC</td>
<td>Identify situations to avoid and how they can</td>
</tr>
<tr>
<td></td>
<td>CC</td>
<td>counteract them</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Leave clothes and shoes in prominent positions as</td>
</tr>
<tr>
<td></td>
<td></td>
<td>cues for activity.</td>
</tr>
<tr>
<td>MN</td>
<td>HR</td>
<td>Help someone else take up exercise to help</td>
</tr>
<tr>
<td></td>
<td>SL</td>
<td>Renew their personal exercise commitments</td>
</tr>
</tbody>
</table>

Overall there is a shift from cognitive (awareness raising) strategies in PC / C / PR to behavioural (action oriented) strategies in PR / AX / MN. All interventions can be viewed in their entirety in Appendix D 1-5.
4.1.3 Follow-up Questionnaire

Identical questionnaires were forwarded for comparative purposes. They were distributed to the original cohort of questionnaire completers (n=172) via mail and e-mail with a letter (Appendix C-3) asking the participants to complete and return the questionnaire in the pre-paid envelope provided. On receipt of the completed questionnaire participants were again forwarded a letter thanking them for their continued help along with relevant interventions (see above). At six weeks a follow-up letter and interventions were again forwarded. The cut-off period for response were maintained at that described for the non-intervention study in section 3.1.2.

4.1.4 Final Questionnaire

Identical questionnaires were forwarded for comparative purposes. They were distributed to the mid-point cohort of questionnaire completers (n=92) via mail and e-mail with a letter (Appendix C-4) asking the participants to complete and return the questionnaire in the pre-paid envelope provided (cut-off period for collection as previous). On receipt of the completed questionnaire participants were again forwarded a letter thanking them for their help. In addition, copies of all interventions were forwarded along with information on how to select the correct intervention for their current level of physical activity and how to decide when to introduce a new intervention.

4.2 Data Analysis

This trial was designed to answer the questions described in sections 4.0.2 and 4.0.3 above; to assess whether matched interventions for both physical activity and fitness suite activity had a greater effect on uptake and maintenance of those activities compared the same interventions purposefully mis-matched to Stage of Change and a control group who received no intervention material. In addition the effect of all conditions were assessed alongside the TTM subcomponents
and demographic information to identify whether any one variable had equal or similar effect to the interventions in promoting Stage of Change movements.

The primary outcome in this trial was the identification of the most efficacious method of intervening with a group of individuals to increase intention to, uptake or maintenance of physical activity and fitness suite activity over a six month time span. There were four waves of intervention and three observation points (baseline, mid point (3 months) and end point (6 months)). The primary endpoint with regard to this trial is to identify those interventions which have the greatest effect on increasing the likelihood of positive Stage of Change movements or maintaining activity levels if currently in action or maintenance for both physical; activity and fitness suite use.

The secondary outcome in this trial was to assess whether the interventions (variable combinations) were statistically more important variables for positive Stage of Change movements than individual variables from either the Transtheoretical Model or from demographic data.

4.2.1 Statistical Tests
A number of statistical tests were selected for analysis of the data set. Initially a Kruskal Wallis ANOVA was employed to assess whether there were any differences between participants who completed all questionnaires compared with those who dropped out; any significant effects were post hoc tested using Mann Whitney U tests. This was used to ensure that those completing the trial did not differ markedly from the drop outs and thus there was no innate difference in completers that may have impacted preferentially on the interventions effect in the trial completers.

In relation to the assessment of change, variables were calculated for each SOC, POC, DB variable and SE by subtracting baseline values from mid-point and endpoint values. These new change variables were those employed for assessment
of all movements during the intervention study. Subsequently, cross-tabulations with chi square statistics were utilised to determine association between SOC movements and experimental condition (H1 - 4). SOC movements were collapsed into Improvers and Non-improvers (PC / C / PR) and Regressors and Maintainers (AX / MN).

Non-parametric Kruskal Wallis ANOVA's were also employed to assess differences in both cross-sectional and longitudinal change values for all tested variables based upon experimental condition. Post hoc testing was carried out with Mann Whitney U tests if significant results were obtained.

In a further analysis Binary Logistic regression was used to analyse the determinants of Improvement/Non-improvement and Regression/Maintenance based upon experimental conditions (H1 - 4). A second logistic analysis was carried out including experimental group, categorical and TTM variables. This relates to H5 as a means to check that it is the combination of effects from the interventions rather than a specific variable that delivers any positive Stage of Change movement effects.

Below is a flow chart indicating the attrition of the participants throughout the study and an indication of the numbers included in the final analysis.
Assessed for Eligibility (n = 172)

Excluded (n = 0)

Randomisation into four treatment groups

Matched PA (A) (n = 43)
Received intervention material matched to current SOC for physical activity

Followed up at:
Wk 13 (n = 25)
Wk 26 (n = 19)

Lost to Follow-up (n=24)
Included in Analysis (n= 19)

Matched FS (B) (n = 43)
Received intervention material matched to current SOC for fitness suite

Followed up at:
Wk 13 (n = 22)
Wk 26 (n = 18)

Lost to Follow-up (n=26)
Included in Analysis (n= 18)

Mis-matched (n = 43)
Received intervention material NOT matched to current SOC for physical activity

Followed up at:
Wk 13 (n = 21)
Wk 26 (n = 16)

Lost to Follow-up (n=27)
Included in Analysis (n= 16)

Control (n = 43)
Received NO intervention material

Followed up at:
Wk 13 (n = 24)
Wk 26 (n = 17)

Lost to Follow-up (n=26)
Included in Analysis (n= 17)
4.3 Results

Of the original cohort of 172 participants a 41% response rate (n=70) was obtained for the subsequent two data collections. This was made up of 45 females (64.3%) and 25 males (35.7%); 38 students (54.3%) and 32 employed (45.7%).

4.3.1 Crosstabulations

Stage of Change (PA)
Subjects were classified into one of five stages at both observation points.

Table 1: Stage of Change (Physical Activity) classification at all observations

<table>
<thead>
<tr>
<th>Stage of Change</th>
<th>Observation 1</th>
<th>Observation 2</th>
<th>Observation 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=</td>
<td>%</td>
<td>N=</td>
</tr>
<tr>
<td>Precontemplation</td>
<td>4</td>
<td>5.7</td>
<td>3</td>
</tr>
<tr>
<td>Contemplation</td>
<td>15</td>
<td>21.4</td>
<td>17</td>
</tr>
<tr>
<td>Preparation</td>
<td>14</td>
<td>20.0</td>
<td>18</td>
</tr>
<tr>
<td>Action</td>
<td>5</td>
<td>7.1</td>
<td>9</td>
</tr>
<tr>
<td>Maintenance</td>
<td>32</td>
<td>45.7</td>
<td>23</td>
</tr>
</tbody>
</table>

In order to assess whether there were any differences between completers and dropouts of the intervention study, analysis was made on sex, status, age group and SOC at baseline and midpoint.

Table 2: Status by study completion categorisation cross tabulation

<table>
<thead>
<tr>
<th></th>
<th>Completers</th>
<th>Drop-outs</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students</td>
<td>32</td>
<td>71</td>
<td>103</td>
</tr>
<tr>
<td>Employed</td>
<td>38</td>
<td>31</td>
<td>69</td>
</tr>
<tr>
<td>Total</td>
<td>70</td>
<td>102</td>
<td>172</td>
</tr>
</tbody>
</table>
Only Status showed any significant differences ($\chi^2 = 9.865$ (1) $p<.05$). This result indicates that students had an increased likelihood of dropping out of the study when compared with employed participants, even though all volunteered to take part in the study at intervention baseline.

The main aim of the study was to examine whether matched interventions were more efficient at promoting activity uptake compared with mismatched interventions or self change. In order to test this a number of cross-tabulations were completed. Four groups were devised from the movements in SOC that occurred during the intervention period.

1. **Non-Improvers (NI)** – Those who remained stable or regressed in SOC who did not meet criterion behaviour at observation points one and two.

2. **Improvers (Imp)** - Those who progressed to a higher SOC who did not meet criterion behaviour at observation points one and two.

3. **Regressors (Reg)** - Those who regressed to a lower SOC who met criterion behaviour at observation points one and two.

4. **Maintainers (Main)** - Those who remained stable or progressed to a higher SOC who met criterion behaviour at observation points one and two.
Table 3: Crosstabulations showing association between SOC movement and experimental group (SOC PC, C and PR – below criterion)

<table>
<thead>
<tr>
<th>Movement Group &amp; Time Frame</th>
<th>Experimental Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
</tr>
<tr>
<td>NI (baseline-midpoint)</td>
<td>15</td>
</tr>
<tr>
<td>Imp (baseline-midpoint)</td>
<td>2</td>
</tr>
<tr>
<td>NI (mid-endpoint)*</td>
<td>14</td>
</tr>
<tr>
<td>Imp (mid-endpoint)</td>
<td>3</td>
</tr>
<tr>
<td>NI (baseline-endpoint)*</td>
<td>15</td>
</tr>
<tr>
<td>Imp (baseline-endpoint)</td>
<td>2</td>
</tr>
</tbody>
</table>

* significant at p<.05

Four associations were significant. Improvement or Non-Improvement between the midpoint observation and final observation ($\chi^2 = 4.540$ (1) $p<.05$) and from baseline to endpoint ($\chi^2 = 9.032$ (1) $p<.05$) were significant for matched compared with non-matched experimental groups; indicating it was more likely for those in a matched observation to increase their general physical activity. In addition, for the Fitness Suite matched condition both baseline to endpoint movements ($\chi^2 = 4.450$ (1) $p<.05$) for general physical activity and midpoint to endpoint movements ($\chi^2 = 7.772$ (1) $p<.01$) for fitness suite activity showed significant associations, with those in this experimental group being more likely to increase their general physical activity as opposed to their fitness suite activity.
Table 4: Crosstabulations showing association between SOC movement and experimental group (SOC Action and Maintenance – attaining criterion)

<table>
<thead>
<tr>
<th>Movement Group &amp; Time Frame</th>
<th>Experimental Group</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>Mismatched</td>
<td>Matched A</td>
<td>Matched B</td>
<td>Matched B</td>
</tr>
<tr>
<td>Reg (baseline-midpoint)</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Main (baseline-midpoint)</td>
<td>3</td>
<td>9</td>
<td>7</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Reg (mid-endpoint)</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Main (mid-endpoint)</td>
<td>4</td>
<td>9</td>
<td>5</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Reg (baseline-endpoint)</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Main (baseline-endpoint)</td>
<td>3</td>
<td>9</td>
<td>7</td>
<td>5</td>
<td>2</td>
</tr>
</tbody>
</table>

There were no significant associations between experimental group and SOC movements for those in the action and maintenance at the different timeframes. The trends do indicate that those in the higher SOC are more inclined to remain active at appropriate levels with only the control group and matched B (for fitness suite usage) showing a regression rate of 50% or more from baseline to end point.
4.3.2 Analysis of Variance

Kruskal Wallis (Non parametric ANOVA) with Mann Whitney follow up comparisons.

Table 5: Cross Sectional assessment of TTM variables at all observation points

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Mismatched</th>
<th>Matched A</th>
<th>Matched B</th>
<th>Mann Whitney</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR</td>
<td>2.5</td>
<td>2.7</td>
<td>2.4</td>
<td>2.8</td>
<td>a</td>
</tr>
<tr>
<td>DR</td>
<td>2.6</td>
<td>2.7</td>
<td>2.4</td>
<td>2.8</td>
<td></td>
</tr>
<tr>
<td>ER</td>
<td>2.4</td>
<td>2.6</td>
<td>2.4</td>
<td>2.5</td>
<td>d</td>
</tr>
<tr>
<td>SR</td>
<td>3.2</td>
<td>3.6</td>
<td>3.1</td>
<td>3.4</td>
<td></td>
</tr>
<tr>
<td>SO</td>
<td>2.6</td>
<td>2.4</td>
<td>2.6</td>
<td>2.7</td>
<td></td>
</tr>
<tr>
<td>CC</td>
<td>3.0</td>
<td>3.4</td>
<td>3.3</td>
<td>3.2</td>
<td></td>
</tr>
<tr>
<td>HR</td>
<td>2.0</td>
<td>2.3</td>
<td>2.3</td>
<td>2.1</td>
<td></td>
</tr>
<tr>
<td>RM</td>
<td>2.8</td>
<td>3.1</td>
<td>2.8</td>
<td>2.9</td>
<td></td>
</tr>
<tr>
<td>SL</td>
<td>3.0</td>
<td>3.5</td>
<td>3.1</td>
<td>3.3</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>1.9</td>
<td>2.2</td>
<td>2.0</td>
<td>2.1</td>
<td></td>
</tr>
<tr>
<td>PROS</td>
<td>3.7</td>
<td>3.9</td>
<td>3.3</td>
<td>3.7</td>
<td></td>
</tr>
<tr>
<td>CONS</td>
<td>2.8</td>
<td>2.6</td>
<td>2.3</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>SE *</td>
<td>2.6</td>
<td>3.4</td>
<td>2.7</td>
<td>2.8</td>
<td></td>
</tr>
</tbody>
</table>

The ten POC, two DB variables and SE were analysed through Kruskal Wallis non-parametric analysis of variance. Follow up comparisons for each significant variable were conducted (Mann Whitney U: p<.05*) on all experimental group pairings to assess where the significant differences lay. Mann Whitney tests letters denote significant differences between experimental groups. a= control and mismatched; b= control and matched A; c= control and matched B; d= mismatched and matched A; e= mismatched and matched B; f= matched A and matched B.
The only significant difference was found at the endpoint observation for Self Efficacy.

Post Hoc testing revealed the difference lay between control and mismatched groups and the mismatched group and matched A group. The mismatched group having a significantly higher Self Efficacy for physical activity than the other groups.

Table 6: Longitudinal assessment of TTM change variables at baseline to midpoint timeframe

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Mismatched</th>
<th>Matched A</th>
<th>Matched B</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR</td>
<td>-.03</td>
<td>.02</td>
<td>-.04</td>
<td>-.21</td>
</tr>
<tr>
<td>DR</td>
<td>-.38</td>
<td>.03</td>
<td>-.08</td>
<td>-.08</td>
</tr>
<tr>
<td>ER</td>
<td>.02</td>
<td>.14</td>
<td>-.08</td>
<td>-.08</td>
</tr>
<tr>
<td>SR</td>
<td>-.12</td>
<td>.17</td>
<td>.08</td>
<td>.00</td>
</tr>
<tr>
<td>SO</td>
<td>-.13</td>
<td>.11</td>
<td>-.24</td>
<td>-.18</td>
</tr>
<tr>
<td>CC</td>
<td>-.24</td>
<td>-.22</td>
<td>.24</td>
<td>.21</td>
</tr>
<tr>
<td>HR</td>
<td>-.04</td>
<td>.13</td>
<td>.05</td>
<td>-.15</td>
</tr>
<tr>
<td>RM</td>
<td>-.35</td>
<td>.08</td>
<td>-.16</td>
<td>.07</td>
</tr>
<tr>
<td>SL</td>
<td>-.38</td>
<td>-.11</td>
<td>.05</td>
<td>.05</td>
</tr>
<tr>
<td>SC</td>
<td>-.03</td>
<td>-.08</td>
<td>-.09</td>
<td>.36</td>
</tr>
<tr>
<td>PROS</td>
<td>-.23</td>
<td>-.08</td>
<td>.10</td>
<td>.16</td>
</tr>
<tr>
<td>CONS*</td>
<td>.35</td>
<td>-.09</td>
<td>-.39</td>
<td>.22</td>
</tr>
<tr>
<td>SE*</td>
<td>-.36</td>
<td>-.14</td>
<td>.24</td>
<td>.21</td>
</tr>
</tbody>
</table>

Mann Whitney U test letters denote significant differences between experimental groups. a= control and mismatched; b= control and matched A; c= control and matched B; d= mismatched and matched A; e= mismatched and matched B; f= matched A and matched B.

An identical analysis to that described above was performed on the data following calculations of change between observation points. From baseline to
midpoint only two variables were significantly different between experimental groups.

CONS were found to be significantly different ($\chi^2 = 8.481$ (3) $p<.05$). Post hoc testing identified the differences were between control and matched A and matched A and matched B with Matched A having a significantly greater reduction in the perceived cost of physical activity compared with those in the control and matched B conditions. In addition Self Efficacy was found to exhibit significant differences between experimental conditions ($\chi^2 = 7.649$ (3) $p<.05$). Mann Whitney U follow up tests identified that the control group differed significantly from both the matched A and matched B conditions with those in the control condition exhibiting a mean reduction in Self-Efficacy and those in the matched conditions exhibiting mean increases in Self-Efficacy.

No significant differences were found between experimental groups and change in TTM variables between the midpoint and endpoint observations.
Table 7: Longitudinal assessment of TTM change variables at baseline to endpoint timeframe

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Mismatched</th>
<th>Matched A</th>
<th>Matched B</th>
<th>Mann Whitney</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR</td>
<td>.00</td>
<td>.02</td>
<td>-.07</td>
<td>-.01</td>
<td>a</td>
</tr>
<tr>
<td>DR</td>
<td>-.03</td>
<td>.34</td>
<td>.01</td>
<td>.21</td>
<td>b</td>
</tr>
<tr>
<td>ER</td>
<td>.22</td>
<td>.13</td>
<td>-.05</td>
<td>.08</td>
<td>c</td>
</tr>
<tr>
<td>SR</td>
<td>-.22</td>
<td>.38</td>
<td>-.12</td>
<td>-.06</td>
<td>d</td>
</tr>
<tr>
<td>SO</td>
<td>.28</td>
<td>.11</td>
<td>-.09</td>
<td>.01</td>
<td>e</td>
</tr>
<tr>
<td>CC</td>
<td>-.02</td>
<td>-.16</td>
<td>.20</td>
<td>-.07</td>
<td>f</td>
</tr>
<tr>
<td>HR</td>
<td>-.07</td>
<td>.41</td>
<td>-.17</td>
<td>.17</td>
<td></td>
</tr>
<tr>
<td>RM</td>
<td>-.17</td>
<td>.20</td>
<td>.04</td>
<td>.22</td>
<td></td>
</tr>
<tr>
<td>SL</td>
<td>-.40</td>
<td>.09</td>
<td>.08</td>
<td>.17</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>.28</td>
<td>.06</td>
<td>-.03</td>
<td>.29</td>
<td></td>
</tr>
<tr>
<td>PROS</td>
<td>-.22</td>
<td>-.14</td>
<td>-.14</td>
<td>.14</td>
<td></td>
</tr>
<tr>
<td>CONS*</td>
<td>.59</td>
<td>.02</td>
<td>-.30</td>
<td>.30</td>
<td></td>
</tr>
<tr>
<td>SE</td>
<td>-.23</td>
<td>.06</td>
<td>.05</td>
<td>-.04</td>
<td></td>
</tr>
</tbody>
</table>

Mann Whitney U test letters denote significant differences between experimental groups. a= control and mismatched; b= control and matched A; c= control and matched B; d= mismatched and matched A; e= mismatched and matched B; f= matched A and matched B.

The final Kruskal Wallis ANOVA (Table 7) revealed that there was only one significant difference between experimental groups and TTM variables over the whole intervention period (baseline to endpoint). This difference was in changes in the CONS of exercise ($\chi^2 = 9.259$ (3) $p<.05$). Mann Whitney U follow up analysis identified that the differences were between the control group and the mismatched group and the control group and the matched A group. In both cases the CONS of exercise increased on average significantly more in the control group compared with the mismatched and matched A groups.
4.3.3 Logistic Regression

The Dependant variable was Stage of Change (Physical Activity) with both categorical factors (Age Group, Status, Sex) and continuous co-variates (Consciousness Raising, Dramatic Relief, Environmental Re-evaluation, Self Re-evaluation, Social Liberation, Counter Conditioning, Helping Relationships, Reinforcement Management Self Liberation, Stimulus Control, PROS, CONS and Self Efficacy) being regressed onto the Stage of Change movement variables. Backward elimination was the method of model simplification.

Binary Logistic Regression

Binary Logistic Regressions were undertaken to assess predictor variables for Stage movement for all three time frames and for both movement pairings. Two sets of tests were performed:

1) experimental group only as regressors (further assessment of crosstabulation findings in Tables 3 and 4)

2) experimental group, categorical variables and all TTM variables acting as regressors (assessment of all variables proposed to have an effect on SOC movement).

A number of regression tables are not included this is due to no significant relationships being identified through regression analysis for the test performed.

All predicted probabilities are for positive stage movements i.e. Improver or Maintainer.
Physical Activity:

Table 8: Determinants of Stage of Change movement (NI vs Imp) between baseline and midpoint

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Wald</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matched (1) non-matched</td>
<td>-1.349</td>
<td>2.814</td>
<td>.260</td>
</tr>
<tr>
<td>Constant</td>
<td>-.118</td>
<td>.059</td>
<td>.889</td>
</tr>
</tbody>
</table>

The overall fit of the classification of the model predicts Stage of Change movement 66.1% correctly.

The matched experimental groups have an increased likelihood of movements from a lower to a higher stage of change in relation to general physical activity.

Table 9: Determinants of Stage of Change movement (Reg vs Main) between baseline and midpoint

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Wald</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (1) other</td>
<td>.847</td>
<td>.870</td>
<td>2.330</td>
</tr>
<tr>
<td>Constant</td>
<td>.393</td>
<td>.315</td>
<td>1.481</td>
</tr>
</tbody>
</table>

The overall fit of the classification of the model predicts Stage of Change movement 66.7% correctly.

All experimental intervention groups are more likely to remain active at criterion level when compared to the control condition.

Table 10: Determinants of Stage of Change movement (NI vs Imp) between midpoint and endpoint.

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Wald</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matched (1) non-matched</td>
<td>-1.723</td>
<td>4.222</td>
<td>.179</td>
</tr>
<tr>
<td>Constant</td>
<td>-1.235</td>
<td>2.379</td>
<td>.291</td>
</tr>
</tbody>
</table>
The overall fit of the classification of the model predicts Stage of Change movement 72.9% correctly.

Matched interventions have a significant effect on likelihood of positive SOC movements between the midpoint and endpoint of the intervention study.

Table 11: Determinants of Stage of Change movement (Reg vs Main) between midpoint and endpoint.

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Wald</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matched (1)</td>
<td>-.843</td>
<td>1.243</td>
<td>.430</td>
</tr>
<tr>
<td>non-matched</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>1.022</td>
<td>2.145</td>
<td>2.711</td>
</tr>
</tbody>
</table>

The overall fit of the classification of the model predicts Stage of Change movement 70.4% correctly.

In the higher SOC only matched interventions have a positive effect on likelihood of SOC movement profile between the mid and endpoints of the intervention. Those receiving matched interventions are more likely to maintain their level of activity at criterion in order to remain in the MN SOC or to move from AX to MN.

Table 12: Determinants of Stage of Change movement (Nl vs Imp) between baseline and endpoint.

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Wald</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matched (1)</td>
<td>-2.072</td>
<td>6.431</td>
<td>.126</td>
</tr>
<tr>
<td>non-matched</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>.606</td>
<td>1.426</td>
<td>1.833</td>
</tr>
</tbody>
</table>

The overall fit of the classification of the model predicts Stage of Change movement 71.9% correctly.
Over the whole intervention period the matched interventions are more likely to result in a positive movement profile for physical activity consideration and uptake when compared to control or mismatched conditions in the below criterion SOC.

Table 13: Determinants of Stage of Change movement (Reg vs Main) between baseline and endpoint.

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Wald</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matched (1) Non-matched</td>
<td>-1.745</td>
<td>3.216</td>
<td>.174</td>
</tr>
<tr>
<td>Constant</td>
<td>.416</td>
<td>0.706</td>
<td>1.516</td>
</tr>
</tbody>
</table>

The overall fit of the classification of the model predicts Stage of Change movement 69.8% correctly.

Over the whole intervention period receiving the matched interventions increases the likelihood of an individual having a positive profile for physical activity maintenance at criterion.

Fitness Suite Activity:

Table 14: Determinants of Stage of Change movement (Nl vs Imp) between midpoint and endpoint.

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Wald</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matched (B) Fitness Suite</td>
<td>-2.756</td>
<td>.093</td>
<td>.064</td>
</tr>
<tr>
<td>Constant</td>
<td>-1.203</td>
<td>.102</td>
<td>.300</td>
</tr>
</tbody>
</table>

The overall fit of the classification of the model predicts Stage of Change movement 69.8% correctly.

Receiving interventions matched to fitness suite SOC have a significant effect on likelihood of negative SOC movements between the midpoint and endpoint of the
intervention study for participants in Stages of Change which represent below criterion behaviour.

4.3.3.1 Binary Logistic Regression (all categorical and TTM Variable)

Physical Activity:
Table 15: Determinants of Stage of Change movement (NI vs Imp) between midpoint and endpoint.

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Wald</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex (1)female</td>
<td>1.290</td>
<td>3.374</td>
<td>3.632</td>
</tr>
<tr>
<td>Matched (1)non-matched</td>
<td>-2.877</td>
<td>4.157</td>
<td>.056</td>
</tr>
<tr>
<td>Δ DR</td>
<td>-0.592</td>
<td>2.835</td>
<td>0.553</td>
</tr>
<tr>
<td>Δ SL</td>
<td>0.479</td>
<td>1.548</td>
<td>1.614</td>
</tr>
<tr>
<td>Δ SC</td>
<td>0.262</td>
<td>1.719</td>
<td>1.300</td>
</tr>
<tr>
<td>Constant</td>
<td>-2.026</td>
<td>1.435</td>
<td>0.132</td>
</tr>
</tbody>
</table>

The overall fit of the classification of the model predicts Stage of Change movement 86.5% correctly.

As in Table 10 matched interventions have a significant effect on likelihood of positive SOC movements between the midpoint and endpoint of the intervention. In addition, women and both Self Liberation and Stimulus Control are associated with increasing the likelihood of positive stage progression whilst an increase in Dramatic Relief has a negative effect on improvement in SOC.
Table 16: Determinants of Stage of Change movement (Nil vs Imp) between baseline and endpoint.

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Wald</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status (1) Student</td>
<td>-1.448</td>
<td>3.868</td>
<td>.235</td>
</tr>
<tr>
<td>Matched (1) non-matched</td>
<td>-.984</td>
<td>1.204</td>
<td>.374</td>
</tr>
<tr>
<td>Δ CC</td>
<td>.052</td>
<td>.013</td>
<td>1.053</td>
</tr>
<tr>
<td>Δ HR</td>
<td>.212</td>
<td>.187</td>
<td>1.236</td>
</tr>
<tr>
<td>Constant</td>
<td>.524</td>
<td>1.098</td>
<td>1.689</td>
</tr>
</tbody>
</table>

As in table 12 matched interventions are associated positively with improvements in Stage of Change. With all other variables included studenthood has a negative effect on positive stage movements, whilst both Counter Conditioning and Helping Relationships have a positive affect.

Table 17: Determinants of Stage of Change movement (Reg vs Main) between baseline and endpoint.

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Wald</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status (1) Student</td>
<td>-3.332</td>
<td>5.244</td>
<td>.036</td>
</tr>
<tr>
<td>Δ ER</td>
<td>1.097</td>
<td>2.101</td>
<td>2.995</td>
</tr>
<tr>
<td>Δ SO</td>
<td>.559</td>
<td>1.627</td>
<td>1.749</td>
</tr>
<tr>
<td>Δ SC</td>
<td>-.974</td>
<td>.666</td>
<td>.378</td>
</tr>
<tr>
<td>Constant</td>
<td>.525</td>
<td>.992</td>
<td>1.690</td>
</tr>
</tbody>
</table>

The overall fit of the classification of the model predicts Stage of Change movement 80% correctly.

Unlike Table 13, over the whole intervention period, interventions are not implicated in the likelihood of stage of change movements in above criterion individuals' when all other variables are included in the model. In this case, being employed increases the likelihood of an individual having a positive profile for physical activity maintenance at criterion. In addition, Environmental Re-
evaluation and Social Liberation both have a positive effect on maintaining activity and Stimulus Control has a negative effect on maintaining criterion behaviour.

Fitness Suite Activity:

Table 18: Determinants of Stage of Change movement (Nl vs Imp) between baseline and midpoint

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Wald</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Δ DR</td>
<td>.352</td>
<td>.685</td>
<td>1.422</td>
</tr>
<tr>
<td>Δ ER</td>
<td>-.125</td>
<td>.435</td>
<td>.883</td>
</tr>
<tr>
<td>Δ SR</td>
<td>.512</td>
<td>2.856</td>
<td>1.667</td>
</tr>
<tr>
<td>Δ HR</td>
<td>1.102</td>
<td>5.039</td>
<td>3.010</td>
</tr>
<tr>
<td>Constant</td>
<td>-.703</td>
<td>.763</td>
<td>.495</td>
</tr>
</tbody>
</table>

The overall fit of the classification of the model predicts Stage of Change movement 90.4% correctly.

Four Processes of Change are significantly associated with SOC progression between baseline and midpoint of the intervention study. Increases in Dramatic Relief, Self Re-evaluation and Helping Relationships all have positive relationships with improvement in SOC, whilst Environmental Re-evaluation has a negative effect on SOC progression.

Table 19: Determinants of Stage of Change movement (Nl vs Imp) between midpoint and endpoint.

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Wald</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex (1)fEMALE</td>
<td>.398</td>
<td>2.345</td>
<td>1.489</td>
</tr>
<tr>
<td>Matched (A)Physical Activity</td>
<td>-3.437</td>
<td>6.720</td>
<td>.032</td>
</tr>
<tr>
<td>Δ ER</td>
<td>-.891</td>
<td>1.324</td>
<td>.410</td>
</tr>
<tr>
<td>Δ PRO</td>
<td>-1.052</td>
<td>5.978</td>
<td>.349</td>
</tr>
<tr>
<td>Constant</td>
<td>-.063</td>
<td>.706</td>
<td>.939</td>
</tr>
</tbody>
</table>
The overall fit of the classification of the model predicts Stage of Change movement 84.9% correctly.

A number of variables reduce the likelihood of progressing in fitness suite SOC. Receiving material matched to general activity level reduces likelihood of SOC progression for fitness suite activity (unlike in table 14 where material matched to fitness suite stage of change had a negative effect). In addition, increasing Environmental Re-evaluation and PROS for exercise also have a negative effect on structured activity SOC improvements. However, being female increases the likelihood of improvements in SOC (structured activity) occurring.

Table 20: Determinants of Stage of Change movement (NI vs Imp) between baseline and endpoint.

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Wald</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matched (A)Physical Activity</td>
<td>-1.154</td>
<td>3.118</td>
<td>.315</td>
</tr>
<tr>
<td>Constant</td>
<td>-.134</td>
<td>.067</td>
<td>.875</td>
</tr>
</tbody>
</table>

The overall fit of the classification of the model predicts Stage of Change movement 71.2% correctly.

Overall improvements in Fitness Suite activity levels for those in precontemplation, contemplation and preparation are negatively effected by receipt of interventions that are matched to their general physical activity/exercise Stage of Change.
4.4 Discussion

The experiment compared matched and mismatched postal interventions for general and structured physical activity. Whilst there was an attempt to change behaviour there were no instructions with regard to specific behaviours just general information on what criterion behaviour was. The main purpose of the study was to assess the effect of a 6 month intervention on physical activity behaviour with SOC classification acting as self-reported indicator of level of activity and behaviour change. SOC has been previously identified as having close correlational relationships with 7-day recall (Marcus et al, 1992b) so it was deemed unnecessary to include this along with the full TTM questionnaire in data collection. An objective assessment for fitness suite SOC was utilised which identified a close significant association (p<.01) between self reported and actual fitness suite use (based on number of entries per month).

Due to the high level of dropout in this type of study and the potential differences in motivation or other attitudinal variables between those who drop out and those who do not it was decided to test for differences between responders and drop outs. The only significant difference between these two groups was that students were more likely to drop out than employed participants ($\chi^2 = 9.865$ (1) $p<.05$). This does not, however, indicate that the employed were more likely to change behaviour than students or that students dropped out of physical activity. Students have been found to have chronically low response rates (Buckworth, 2001); however, in this case it may have been due to the request for questionnaire completion at observation two coinciding with a time of high levels of course work and exam preparation requirements (four weeks prior to end of semester one) with the response rate at this time point reaching 52.9% (n=91). Although there is no corroboratory evidence this may be a suitable explanation as the final questionnaire request resulted in an extremely high response rate (76.9%) with the request being made immediately following the Easter break (eight weeks prior to end of semester two).
Intervention Effects
Post intervention, significantly more of the participants who received matched interventions in the below criterion stages improved their stage of change compared with the non-matched groups (70.6% vs. 18.8% respectively; \( \chi^2 = 9.032 \) (1) \( p<.05 \)) over the six month intervention period. The major changes seemed to be concentrated in the last three months of intervention according to the crosstabulation results (\( \chi^2 = 4.540 \) (1) \( p<.05 \)). In addition, those in the matched B condition were significantly more likely to increase SOC PA from baseline to endpoint compared with all other experimental groups (\( \chi^2 = 3.888 \) (1) \( p<.05 \)). Receiving mismatched material was not significantly associated with SOC movements any differently than receiving no intervention material in those with below criterion SOC.

These results can be taken as preliminary indicators that the interventions were effective in promoting positive SOC movements for those in precontemplation, contemplation and preparation, which provides initial support for \( H_1 \) and \( H_2 \). However, one unexpected outcome from this analysis was the effect of condition D (Matched B) on SOC PA movements. Whilst it was not expected that this intervention would be overtly detrimental it was not expected that it would promote improvements in SOC PA significantly more than Condition C (Matched A) which was matched directly to SOC PA. One possible explanation may be due to the close relationship between SOC for physical activity and SOC for fitness suite attendance, thus the intervention would be highly matched to physical activity stage.

In the analysis which assessed associations between experimental group and stage movements for those participants at or above criterion behaviour no significant relationships were exhibited in the cross-tabulations. However, trends indicate that those receiving interventions had a lower tendency to regress compared with control subjects (56-82% vs. 50% respectively). This has been seen previously when comparing matched and standard self-help materials.
Marcus et al., (1998) postulated it was unlikely that a brief intervention (baseline and 1 month) would promote significant changes in physical activity among long-term regularly active individuals. Titze et al., (2001) agreed with this when they contended that a "hard core" of active individuals are unlikely to be affected negatively by health promotion interventions.

In order to further analyse these relationships and crosstabulation analyses were followed up with Binary Logistic Regressions. Again, the analysis was split into below and above criterion behaviour with low SOC participants being assessed on improvement/non-improvement and those above criterion being assessed on likelihood of regression or maintenance of activity levels.

In below criterion SOC those receiving matched interventions increased the likelihood of SOC improvement by 27% (from baseline to midpoint). In the above criterion stages the control group was negatively associated with maintenance of criterion behaviour with controls being 16.3% more likely to regress in their level of physical activity during the first three months of the study. This is indicative that in this population, receiving an intervention may be more important than underlying factors (i.e. age, sex) in an initial period of intervention. With reference to participants in higher SOC (AX & MN) from 3-6 months again matched interventions were the only discriminating factor between regressors and maintainers.

When the long-term effects of experimental group and demographics are considered (Baseline to Endpoint c. 6 months) those in the lower SOC were significantly affected by the matched material with those receiving matched interventions having a probability of 64.7%⁸ of exhibiting positive SOC movements. The non-matched groups however, only exhibited a probability of 18.8% of exhibiting positive SOC movements. This was supported in the higher

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⁸ See appendix D6 for calculations performed to assess probability using the regression equations results
SOC too with matched interventions again being positively associated with the odds of maintaining physical activity at or above criterion with a probability of 60.3% versus non-matched with a probability of 20.9% chance of maintaining activity. One interesting fact is that the disparity between matched A and B interventions identified in the cross-tabulations during this period is not evident with the matched interventions being identified as major predictors and no lone intervention (i.e. matched A or B) being identified with predictive capabilities.

In summary, matched interventions increase the likelihood of positive stage movements over mismatched and control conditions, thus H1 is accepted. However, there is no differentiation between Matched A and B conditions in relation to their likelihood of improving physical activity SOC therefore H2 is rejected. Whilst there is some support for H4 from the cross-tabulation results and from the baseline to mid point regression analysis (table 9) for those already above criterion, the evidence is not sufficient. This is an area which requires further study, whilst those in lower SOC are at higher risk of morbidity and mortality and interventions for these groups are required most urgently. There are no long-term benefits in enabling people to begin active lives if we do not fully understand the most efficacious manner in which to help them to maintain these new health and/or fitness promoting lifestyles. Whilst there may be a ‘hard core’ (Titze et al, 2001) of exercisers unlikely to be affected by health promotion campaigns it is also evident that even with interventions supposedly matched to the requirements of those in action and maintenance the attrition rate for these groups still reach levels almost akin to the 50% drop-out rate of new exercisers (Dishman, 1988).

Whilst matched interventions have been identified as beneficial for SOC PA progression the evidence does not indicate a similar trend for SOC FS progression when matched B results are assessed. In fact, cross-tabulation results indicate that receiving interventions matched to current SOC FS is associated with non-improvement in SOC FS for those below criterion;
significantly so between the 3-6 month intervention period ($\chi^2 = 7.616 (1) p<.01$). For those in the higher SOC initial indications were promising with only one in five (20%) regressing, however, when the full six month intervention period was assessed 60% had regressed overall. When follow-up logistic regressions were analysed only the matched B condition was significant, with a strong negative relationship being evident in the below criterion SOC. Those in the matched condition were 39% more likely to regress or remain stable than all other experimental groups in relation to fitness suite activity according to the cross tabulation results. When examining the regression results those who received the material matched to their fitness suite Stage of Change had only a 1.9% probability of increasing their fitness suite Stage of Change compared with other groups whose probability of increasing fitness suite Stage of Change was 23.1%. Thus, H3 is rejected; this may in part be due to the FS messages used being inappropriate for the stages of change targeted, particularly in light of the disparity in POC relationships in relation to FS, versus those encountered in the previous literature for physical activity, as this research was the basis for intervention (Cash, 1999; Marcus et al, 1992a; Marcus et al, 1992b; Prochaska, Norcross & DiClemente, 1994; Prochaska & Marcus, 1994; www.hebsweb.co.uk, 2000). Thus there may be a need for further examination of SOC by POC interactions in relation to structured activity as there seem to be different assumptions/relationships that need accounting for when structured activity promotion is the target.

This area is important for future research as the Transtheoretical model, most notably the Stages of Change, are regularly included in GP referral and primary care staff training (Ashworth, 1997) and it is important that these professionals are provided with the correct information with respect to the environment in which they will be attempting to change exercise behaviour.
Co-existing Intervention, Demographic and TTM construct effects

The discussion to date only includes Stage of Change and experimental group however, the Transtheoretical Model includes four core constructs of which SOC is only the temporal factor. It is the other three factors by which the experimental interventions were guided for their content, with SOC indicating which intervention was required at that point in time by the individual. In addition, in the previous chapter some of the demographic variables were implicated in Stage of Change movements as a result further logistic regression analyses were undertaken to assess the relative effect of variables other than the interventions.

Past research has tended to focus on which variables exhibit significant differences at different stages, thus the initial analysis carried out was cross-sectional in nature. These results were similar to those discussed in chapter 3 which should be expected of a representative subset of the original cohort of responders. In addition to this, it was decided to undertake cross-sectional analysis of the POC, DB and SE variables by experimental group. This was to ensure that the groups did not differ at baseline and to identify whether change was a consequence of intervention.

As expected there were no significant differences at baseline. None were evident at observation 2 either. However, at observation 3 (6 months) Self Efficacy (SE) was indicated as having significant differences. Self Efficacy has previously been identified as having a strong relationship with SOC distribution whereby SE increases as SOC increases (Marcus & Owen, 1992; Marcus et al, 1992b; Prochaska, 1994). Indeed there is a great deal of evidence which links improvements in SE with increased adherence to physical activity (Hofstetter et al, 1991; McAuley et al, 1994; McAuley, 1992; Sallis et al, 1992a; Schwarzer, 1992; Woods, 2000). In one study it was suggested that a 1 unit increase in SE score increased the probability of SOC improvement by 26% (Woods, 2000). On further analysis through post-hoc testing it was identified that SE for the mismatched group is significantly greater than the control or matched A groups.
Earlier crosstabulations and regressions identified that the mismatched intervention was associated with increased likelihood of maintenance in the higher SOC, thus higher Self Efficacy could be presupposed as a reason for this, however, as this experimental group was only linked with increased probability of maintenance in the first half of the intervention period and Self Efficacy is only significantly higher at the end of the intervention period then it could be reasonably postulated that maintaining activity actually increases Self Efficacy, rather than Self Efficacy increasing likelihood of maintenance. This conclusion however, cannot be supported by cross-sectional analysis. In order to examine the relationship between experimental group and TTM constructs further; another series of ANOVAs were conducted. The two time frames and overall intervention period were assessed with differences between experimental group and changes in Processes of Change, Decisional Balance and Self Efficacy variables calculated.

These analyses identified three significant differences. In the initial phase of intervention the change in CONS for physical activity was significantly different between matched A and the matched B and control conditions. This indicated that in the matched A condition the perceived costs of involvement in physical activity were significantly reduced when compared with controls and matched B participants where CONS actually increased on average ($\chi^2 = 8.481$ (3) $p<.05$). This, however, does not seem compatible with the crosstabulation and regression results previously reported where matched B is linked with increased likelihood of improving SOC PA (unless perceiving that undertaking physical activity has costs to the individual does not affect their attitude to or uptake of activity). This, result however, must be viewed alongside the fact that matched A and B have an increase in SE compared with the other groups (significantly so compared with controls ($\chi^2 = 7.649$ (3) $p<.05$), which supports previous work identifying that SE is more strongly related to SOC improvement than decisional balance variables (Marcus et al, 1994; Woods, 2000). This somewhat disagrees with the argument raised above with regard to SE, however, all it does is highlight
the problems with interpretation of relationships in a cause and effect manner when using cross-sectional data.

In order to make inferences such as those alluded to above regression techniques need to be utilised. The final analysis undertaken on this data set was binary logistic regressions. Again the analysis was split into below and above criterion behaviour with low SOC participants being assessed on improvement/non-improvement and those above criterion being assessed on likelihood of regression or maintenance of activity levels. All variables were included in the analysis (experimental group, demographics, POC, DB, SE). In order for inference to be made regarding the relative effect of the predictors the Wald Chi Square statistic was used.

A number of models were not computed as they did not reach significance; from the successfully computed resulting models a number of factors will be discussed. Again matched interventions are indicated as positive for increasing PA in the latter portion of the intervention. During the second timeframe analysed (3-6 months) this relationship was again exhibited for those in below criterion stages; in addition sex was also a significant predictor with females being more likely to progress at least one SOC. This is somewhat encouraging as cross-sectional results identified in chapter 3 and a previous study (Woods, 2000) have indicated that women are being more likely than men to be in lower SOC for physical activity. Thus, whilst they are less likely to be undertaking criterion behaviour they are potentially more open to the suggestions to increase physical activity levels. It was identified in the previous chapter that women have been found to have higher cognitive process use at lower SOC than men and also greater availability to social support and reward mechanisms which could potentially culminate in an increased likelihood for women in lower SOC to improve physical activity Stage of Change more readily than men as a consequence of simple low cost interventions. This is an area worthy of further study as women are regularly identified as having chronically low compliance.
rates in relation to health and/or fitness related levels of activity (ADNFS, 1992; Health Promotion Authority Wales, 1992). Further additions show that Dramatic Relief (DR) has a negative effect. This is in opposition to previous results which identify DR as a frequently used POC in lower SOC (Marcus et al, 1992a; Prochaska & DiClemente, 1983; Prochaska & Velicer, 1997c; Prochaska & Norcross, 1999) and suggest it should be used for intervention purposes in these stages. This result is, however, in agreement with Woods (2000) who identified that a young student population are unlikely to identify with dying in the near future from inactivity related causes. The study population discussed here, whilst not totally made up of students, 70.6% of the cohort were under 35 years. In relation to the relative effect of the variables in the regression when the Wald statistic is examined intervention and sex are the greatest contributors to change if all other variables are held constant when inverting the odds for non-matched interventions it is revealed that receiving matched interventions more than double your chance of gaining positive Stage of Change movements. With regard to sex; the probability of increasing Stage of Change is 32.4% if you are female.

Self Liberation (SL) and Stimulus Control (SC) both have positive effects on stage movement in lower SOC. This suggests that interventions aimed at these stages should concentrate on helping the individual make choices and formulate an intention to change along with providing information on how to control situations which promote inactivity and tips on maximizing cues for activity. The previous chapter, whilst highlighting the use of SC in the Contemplation stage does not identify SL as a useful POC until the transition from AX→ MN. However, previous findings do highlight this POC as useful in PR (Prochaska et al, 1994) and it was included in the intervention for this SOC. The reason for this discrepancy may be that self changers lack the ability to use this POC without help, but once they have moved to the action stage it becomes an important factor in their continued adherence to the behaviour. Therefore, with interventions those in preparation are able to use this POC as a means to increase their activity level and thus progress to Action.
With reference to above criterion stages, no interventions were implicated in the likelihood of Stage of Change movements; however, being a student was identified as reducing the likelihood of maintaining activity levels. Students were only indicated as having a 5.7% probability of improving or maintaining Stage of Change if all other factors were held constant. One possibility for this is that the final observation occurred immediately following a university vacation period and any lapses that happened during this period would be easily remembered, also they would have experienced environmental and social support discontinuity immediately prior to measurement. These confounding factors are however, not relevant to the employed participants as they are highly unlikely to have had any major environmental or social support network changes during this period. Another factor is that observation two results may have been artificially high in the student population as a consequence of the supportive environment of the university and the regrouping of social networks culminating in renewed commitments to be active with friends. Finally, it again could be postulated that course requirements may in the long-term manifest in reductions of physical activity levels.

Further study of this phenomenon is needed, as there is a need to assess whether the negative impacts of student life indicated here are transient or have a more pronounced long-term effect on physical activity adherence. This may have implications on a university’s role in promoting physical activity and uptake as part of its duty of care for its students. Whilst these results seem alarming attention must be drawn to the relatively low number (n=70) of participants in this study; however, this trend should be examined further. In addition to this factor, the regressions identified that interventions aimed at promoting maintenance require the advocacy of improving awareness of the social acceptability of having a physically active lifestyle (Social Liberation) along with the need to boost the realisation of how inactivity is a negative factor in relation to the social and physical environment of the individual (Environmental Re-evaluation). Whilst the
result for ER is in support of previous literature (Prochaska et al, 1994; Plotnikoff et al, 2001) and the results from the previous chapter (ER implicated in increasing likelihood of Maintenance), the SO result is unexpected. Social Liberation is a POC usually advocated to be most beneficial at earlier SOC (Prochaska et al, 1994; Plotnikoff et al, 2001) and was actually found to increase likelihood of regression from Maintenance in the previous chapter. Why it has a positive effect here is unknown. One factor maybe that those in the later stages are far more aware of the availability and acceptance of regular physical activity, which may impact upon their continued adherence to activity as there are no negative pressures from society to effect their commitment to exercise. Alternatively it could relate to the questionnaire. It would seem intuitive that people in higher SOC would indicate high levels of awareness of exercise acceptance and opportunity and this may indeed increase over time as their time in regular activity extends, but whether this an antecedent to the prolonged activity or a consequence of the extended activity level is unclear. When accounting for the results described previously regarding students, even with a 1 unit increase in the use of Environmental Re-evaluation and Social Liberation assessed on a 5 point likert scale the probability of maintaining criterion behaviour if you are a student is only 24%.

These results, whilst providing further insight into the development of interventions, need further analysis with larger cohorts preferably split into individual stages of change and in different populations for a fuller understanding of the effects of different factors to enable the production of fully stage matched interventions. However, a number of factors have been identified within this research. As a result of these findings H5 is rejected; whilst there were some indications that the matched interventions were still implicated more favourably in positive Stage of Change movements or maintenance, the Wald statistics identify that the effect does not always outstrip the effect of some of the categorical variables such as sex and status. This in part may be due to the fact that due to the interventions being designed based on previous recommendations then the
resultant target POC selected may not have been appropriate as discussed in the previous chapter.

**Summary**

Interventions matched to Stage of Change based upon previous empirical findings were beneficial in promoting significantly better SOC movements than a mismatched intervention or no intervention. However, regression analyses assessing POC, DB and SE variables in relation to positive stage movements identified other variables that were of benefit to SOC progression that were not necessarily included in the intervention. There is a need for more longitudinal studies to assess stage movements with concurrent POC, DB and SE fluctuations in order to further test the relationships between the core constructs of TTM to ensure future intervention design is the most appropriate available.

Intervention designs based on previous empirical findings and distributed matched to SOC FS had a detrimental effect on attendance at a sport centre fitness suite. There is a need to identify suitable matched interventions for structured activity with preliminary findings having been reported in the previous chapter. When examining the recommended target POC from past research on which these interventions were predominantly designed (Prochaska et al, 1994) along with two studies that published recommendations for stage progression in the exercise domain (Plotnikoff et al, 2001; Woods et al, 1999a) and the positive results from the longitudinal SOC FS study, it can be seen that there are no matches between what was included in the intervention and what was found specifically relevant to FS activity (Table 4.4.1). This may indicate the reason for the poor results of the intervention.

This highlights the need for further examination of the relevant antecedents to fitness suite uptake and maintenance due to the high level of availability of this type of facility in the UK (17 public and private facilities in the study locality...
alone). Whilst TTM may be able to inform interventions for this and other activity modes, as Table 4.4.1 (p148) highlights, there is still need for further research in this area. Only three processes are found consistently to relate to an increased likelihood of improving SOC (Table 4.4.1). These are Counter Conditioning, Helping Relationships and Stimulus Control; all of which exhibit significant positive relationships in the Contemplation to Preparation transition. This is an encouraging finding especially as this transition relates to the adoption of physical activity behaviour.

Another encouraging finding from this study is the positive effect that the stage matched interventions had on adoption and maintenance of physical activity particularly in women in lower SOC. Women have been found to have lower activity levels than men (ADNFS, 1992) and were also more likely to regress in SOC (study 1) than men. Thus it seems that a simple postal delivered cognitive oriented intervention has a positive effect on women; again supporting the findings in study 1 that woman may be more aware of cognitively based interventions, which is in agreement with Woods (2000).

Overall the matched interventions had a positive effect on SOC physical activity progression; however, the incompatible results from a number of studies highlight the need for further testing of the TTM in the exercise domain. Furthermore, the consistently identified relationship of CC, HR and SC to transition from Contemplation to Preparation indicates that physical activity adoption and maintenance may have different requirements in POC utilisation than the cessation research. As the recommendations for POC use across stages are historically based on qualitative research from the area of smoking cessation and considering the differences found above and in the previous chapter it seems that there is a need to undertake qualitative analysis of peoples’ attitudes and perceptions with regard to physical activity adoption and maintenance. As there have been numerous differences found between the Transtheoretical Model theory and the importance of certain variables at different Stage of Change in
these studies when compared with previous research then it seems necessary to assess the model qualitatively particularly as the original theory emerged from qualitative research. Thus, the next chapter in this thesis examines and reports these relationships.
Table 4.4.1: Cross study comparison of SOC * POC interactions.

<table>
<thead>
<tr>
<th>SOC</th>
<th>Prochaska et al, 1994</th>
<th>Woods et al, 1999a</th>
<th>Plotnikoff et al, 2001</th>
<th>SOC PA Study 1</th>
<th>SOCPA Study 2</th>
<th>SOC FS Study 1</th>
<th>SOC FS Study 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC</td>
<td>CR, HR, SO</td>
<td>DR, SR, SO, SL</td>
<td>CC, SL</td>
<td>HR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>DR, CR, SR, HR</td>
<td>CC, HR, SC</td>
<td>CC, HR, SC</td>
<td>CC, HR, SC</td>
<td>SL, SC</td>
<td></td>
<td>DR, SR, HR</td>
</tr>
<tr>
<td>PR</td>
<td>SR, SL, HR, DB</td>
<td>DR, ER, SR, SL, HR, SC</td>
<td>CC</td>
<td></td>
<td>CC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AX</td>
<td>CC, SC, RM, HR</td>
<td></td>
<td></td>
<td>HR, SL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MN</td>
<td>SL, HR, SE</td>
<td></td>
<td></td>
<td>ER, CC</td>
<td>ER, SO</td>
<td></td>
<td>CR</td>
</tr>
</tbody>
</table>

Only three POC exhibit similar relationships across studies in the exercise domain. All three are implicated in increasing the likelihood of moving from Contemplation to Preparation. None of these relationships agree with those proposed from cross-sectional research.
Chapter 5

Qualitative assessments of study drop-outs' perceptions, attitudes and beliefs in relation to TTM core construct interactions for adoption and maintenance of physical activity, the usefulness of the intervention material, and compliance to questionnaire completion.
5.0 Introduction

The previous two chapters have examined the Transtheoretical Model (TTM) empirically in a longitudinal style in both a non-invasive and invasive manner. The intention was to quantitatively analyse TTM core construct interactions within itself and between participant variables to increase the understanding of these relationships. In addition, the usefulness of this model for promoting adoption or maintenance of physical activity levels from the statistical standpoint; and through comparative methods with previous research was also undertaken. The overall aim was to establish the usefulness of the TTM for development of interventions and then test the effectiveness of stage matched interventions devised upon previous recommendations. This research was not limited to unstructured physical activity but also assessed the structured activity setting for further understanding of the demands for intervention design research based upon different definitions of activity. These chapters have highlighted a number of discrepancies with past research, along with the indication that there are different intervention needs for structured activity in fitness suite/gym settings. In addition participant attrition from the study was highlighted as a major defect of this research with longitudinal repeated measure designs being viewed as problematic in retention of subjects. In this case response rate was 22.7% at final observation when compared with original cohort numbers. As multiple sampling designs are needed to further test the TTM conceptual framework and its temporal sequencing of core construct relationships over longitudinal periods, along with the need to regularly assess Stage of Change (SOC) to ensure up to date cues and tips are provided based on staged matched interventions then there is a need to examine the potential reasons for non-compliance with questionnaire completion and return. Further to this it was deemed appropriate to assess the make-up and perceived usefulness of the stage matched interventions in a population who had not received the interventions due to a failure to respond to the call for volunteers for the intervention study.
As the participants had previously failed to respond to postal prompts for questionnaire return and also the need to extract as full and detailed a response with regard to the areas for investigation it was deemed that a qualitative approach would be most appropriate in order that as rich a description of the beliefs, attitudes and perceptions of societal and personal exercise behaviour was solicited, along with an attempt to map some of the reasons that may explain low response rates in general, but more pertinently in this research study population. Furthermore it was felt that a face to face evaluation of the intervention material was needed in order to develop and refine the material for appropriately stage matched clients as a call for comments from intervention participants had yielded a small response (n=3 ~ 8%). In addition to this and as described previously; the original Transtheoretical Model was developed from qualitative studies of self changers in smoking cessation research. Whilst the drop out observed in physical activity uptake/maintenance research and that seen in addictive behaviours such as smoking cessation are similar (Hunt, Barnett & Branch, 1971), it has also been observed in the earlier research utilising the framework of the Transtheoretical Model that different interconstruct relationships (later peak of experiential and earlier peak of behavioural processes of change) are evident when compared with a cessation activity such as smoking. This leads to the conclusion that there may be subtle differences in the operationalisation of the model in adoption activities such as exercise (Marcus et al, 1992a). Despite this there has not been any exploratory analysis of the Transtheoretical Model on a stage by stage basis from a qualitative standpoint, with measures used in physical activity research being developed directly from the empirical items used in smoking cessation (Marcus et al, 1992a) rather than from a qualitative perspective; as were the original theory and measures in smoking cessation research (Prochaska & DiClemente, 1982).

Qualitative enquiry benefits from the ability to describe, interpret, verify and evaluate rich descriptions of variables and theories as a means to illuminate unknown or tenuous aspects of the research area under examination (Strean, 1998). It is also viewed as a suitable means of verifying and evaluating
previous research findings and conclusions. However, what the researcher will be able to discover, and relate to their audience will reflect their paradigmatic, ontological and epistemological standpoint.

A paradigm is a world view, a research tradition that is deeply embedded in the social world of its adherents (Patten, 1978). Every individual who engages in research does so through a set of paradigmatic lenses (Sparkes, 1994) with a research community being identified by the methods and problems they have as a commonality (Shulman, 1986). There are three major paradigms: Positivist, Interpretist and Critical (Sparkes, 1994), with this so called world view or general perspective being shared across disciplines as common beliefs, commitments, values, methods and outlooks, which determine the tradition guiding the research (Kuhn, 1970; Schwandt, 1997).

The ontological standpoint of the researcher defines the form and nature of the reality the research is viewed under, in that the data can only be analysed from the sense of the real world view the researcher perceives as their own (Guba & Lincoln, 1998), which is strongly influenced by their paradigmatic tradition as this considers what can be discovered about the real world. As a consequence the epistemological perspective or what the researcher thinks they will find; what they will tell their audience and what they believe is acceptable as knowledge is substantially defined by ontological position as it is in essence the underpinnings of the researcher, subject interaction.

As discussed there are three major paradigmatic traditions (Sparkes, 1994), and, as a result of these traditions, the perceptions of reality along with the thrust and, in some cases the anticipated outcomes of the qualitative enquiry undertaken, are anchored to the lenses the researcher views the world through which is embedded within their social existence. In order to understand which perspective and to be aware of the foundations of the paradigm selected for the qualitative analysis the ontological and epistemological leanings of these said traditions are summarised below along with a rationalisation for the viewpoint selected for this study.
A positivist ontologist postulates that what exists is real and assumes a "stable reality" (Oakley, 1999 p.156), which reflects concerns for validity and reliability and the need for credibility of the research to be determined through proof that the phenomena identified exist and can be measured empirically in a way that seeks facts, identifies social phenomena and establishes cause and effect relationships (Oakley, 1999). However, whilst using this scientific method to study the reality that exists outside the human mind to obtain true knowledge in the natural and physical sciences is accepted (Hoshmand & Polkinghorne, 1992), this positivist epistemology in both social and psychological enquiry is that we partial out the world and study the parts independently (Strean, 1998). This eliminates any interaction between the researcher and study matter in order for a true emergence of reality (Guba & Lincoln, 1998). This external perspective assumes that for validation's sake the biases, opinions and interpretation by the researcher are removed from the findings of the research (Oakley, 1999). Whilst this is the most appropriate method for disciplines such as biomechanics and physiology, psychology is concerned with people and their perceptions, feelings and beliefs as a basis for the behaviour they exhibit and is not so black and white. As a means to depart from this positivist domain where reality exists as an empirical entity (Sparkes, 1994), many qualitative studies, particularly in sport psychology, adapt the methods available to their specific needs. Such an example is post-positivism where the researcher believes there is a reality to be capture but does not feel that one paradigm's methods are enough (Culver, Gilbert & Trudel, 2003). Thus, qualitative methods from a more interpretist/constructivist paradigm are used to assess whether anything has been missed. However, the researcher gets pulled back into the positivist paradigm to become accepted through such methods as triangulation and techniques associated with grounded theory such as semi structured interview and content analysis. In addition, efforts to remain objective and attempts to align the outcomes with past theories imbue the process (Guba & Lincoln, 1998). The positivist paradigm and post-positivist position are the predominant pattern of research in the sport psychology domain (Faulkner & Biddle, 2001).
The interpretist paradigm is based on the assumption that knowledge is socially constructed (Bain, 1989). An interpretist would reflect on what others say and not create their own view based on others' opinions and views, they want to understand phenomena not challenge them and may check that their interpretations are correct. Constructivism is interpretist in essence although these researchers take that extra step, where following reflection on their subject's knowledge, the constructivist uses this and their own knowledge to generate a third knowledge; no checking of interpretation would occur as the point is to construct their own meanings. The ontological perceptions of the world from this paradigm consider that reality is dependent on the social and experimental setting and is mentally formed (Guba & Lincoln, 1998). Constructivists believe that social experiences construct the researchers' reality with alterations in the mental construct altering reality (Richardson, 1996). A true reality is viewed as untenable as the reality constructed may be meaningless to others as it is specific to the researcher and population studied at that time point. Epistemologically, the reality identified is constructed through the interaction of the researcher and subject and cannot be generalised to the social world as any findings are resultant from this interaction with the perceived ontology changing as new interpretations and understanding are developed (Miller & Glasner, 1997). This would lead to an emergent interview design as the schedule is continuously adapted on the basis of each interview (Faulkner & Biddle, 2001). This 'unscientific approach' is not often found in the sport psychology literature as journals in this field attempt to show rigorous-valid results as the positivist standpoint of sport science research and dissemination is the preferred method with empirically driven research being the crux for credibility of sport and physical education research (Rutherford, 1990). The consequence of this is that sport psychologists feel the need to seek non sport-specific journals for publication of research outside the positivist genre (Biddle et al, 2001).

The criticalist approach is the third major paradigm (Sparkes, 1994). Criticalists are concerned with the broad social historical context in which underlying phenomena interrelate. This approach combines the social, cultural and economic experiences which form beliefs into an individualised
reality based upon historical facts. It attempts to move the interpretive paradigm beyond its uncritical boundaries of the subjects’ self-understanding to clarify, explain and eliminate the causes of the individual’s reality and the “distorted self-understanding” which manipulates and controls the individual’s behaviour and perceptions (Carr & Kemmis, 1986 p.137). Thus, the researcher should not have any epistemological assumptions as the accepted knowledge emerging from this paradigm are heavily reliant on the researcher’s and subjects biased values, the challenge is to remain subjective as the findings are contingent on the researchers values which are an indicative part of the research (Guba & Lincoln, 1998). The aim is to identify and understand the causes of peoples’ ‘distorted understandings’ and to help them change their perceptions (Carr & Kemmis, 1986). Within this research process the participants and researcher need to share decision making, interpretation and understanding to reveal truth, whereby the process of understanding alone is the reality without the need to link the implication of the knowledge gained to models or theories. This approach acknowledges that past experiences on many levels are critical to current behaviour and results in a more rounded or holistic realisation and approach.

In summary, there are a number of paradigms which offer the availability to gain a broader and richer understanding of reality. They offer contrasting truths or different outlooks on the world. No one is better than the other just distinct and all have their part to play in contributing to knowledge and as such need to be aware of each other (Biddle et al, 2001). They also have the ability to back each other up by offering different ways of knowing resulting in the potential for a more rounded knowledge base.

Few published studies utilise qualitative methodologies in the field of exercise behaviour research. The assessment of subjective perceptions of physical activity and how an individual’s beliefs, attitudes and past experiences may effect intervention requirements with reference to adoption and maintenance of regular physical activity and structured activity is needed in order to elucidate a deeper more complex understanding of how interventions may work in the real world. In addition, this approach may also help realise a richer
understanding of the reasons why participants do not adhere to inventory completion and also aid in describing and interpreting how interventions have the potential to impact upon the individuals. This potentially has the advantage of advancing intervention research and design resulting in a greater impact of interventions upon the population at large.

5.1 Methods

Qualitative methods were adopted as such techniques have the potential to unearth some of the unique information individuals have with regard to physical activity adoption and maintenance. The qualitative process identifies the need to make sense of and identify meaningful patterns, and construct a framework to communicate the essence of the data (Patten, 1990). It allows the researcher to study the areas of interest in greater depth and detail and is well placed to aid the description and understanding of the complexities of the questions being asked.

The paradigmatic assumptions of the research are of the post-positivist/interpretist ontology utilising various methods attempting to describe, interpret and understand the nature of the complex issues of adopting and maintaining physical activity at or above criterion level. It must be accepted that all phenomena are subject to interaction, thus, objectivity must be attempted throughout, although acceptance that this may not be possible is implicit in the epistemology of this paradigm. This is predominantly due to the requirement for researcher presence as a tool for the selected enquiry method of semi-structured interviews. However, if these issues are accepted from the outset and the researcher acknowledges the need to remain objective then the possible influence of researcher bias should be reduced. Add to this the use of “external guardians” such as past research or persons not involved in the study (Guba & Lincoln, 1988p.205); along with member checking then objectivity and verification of interpretations can be guaranteed as much as possible.
5.1.1 Design

An interview guide was developed which was constructed in four sections. All sections were completed in one session. The interview guide was standardised although the order of topics was flexible within sections allowing for the probing of interesting issues that emerged. The sequence of sections did not deviate from the interview guide.

Section:
1. Demographics and SOC clarification;
2. Open questions with probing on thoughts, feelings, emotions, experiences, attitudes, perceptions and beliefs;
3. Semi-structured questions on inventory completion;
4. Semi-structured questions regarding the stage-matched interventions.

Pilot interviews were undertaken to ensure consistency in sequencing of sections and question phrasing. In addition, it was an opportunity to confirm that the interviewer was able to build rapport, put the interviewee at ease and elicit open responses when asking the questions indicated on the guide (Patten, 1990). Following the interviews the participants were asked verbally to indicate any problems with the question content and their perceptions of comfort before, during and after the interview. Only one area was noted as being problematic. This involved the questions that asked about their failure to return the inventory as they perceived being “put on the spot” and being “told off” about not returning the questionnaire. As a consequence the questions “Why did you fail to return the questionnaire” and “Did you receive all the reminders” were altered to “Why do you think people sometimes do not return postal questionnaires” and “How effective do you think postal reminders are to encourage questionnaire completion and return” respectively.

The pilot interviews were also viewed as an adjunct to the researcher’s formal interview training provided as an ongoing process of the doctoral development experience. It was primarily seen as an opportunity to test run the questions to
identify any problems with the ordering of the questions and also as a means to habituate the researcher to the interview guide. At all times the researcher attempted to remain impartial and to adopt a neutral stance to avoid biasing responses and to encourage the interviewees to be open and truthful in their responses.

5.1.2 Procedure

At the beginning of the interview\(^9\) the participants were informed of the general content of the interview and the voluntary nature of their participation. Confidentiality was also addressed and they were asked whether they had any questions or problems regarding the interview that was about to begin. They were informed that the transcripts would be checked by an "external guardian" to assess the interpretation of the interviews and were assured that at no time would their name or other data protected information be revealed. They were also informed they would receive a copy of the transcribed interview and the researchers' interpretations to allow member checking. All subjects were thanked for their involvement and the importance of their participation was re-iterated.

5.1.3 Data Preparation and Analysis

5.1.3.1 Transtheoretical Constructs (SOC and POC)-Inductive Approach

Tape recordings were transcribed literally and then scrutinised through a process of close reading in order that the researcher could become immersed in the data as a means of understanding the participants' perceptions. In the first instance the inductive analysis was used to extract the participants' thoughts, feelings and experiences regarding physical activity, when these themes were extracted from the data they were coded quotations representative of the themes emerging which served as units of analysis (Coffey & Atkinson, 1996; Maykut & Morehouse, 1994).

\(^9\) The interview was conducted in a private office located on campus which was either local to the interviewees' homes or which they visited to study/work.
On completion of the analysis the coded data and interpretations were forwarded to a qualitative expert who was challenged to provoke discussion with the researcher with regard to the connections and interpretations devised as a means of developing authenticity and believability (Sparkes, 1998).

Finally the case analysis was forwarded to the participants for member checking (Lincoln & Guba, 1985) which offers the opportunity for the participants reflexive elaboration on any topics or areas of the text which have been interpreted incorrectly with regard to the reality of the participant or factors which the participant believes important that they failed to detail fully during the interview (Bloor, 1997).

5.1.3.2 Transtheoretical Constructs (SOC and POC) - Deductive Approach

As the interviews were designed around a conceptual framework Deductive Content Analysis (DCA) was also selected as an analysis method. This consists of assigning the participants statements to categories predetermined by theoretical grounds (Patten, 1990).

It differs from the inductive approach as themes do not emerge, but participant's responses are assigned to categories developed from the theoretical framework underpinning the interview questions. The inherent bias involved (Lincoln & Guba, 1985) is offset by the coherent interpretations that can be developed from complex psychological and behavioural processes (Patten, 1999). This method is particularly useful for in-depth analysis of theoretical constructs allowing elaboration and reasoning to become immersed in the truths and realities with regard to the behaviour in question.

This method was used as a means to understand and interpret the inductive themes that emerged from the analysis from the perspective of the Transtheoretical Model and to identify any discrepancies between the stories that emerged from the interviews and the relationships expected from the Transtheoretical Model. Using this method allowed expansion of
the emergent themes within the framework of a theory whilst exposing new variables that may add to the utility of the model in the exercise domain.

5.1.3.3 Participant Selection

20 participants were invited to attend interviews. They were drop outs from the original cohort of 308. This sample was selected as it would be expected to conform to the overall study cohort characteristics as they made up part of the original convenience sample. In addition, this group would have some previous experience of completing the questionnaire along with recent failure to return the questionnaire. Furthermore, as the invitations were extended to those who failed to respond to the call for volunteers for the intervention study it would be expected that they would not have seen the interventions previously. Of the invited cohort 15 attended for interview; following the interviews 5 were discarded due to the feeling by the interviewer that they were seeking to provide expected answers and were not truthful throughout their interview or the interview lasted less than 30 minutes and there was a failure by the interviewer to glean elaboration on question response. The final 10 interviewees were made up of all five SOC: PC (1), C (3), PR (2), AX (2), MN (2). A multiple case design selecting randomly one individual from each SOC was selected as the most appropriate method of analysis.

5.2 Results / Interpretation

Case Analysis: Amy

Profile

Amy is 30 years old and lives with a group of friends. She is a student but also has two part-time jobs to support her financially. She does not indicate any particular interests apart from socialising. She seemed relaxed during the interview and appeared to answer questions candidly and without hesitation. Past activity levels were greater than present and she feels that her current activity levels were not ideal for her health and well-being. In addition, bereavement still weighs heavily on Amy's mind and she feels that this is also one of the reasons behind her current activity levels although this factor was
not mentioned within the actual interview process as a barrier. On reflection she answered openly about her feelings with regard to activity. The interview length was 70 minutes in total.

<table>
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<td>I just haven't got time... I was so intimidated by the other people there you know the other thin people... I think I would exercise more if I have the stuff but only at home. I can't bear the thought of exercising in front of people especially if they're thin... it's just I need that kind of support from a friend or whatever, and also I need the right opportunities... not aerobics or anything I can't think of anything worse but you know I like cycling but haven't got a bike and even if I had wouldn't have a clue where to go that would be OK for me... god I feel like I'm just making excuses but I just don't think it's all come together for me and that's why I'm still stuck in a rut and can't seem to escape.... I'd really like to go swimming but the changing rooms are so freezing it completely puts me off going in the winter and in the summer it's full of kids so you know a nice facility and also money you know I just can't afford a gym or anything like that.</td>
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Amy appears to be adept at rationalising her lack of activity with reasons such as time, cost and equipment to the externalisation of the seasons and others which stop her taking part in swimming. These are proposed as key factors in preventing movement from PC to C (Prochaska et al, 1994). In addition, her self-esteem is an issue as she feels intimidated by the thought of being active in front of others particularly those she classifies as "thin"; as a result she is disheartened and admits to being "stuck in a rut and can't seem to escape" and in a way resigns herself to her fate and accepts she will remain in this behavioural quandary.

Within this section the CONS of activity are apparent which would be expected according to the TTM at this Stage of Change (Prochaska, 1994). A factor that further exacerbates Amy's CONS is her low self-esteem with regard to body image. The idea of exercising in front of others allied with her perceived lack of suitable facilities, equipment, opportunities and support combine to elevate the cost of activity to Amy particularly in relation to disapproval of herself and the perceived disapproval of others (Janis & Mann, 1977). These factors combine to create too great a hurdle to seriously think about exercising particularly when we consider Amy's adeptness at
rationalising her sedentary behaviour. Past research suggests that it may be the PROS of activity that would be the most beneficial to target (Prochaska 1994) and this would, in this instance seem to be most appropriate with a combination of Consciousness Raising (CR)\textsuperscript{10} and Helping Relationships (HR). With reference to CR the information Amy needs is regarding suitable opportunities, facilities and equipment. In addition, HR would seem important particularly in relation to a training partner as this would provide camaraderie and may reduce any feelings of isolation Amy may perceive as a lone exerciser.

\section*{Awareness}

I know exercise is good for your lungs and particularly swimming which is good for my asthma...there's been lots of stuff on obesity and things on the TV and in the papers. Also about how much its gonna cost the national health and stuff like that I suppose if we all got off our backsides and did something then we'd stop being a drain on the NHS ...I think all the reports and that do make you more aware of all the beneficial aspects of exercise because of health programs but that's only because I'm interested in watching them... the information is there but its only if people choose to take that information in it might have an effect and then still people have to make the choice to take action... all this sort of stuff does make me think you know... making different programs which aren't patronising and making the programmes more mainstream and even sort of non educational because the people who watch educational programs may be the type of people who would know this stuff anyway... its not like you can change the law to make people do it... people do get turned down for operations because they're too big and stuff so I guess the message needs to get out there. Maybe if this sort of stuff was publicised more it would give people a kick up the behind... I read stuff on diet and exercise so I know what it can do for me but I just can't get going.

Amy states that she knows that exercise is good for her and she actively seeks out information about activity and health; however these programmes are “patronising” and she just can not get going. Key to this may be the projection onto society that is evident from her comments “give people a kick up the behind” “its not like you can change the law to make people do it” in all of these comments it is never ‘I’. Amy does indicate that it maybe her problem “if we all get off our backsides” but again implicit in this is her diagnosis of society with her problem. This is another defence that precontemplators use to deflect the idea of change (Prochaska, et al, 1994). Indeed implicit within

\textsuperscript{10} Reference to Processes of Change are made in light of the definitions of Marcus et al, 1992a (p.425) presented in table 2.2.2.4 p28 in chapter two of this thesis.
these comments may be that if others took action then perhaps she would not need to, as the burden on the NHS would no longer be there. In contradiction to this is her previously highlighted seeking of information; however, she then removes herself from the equation again by stating that “people” still have to make the “choice to take action” and indicates this only makes her think about activity and not formulate any intentions to be active.

This section highlights Amy’s knowledge about the benefits of activity and the fact that she is interested in the outcomes, this indicates that Amy does raise her consciousness regarding her inactivity and what she could get from being physically active (PROS); however, she intimates that for her there is no awareness that society in general is active and thus may not be able to accept that physically active lifestyles are available (Social Liberation). To further compound this issue is the acceptance that even if options are available there is still the freedom of choice which relates to Self Liberation where choice, commitment and belief are key to changing the problem behaviour (Marcus et al, 1992a).

In this case CR would again be a likely candidate for intervention but, in here it would be in relation to the awareness and availability of physically active lifestyles (SO). Furthermore choice and commitment are also target POC needs (SL). Amy is aware that she has choices but seems uncertain whether she would act upon them.

Externalisation
I did do before but that’s because a friend used to make me go (ha, ha)... I suppose if I had to you know, if the doctor said to me “your blood pressure’s really high go to the gym” then I would. Well I’d like to think I would... I don’t think it would help if it was coming from a boyfriend though; I’d be like...”so you’re trying to say I’m fat then”... its just I need that kind of support from a friend or whatever, and also I need the right opportunities...my friend bought a subscription for a gym and I could go with her but she’s only been a couple of times and wasted loads of money, maybe if I went it would encourage her but how I see it happening is we’ll both end up moaning about how much money we’ve wasted and not be able to motivate each other...The only time I’ve been regularly active for a long time has been when I used to go with my housemate and it was like she was doing lots and I used to get dragged along to stuff like aqua aerobics but it was good and I did enjoy it...
Externalisation Continued...

she's still swimming everyday but now you know; she's not around to give me a hard time anymore so I just don't do it...its not about letting myself down its about letting someone else down; it kind of takes it out of my hands. If I know they're coming down then I can't get out of it or they might shout at me and bully me into doing it but it works that's why I think I need a personal trainer...I know for sure I wouldn't pay for that and miss the session, for me I feel that it's the only way for me or at least a very important factor for me... basically I just can't commit to exercise its like having a fling its fun but it doesn't last...Also its like not part of my lifestyle or my friends you know none of them are active its always I'll see you later in "pub name"... I guess that doesn't help.

When talking about friends Amy indicates that in the past a friend was a catalyst, however, there was no choice on Amy's part. She wishes to become active but to have no control over it, even though she has a friend with whom she could make a pact to be active she still feels doomed to remain trapped in inactivity and feels hopeless. She is willing to let herself down and now that her current social circle is predominantly inactive she can use them as scapegoats for her activity levels. Even when confronted with the idea that a GP advises her to be active she initially says that this would make her change but immediately say that she would “like to think” she would which defends herself from any awkward self analysis another skill of the precontemplator (Prochaska et al, 1994). When considering how a partner may impact upon her activity levels she again indicates that a displacement onto another person may occur, possibly resulting in anger; again displacement is a regularly used resource of the precontemplator to ward off negative comments from others (Prochaska et al, 1994).

In this passage Amy again highlights her need for support to even begin thinking about being active. Whilst it is apparent Amy has the opportunity for this she does not think that this friend would offer her the controlling influence she feels that she needs. In addition, again commitment is an issue; when examining her most recent regular activity it is apparent that she was not the one who made the commitment and highlights that she needs to be coerced into the activity, and despite enjoying it, once this influence was removed she returned to inactivity.
In this case Amy needs to solicit the aid of her friend to discuss the possibility of beginning exercise, but within this Amy needs to incorporate a personal element of choice and commitment. The decision about what activities to take part in needs to be formulated as a joint plan in order to enhance Amy's commitment. It seems that in order for Amy to change she needs to take some responsibility for her actions and choices and until this time it may be that she will not begin to believe that change is an option. This combines Helping Relationships and Self Liberation.

Routine

I just haven't got time; I've got two part-time jobs and am a student so... So at the moment I'd say other things are more important to me than exercise...other things come up and then you miss a session then you make up excuses not to go and that's it really...I used to you know every morning I would do floor exercises and stuff and I'd like to do that again because that was good you know just sit ups and that just a routine I did every morning...I just think its juggling the jobs and my studying. But you know the feeling that you've done it everyday though that's a great feeling... maybe I can do it again get myself a routine as I have already had the results before but then I now tend to think I'm too far gone...Also its like not part of my lifestyle or my friends you know non of them are active its always I'll see you later in "pub name" I guess that doesn't help.

Again rationalisations are evident in Amy's discussions "juggling the jobs and study" and also the current lifestyle of herself and her friends. She does however, highlight that when she was active under her own volition she felt great and as though she had achieved something going as far as telling herself that maybe she could do it again, but self doubt remained an issue and she seems to admit defeat "I now tend to think I'm too far gone" and resigns herself to not changing.

This emphasises the value that Amy places on exercise and that it is less than work, study and friends. Whilst all are important factors in a balanced lifestyle in order for Amy to change she could possibly need some help in how to increase the importance of activity to herself to aid her in putting these valuable factors into context so that physical activity is no longer the most expendable lifestyle choice. Despite the high level of knowledge declared
previously Amy does not indicate that physical activity is important to her and that this knowledge has any impact on her intention to be active. Again, CR would be a useful tool in this case allied with Dramatic Relief (DR) as this would help to highlight the long-term consequences of inactivity (Marcus et al, 1992a). Whilst in a previous section she indicates that obesity is an issue and also intimates her own poor body image she does not inform regarding other health issues. It may be that whilst CR is occurring the main consideration is her weight and either she doesn’t accept or is not fully cognisant of or doesn’t care about the other health related issues of inactivity something which DR would help to make apparent. Furthermore, Self Re-evaluation would also be a helpful tool as this would allow Amy to re-evaluate the value she places on exercise both cognitively (CR) and emotionally (DR) (Prochaska et al, 1994). Thus, CR and DR need to combined for this participant, which should help her to re-evaluate her values with regard to physical activity (SR).

**Self Analysis**

I do know its good for you...its good for you’re moods as well and for depression but I just haven’t got time...the tabloids and stuff, their attitude to people being overweight is just different again its derogatory and you’re not a real woman or man if you’re different...it makes me panic and worry that I’m making myself ill, not helping myself enough which leads to depression which leads to eating which leads to cigarette smoking, excessive drinking and there we go and no exercise. So I kind of punish myself in a kind of downward spiral...I think that’s what its all about really you know losing weight looking like some model rather than health...I’d say for me definitely its for vanity but then again that’s the downward spiral for me as I’m pretty vain and I’m overweight...recently its a bit more health related again its derogatory and body image cause that what we’ve got rammed in our face all the time everywhere you go...it’s all about body image. Like in a gym its surrounded by mirrors...like I said earlier it’s like a downward spiral I start getting frustrated and I blame myself...it’s not about letting myself down its about letting someone else down; it kind of takes it out of my hands. If I know they’re coming down then I can’t get out of it or they might shout at me and bully me into doing it but it works that’s why I think I need a personal trainer...I just think its juggling the jobs and my studying. But you know the feeling that you’ve done it everyday though that’s a great feeling and your self esteem is better and you start the day with an achievement, then after that body image comes along like a bonus. I mean its maybe something I should focus on to help me...even in the high street I can’t even get clothes I want...to me there’s just middle aged shops or shops for teenagers nothing for normal women you know.
Amy does try to analyse her behaviour during the interview, she attributes the positive outcomes of exercise to factors such as vanity and body image and indicates a degree of self blame with regard to her activity levels. She feels that society is letting her down through the images portrayed as ideal and whilst she feels that she is a normal woman it seems that the high street is denying this. In addition, she is aware of her other worrying health behaviours which she feels emerge from self analysis; possibly resulting in the idea to give up on her behaviour ever changing. This could potentially result in her current problem behaviour becoming more dominant through her excesses. She does not believe she can change by herself and indicates she needs to be cajoled into exercise something she has mentioned earlier. However, one thing that Amy could concentrate on is the fact that she has stated how good she has felt previously when she was exercising and that her self esteem was much better, and thinks that this would be worth focussing on in order to help herself. This is the only time during the interview that Amy talks about helping herself and does not expect to be encouraged, bullied or have everything taken out of her control.

Self analysis is occurring, with CR seeming to be inextricably linked with body image and societal pressures causing reductions in self esteem. Again this process seems to be key here as Amy is evaluating herself according to the sources of the information she seeks which further impacts on her self esteem. The Self Re-evaluation evident here is not in line with the POC (SR) but her ability to evaluate should be built upon with a re-direction aimed at focussing on past positive exercise experiences to increase self efficacy (Bandura, 1986) and further re-assessing the value of exercise to Amy.

Reflective Summary:

This analysis has highlighted that Amy, whilst conveying the message that her behaviour is not the ideal, she is able to validate her current behaviour very reasonably. In order for Amy to change she may need to become more aware of her defences and whilst she seeks information regarding the behaviour she could perhaps re-assess her perceptions of this information. She could work
on accepting that whilst she perceives physical activity predominantly as a means to fuel her vanity and promote her body image it also has other benefits. She does indicate that this is something she has considered but returns to weight, vanity and body image like a mantra; which are perhaps things she can trivialise and put off until another day. In this way she does not have to confront the real issue of how physical activity could improve her health and well-being. She needs to become aware of her defences and analyse her resistance to change; in order to do this Consciousness Raising is the key (Prochaska et al, 1994). In addition, Amy may need to accept that she is responsible for her own actions and cannot expect others to be her crutch, however, it is also obvious that Amy requires a lot of support in order to change but this support needs to be accepted as such by Amy and not seen as something over which she has no control and input. In the first instance she could require help to identify and overcome her defences rather than someone whisking her away to be physically active as this activity would not be sustained if this controlling support was removed if her past behaviour is anything to go by.

From this analysis two POC are evidently used by Amy (CR and SR); however in both incidences these processes may need some re-direction. From the themes that have emerged from the interview a number of POC have been highlighted as a useful source of intervention to increase the PROS and reduce the CONS of activity for Amy with the intent, being a positive SOC movement. Below is a comparison of these results with those from this thesis and past research.

When comparing the findings from the interview, whilst there are differences between studies, it is apparent all of the needs for Amy are indicated. These results fit well with previous TTM findings. However one factor that cannot be explained or alleviated by the TTM is that of body image. This factor was discernible from a number of comments made by Amy in particular were her feelings of intimidation and the unbearable thought of exercising in front of people. This may relate to Social Physique Anxiety (Hart, Leary & Rejeski, 1989) and will be discussed later in this chapter.
Recommendations from:
Interviews | Past research
---|---
CR+DR | Prochaska et al, 1994
CR+SL | 1994
CR+SO | Woods et al, 1999a
HR+SL | Plotnikoff et al, 2001
SR | Chapter 3 (p 73-133)

Case Analysis Robert
Profile
Robert is 22 years old. He is a full-time student and the main interests he has are sport (watching), drinking and the cinema. Robert was previously a dedicated sportsman competing at both school and in local leagues; his main activity was Rugby. He sustained a back injury through sport approximately 18 months ago and was given the go ahead to return to activity 9 months ago. Since this date he has unsuccessfully attempted to take up gym/weights type activities along with trying a number of classes ranging from Circuits to Pilates. He is not able to return to his previous activities due to re-injury risk and is struggling to find a suitable replacement activity. He seemed to answer freely during the interview which lasted 45 minutes.

Commitment
I haven’t been able to find my old level of enthusiasm or willingness to go that extra mile...you know you should be doing something but you can’t always manage to and that can kind of like works the opposite effect and you think whatever I can only do what I have time for... I have tried lots of different stuff as well even Pilates as I’ve heard that’s supposed to be good for you back but I just didn’t like it. Its pretty boring really, I went for a couple of weeks but it just wasn’t for me... well I kind of look at it like this if you don’t enjoy it then don’t force yourself to do it...

Those POC in bold denote matches between previous research and the recommendations from the interviews.
Commitment Continued…

I wouldn’t eat stuff I didn’t like just because its good for me, if I don’t like it I don’t eat it. I mean its also a time and energy thing too I don’t have the time and won’t put the energy into doing something I don’t enjoy just because it good for me you know... I would like to do some sort of exercise once or twice a week but don’t seem to be able to get into a routine, you know college and stuff kind of gets in the way. I go through fits and stages its kind of like I get into a routine and then something comes up and I miss a couple of sessions, that’s it then back to square one. It’s frustrating you know... Its probably about a month since I did anything to be honest, but I always start the week thinking I’ll do something about it but then it just gets pushed aside for other stuff, mainly work or study... not always though sometimes I get in turn on the TV and my plans go out of the window... I suppose leaving yourself notes or maybe putting it on your to do list, I have to use them otherwise I don’t know whether I’m coming or going, yeh that could work I guess. I dunno though maybe some people find it useful, I’m not sure I would... just telling yourself you’re gonna do something well it just doesn’t work... what if you fail you’ll look like a right prat won’t you. I mean broadcasting that you’re gonna go to the gym three times a week on such and such a day, what if you don’t go you’ll have to hide in a cupboard when you’re supposed to be there. No I think that’s something I definitely wouldn’t do.

Robert seems aware of the problem (physical inactivity) but he cannot make the next step and he still uses his defences with his major rationalisation being time (Prochaska et al, 1994). He attempts to take action and either does not take action or drops out this could be due to a lack of preparation and trying to take action too early (Marcus et al, 1998), he also indicates a fear of failure “look like a right prat” and points out he will not do it just because its good for him, thus he may need to find reasons to change and increase PROS for changing (Prochaska, 1994).

The CONS for activity are evident. Furthermore, he seems to lack in commitment to the change process; whilst he acknowledges he has tried different activities and has even been regularly active fairly recently he indicates other things curtail his commitment (Prochaska et al, 1994). He does allude to a possible way of helping himself (contracting), however, his current ‘fear of failure’ will not allow him to be open to defeat so he does not attempt it again.
In order to address these issues CR and RM are recommended with goal setting as a key vehicle for this (Prochaska et al, 1994). He needs to change the contingencies that control his current behaviour (RM) by raising his consciousness to other activity opportunities and the benefits of exercise thus increasing the PROS and using this knowledge to set attainable goals reducing his fear of failure enabling him to prioritise activity thus, impacting on his commitment and belief in change (SL) (Prochaska et al, 1994).

Awareness
nothing specific really just general stuff like heart problems and also may be gaining more weight. I've read that being overweight is a major risk for lots of things especially heart problems but also diabetes and stuff like that. I really don't want to be worrying about that stuff when I'm older so I think I should try and do something about it now while I'm still young... there's always something in magazines or on TV about health and how exercise is one of the best ways to be healthy along with eating properly and not smoking... You read all these statistics and it can be a bit worrying but its everywhere and sometimes you just think like OK you know I get the message but if you just can't find the time and that you can get you down about it... you know you should be doing something but you can't always manage to and that can kind of like works the opposite effect and you think whatever I can only do what I have time for ... I suppose we'll get fatter and sicker from heart problems and stuff. I don't know really but erm I guess it doesn't look too good in the long run does it? It is kind of worrying especially when you think I'm only 22 and can see a difference from only a few years ago really I mean what's gonna happen in 50 years who knows its kinda scary when you look at it like that... I have read lots about different sorts of exercise, when trying to choose something for myself especially due to my previous injury... I kinda take the information in as I look out for it but I suppose if you have no interest you just wouldn't read it would you, like when there's stuff on politics I just don't read it... you just feel good, physically and mentally, and there's lots of health benefits you know for your heart and lungs and stuff. Yeh I always seem to sleep better if I am more active...probably just more tired at the end of the day.

Robert has used his imagination to examine how he may feel in later life if he does not change; he also recalls benefits from past activity bouts. However, he feels that sometimes the information available over emphasises the need for change and he becomes resistant to the thought of changing; this could relate to procrastination as he does seek information but does not appear ready to prepare to act, does not seem to finalise decisions and gives the impression he avoids action. All of these factors combine to create a
comfortable unchallenging place for the contemplator (Prochaska et al, 1994). This ambivalence manifests in the assurance to the self that he wants to change but he then unwittingly resists the change. This section indicates that Robert has used CR and DR effectively to develop the intention to be active.

The passage below identifies the changes that have occurred due to Robert's recent lack of activity compared to previous which appear to make it harder for him to be active. He has also been unable to find the right activity / opportunities. He does say that the kudos of attending the gym regularly is something he would like to be able to achieve and identifies a way of measuring the success of the goal "I go to the gym three times a week" but he does not indicate how this goal may be achieved or how to make the first step towards the goal. Furthermore, he shows awareness that general activity changes may be of benefit "I'd have to walk more" but he then rationalises his reasons for not doing so with time.

Lifestyle Activity

due to the weight I have put on recently I have found it harder and harder to be active not only because of embarrassment but also because it seems to be getting harder and harder... at school you know I was in a couple of teams and then again at college but I damaged my back which you know should be better by now but its always in the back of your mind and also I have been advised against certain activities particularly contact sports which was my bag really. I kind of miss them but you know shit happens... there seem to be lots of kids who are pretty chubby, In know I worry about my weight now I'm older but I never had to when I was a kid, I was pretty active most of the time, you know during school breaks I would be out playing most of the time all sorts of stuff, tennis, football, cricket or just riding around on my bike. No computer games well nothing as complex as now anyway or whatever they do watching TV too I guess, I did watch TV of course but I remember being out a lot just playing... there're more gyms and stuff and you know its kinda a good thing to be able to say to people yeh I go to the gym three times a week you know a sort of kudos thing yeh its kinda kudos... its harder as well cause everything is easier, you know day to day stuff, most people have cars and you know erm how do they put it "labour saving devices" yeh that's it so its easier to do housey things so you are less energetic... no less active yeh that's it... maybe if I didn't have a car I'd be more active cause I'd have to walk more often and stuff but then again I'm always in a rush so I'd end up late for everything and would have even less time to go to the gym or whatever.
As previous key to eradicating some of the issues here would be goal setting and Reinforcement Management. In addition, Counter Conditioning may also be of benefit; Robert indicates that he would walk more if he did not have a car, perhaps it would help if he actively sought to substitute some of his car use with walking to attempt to fit activity into his lifestyle (Prochaska et al, 1994).

Below Robert indicates that friends or a training partner may be of benefit in helping him to change, however, he does not indicate that there is anyone like this he can call on and says that his friends are more likely to encourage other behaviours. In addition if he did have a training partner he feels that they would need to be similar to him and be “comfortable in each others company”

Others
sometimes it’s good and helps you feel positive about doing something but other times it can put you off yeh, I must admit it does put you off sometimes. Especially when its some skinny person on the TV ranting on about what you should eat and how much you should do... you can look at it two ways; erm you know like they’re like that because they practice what they preach or they could just be like that anyway, how do we know?.. Training partners are a good idea but I would say only if you are pretty equal and feel comfortable in each others company. Like all you need is some fitness freak yelling in your ear. God that would be so off putting, you’d just avoid going wouldn’t you, who needs to get shown up... as long as they practice what they preach, all you need is your skinny mate telling you to go to the gym or whatever and they’ve never been inside one, its kinda off putting... not some do-gooders who haven’t got a clue but someone who maybe knows where you are coming from yeh that would probably be pretty good... they could make me not want to go cycling or something erm well I dunno lets think, I suppose if they were off out to the pub or something it would probably make me think twice about doing something cause I’d probably want to go with them.

Furthermore, there is evidence that he doesn’t envisage himself as an exerciser “some skinny person on TV ranting” and in fact possibly does not believe that exercise will give him what he wants “they’re like that because they practice what they preach or they could just be like that anyway, how do we know”, despite his previous experiences with physical activity.
It is evident that a Helping Relationship may be one of the catalysts Robert needs (Prochaska et al, 1994), however, there is also a need to preserve his self image and for that person to be equal to him. Unlike Amy, however, body image does not seem to be create anxiety in the same way, despite being put off by "skinny people" it does not appear that this makes him reticent to be seen exercising. His comments do, however, indicate the need to safeguard his Self Efficacy (SE) which appropriate HR development would provide for modelling (vicarious experience) purposes (Bandura, 1986). In addition, there may be a need for some control of the situations that could trigger inactivity (SC).

**The Pay Off**

Well its not like I don't do anything ever but its like I'm not reaching my goals I feel like I'm letting myself down a bit ... kind of yeh well not in a bad way you know I just sort of feel guilty, no not guilty like I've let myself down and especially cause I'd like to lose a few pounds I just think OK right well that's it then you not having that new gear now are you... erm probably not its like I use them as a way to punish myself, like if I don't do something you know. In fact I don’t know if I ever do give myself a reward for doing something just tell myself I can’t have something when I haven’t done something.

Here Robert indicates that he sets himself goals but never reaches them which then demoralises him as he feels that he's let himself down. This in turn makes him deny himself things he would like to have. This is a self defeating spiral; to help he could concentrate on setting the right goals which can be measured adequately (Anderson, 2004). This can be part of preparing for a move... these disappointments are a major threat to his self esteem which are potentially a barrier to his movement into preparation and action (Prochaska et al, 1994). Whilst Robert is not in preparation he needs to become an accomplished goal setter to enhance the likelihood of change (Norcross, 2001). He also may need to be made aware that his previous experiences could hinder his goal setting as he could expect too much.

**Reflective Summary**

On reflection much of what Robert said was negative; he still rationalises his inactivity and has not broken down his defences. He has a fear of failure and in fact admits to not meeting his goals recently. In addition he does not seem
to prepare well for any changes he does make. This has resulted in him yo-yoing between contemplation and preparation a number of times. It seems evident that there are a number of factors that stand in Robert’s way. He could increase his Consciousness Raising further in order to help reduce his defences so he is free to develop a greater awareness of his problem (Prochaska et al, 1994). He also needs to develop commitment and a belief that he can change (SL); furthermore, he needs to identify suitable friends whose help he can elicit (HR); ideally someone similar to him who will support his change efforts by being a suitable role model (SE). One positive is that he recognises the long-term effect his inactivity could have on his health (DR); and has what appears to be on the surface an attainable goal. Goal setting is potential key to Robert moving to a more active SOC. He also could also concentrate on reinforcing any changes he makes along with monitoring his improvements (RM). Another thing is perhaps to control those factors that increase likelihood of inactivity occurring (SC). Furthermore, attempting to instil the idea of substituting some car use with walking to encourage adoption of activity into day to day life rather than as specific sessions of overt activity may also help to overcome some of the issues Robert has with regard to fitting activity in (Prochaska et al, 1994).

Recommendations from:

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<th>Interview</th>
<th>Past research</th>
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<tr>
<td>DR</td>
<td>CR DR SR HR</td>
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<tr>
<td>CR+RM → SL</td>
<td>CR+RM CR DR ER CC HR SL SC</td>
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<tr>
<td>goal setting +RM</td>
<td>Woods et al, 1999a CR DR ER CC HR SL SC</td>
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<td>HR</td>
<td>Plotnikoff et al, 2001 CR SO CC HR SL SC</td>
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<tr>
<td>SE (modeling)</td>
<td>Chapter 3 (p73 -133 )</td>
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<td>SC</td>
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Again findings from the interviews add credence to past research; in particular there is support for the need of Counter Conditioning, Helping Relationships and Stimulus Control in this stage. In the previous quantitative accounts these
three POC were advocated at the contemplation stage due to their consistent support across studies. Here again it seems that these three behavioural processes are important factors in helping individuals move from Contemplation to Preparation. It is also apparent that Robert and Amy have very different needs for intervention purposes thus, there is support for using different matched interventions in the two inactive SOC. Again as with Amy body image is also a factor however, in this case it seem to be more related to the need for appropriate modelling as training partners were deemed useful 'only if you are equal' which has the potential to affect Self Efficacy through vicarious experience (Bandura, 1986).

Case Analysis Jake

Profile
Jake is 29 years old and lives with his partner and two young children. He is employed full-time as a warehouse manager for a local employer. He has a number of interests including golf, computing and socialising. He seemed outgoing and relaxed throughout the interview process. He indicated that he used to be significantly more active than he currently is in more physically active pursuits. He has had some recent health problems including stress induced alopecia and he is a non-smoking asthmatic. On reflection the researcher feels that Jake answered freely and truthfully with no effort to seek to deliver the answers he thought were expected. The interview length was 65 minutes in total.

Family (friends)
maybe I should take more notice but you know there are other things that you think are more important. With a young family and working you just don't find the time none of us do... in the long-term my family would benefit but it's just doing it isn't it... I enjoy spending time with my family and I expect as they get older then they will be more active and I'll get the chance to be active with them... time with my family is more important than time to myself at the moment... Exercise is the thing you can drop if you get too busy... if you're thinking about doing more then or, starting then you have to find time to do it maybe giving up something you enjoy more to do it... its not that the time isn't there its whether you want to give up time doing other things to exercise... only if they were like me... You'd probably exercise more because your seeing someone close to you gaining the benefits... Less likely with a distant friend but a close family member you would probably gain off them...
I'd have the support if I did do it but at the moment its just not practical for me... its difficult to find the time, everyone is on the same wavelength as me I expect but I think you need to find something you enjoy first and foremost as you don't view it as a burden... I do understand that in the long run I would be better off being active and that; but I'm not really ready to give up my time from my family.

Jake is highly family oriented and feels that time with his family is more important than time to himself; this is despite the indication that he is aware that in the long-term he and his family would benefit if he was active. In essence he does not feel able to take time away from his family to be active as his family life is important to him; he feels that this must be the case for everyone in a similar situation as they are all on the same ‘wavelength’ as he is. Key to this is that exercise is expendable as it’s the ‘thing you can drop’ if you are busy and also you may in fact have to give up something you prefer doing to find the time to exercise. However, he does conclude that maybe its not that time is a factor but that it’s perhaps the willingness to take part in physical activity in preference to other activities that is an important determinant of his activity. The need for Self Re-evaluation is evident here as this “reappraises the values of the individual with respect to the problem behaviour” (Marcus et al, 1992a p.425) Jake also identified that if he did wish to exercise the support would be available and that a training partner might help but only if they were like him; he also thought that seeing someone close to him exercising would spur him on but only if their achievements were equal or attainable. Both of these factors relate to Self Efficacy in that models for vicarious experience should be similar to the observer to encourage the belief that they are capable of the same task (Bandura, 1997; Bandura, 2004).

This passage could indicate that whilst Jake is aware that time is not the real issue but, whether he is willing to give up time to exercise rather than doing something else (Self Liberation). In addition, there is a need to negate negative ego comparisons by exercising with someone ‘like him’ thus helping to maintain his Self Efficacy through vicarious experiences similar to Robert (Bandura, 1986; Prochaska et al, 1994). Furthermore, in order to increase his value of exercise (SR) there is also a need for Social Liberation as he feels
that an active lifestyle is not attainable and that everyone is on the same wavelength.

**Psychological Affect**

I would feel better in myself because I'm physically doing something and achieving something... I'd have to find something that appeals to me so that I'm exercising and enjoying myself at the same time... When I was fitter I was happier and healthier, and now I get less time to do physical exercise I feel a lot downer in myself... I suppose if I was more active again I'd feel healthier I would see myself more positive... I do know that I would feel better about myself and more positive about my future if I was more physically active... I would probably have a more positive state of mind if I got more exercise... it would be a positive in the long-term, but with it being a negative at the moment and not being able to achieve what I think I could achieve it would stop me from exercising more than it would drive me on... I would give up easier at the moment cause I'm that unfit... exercise should lead to its own rewards like improved health and weight and erm positive outlook... Well like a holiday... it would break a routine but it puts you back... Not into a lazy state of mind but that sort of state of mind... The way you feel afterwards, as in well it is a negative but it isn't... you feel as in tired you feel run down, but I don't suppose it is a negative cause you achieved something to feel like that... if your exercising with others and you don't achieve what others are achieving that's a negative... Achieving more than what you thought before you set out and I suppose participating in something and you've gone further than anticipated or just achieving what you set out to achieve is a positive... Energy levels may increase through a positive state of mind really, because you're feeling better before the actual physical side of it... your mental sides better because you're doing something rather than not. Half pint full or half pint empty sort of thing it's a state of mind.

Jake perceives that apart from the physical benefits of exercise there are psychological outcomes regarding a 'positive state of mind' and that exercise could make him 'feel better'. He acknowledges that these benefits may be down to achieving and this would make him 'feel healthier' and see himself in a 'more positive' way. Indeed he describes how he was 'happier and healthier' when he was 'fitter'. However, whilst acknowledging that he thinks he would feel better if he was more active he thinks that physical activity for him at this time would have a negative effect as he would not be able to achieve what he feels he can or has done previously and that if he did increase his activity levels he would 'give up easily' and actually views exercise as having negative outcomes such as 'tiredness and feeling run down' (CONS). Even though he would also gain the positive reinforcement of achievement (PROS), this seems to be in this sense a double edged sword as Jake would feel
compelled to compare himself with others and may not be 'achieving as much as others' which relates back to the above message that his achievements need to be equal to a person close to him who he may choose to exercise with.

This section highlights the ambivalence Jake feels towards exercise.Whilst he acknowledges he would feel better (PROS) he also describes negative outcomes of exercise (CONS) (Janis & Mann, 1977). He does not believe he can achieve what he would want to which impacts on his SE (Bandura, 1997). His SE could be improved with appropriate setting of attainable goals (Bandura, 1997; Bandura, 2004). Furthermore, for a Helping Relationship to be effective, then as above suggests, they would need to be reaching a similar level of achievement as Jake otherwise this would be perceived as negative. Overall Self Efficacy is the key issue here which again could be helped with suitable modelling opportunities from a Helping Relationship and appropriate attainable goal setting.

Cognitions

I would probably stand a higher risk of heart complaints... I do suffer from asthma and that's not going to get any better without exercise, so it's a detriment to myself not exercising but its getting up and doing it... Well although I know there are risks they seem such a long way off... maybe I should take more notice but you know there are other things that you think are more important... there is a lot of information out there especially on the internet but how this effects people I don't know from my point of view it can give you a bit of an idea of what to do but it won't make me exercise... I've read lots of information and that, and can remember some things like doing it three times a week for harder stuff and everyday for a things like walking but it hasn't made me go out and do it. I expect that's the same for everyone... Well I think that pretty much everyone knows that exercise is good for you; that message is out there. I think a lot of the problem is time and motivation... I suppose it might make you think about it cause I think that's why I think about starting again really but it hasn't made me do it... all of the things we've talked about could have an effect on my willingness to take part in exercise but its not likely to make me suddenly start going to the gym every day or something.... I do understand that in the long run I would be better of being active and that; but I'm not really ready to give up my time from my family.

With reference to cognitions Jake is aware of the risks of inactivity and also that exercise would be beneficial for a pre-existing condition; however, the motivation to get up and do it is not there. A factor which may further
encourage what seems to be a lack of 'drive' is the view that any risks to the self are 'a long way off'; and again he describes other things as more important to him than himself. He feels that everyone knows exercise is good for them and recalls the criterion behaviour from both health and fitness perspectives from things he's read; however, he acknowledges that whilst this gives you an 'idea of what to do' and its even this type of information that made him 'think about starting again' it has not instigated any actual increased activity levels and does not think it will have any short-term impact as it is 'not likely to make me suddenly join a gym' although he feels that some of the issues he has talked about may 'affect his willingness to take part in more exercise' although this does not seem to increase the likelihood of taking part from what Jake has said.

Again the PROS are apparent, as is the evidence that Jake has absorbed some of the information he has sought; however this information whilst helping him think, as he states it will not catalyse him into action as again his CONS are too high. The balance of PROS and CONS is an important factor in physical activity with them generally balancing in this SOC (Marcus et al, 1992c; Prochaska et al, 1994; Prochaska & Velicer, 1997).

**History**

When I was fitter I was happier and healthier, and now I get less time to do physical exercise I feel a lot downer in myself... I suppose if I was more active again I'd feel healthier I would see myself more positive... I do know that I would feel better about myself and more positive about my future if I was more physically active... not being able to achieve what I think I could achieve it would stop me from exercising more than it would drive me on... pre-season break, they come back its twice as hard to get back, and when you've hit a level and you stop your exercise and you drop down its hard to get back to something you know you can be ...it makes it twice as hard

In the past Jake has been fairly active and he does take some activity now in the form of golf (one-two times per week). It becomes apparent that he recalls that he was 'fitter, healthier and more positive' and would 'feel better about himself' if he was more physically active and that he recognises he feels less positive than when he was active. However, his past activity levels whilst being perceived as beneficial to the self have also created a barrier for him,
as he believes that once you attain a certain competency and have then regressed it is harder to get back into this type of lifestyle. It seems from this passage that the ability to ‘achieve’ what you ‘think you can’ perhaps based on past experiences can actually hinder you rather than enabling you ‘drive you on’. Again it seems that ambivalence as a consequence of PRO and CON balance is the key factor (Marcus et al, 1992c; Prochaska et al, 1994; Prochaska & Velicer, 1997).

Goals/Rewards

I would use a goal... It’s your predetermined goal sort of thing... I suppose it depends on what your reasons for exercising is... I think what I’m saying is exercise should lead to its own rewards like improved health and weight and erm positive outlook and stuff like that... It would probably spur you on as a goal to repeat them

Jake identifies that goals are motivational and that they give you a reason to be active including seeing someone close to you gain benefits with this spurring you on to emulate them. However, he does not verbalise any personal goals leading to the impression that he does not have any and that there are no intentions to become more active. In addition, it seems that there is no point in setting goals as there would be no rewards for the effort as ‘exercise should be its own reward’.

Jake recognises the utility of goals, however, he is reluctant to reinforce positive behaviours; the potential for rewards to impact on the reinforcement of new uptake behaviours is what Jake may need to concentrate on in order to reduce the contingencies that maintain his low activity levels (Prochaska et al, 1994). Thus, RM and goal setting are key targets here to help change behaviour.

Reflective Summary:

Key factors that have been highlighted in this analysis are the value of exercise to Jake in order for this to change Jake needs to re-evaluate his values (SR) through further Consciousness Raising. In addition, a sense of achievement and the need for appropriate modelling are evident from
comments across the three themes family (friends), psychological affect and history, which relate to Self-efficacy as “knowing you are capable of achieving something if you make the effort is very important” (Hayes & Orrell, 1993 p232). This could be supported with the development of attainable goals and not dwelling on past achievements which should help to create a commitment to activity that Jake feels he can attain (SL). Furthermore, the need to remove the rose coloured spectacles that Jake seems to have about the distance of the threat to the self ‘I know there are risks they seem a long way off’ is perhaps something that may help Jake change through increasing the awareness of the risks of inactivity rather than providing behaviourally oriented information on how much activity is needed (Dramatic Relief). Finally it would seem that the CONS of being active appear to outweigh the PROS (generally equal in PR). Whilst PA would make him ‘feel better/more positive’ the fear of failure to attain previous levels or match what others can do along with the perceived negative outcomes ‘tiredness/run down’ are more prevalent in his conversations. Whilst he mentions that actually doing more activity would give him a sense of achievement he is aware that to gain this he would need to take overt behavioural action; but, he does not seem ready to make this choice and commitment possibly due to the lack of belief that he can change (Bandura, 1986; Prochaska et al, 1994).

The interview indicates that Jake only uses CR; whilst he is aware that other options exist to help him (HR, goal setting) he does not use these in order to help himself increase his activity levels, or he may require some help in how to use this information and other factors that could increase the likelihood of change.
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Jake certainly seems to need help with all of these processes; however, firstly he needs to raise his consciousness of the risks through CR and DR. These processes of change are generally advocated in the earlier stages. Indeed, his lack of intentional statements and his willingness to use time as an excuse (whilst pursuing an extremely time consuming activity) lead to the proposition that Jake, whilst demonstrating a number of attributes of those in preparation, is still stuck in contemplation where his ‘enjoyment’ of golf supersedes his ambivalence to other activities. His change statements almost exclusively talk about ‘thinking’ and not doing and there are no overtly intentional statements made. In addition again, body image was an issue and similar to Robert there was a need for any helping relationships to be provided by some one perceived as equal or similar to the individual “only if they were like me”.

**Case Analysis Jessica**

**Profile**
Jessica is 24 years old and lives with her partner. She works full time and enjoys attending bike rallies with her partner at weekends. In the past she has been active in gymnastics but this was curtailed due to a back injury. She has also been periodically active in a gym at criterion level and has a recent history of being an exerciser who drops out after brief periods of regular
activity. Her current goals centre around weight loss for her upcoming wedding and she uses exercise to help her to attain this goal. She answered easily and frankly during her interview which lasted for 50 minutes.

Social / Environmental Evaluation

Everyone I know is gaining weight. Nobody I know exercises, everybody’s just getting lazier and lazier... You can see it in kids. When I was growing up I wasn’t chubby; kids now are massive compared to what I was like. I mean it because fast food and stuff is so cheap and available... mums and parents don’t wanna be cooking a healthy meal they end up cooking burgers and chips because its quick and easy... I read a report the other day which says what the excuse was that now that more mums; now because more mums especially are working that they don’t have the time to make a nutritional meal... that’s rubbish; both my parents worked and my mum worked full-time in a school and when I got home we always had a healthy meal, we hardly ever had chips at home; so that’s just rubbish to me... its easier to buy a box of something with something already made in it than it is to buy you know buy vegetables and cook something from scratch... I agree with reports saying something seriously has to be done. I dunno how it’s gonna be sorted. I think you can’t ban McDonalds you can’t ban the food. I suppose the biggest thing is educating parents or you know new parents and teach them how to make proper food... I think its made it easier I just think people have become lazy. I mean I’ve become really lazy since I’ve bought the car; I take the car to the top of the street just to go to the garage I don’t even walk to the top of the street... I think its just sheer laziness I think the attitude is just I can’t be bothered... from another point of view things have changed so people don’t get activity from their jobs. I suppose years ago more people cycled whereas now people don’t they use cars they’re not exercising... people have mentally busy jobs and things like that. The last thing you want to do when you get in is go to the gym to work out for 2 hours or even 20 minutes... I suppose because of the way society is changing it’s also harder for people to get the activity they need... its harder from the point of view that people’s jobs are less physically and more mentally demanding whereas its easier because the opportunities are there and its more socially acceptable for people particularly women to be working out... the new factories which used to be hard jobs you know active are call centres where the predominance of jobs are inactive and you’re sat on your bum. You get there only walking down stairs for lunch or at the end of the day.

At times Jessica classified herself as lazy which is an attribute she also placed upon society at large; she indicates that she often feels that she can not be bothered to exercise (Inertia Complex, Woods 2000) something which she does give into on occasion. She also places a large emphasis on eating habits which she equates with activity possibly due to her current goals.
This passage highlights Jessica's lack of belief that active lifestyles are available which could impact upon her own activity in the long-term as a way of rationalising should she have a lapse; this could also impact on her own Self Liberation as it may erode her belief that she can be active thus affecting her commitment to her activity schedule (Prochaska et al, 1994).

**Significant Others**

When I had a dog I exercised a lot more as well I was always over the park playing football with the dog but I know I need to exercise more because it does make me feel better when I do it. Having a dog can make a huge difference especially for me cause the dog was always bounding with energy so every morning I was over the park playing football cause it was the only way I could tire her out... So I'm running lengths of the football pitch then I'm off to work, working at the hotel all day running round then by the time I got home I was taking her over the park again. Then at weekends we were taking her out walking round the mountains and you know going out through forestry maybe for 3 - 4 hours whereas now I don't even go out for a walk at all... I don't know I think for me the biggest motivation is my friends you know they say oh come on lets go to aerobics or the gym or asks me to go walking the dog... I absolutely hate it (Aerobics) whilst all my mates love it but I can't stand it, I just stand there thinking oh god I'm doing the wrong blooming thing everyone's going the other way, you know people are looking at me and laughing. Its more psychological with me and I won't do it, I hate stuff like that but my friend says Oh come on Jess lets go to aerobics tonight. The thing is I go... if I've agreed to go somewhere with someone I don't want to let people down so I do it, that is a big thing that really helps... you know I probably wouldn't have joined a gym before if it wasn't for my friend. She really wanted to go so I went with her, same with the diet class I went with a mate and we are kind of helping each other. Also another friend won't go to aerobics alone so she calls me and drags me along even though I flaming hate it I'll do it to help out my friend. I wouldn't go into a gym on my own. I like someone to be with me so we can have a laugh together you know if I fall off a machine or whatever... Its support you know and if you mess up then you know its only your mate. You're not on your own, the only thing I've done on my own is go to my diet class... I do tend to be less likely to do my exercise machine if my partner is around but when he isn't I think oh well what else am I going to do... my aunt has been going on to go to the gym with her but she's so fit I wouldn't feel confident with her but that doesn't stop me from doing my other exercise.

Friends and family may have a significant impact on Jessica. Her friends provide her with numerous opportunities to exercise and she is happy to help someone out who needs company thus helping someone to help herself (Prochaska et al, 1994); this works like a buddy system in that they provide support for each other. In addition, her “diet class” attendance is also on a
buddy basis or at least started as such. However, it also provided the opportunity to make a contract (target weight) along with regular sessions that if exercise is stuck to will result in reinforcement due to the weight loss achieved (Marcus et al, 1992a; Prochaska et al, 1994). However, these positive steps could be eroded by the admission that she is less likely to exercise if her partner is there and the pressure from an aunt may also impact in the long term although at the moment she feels happy exercising on her own. These factors may if not addressed be her undoing. She may need to be more assertive and ask for exercise to be taken seriously by her partner even eliciting his help to keep her on track; in addition, she could communicate her current needs to her aunt who as a regular exerciser may be able to empathise and again enlist her help (Prochaska et al, 1994).

Overall Jessica uses HR well, however, she needs to be wary of threats to her commitment from significant others most prominently she needs to control the stimulus for inactivity that her partner has, particularly as she has decided to exercise predominantly at home.

Incentives

I don't know I've never really had a reward for doing exercise... I've joined slimming world so I do give myself incentives for that. But to me the exercise thing is linked with my slimming world because if I exercise 3 times a week I tend to have lost more weight when I go to be weighed and I know my jeans are hanging off my bum so I can buy a new pair of jeans... I do allow myself chocolate,... I don't go mad and only have it if I lose weight but to me it's the weight loss which I get from exercise so I suppose I reward the exercise in a round-about way... I can see the difference the exercise makes in my weight loss. I can see my jeans and my legs have changed... Chocolate is one of the biggest things I reward myself with but I will only have one bar a week if I have lost weight on Thursday night.

Jessica sees exercise as its own reward but also recognises the tangible reward is her continued weight loss. In addition, she further reinforces positive outcomes with a weekly bar of chocolate. Stimulus Control helps to modify the cues that precede or trigger inactivity (counter-thinking) (Prochaska et al, 1994). The rewards that Jessica gives herself also help as they modify the consequences that follow the target behaviour (Marcus et al, 1992a). Others (Jake) do not feel that they should reward changing a bad behaviour however;
this is not the case with Jessica. She seems to have identified that whilst the exercise itself is not rewarded the outcome is. This shows she is gradually shaping her behaviour with what can only be assumed are reasonable goals that are regularly reinforced on attainment.

Self Analysis

I'm not doing enough exercise and it makes me feel very tired if I don't exercise. Cause I'm not exercising I feel really lazy I just sit in the house flop in the chair and think uhm... But I don't wanna get a swimming costume on, I look like a whale... I find it hard when I get in getting my butt on that machine to work out for half an hour but I do feel better once I've done it... I used to be really active with my bike or gymnastics so its kind of out of character for me and I feel lazy... I dunno its just the thing about doing it... once I'm exercising I'm fine its just the umph to get me going... it needs to be seen as a positive thing... not just a means to an end its come on do this make it more interesting cause people just don't want to know otherwise... I've been to yoga I found it quite easy cause I'm quite bendy due to the gymnastics when I was younger, so I really enjoyed it but I absolutely hate aerobics. Someone standing at the front shouting at me. I always think I'm going the wrong way and always think people are staring at me... I just stand there thinking oh god I'm doing the wrong blooming thing everyone's going the other way I'm doing... you know people are looking at me and laughing. Its more psychological with me and I won't do it, I hate stuff like that but my friend says Oh come on (name) lets go to aerobics tonight. The thing is I go... I mean when I used to go to the gym I just got bored of standing on that treadmill... how boring. Watching MTV with my things on thinking Oh god this is boring as hell... I'm much happier working at home on my machine than going to a gym because I feel a bit self-conscious. I'm the same with swimming because there's always gonna be somebody there who's like a stick you know what I mean I hate thin people... you could go to a gym once and someone could make a comment you would never go back well I would never go back and that would put me off exercise completely.

This section highlights some of the issues that Jessica could deal with in order to remain active. She feels that it is difficult to exercise regularly, sometimes does not feel like doing it and gives into her urges to “flop in the chair” (Inertia Complex, Woods, 2000), however, she also attests that if she gets over this possible negative self talk (Prochaska et al, 1994) then she feels better. This ability to counter-think is something that Jessica could work on to reduce the incidences or the effect of these often sub conscious thought patterns (Prochaska et al, 1994). In addition she is happy to exercise at home alone which is excellent as she has found something she enjoys, however, she needs to be aware that she is closing off other opportunities possibly as a
result of poor body image and Social Physique Anxiety (Hart et al, 1989). In order to improve her chances of long term change she may need to revisit her reasons for activity and look at the PROS and CONS of her active lifestyle to identify whether her attitudes have changed enough for her to be able to throw off the shackles of exercising alone so that variety is allowed into her activity levels; it is evident that she does exercise outside the home with friends but this does not seem to be a regular occurrence but could be something to aim for in the long run. She will however, need to reassess herself to determine whether she is ready for this (Prochaska et al, 1994). The fact that Amy still feels that she can not be bothered is a factor she perhaps needs to work on. Recommended processes for this are Counter Conditioning and Stimulus Control (Marcus et al, 1992a).

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Planning
I know I have to do more know swimming would be great too. But its just that it's fizzled out and I just can't be bothered and also it's the hassle with it you gotta get changed and you gotta get wet and then wash your hair. I dunno its just the thing about doing it... once I'm exercising I'm fine its just the umph to get me going... I guess if I had stuff ready I would go yes but its not something that I do. I think that people have to be better at planning... I know that if I had a bag with my swimming costume in ready and towel and all that, I would probably come in and go... oh go on straight away... if it wasn't there I'd think Oh god I've got to go and get my cossie and oh where's my towel and oh I've got to wash my hair where's my shampoo, and you know rar ra moan moan moan and an hour later you think its too late and you just don't go... It's the whole thing about if I had my bike somewhere that I could just grab it and go then yeh I'd use it more but. As it stands I have to go out to the shed, move about 8 BBQ's to get to it, your tyres are flat... if it was just done I'd just grab it and go.
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Again the "I can't be bothered" mantra can be heard (Inertia Complex, Woods, 2000); however, this perceived hassle could be easily overcome with a little planning and forward thinking which are key to Self Liberation (Marcus et al, 1998). Taking preparation lightly can lead to the temptation to revert to previous behaviours as evidenced above. By preparing well Jessica could again counter her negative thoughts and control the stimulus for inactivity by restructuring her environment to elicit the target behaviour (Prochaska et al, 1994). Preparation would provide cues for the target behaviour as suitable clothes and equipment will be available immediately thus negating the inconvenience she perceives. Jessica indicates that this is perhaps true in
her case but as yet has not put this into action. This could perhaps be something for Jessica to work on to further enhance her options with exercise.

Reflective Summary:
Jessica uses a number of techniques to increase the likelihood of activity occurring. In particular she feels that friends are a great source of help although she tends to exercise alone. Goals and rewards are also useful techniques which she seems to use effectively. However, she does not use two techniques at her disposal: Counter Conditioning and Stimulus Control. These two could both prove to be effective weapons for some of her lapses, as could the eliciting of support from her partner and family (Prochaska et al, 1994). In addition, Jessica could perhaps accept that a physically active lifestyle is possible despite the issues she highlighted above. Without this acceptance then she may not be able to fully commit to her own lifestyle activity choices.

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Previous research indicates that those in action need to consider the use of all the above techniques (Prochaska et al, 1994). It would seem that Jessica is typical of those in action and needs to continue to develop her skills to ensure she is helping herself as much as possible in this the busiest period of change.
(Woods, 2000). In addition, similar to Amy, body image is an issue with Jessica “I'm much happier working at home on my machine than going to a gym because I feel a bit self-conscious. I'm the same with swimming because there's always gonna be somebody there who's like a stick; you know what I mean I hate thin people” again this could relate to Social Physique Anxiety.

**Case Analysis Jules**

**Profile**
Jules is 43 years old and combines a full-time job with part-time study. She is a highly committed exerciser who has been exercising at her current level (approx 5 overt bouts per week) for over three years and around criterion (2-3 sessions per week) for at least 10 years, no comments about other interests were made. It is believed that Jules answered fully and frankly throughout the interview which lasted for 75 minutes.

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<td>You know if I had to miss sessions I would feel really guilty and sluggish even if I couldn't do anything about it. I would worry it was the start of a slippery slope. That has happened on occasions and my self esteem went down and I almost panicked thinking oh no I'm never going to get back to it... I'm committed its something you've got to do. I think it's a kind of all or nothing... You know its like paying a debt; you have to pay so much a week but I just like to get it over with. I like the outcomes but not really the process but then again to keep myself up to the level I am at now I have to do it... I am generally active alone, which I do enjoy because I can just get in there get it done and I'm away. I suppose family and friends do have an effect on some people they probably wouldn't for me but I think that's down to my reason for exercising so I'm probably not your run of the mill case... I don't even enjoy it really I just feel that I have to do it no matter what. To be fair I am pretty rigid regarding my exercise goals and think it would have to be pretty major to upset that apple cart.</td>
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These comments highlight this individual's commitment to physical activity with goals being an important factor in prolonging the long-term behaviour (Anderson, 2004). Furthermore, there is no evidence of complacency with missed sessions acting as a warning to relapse particularly when reflecting on past lapses and their outcomes (Prochaska et al, 1994). Whilst this individual indicates that the activity undertaken is not an enjoyable task their commitment to their long-term health overcomes this aspect and is a key factor in their liberation from an inactive lifestyle. These comments indicate
that Self Liberation is a key factor in prolonging and maintaining physical activity for this individual.

Normality

Also no-one seems to walk anywhere everyone seems to have a car. I choose to walk when I can and because I choose to do that people think I'm a bit eccentric; a bit of a nutter really you know a weirdo... People will, the type of people I know will pay extraordinary amounts of money to go to the gym really posh gyms and then they'll spend about half an hour before hand trying to park their car as near to the door as possible before going to that gym. You know it seems so stupid... I just think that people don't understand it should be an everyday part of life not just these bouts a few times a week when they feel like it or when they've got nothing better to do. It should be an integral part of their life... even when I'm shopping I just look for where there are plenty of spaces I don't feel the need to have to wedge myself in it's only say one more minute walking and it makes things so much more serene I think... rather than just bits of information if there is a massive campaign that covers every angle to the point that it almost normalises physical activity then I think it could be effective but anything on a lower scale like posters and the odd leaflet I think its effectiveness would be negligible or short lived. I think it would have to be a prolonged campaign so exercise becomes part of a day to day thing... I think if someone is looking for a way in it's easier now than years ago. But then years ago well people seemed to me to exercise more then. Then again I came from the countryside where buses were sparse so you had to be active to get anywhere... I don't think people like being sweaty you know it's considered primitive isn't it. Also we're so obsessed with cleanliness and personal hygiene you know... I just resign myself to be sweaty and it's always nice to shower afterwards anyway.

Jules perceives that the acceptable face of physical activity is going to the gym and that it's easier to get into exercise particularly through this mode than it was in the past. However, she feels that people in general do not view lifestyle activity in the same way and feels that it is in fact frowned upon as are the outcomes of activity (sweating). Whilst she sees physical activity as a lifestyle choice and accepts this as part of her own problem-free future (Marcus et al, 1992; Prochaska et al, 1994) it seems to her that others do not see it this way; and that this lack of acceptance of general activity as normal needs to be addressed for interventions to have any long-term impact. Thus, whilst Jules accepts that active lifestyles are available (SO) to everyone she feels that there is a lack of acceptance in the general population that physical activity is normal particularly if it is outside the confines of "these bouts a few times a week". Thus it seems that CC (alternative behaviours to inactivity i.e. walking when can, parking a distance away from the shops etc...) and SO
(awareness and acceptance that activity is part of her lifestyle) have been key in getting Jules to where she is at this moment.

**Routine**

I just build it into my routine which is also important to me.. You know with me the exercise is almost like taking medicine I don't particularly enjoy it but I do it for a reason you know when I swim that's for pleasure but the gym it's done to safe guard against my health problem... I like the discipline of it. I like to feel quite free spirited but I do have these anchors that I stick to like the gym and work and the rest of the time I can be wild and crazy you know (laughter)... I have my set routine and that's not to be messed with especially as I would find it hard to fit a session in at any other times... Well I would pretty much say that I will do my sessions no matter what unless I am actually incapacitated; or at least I would immediately return to then should anything happen that stops them for the short term.

Jules enjoys the discipline of activity rather than the process; she however seems to segregate it from herself too as she does not seem to identify as being an exerciser with her persona and views it as a form of self medication. She is, however, aware that it is the routineness of it within her life which helps it to be maintained in the long-term with health again being obviously the key motivator. The routine element of the activity she does seems to be the way in which she controls it; in other words the way she negates a possible trigger to be inactive or to procrastinate with her routine is that she is aware that changes are impossible and when it's due she just does it. Thus, her awareness of her routine and the fact that she will not fit exercise in at any other time acts as the control for the stimulus of procrastination with regard to activity (Prochaska et al, 1994). It also gives her a freedom to do whatever she likes at other times as she knows she has done her medicinal bout.

**Social Change**

You only have to look around at the people in Newport now compared to the people I used to see in Newport say 20 years ago and I notice they are a lot more obese... In the past activity was something that just happened whereas now its more of a thing to do you have to make a deliberate thought to exercise... I think that's what we've been striving for as a race to make things as easy as you can for yourselves and that's what has happened and now of course it's so unnatural or it's happened so fast then perhaps we're not reaping the benefits and it's having bad effects... there was an article in the paper recently about housework and how energy consuming it was and how easy it is now. I can remember having to wring out the washing through one of those mangles and that really took a lot of effort it was a lot of effort even...
... vacuum cleaners weren’t as effective and you had to go over everything about 64 times... I live in an old house and on the front door there’s a brass door step and knocker and key thing and that takes me a good hour every Sunday really rubbing to get that looking good. Whereas you can buy them now and they’re lacquered and you haven’t got to be doing anything to them. You know something as silly as that you know I end up exhausted and have built up a sweat afterwards.

Jules views inactivity as a major societal issue and feels that advancing technology has a major impact on this. Again reference is made to normality of activity in that technological advances have made it not normal to be active on a day to day basis which links to the idea that exercise is viewed as “bouts a few times a week”. Jules seems to be very aware of how the issue of inactivity may have been brought about by the social environment and the changes that have occurred over her lifetime; and seems to be saying that society in a way is to blame because we want everything to be easier. This refers to Environmental Re-evaluation (Marcus et al, 1992a) and this knowledge by Jules may act as a buffer (Prochaska et al, 1994) to lapsing into inactivity, particularly as one of her reasons for exercising is vanity and the fact that she seems to equate lack of activity with the rise in obesity.

Vanity/Smugness

Vanity as well its was erm well before I used to do it for vanity but then this health reason gave me a reason for vanity you know so it was a double whammy... I also like the smugness of the deferred gratification of it you know the fact that I'm doing this now and hopefully my bones won't crack later and I'll be you know able. Other people I know are like oh you don't want to be bothered by that you might get run over by a bus you know I want to be able to you know, know I've done all that I can it's also great that I'm in shape and the knockers aren't.... Well I see it as something I have to do and the outcome is the reward especially if it helps my long-term health but I guess if people need the reward then yeh no problem with that... I definitely wouldn’t reward myself in any overt way again it’s the smugness that’s my reward I can't justify my thinking knowing great I've done something for me today for my health and something that'll make me look and feel better... For me it’s health and vanity. Health in general for anyone there’s heart disease and obesity and all of that it’s how I would promote it anyway.

It seems that for Jules Dramatic Relief was a key factor in the increase and maintenance of her active lifestyle; particularly as enjoyment of the actual process of activity is not a high priority. Whilst health was not the initial
catalyst in her activity levels it now acts as the reason she continues. Furthermore, the knowledge that she is going to get long-term benefits along with the "smugness" that this engenders are key motivators here. In addition, the awareness that it is the long-term that she should be focused on for the gratification or pay back reinforces the maintenance of activity and further fuels the "smugness" she feels for her activity levels. This relates to reinforcement management which concentrates on the contingencies that control the behaviour in question (Marcus et al, 1992a).

Reflective Summary
There seem to be a number of TTM processes of change that sufficiently describe the reasons why Jules has been able to become and remain physically active above criterion. DR was a key catalyst at earlier stages to promote SOC progression and also remains a key POC in continued motivation. In addition SL, SC, RM seem to work in unison to further enhance the likelihood of maintenance. Furthermore, SO and ER support maintenance by generating an awareness of relapse possibilities as she is fully cognisant of how social and environmental factors can contribute to inactivity and what the consequences would be to her. One surprising factor is the lack of Helping Relationships. This could be particular to this interviewee or it could be that once maintenance has been reached and continued for a lengthy period (in this case three years at the current level of activity) the Helping Relationships are redundant.

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<td>Chapter 3 (p 73-133)</td>
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</tbody>
</table>
Thus, in summary, to remain in maintenance it seems there is a need to continue to use a number of POC which are a mixture of experiential and behavioural POC. With the behavioural POC supporting the behaviour itself, whilst the experiential re-affirm and cement commitment. Jules appears to be a highly committed exerciser however, body image issues may have been the original catalyst in her uptake of activity “I used to do it for vanity but then this health reason gave me a reason for vanity you know so it was a double whammy” this shows a movement from extrinsic type motives to an intrinsic motive. However, body image and the outcome of exercise on physique are still important “know I’ve done all that I can, it’s also great that I’m in shape and the knockers aren’t” and still contribute to her commitment “something that’ll make me look and feel better... for me it’s health and vanity”. Again Social Physique Anxiety could be a related factor.

5.3 Case by Case Analysis Discussion
These interviews have emphasised the fact that whilst cognitive strategies are important in the inactive Stages of Change in order to formulate intent and to take the necessary steps to make small changes which is in agreement with the TTM theory and previous research (Prochaska et al, 1994; Prochaska & Velicer, 1997). In physical activity behavioural POC are also important in these earlier stages.

Helping Relationships are needed from Precontemplation where even the intent to be active may be held back by a lack of a supporting friend (in particular a training partner rather than verbal support from a significant other) with whom to be active when and if the intention is formulated.

In Contemplation, in addition to cognitive POC that will aid in further raising and targeting appropriate awareness strategies behavioural POC are also important. Reinforcement Management, Stimulus Control and Counter Conditioning are all important in aiding the contemplator to make some small changes. However, these behavioural POC are utilised in a cognitive manner
at earlier SOC. There is a need to raise awareness with regard to the contingencies and stimuli which maintain inactivity. These POC can be used to reward positive and counter/control negative thinking in Contemplation to aid the activation of the intent to bring about the first behavioural encounter (an activity bout). Goal setting has also been identified as a useful moderator when moving from Contemplation to Preparation.

In the Preparation SOC some behavioural change has already occurred, however, the experiential POC are still of value here. CR, DR, SR and SO are all highlighted as useful POC from the case analysis. These POC whilst not being utilised to increase the activity level of the individual are all important to re-affirm the decision made and to provide the information needed to be active at criterion. As some activity has occurred behavioural POC are now increasing in importance with countering being a key process. At this stage the insertion of an increased number of activity sessions would be the aim of an intervention as would the countering of the possible negative impact of physical activity on perceived time availability which is a consistently mentioned barrier to physical activity within these case analyses and in general (Willis & Campbell, 1994).

In Action the emphasis switches to behavioural POC (in agreement with the theory). CC, HR, RM and SC are all useful strategies to aid commitment (SL). Social Liberation is also important as this relates to awareness of increased social opportunities to be active from awareness of these opportunities. Again goal setting is a useful aid to Action. Goal setting is a way of directing, mobilising and prolonging motivation and task performance (physical activity in this case) with feedback and reinforcement (RM) being important factors which enhance this technique (Willis & Campbell, 1994).

In Maintenance the previous behavioural POC are again supported with the exception of Helping Relationships. As in action the reasons are to help sustain action through commitment and reinforcement. Both ER and SO were also deemed important; however, in this instance it seems that these POC are useful means to ward off complacency as they enable the maintainer to be
fully cognisant and reminded about the outcomes of inactivity which further enhances commitment to physical activity.

In summary, the case study analysis has underlined the use of the Transtheoretical Model as a useful tool on which to base interventions. However, in contrast to previous research experiential POC are supported as influential processes at least until the individual has moved into Action. Behavioural POC are arguably needed from the transition from the inactive to irregularly active SOC which is earlier than previously suggested. Whilst not entirely in line with the empirical findings of earlier chapters and Plotnikoff, Hotz, Birkett and Courneya (2001); again it does seem that the operationalisation of the processes of change may differ in the exercise domain to those evident in other behaviours in order for change to occur.

During the case by case analysis two factors external to the TTM were identified as having the potential to impact on SOC progression:

- Goal setting
- Body Image

Goal setting has been discussed within the previous section as it is integrally linked with the need for reinforcement (Willis & Campbell, 1994) which is an important Process of Change. However, body image will be discussed separately.

**Body Image**

All five case study participants mentioned factors surrounding body image within their interviews. In three cases (Amy, Jessica and Jules) the comments correspond with interpersonal evaluations of physique which relates to Social Physique Anxiety (Hart et al, 1989). However, in the case of both Robert and Jake interpersonal comparisons related to the need for helping relationships to provide support from someone who was similar to them; this would aid in
the modelling proportion of Self Efficacy and would have the effect of providing good sources of vicarious experience (Bandura, 1997).

**Social Physique Anxiety**

Social Physique Anxiety (SPA) is a “subtype of social anxiety that occurs as a result of the prospect or presence of interpersonal evaluation involving one’s physique” (Hart et al, 1989 p.96). Body image issues within fitness environments are hypothesised to be related to SPA. Fitness environments focus on the development of physical self and are, as a result, conducive to the manifestation of anxiety (Gray, 1997). It has been identified that SPA may relate to perceptions of the environment in which people prefer to be active; with those who exhibit higher SPA being more favourable to environments that do not emphasise physique i.e. shorts and t-shirt vs. aerobic wear and locations which people perceived as more comfortable i.e. private (home) vs. public (fitness facility) (Crawford & Eklund, 1994; Spink, 1992). SPA has been found to differentiate between those who have intrinsic and extrinsic (body appearance) motives (Frederick & Ryan, 1993). In addition gender differences have been identified with reference to SPA with women being significantly more likely to score highly on SPA than men (Frederick & Morrison, 1996).

With reference to the above case studies; it is proposed that all the female participants potentially exhibit high SPA. With regard to Amy this seems to be creating an insurmountable barrier with the challenge to her body image being too great for her self esteem to handle. In the case of Jessica whilst she is comfortable exercising in private the thought of public activity creates anxiety where she feels that people are laughing at her or that she looks like a whale. This reduces the number of opportunities she has for physical activity and could have a long-term impact on her maintenance at criterion. With regard to Jules, whilst she has been exercising around criterion for over 10 years and at her current level for the last three years, she indicates that her original reason for exercise was vanity (extrinsic motive) which would relate to SPA and her activity has only been above criterion since health was also considered an important reason to be active (intrinsic motive). Past research into SPA has indicated that those with high SPA are more likely to adhere
than those with Low SPA (Frederick & Morrison, 1996). However, this study was conducted on fitness centre members only and it may be that SPA has influence across the breadth of physical activity adherence acting as a barrier as well as a motivator at different SOC. Another interesting fact is that the men in the study seemed more concerned with their body image in relation to others for modelling purposes rather than it acting as a barrier to activity; this adds some credence to the fact that men may exhibit lower SPA than women (Frederick & Morrison, 1996) and could also provide some form of explanation for why women are less likely than men to self change, as indicated previously in this thesis.

**Modelling**

With regard to the body image statements by the male interview participants; both hinted that helping relationships would only be of value if the helper was similar to them. This could relate to Self Efficacy where the role models for vicarious experiences are recommended to be similar to the observer in ability; and that the outcome should be to raise expectations that the individual can perform as well as the model, with the desired performance being realistically attainable (Bandura, 2004). Vicarious Experience relates to Efficacy Expectations within the Social Cognitive Theory (Bandura, 2004). Bandura (1986) observed that seeing similar others succeed or fail at a task can affect such individuals' self-efficacy beliefs. This theory indicates that the individual undertakes the behaviour as a response to self reflection (anticipation and planning) and self regulation (behaviour modification) through the evaluation of the discrepancy between the target behaviour and the current behaviour. Self Efficacy (SE) is a key aspect as it relates to the belief in the individual's ability to meet the demands of the planned task prescribed by the discrepancy evaluation (Buckworth & Dishman, 2002). Thus, the use of modelling may enable an increase in the perception of the ability to undertake the task as a response to seeing someone similar successfully undertake the task. This is an important part of SE and is also apparent for Jessica, who is unwilling to visit a gym with her aunt as she does not perceive herself as equal to her aunt; in addition her SPA may be too high.
to allow this assault on her self esteem. In summary, from the case by case analysis it seems apparent that SPA may have a moderating effect on physical activity uptake and maintenance; particularly in women. In addition the concept of modelling and vicarious experiences may need to be an integral part in selecting an individual to act as a training partner (HR) to promote Self Efficacy.

Triangulation
In addition to the interviews a concurrent questionnaire sample was collected. The interviews identified that certain TTM variables were at work during each SOC which differed based upon the SOC. These findings are tabulated below alongside the questionnaire results. The questionnaire results are included for triangulation purposes to assess whether the interview and questionnaire data were in agreement. Any results which did not tally with those determined from the interviews are highlighted (italics). Plotnikoff et al (2002), highlighted that the lack of congruence between repeated measures assessing the TTM may indicate that the theory may lack in internal validity, however, it may not be the internal validity of the theory that is not correct but the actual measures used to assess the theory in the exercise domain particularly as they have been developed in a doubly indirect manner (i.e. developed on a previous measure designed to assess smoking cessation which was itself developed from a qualitative study, the direct method of assessment). As one of the aims of this study is to examine the measures used and their perceived relevance to the population assessed then this method of triangulation was considered to be another means to further assess the specificity and sensitivity of the measures in comparison with concurrent real life stories.
Table 5.3.1: Cross comparison of TTM variables from the interviews and questionnaires in those subjects below behavioural criterion.

<table>
<thead>
<tr>
<th>Name</th>
<th>Interview Results</th>
<th>Questionnaire Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amy</td>
<td>CR</td>
<td>CR 2.0</td>
</tr>
<tr>
<td></td>
<td>CONS (high)</td>
<td>CONS 4.0</td>
</tr>
<tr>
<td></td>
<td>PROS (low)</td>
<td>PROS 2.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>ER 2.5</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>SL 2.25</strong></td>
</tr>
<tr>
<td>Robert</td>
<td>DR</td>
<td>DR 4.0</td>
</tr>
<tr>
<td></td>
<td>CR</td>
<td>CR 2.75</td>
</tr>
<tr>
<td></td>
<td>CONS (high)</td>
<td>CONS 2.33</td>
</tr>
<tr>
<td></td>
<td>PROS (low)</td>
<td>PROS 4.40</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>ER 3.5</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>SO 3.75</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>SE 4.0</strong></td>
</tr>
<tr>
<td>Jake</td>
<td>CR</td>
<td>CR 3.25</td>
</tr>
<tr>
<td></td>
<td>HR (low)</td>
<td>HR 1.75</td>
</tr>
<tr>
<td></td>
<td>CONS (high)</td>
<td>CONS 3.38</td>
</tr>
<tr>
<td></td>
<td>PROS (low)</td>
<td>PROS 4.70</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>SR 4.0</strong></td>
</tr>
</tbody>
</table>
Table 5.3.2: Cross comparison of TTM variables from the interviews and questionnaires in those subjects above behavioural criterion.

<table>
<thead>
<tr>
<th>Name</th>
<th>Interview Results</th>
<th>Questionnaire Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jessica</td>
<td>SL</td>
<td>SL 4.25</td>
</tr>
<tr>
<td></td>
<td>HR</td>
<td>HR 4.75</td>
</tr>
<tr>
<td></td>
<td>RM</td>
<td>RM 4.75</td>
</tr>
<tr>
<td></td>
<td>CONS (low)</td>
<td>CONS 4.0</td>
</tr>
<tr>
<td></td>
<td>PROS (high)</td>
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<tr>
<td></td>
<td>SE (low)</td>
<td>SE 1.80</td>
</tr>
<tr>
<td>Jules</td>
<td>DR</td>
<td>DR 4.0</td>
</tr>
<tr>
<td></td>
<td>ER</td>
<td>ER 2.0</td>
</tr>
<tr>
<td></td>
<td>SO</td>
<td>SO 3.0</td>
</tr>
<tr>
<td></td>
<td>CC</td>
<td>CC 5.0</td>
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<tr>
<td></td>
<td>HR (low)</td>
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<td>RM</td>
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<td>SL</td>
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</tr>
<tr>
<td></td>
<td>SE (high)</td>
<td>SE 5.0</td>
</tr>
</tbody>
</table>

As can be seen in the case of below criterion SOC (Table 5.3.1) whilst there are a number of agreements there are also some major differences. In general there are issues with POC, DB and SE results which do not fit with the stories told above; with Amy it is the lack of CR, which is in fact lower than
commitment (SL) and assessments of the environment (ER) although all are well below the middle response option (3.0). With Robert whilst DR seems to exhibit the expected utility discussed above it seems that ER, SO and SR all exceed the utility of CR. Furthermore the PRO-CON balance does not tally with his story as do not the SE results particularly in light of how easily Robert admitted to being sidetracked and allowing his commitment to falter. The results for Jake whilst finding agreement regarding CR and HR use; again the PRO-CON balance does not seem to reflect the feelings of Jake. In essence in the below criterion cases it seems apparent that the questionnaire lacks in accuracy and validity when compared with the concurrent interview sample.

However, when the above criterion results are compared in Table 5.3.2 this trend seems to be reversed with the questionnaire results tallying quite well with the stories described above. In the above criterion cases it would seem that the questionnaire is a useful tool to quickly and effectively gain information for intervention purposes to aid maintenance of a physically active lifestyle.

These differences in cross validation could be a result of a lack of construct validity. The questionnaire was validated on a large US sample (Marcus et al, 1992a). According to Nunnally (1978), a Cronbach alpha over 0.70 is indicative of an acceptable level of validation. Internal consistency (alpha) coefficients ranging from 0.62 – 0.89 across the 10 subscales were reported (Marcus et al; 1992a). Thus there may be some foundation in arguing that there is a lack of internal validity for the instrument used. In addition as the samples on which validation occurred are U.S. and the sample under discussion here is from a UK population there may also be issues with regard to cross cultural differences and language semantics. Marcus and Owen (1992) identified irregularity in the patterns of Self Efficacy and decisional balance across the Stages of Change in Australian and US samples. They indicated that cultural differences may influence the patterns observed, which was supported by Gorley and Gordon (1995).
When considering the problem with the below criterion cases and the lack of consistency between the interview and questionnaire results and considering it is this portion of society that stands to make the most gains from accomplished intervention design then this is of vital importance if the TTM is to be used to guide interventions. It is imperative therefore, for the measures to be assessed fully and either further validation checks to be made and/or alterations in the measures to be undertaken as without a reliable method of assessment of the interconstruct relationships then interventions using the Transtheoretical Model in the physical activity arena cannot be developed to meet the needs of the population.

Following the completion of the questionnaire during the interview process a number of questions were asked about why they thought people did not return postal questionnaires, how this could be improved along with their impressions of the questionnaire they had completed. These responses were split into two sections a) response rate and b) questionnaire critique. All 10 interviewees (described above) are included in this part of the analysis as the responses were not expected to be SOC dependent.

The reasons why the interviewees thought people would not respond were varied and included ‘time’, ‘just forgot’ and ‘couldn’t be bothered’, however some other factors did emerge.

<table>
<thead>
<tr>
<th>Interest</th>
</tr>
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<tbody>
<tr>
<td>“if you had no intention of returning it because its not interesting to you then you’d probably just bin it” – Amy (PC)</td>
</tr>
<tr>
<td>“They just weren’t interested in what it was asking” – Clare (C)</td>
</tr>
<tr>
<td>“I think that if the content of the questionnaire is not of interest to you then you are less likely to give up your time to complete it” – Jules (MN)</td>
</tr>
</tbody>
</table>
Guilt

"I admit that for me I didn't respond because I felt bad because I wasn't changing my exercise levels and I assumed that was what you were looking at" – Jake (PR)

"Erm OK yeh I suppose for me for this questionnaire I was embarrassed; I was going from being a regular exerciser to doing nothing you know and I didn't want to admit it not to myself let alone someone else" – Tracey (C)

Too Complex

"Well I didn't quite understand it properly, I wasn't sure about the middle section. I thought the question didn't really make sense as they were asked (section indicated was POC questions) I didn't know whether it was how often I had thought about these areas or how often other people may have mentioned things to me" – Sadie (PR)

"I was fairly daunted by the questionnaire so it didn't provide a cue to respond" – Sadie (PR)

"But you know when you get things through your door you think oh my god... if it was one A4 back to front and was tick boxes then yeh OK but the way it is means I've really got to read it and that's just too much it was just asking too much information" – Jessica (AX)

Thus, in addition to time and forgetting to return the questionnaire it seems that other cognitive factors are at play in nonresponse to postal questionnaires, if those being asked to complete the questionnaire do not find it of interest then it seems the chance of response is reduced, in addition, the content of the questionnaire may cause a guilt response based upon what is being asked which again could result in increased attrition. Highlighted is the guilt and embarrassment that some people feel when completing serial questionnaires particularly when accounting for why they think they are being undertaken. It also shows the way that people may assess themselves simply from completing a questionnaire. Furthermore, there is a need to ensure that the questions and format are easily understood and completed to maximise response rate.

Response rate was an issue throughout this study and postal reminders were used as a means to improve this; interviewees were asked what they thought
of this method and what other ways they thought response rate could be improved.

"I do think that reminders will help just for those who have genuinely forgotten though" – Amy (PC)

"I dunno, it can be a pain filling it in then posting it even if its free postage you still have to make the effort; doing it online might be better cause you just have to log on and send it although that means you need internet access which everyone doesn’t have" – Amy (PC)

"I think postal yes and no. I think verbal erm you can’t beat speaking to the individual it’s not fool proof but yeh I think reinforcement and going that way would help” – Mike (AX).

"I think it's got to be made a bit more appealing perhaps possibly something for them you know there must be a reason for them to fill it in. You know you need to entice them to return it. Erm gifts or vouchers or something like that" – Mike (AX)

"Yes but they didn’t help as I just felt guilty for not returning them in the first place." – Jake (PR)

"Erm well yes I suppose so but as I said I wasn’t sure about what I was being asked so they wouldn’t have encouraged me but they might help someone else." – Sadie (PR)

"I mean if you get reminders it might increase returns for the people who genuinely forgot but other than that people would probably just chuck it wouldn’t they." – Clare (C)

"Yeh, they kind of made me feel worse cause you were sending them out and I was just not responding I do admit I kind of ignored them after the first one but did genuinely forget the first time" – Robert (C)

"I’m not sure anything would have helped; I suppose if you had rang to remind that might have helped but then I might have been a bit peeved as well so who knows" – Robert (C)

"Well yeh reminders might help but I think again it’s the length and that, it’s just too long if you don’t have time or can’t be bothered the first time that’s not going to change when you get a reminder. I don’t know what will help I suppose erm prize draw or something I don’t know” – Jessica (AX)

"Yes and each time they arrived I did think to myself hmmm yes I must remember to do that but just forgot. I suppose I also felt a bit guilty that I had to be reminded to send it back... that’s why I decided to take part in this interview" – Tracey (C).

"No I don’t think they’re very useful I think if you are going to do it you’ll just do it there and then so when a reminder comes in you just think oh for god’s sake not another one" – Jules (MN)

"I’m not sure what would improve the rate I suppose telephone surveys are better cause you can get it over with quite quickly and you don’t even have to remember to post it." – Jules (MN)
“Erm reminders oh I don’t know I’d be more inclined to reply if I got something back or even if I know I was going to get some sort of feedback like an interactive thing and the people collecting it sent you some results or whatever I think that would be quite interesting” — Steve (MN)

The usefulness of postal reminders was gauged as fairly poor from the comments above, it also seemed that they caused feelings of guilt or even harassment and would only help if the person receiving it had "genuinely forgot" and that if you “can’t be bothered the first time that's not going to change when you get a reminder”.

The suggestions to increase response rate were varied they included phone reminders, enticement or reward and making them interactive so you are more interested in the outcome; however, all of these have a cost whether that is monetary or time based which is something that may not be suitable in large scale surveys.

In addition to questions about the method of data collection and how this could be improved the interviewees were also asked about the general content of the questionnaire, what was thought about the format and how relevant they thought the questions were to themselves.

“I find the questionnaire quite motivational it makes me feel bad when I’m going through it... It’s not to long or short its fine... I feel it’s relevant to me cause I think they’re important questions and I can kind of see what they’re trying to get at but some are maybe more for people who do exercise, it’s a little confusing I guess” — Amy (PC)

“I think it's a bit long it might have been cut down a bit you know I had to double check a few questions and people might look at it and just think oh whatever and just fill it in without really thinking about it then stick it back in the post...Yeh I think they’re very relevant, well laid out yeh. Again it’s sort of difficult you know, they’re relevant to me but I’m motivated to exercise maybe for other people they might be off putting or they might not have thought about stuff like what’s included” — Mike (AX)

“The length of the questionnaire was a bit long and repetitive but I suppose it wasn’t too bad. It only took a few minutes to complete... They were fairly relevant and in some ways they did give you some hints on how you could make some changes but again this just made me feel bad about my lack of exercise especially as I used to exercise a lot and be pretty fit and now I’m just not motivated to do it” — Jake (C)
"The length is OK I suppose it is only 5-10 minutes... most of them were OK but again the middle section didn’t really make sense to me so I couldn’t view them as relevant" – Sadie (PR)

"A bit boring, its not to long but the questions just tend to go on and on, a bit repetitive... Erm the questions were pretty relevant some of em just sound funny don’t they you know erm like “images of inactivity move me emotionally” what’s that all about... what does that mean well yeh it might be relevant but I’m not really sure what its asking me so... I also kind of think that some of it’s saying like rather than finding out what you do do its kinda saying “oh this is what you could do” so it’s giving you information on how to be active as well then asking you what you do or say or think so that can be a bit confusing. I was filling it in and thinking oh yeh that’s a good idea or maybe that’ll work for me” – Clare (C)

"Well not too bad it looks longer than it is cause you don’t really have to think of long answers it’s just tick a box or whatever... Erm some were yeh, but others were just stupid it was like what’s all this about dramatic portrayals of inactivity yeh right. They also repeat themselves you know and you just think I’ve just told you this” Robert (C)

"Its too long, you know its quite big... Yeh they were relevant pretty much but the questions in some cases was a bit strange, or, I don’t know maybe it could have been phrased a bit better" – Jessica (AX)

"Quite sensible I would say it would take me 10 minutes tops to fill in... Very relevant, nice plain English" – Steve (MN)

"It was a little bit long and lots of the questions did seem to ask the same sorts of things, I suppose that’s another reason I forgot to send it back as it wasn’t a two minute job to fill it in... What in the questionnaire? They were OK, some of them did use strange wording like this one here, dramatic portrayals of the evils of inactivity move me emotionally I did think that was a bit weird and some were a bit strange in that they were hard to answer unless you did exercise. But all in all they were fine.” – Tracey – (C)

" It wasn’t too long but it could have been designed to look a little more interesting, not just pages of questions I’m not sure how but I think it just looks boring and I also found it quite tedious too... I would say the questions were relevant yes erm they do have a kind of motivational slant though, it was asking you for information but you were also thinking yes I could do that as you were going along well I did anyway but maybe that’s because I’m pretty committed and always look for ideas but then after a while I thought oh there’s still more to go so I got bored” – Jules (MN)

With regard to the format the response varied with some believing it was too long and repetitive whilst others thought it was OK, there were no differences in this based upon SOC. Another interesting factor that emerged was the confusion the questionnaire generated; some thought that it provided tips on how to change or was motivational which made them feel bad or might be off
putting. These factors identify that there may be both teleological and tautological issues with the instrument that was used within the study; in other words the measures did something other than it was designed to do in being perceived as motivational by the participants and in addition some of the questions were redundant and perceived as contextual repetition of the same statement or query. This could have a major effect on the results generated from the instruments and may be a reason behind the differences found within this chapter between interview and questionnaire results. It may also explain some of the varied results found in similar studies carried out previously.

Again this is a validity issue particularly with regard to internal validity on the reactive effects of the testing instrument and how the taking of the test may influence a second testing; in addition the Hawthorne effect is a potentially major factor here especially when considering the perceived motivational leanings of the instrument eliciting a socially desirable response (Thomas & Nelson, 2001).

 intervention Comments:

I think it's pretty good overall I like the benefits because I think its important to stress the positives. The more positive you are the more reaction you're gonna get. What's stopping you is good cause that hits the nail on the head for me and sometimes people don't recognise the barriers they're putting up and how it's put to you is good. I would say this is very relevant to me because these are... it's well it's me all over (ha ha). Also the fact that you have a contact on there for more information is also good. If I put it on my board with all my other stuff and it's in my face all the time then it might make me feel guilty enough to do something. I like the heart bit on the front and also the benefits; but I would say change the writing to Ariel (dyslexia) and this bit at the beginning straight away because it's a large block of information I just panicked and didn't take any of it in erm but the font will also help, but also changing the colour of the leaflet too (dyslexia) maybe a yellow background. So you need to be aware of the font and colours and also blocks of text. That's how I'd say to improve it... Well I think straight away good little beginning and what caught my attention was the "BE SMART" which is a good little saying and then you know it catches your eye and you want to read on. Erm it's clear concise not to big not too detailed it's good overall... It's just enough you know with the tips you're just reinforcing everything er...you've just them to sort of encourage that person to carry on and all the way it's well done you can do it... Yeh I think that would pretty much be relevant to me yeh... I think it would be good for me to use; it would probably make me kind of spurt on again I think it's positive encouragement yeh it's good like that...
Interventions Comments Continue...

You're motivating the person it's eye catching it stands out, it's short and concise it's not too complex, there are a few questions and it's there for you to help yourself... Not very exciting pretty normal stuff the way most leaflets are set out, perhaps something a bit different would be more eye catching... Good, well laid out, not too much as it's in point form... Yes pretty relevant I suppose I mean it's kind of general but it has to be as it has to get to lots of people I expect but yes I can see where I fit into it... Well it doesn't really tell me much I don't know, maybe it highlights stuff for me but it wouldn't make me go out and do loads of exercise I think that has to come from inside... Coloured and not overloaded with information... But not eye catching enough compared with all the other leaflets that arrive at your doorstep... Well I don't know, maybe you could do a sort of question and answer thing so that those interested know where to find the next clue/question. Then again that would probably be too much trouble I know it would for me... It's nice kind of attractive and small, slim easy to fit into a handbag or whatever, colorful and nice... I think it's good cause it's kind of realistic it's saying you know don't try and do too much be realistic about what you can do, and if you do have a step backwards don't beat yourself up about it just carry on and you know I think that's really important as. Think that's what tends to happen people say oh you know I haven't been able to do it. It all falls apart. I think that's very important basically it's just encouraging people to do more than they're doing at the moment and if they don't end up doing as much as they should do; at least they're doing more than they were... I think it's good; it's well very relevant to me. It's not telling me anything I don't know but it's good in having it written down like that and em just the main goal and short term goal that's a good idea; cause I think if you do write it down it will help you cause like the main goal may be that'll; I'll enroll in a class and do more walking; then that would help me as I think I'd do something about it because I've made a goal you know... I think it is sort of relevant to me then the info about walking and the classes you know, what we were talking about before. It is true that classes are safe and indoors and it would make sense to try and do something like that; emm I'm not against doing that I've just not been able to do it... I think it would be very helpful I mean I don't think a pamphlet is ever gonna make me do it but I think it's sets out what I am, where I am really at the moment and gives me a few pointers as to where I can move onto really... I think it's kind of easy to understand, erm nice attractive to look at and it's given me something practical what to go on rather than just being told to do more exercise. Its kind of saying right we understand the stage you're at and this is what you need to do now to move on a bit... Maybe there's too much emphasis on having someone else to encourage you; although in an ideal world that would be great but I think a lot of the times people are doing things on their own. Making decisions about their life on their own so you know perhaps that emphasis is slightly over egged... I think adding something about where these opportunities can be found in the locality on the back you know maybe a little bit more specific like numbers you can call for classes or badminton or whatever. So you know people can take the advice onboard and then can look on the back and find a number where they can find out about walking groups or sports clubs...
Intervention Comments Continued...

Yeh I like the layout and the info is OK and yes I do think it's fairly relevant. Erm I don't know I think it's difficult. Would it be useful; in helping me change erm... maybe it would if I really sat down and worked out what I wanted to do and planned to do it. I think for me it's planning and organisation. I spend all day planning and organising at work. I spend all time planning and organising so I can study so the last thing I want to do is plan and organise my personal life I just like to go with the flow. Good points not too long not too much jargon and the information seems pretty good. Bad points it's a bit bland it's a bit boring there are a few pictures but they're not that inspiring. How would I improve it... probably get a bit more of a professional look on it like printed on glossy paper maybe jazzing up a bit different background colour than white. Yeh overall it gives good tips like where I lack I suppose and it may even motivate me to do something if I read it and go through it... Pretty good, easy to follow... Lots of information, a bit much to take in at once but if you keep referring to it yeh some good tips... I like the stuff on goal setting I think this is something I need help with I kind of set goals out of my reach you know and then kind of give up. That makes me feel guilty then... Yeh there is probably some stuff I'll try, can I keep it and give it another go... Colourful, and asks you to do things... Maybe too much information and you have to do things... Yeh but it can also be bad, especially if you're not in the right mood... Don't know really, maybe just a bit less info, but it's pretty good I'm not sure. Erm the picture on the front is a bit weird but that's it really... Yeh its fine it's actually better than the questionnaire because its small and there's not loads to it and its easy to read its simple and I like that and I like the little pictures. It just makes it a bit more eye catching and breaks up the text... It put in easy you know simple terms rather than complicated and its erm you know simple for people to understand... Yeh think so some of the things I kind of do but not as much as I could do...I think the activity log is good idea but I don't kind of make a goal so maybe that's quite useful to do... All of it. It just gives you a starting point like this is what I'm already doing and this is how I can make it better and move forward, I quite like that... I dunno nothing really there's nothing wrong with it. You know I think it's clear and it's to the point it has relevant information it doesn't have too much information its fine as it is... Erm good although it starts with a bit of a long paragraph but other than that its spot on, its got contact numbers for more info yeh spot on... Very good, big list of tips leads your eye through with short headings... Very I'd say I like the bit with the goals yeh its gives you something to work for... Pretty good especially if it's up on a notice board and you can see it everyday, my favorite bit is definitely the goals and sub-goals yeh I think I'll start using that myself... Try and condense the paragraphs at the start as some people see that and think oh god I've got to read something hmm I'll do it later... I also like the front graphic it's kind of funny but also points out what could happen if you don't exercise.
With regard to the format of the intervention the majority of responses were positive, however, three important factors were evident:

1. The introductory paragraph was too long, it needed to be reduced as this may negate any usefulness due people not bothering to read it or may exclude those with dyslexia.

2. It needed to be redesigned in a different fashion to appeal to more people as it was "not eye catching enough compared with all the other leaflets that arrive at your doorstep" to improve impact a different design may be appropriate.

3. The background colour of the leaflet needed to be revised in order to help those with dyslexia.

Of particular importance here were the comments regarding dyslexia as this is an important consideration particularly with postal interventions. There is a need to use all information available to ensure that it is available and appropriate to the maximum percentage of the target population. This is something that unfortunately was not considered at the time of the intervention development, however, it would seem prudent to suggest that all future information leaflets, interventions etc... are aware of and adhere to the recommendations for improving readability for those with dyslexia. In addition the need to appeal to as wide a range of people with a more eye catching design also needs to be considered; marketing information may be a useful adjunct to intervention design as this factor could further enhance the impact of the intervention in the target population.

With regard to content it was overall deemed relevant and useful in improving or maintaining physical activity which was its purpose with no-one interviewed feeling that the information in the stage matched intervention leaflet they were asked to review was inappropriate to their current Stage of Change. The objectives of the intervention were as detailed above "its sets out what I am, where I am really at the moment and gives me a few pointers as to where I can move onto" (Sadie – PR). In essence the intervention aimed to increase
or maintain physical activity in a non threatening way increasing awareness of barriers or opportunities and providing information on where they could find help and advice along with practical tips on for example reinforcement and countering. In conclusion the intervention was perceived as well laid out with relevant content that would help people to think about, increase or maintain their activity levels; which is supported by the results in the previous chapter where stage matched participants were more likely to increase their stage of change compared with mismatched and control study participants.

In summary, a number of factors have emerged from the qualitative study. These include the conclusion that in physical activity uptake behavioural processes are utilised in earlier SOC than proposed by past research (Prochaska et al., 1994; Prochaska & Velicer, 1997). In addition cognitive strategies are still important in preparation despite the uptake of some behaviour change. Furthermore, the Preparation SOC seems to be the busiest stage for POC use. Goal setting is a useful adjunct to the TTM which supports previous findings (Prochaska et al., 1994; Woods, 2000). Further to this body image plays a part in moderating physical activity uptake with men and women differing in how this occurs. In women, Social Physique Anxiety was proposed as a suitable explanation of the body image issues observed, in this case it is hypothesised that SPA can act as a barrier at earlier SOC or in socially anxious individuals and as a potential motivator at later SOC. With reference to men body image is relevant for modelling purposes and to safeguard Self Efficacy. In this instance training partners (HR) should be as similar as possible to an individual to increase likelihood of taking up and increasing physical activity.

In addition to this, the divergence of the qualitative and quantitative results may be indicative of poor validity of the instruments used within this study, which is somewhat supported by the comments of the interviewees regarding the confusion associated with the purpose of the instrument to assess or to motivate. When re-assessing the validity information provided on the questionnaire development the Cronbach alpha scores were at the lower end. This may suggest the need for re-validation; in addition the comments
regarding some of the items in the instrument may indicate a need to revisit the language used within the questionnaire to make it more appropriate for a non US audience and to ensure those who do complete the questionnaire do not feel that they are repeatedly being asked the same thing in a different way.

Finally, the interventions were supported as a means to increase or maintain physical activity by the interviewees with a number of key factors needing to be incorporated to make it more accessible such as reducing large blocks of text and selecting preferably yellow paper to aid those with dyslexia. In addition, the need to use more eye catching / unusual formats to increase likelihood of it being read were also suggested.
Chapter 6

Summary, Conclusions and Future Research Recommendations
Degenerative disease and mental health problems have increased alongside reductions in physical activity in Western societies (DeVries & Housch, 1994). Physical activity has been linked positively with prevention of a number of diseases (Nieman, 1998). Evidence demonstrates that inactivity negatively impacts substantially on both public and individual health (Department of Health (DOH), 2004). The case for increasing physical activity has been discussed in the introductory chapter to this body of work. The public health challenge to physical activity professionals in light of the recent DoH guidelines (2004) of at least five a week bouts of 30 minutes of accumulated activity, is to encourage the sedentary and low active proportion of UK society to increase their physical activity levels to meet this criterion behaviour and to encourage those sufficiently active to maintain their behaviour. There is currently no consensus on how to increase and maintain physical activity in the UK population. In a recent review both primary care and community settings were examined with community based interventions focussed on non-facility dependent, behaviourally tailored interventions exhibiting long-term effects (Hillsdon, Foster, Naidoo & Crombie, 2004) being the supported method for intervention; however, no consensus was reached on the most appropriate behavioural theory for intervention design.

In exercise psychology a number of theories have been applied to explain and predict the adoption and maintenance of physical activity. The model selected for empirical and qualitative analysis herein was the Transtheoretical Model of Behaviour Change (Prochaska, 1979). This model has received increasing support in the literature and is currently being used in primary care settings as a basis for intervention (Ashworth, 1997). However, the area of structured activity, for example fitness suite/gym attendance, has not been studied.

Following the development of measures, many studies have systematically tested TTM constructs in relation to physical activity, however only three studies have done so for the model in its entirety (Bock et al, 1998; Gorley & Gordon, 1995; Nigg & Courneya, 1998) all of which were cross sectional in
nature. Only two prospective studies were identified (Cardinal, 1997; Woods et al, 1999) however, these studies did not assess all the TTM constructs. The three studies that assess all four constructs together, show support for the use of the TTM in our understanding of physical activity behaviour across different populations, however their cross sectional nature limits their applicability in predicting how changes in independent variables may effect stage movement. It was therefore, apparent that longitudinal studies of all TTM constructs in a single study were warranted before any inferences of causality can be made.

Recent meta-analytic (n=68,580) and narrative reviews (Marshall & Biddle, 2001; Spencer, Pagell, Hellion & Adams, 2002) highlighted the need to examine stage transitions through longitudinal designs; randomised controlled trials examining stage matched versus mismatched interventions and case studies examining how the Transtheoretical Model constructs operate at different Stages of Change in exercise adoption and maintenance. These three areas are the basis of this thesis.

6.1 Aims, Objectives, and Hypotheses

Aims
The overall aim was to explore the role of the psychological processes involved in the behaviour change process in relation to criterion physical activity and fitness suite activity adoption and maintenance from both the quantitative and qualitative stand point.

Objectives
- Identify through longitudinal assessments the Transtheoretical interconstruct relationships with regard to both physical activity/exercise and fitness suite/gym use that help to promote activity uptake in order to assess the different requirements if any in each specific mode of activity.
• Compare stage matched interventions for activity promotion in both modes of activity described above versus mismatched and control conditions to assess the enhanced benefit of stage matched approaches.

• Explore exercisers and non-exercisers through qualitative case by case analysis techniques to assess the subjective perceptions of individuals at different Stages of Change in relation to personal and societal physical activity.

It is hypothesised that:

1. Results from cross-sectional difference testing of the four core constructs of the Transtheoretical Model will support previous findings and indicate representativeness of the participant cohort. Thus Processes of Change use, Self Efficacy and the perceived benefits (PROS) of activity will increase as Stage of Change increases and the perceived disadvantages (CONS) of activity will decrease as Stage of Change increases in a similar pattern to previous studies.

2. Results from cross-sectional and longitudinal regression analyses will not support the cross sectional relationships identified either within previous research or, within this study (Study 1). This will identify that incorrect assumptions regarding interventions may have been used as a result of the predominance of cross sectional difference testing research in past research. As a result new or modified recommendations will be generated to increase likelihood of Stage of Change progressions for physical activity uptake and maintenance.

3. The predictors of SOC categorisation and movement from both cross-sectional and longitudinal data analysis will differ as a consequence of exercise definition. This will inform the need for further testing of
intervention methods and or content for different exercise modalities particularly in structured settings (Study 1).

4. Matched intervention conditions (Matched A and B) will cause significantly greater positive movements in Stage of Change than mismatched or control conditions.

5. Matched A intervention conditions (Matched to physical activity SOC) will increase physical activity significantly more than other conditions.

6. Matched B intervention conditions (Matched to fitness suite SOC) will increase fitness suite activity significantly more than other conditions.

7. All intervention conditions (Matched A, B and Mismatched) will exhibit significantly more positive Stage of Change movements when compared with the control condition. This will be indicative of the potential for expectation effects (such as the Hawthorne effect) from receipt of motivationally oriented materials even without specific matching to current Stage of Change.

8. The matched interventions will have a greater effect on Stage of Change progression than will any individual variable either categorical (Age group, Sex, Employment status) or Transtheoretical (Processes of Change, Decisional Balance, Self Efficacy).

No hypothesis was formulated with regard to the qualitative element of the thesis due to its exploratory nature. The original theory emerged from qualitative assessments of smoking self quitters and the construct framework was developed based upon the stories of these self changers and their parallels with common psychotherapeutic systems and processes (DiClemente & Prochaska, 1982). The theory within the physical activity/exercise domain has utilised this early research for the development of empirical measures but has not examined exercisers' stories across all of the Stages of Change. Furthermore, the researcher, who was also the interviewer
believed that pre-conceived notions of the results might add an experimenter bias to the interviews.

6.2 Methods and Design

In order to meet the aims and objectives of the thesis three studies were conducted.

Study 1 (Quantitative)

Longitudinal analysis of 172 individuals recruited from a university and its locality. All TTM constructs were quantified using instruments previously validated (Marcus et al, 1992a; Marcus et al, 1992b; Marcus et al, 1992c). Two datasets were collected (Observation 1 - baseline; Observation 2 - 12 months). Difference testing and regression techniques were employed to assess demographic and TTM interconstruct relationships over time to provide concurrent fluctuation analysis and their effect on Stage of Change progression, stability and regression.

Study 2 (Quantitative)

Longitudinal analysis of 92 individuals recruited from a university and its locality in a four group intervention comparison study with further assessment of all TTM constructs using the instruments referenced above. This allowed further assessment of interconstruct relationships and the ability to identify the effectiveness of Stage of Change matched intervention groups compared with mismatched and control groups over a six month period. Three datasets were collected (Observation 1 - baseline; Observation 2 - 3 months; Observation 3 - 6 months). Again difference testing and regression techniques were employed to determine the utility of the interventions in causing change and to further assess demographic and TTM interconstruct relationships.
Study 3 (Qualitative and Quantitative)

To assess the subjective perceptions of physical activity and how individual beliefs, attitudes and past experiences effect adoption and maintenance of physical activity through case by case analysis techniques. To address how these factors may effect intervention requirements across all SOC and how emergent themes fit with the TTM or other theories in order to develop a deeper understanding of the complexity of physical activity adoption and maintenance to inform future intervention development. In addition, attempts were made to address both response rate issues and the questionnaire applicability and the perception of the stage matched interventions usefulness in the target population. Concurrent quantitative analysis was carried out for triangulation purposes. Five individual cross sectional cases were undertaken using a four section interview guide and the quantitative methods described above.

Summary of Results

Study 1

Cross-sectional analysis

- Representative of previous cross-sectional research: H₁ accepted;
- Women are less likely to be active at criterion than men in both modalities despite having higher use of experiential POC. They are also more likely to be in the lower SOC when adjacent pairs are assessed;
- There is discrepancy between observations regarding useful POC between adjacent SOC pairs, indicating a possible lack of internal validity of the instruments used.

Longitudinal Analysis

- Environmental Re-evaluation and Self re-evaluation increased significantly and CONS decreased significantly over the course of the study;
In this non-intervention study more participants progressed than regressed in both modalities over the 12 month period studied; In PC Helping Relationships was significantly associated with increasing likelihood of progression (Physical Activity); In C (Physical Activity) Counter Conditioning, Helping Relationships and Stimulus Control were all significantly associated with likelihood of SOC progression. In addition, increasing CONS was significantly associated with increasing SOC possibly through emotional inoculation; In structured activity at the contemplation stage Counter Conditioning was again supported as increasing the likelihood of SOC progression, in addition, PROS was also positively associated with positive SOC movements;

In PR Counter Conditioning was again supported for aiding progression for both modalities; In AX Helping Relationships and Self Liberation were associated positively with maintenance of physical activity; In MN (physical activity) Environmental Re-evaluation and Counter Conditioning were associated with maintaining activity; In structured activity Consciousness Raising was associated with increased likelihood of maintaining criterion behaviour. In addition Women were more likely to regress below criterion behaviour than Men.

H₂ is rejected. Whilst there are some differences evident the regression analysis did identify a number of relationships that agreed with previous cross sectional difference testing research. This could be indicative of the robustness of the relationships observed. In particular, the role of CC in SOC progression whilst evidently being of use earlier than indicated from cessation research, the use of this POC agreed well with past research from the exercise domain (Bobick & Courneya, 2000; Plotnikoff et al, 2001; Prochaska et al, 1994; Woods et al, 1999).
H₃ is tentatively accepted. Whilst some similarities are again evident (CC) other relationships are not and as a result whilst further testing is needed it does seem apparent that different stage matched interventions are required for structured activity.

Main findings

- Women are more likely than men to be in lower Stages of Change despite higher cognitive POC use. In addition, even at SOC above criterion they are more likely to regress compared with men;
- Behavioural POC (CC, HR, and SC) appear to be required at earlier SOC than previously identified. In particular, they are needed to aid stage progression from Contemplation to Preparation, as this is when an overt change in behaviour occurs (from no activity to some activity); this would seem intuitive.

Study 2

Cross-sectional Analysis

- Students are more likely to drop out of exercise than the employed;
- Matched interventions were linked to the increased likelihood of improving SOC in physical activity.

Longitudinal Analysis

- Below criterion matched interventions increased likelihood of positive SOC movements compared with non matched conditions (0-6 months). H₄ accepted;
- Above criterion matched interventions and being employed increased likelihood of maintenance of criterion behaviour;
- H₄ accepted. Matched interventions are linked with increased SOC progression in below criterion SOC and maintenance in above criterion SOC;
• No differentiation between Matched A and B conditions for SOC progression or maintenance. \( H_5 \) rejected;
• Matched B conditions (FS) are more likely to cause regression in both below and above criterion SOC. \( H_6 \) rejected;
• No significant differences were exhibited for all interventions compared with control conditions for SOC progression or maintenance. \( H_7 \) rejected. This is an indicator that the Hawthorne effect was not apparent within this study and further supports the utility of stage matched interventions;
• Matched interventions and being female increased likelihood of progression in below criterion Stages of Change (physical activity) after 3 months of intervention;
• Self Liberation and Stimulus Control are both positively linked to SOC progression in below criterion SOC;
• Students are more likely to regress than the employed in above criterion Stages of Change;
• Social Liberation and Environmental Re-evaluation are linked positively with above criterion maintenance (physical activity).

Main Findings

• Matched interventions are supported as the intervention of choice for improving and maintaining physical activity;
• Interventions matched to FS SOC based on previous empirical research are not suitable to aid progression and maintenance of activity in a structured setting. However, this may be due to the differences identified in study 1. Further research is required.
• Women receiving cognitive interventions are more likely to progress than men in lower SOC;
• In this sample students were more likely to regress than the employed. This may have implications for the duty of care offered by an institution. This factor needs further analysis due to the relatively small number (n=70) who completed this research and on whose data this comment is based.
Study 3

- Each Stage of Change exhibited different support demands for progression thus the need for Stage matched interventions is supported;

- Behavioural POC are required in earlier Stages of Change than previously indicated in combination with cognitive POC;

- Experiential POC are required up to Action where emphasis switches to behavioural POC;

- PRO, CON and SE changes are evident in different SOC with POC helping to cause changes. However, it is still not evident whether POC themselves cause SOC movements or whether the effect of POC on PROS, CONS and SE are causally linked. Longitudinal qualitative analysis may be able to answer this question;

- Overall the TM is supported as a useful tool in describing physical activity uptake and maintenance;

- There were two additions to the model evident 1) Body Image 2) Goal Setting;

- Body Image
  - Women display signs of Social Physique Anxiety which could act as a barrier in below criterion SOC and a motivator in above criterion SOC;
  - Men display signs of ego preservation with the need for vicarious experiences in below criterion SOC being available from models similar to themselves;

- Goal Setting – This techniques may be useful as early as the Contemplation stage;

- There was a lack of agreement between the relevant POC identified as being utilised from interviews and those used according to the questionnaire in below criterion SOC. This lack of agreement
disappeared in above criterion cases. This may indicate a lack of internal validity for the instruments used;

- The questionnaire was perceived as motivational, potentially causing an intervention effect that it was not designed for (teleological) and questions were at times viewed as contextually repetitive (tautological). This has implications for usefulness and validity. A revision of the questionnaire is suggested, followed by re-validation in a UK sample;

- The interventions were viewed as relevant and perceived as useful in aiding uptake and/or maintenance of physical activity, but there is requisite for:
  - Need to account for dyslexia in the design;
  - Revise format to make it different from general leaflet layout to make it more eye catching and increase the likelihood of it being read.

Main Findings

- TTM supported as useful in devising interventions for improving physical activity uptake and maintenance;

- Behavioural POC are required earlier and Experiential POC later than previously recommended;

- Women appear to exhibit Social Physique Anxiety in relation to physical activity which can have a positive and negative effect dependent on current SOC. This is not apparent in men;

- The validity of the questionnaire for a UK sample is questioned. There appear to be both tautological and teleological issues with the questionnaire, indicating the need for re-design and validation.

The sections below discuss the findings that contribute to the aims of this thesis. Within these sections are a summary of findings that support and
refute previous research with regard to physical activity uptake and maintenance, along with evidence for sex and status differences in the utility of the TTM and likelihood of adoption of physical activity. Also discussed is the utility of the TTM for intervention in more structured activity settings, beside findings of the relevant predictive variables that contribute to a further understanding of this type of activity. Alongside the findings from the empirical analysis the ideas developed from the quantitative case by case analysis are expanded and further discussed with specific reference to other theories which may contribute to the development of the TTM in the exercise domain. In the first section the findings specifically relating to behaviour change theory as the TTM describes are discussed from both empirical and qualitative standpoints. The following sections discuss factors currently outside the confines of the TTM such as sex, status, potential additions to the TTM and issues with regard to the measures utilised within these studies. Following these discussions the implications of this research are summarised with indications for future research that will advance the understanding of behaviour change and the TTM in the physical activity domain.

Transtheoretical Model

The Transtheoretical model is a four construct model of behaviour change that postulates a number of interconstruct relationships for the facilitation of behaviour change from an inactive level of behaviour to a criterion defined maintenance level of behaviour that will benefit the individual for health and/or fitness gains (Prochaska et al., 1998). The utility of this model is proposed to be the identification of five Stages of Change which require different informational and motivational needs to facilitate an increase in the likelihood of intentional/behavioural change and maintenance with the SOC acting as the key organisational construct.

Within this thesis the SOC component of the TTM is supported as an efficacious method which was shown to have quantitative and/or qualitative associations with the operational constructs of Processes of Change, Decisional Balance and Self Efficacy. As such it is supported as a useful method to delineate between individuals who require qualitatively different
intervening mechanisms for initiating and supporting the adoption and maintenance of physical activity behaviour. This has also been reported elsewhere (Goldberg et al, 1996; Gorley & Gordon, 1995; Marcus et al, 1992a; Marcus et al, 1992b; Marcus et al, 1992c; Marcus & Simkin, 1993; Marcus et al, 1994a; Marcus et al, 1994b; Nigg and Courneya, 1998; Woods et al, 1999a).

With regard to interconstruct relationships the majority of previous research has been cross sectional in nature thus failing to elucidate causal relationships. With regard to the cross sectional associations the results herein predominantly agree with previous findings suggesting the sample is representative of previous samples (Courneya & Bobick, 2000; Gorely & Gordon, 1995; Marcus et al, 1992a; Marcus et al, 1992b; Marcus et al, 1992c; Nigg & Courneya, 1998). However the research herein also attempted to assess the causal interconstruct relationships to redress the issue of the weakness of the research in this area to date (Marshall & Biddle, 2000). The longitudinal aspect of the studies identified a number of corroboratory and distinct relationships when compared with previous research. In essence, cross sectional research postulated that the most beneficial methods to facilitate change are experiential in nature in the pre-active stages with behavioural strategies increasing in benefit at later stages (Courneya & Bobick, 2000; Gorely & Gordon, 1995; Marcus et al, 1992a; Marcus et al, 1992b; Marcus et al, 1992c; Nigg & Courneya, 1998). The longitudinal analysis however, does not agree with these findings because the behavioural strategy of Helping Relationships was the only predictor of progress from PC and two further behavioural strategies (Counter Conditioning and Stimulus Control) adding to the efficacy of HR for positive progression from contemplation. Whilst in opposition to historical accounts of POC by SOC relationships this does agree with two recent longitudinal studies where, amongst other processes, CC, SC and HR all exhibited positive stage progression effects (Plotnikoff et al, 2001; Woods et al, 1999a). Further to this CONS exhibits a relationship in contradiction of that proposed by cross behavioural analysis (Prochaska, 1994) with increasing CONS increasing the likelihood of positive movement out of contemplation possibly through
emotional inoculation (Nigg et al, 1997). Movements across the criterion boundary from preparation to action are facilitated again by a behavioural process (CC). In above criterion stages again the predominance of positive relationships are behavioural in nature with Helping Relationships, Self Liberation (AX) and Counter Conditioning (MN) being indicative of increased likelihood of maintenance which is supported by both cross sectional and longitudinal research (Courneya & Bobick, 2000; Marcus et al, 1992a; Plotnikoff et al, 2001). However, again there is a divergence from the theoretical underpinnings of the model and cross sectional research with an experiential process (Environmental Re-evaluation) also predicting continued Maintenance which again is supported by longitudinal study findings (Plotnikoff et al, 2001).

The longitudinal testing of TTM interconstruct relationships did not agree with previous cross-sectional research, however, the weakness of such methods of assessment have been discussed previously within this work and by other authors (Marshall & Biddle, 2000; Plotnikoff et al, 2001). Despite this the TTM is supported as a suitable method to enable the assessment of behaviour change in part as a result of corroboratory evidence from other longitudinal studies particularly with reference to relationships found at Contemplation (Plotnikoff et al, 2001; Woods et al, 1999a); but also as a result of the different strategies identified as significant at different stages indicating the need for stage matched interventions to promote behaviour change. The quantitative analysis of TTM interconstruct relationships suggests that behavioural Processes of Change are significantly associated with positive behaviour change in relation to intention to adopt, adoption and maintenance of physical activity, with CONS being effective in the movement from an inactive to irregularly active stage through emotional inoculation. No significant longitudinal relationships for either PROS of change or Self Efficacy were exhibited which is somewhat surprising in light of the positive relationships evident in other TTM studies (Marcus et al, 1992b; Marcus et al, 1992c; Woods, 2000). In particular the Self Efficacy relationship is unexpected as it was recently described as the mechanism which mediates all behaviour change (Buckworth & Dishman, 2002).
With regard to the qualitative study relationships across all stages evident with HR from precontemplation onwards along with the SC and CC relationship at contemplation support is found, however, the qualitative analysis also highlights experiential processes in the earlier stages too in line with TTM theory (Prochaska et al, 1994). The crux of the qualitative analysis was that as in the quantitative results behavioural processes are beneficial at much earlier stages than previously postulated alongside the anticipated experiential mechanisms. Furthermore, these experiential factors are still relevant at above criterion stages alongside behavioural factors, which does not hold with the basic TTM theory in past literature. In opposition to the quantitative analysis, self efficacy was regarded as a significant mediator of behaviour change, POC provided potential strategies to improve both self presentation efficacy and goal oriented motivational efficacy with the self efficacy construct being the actual catalyst for change. These issues are discussed later in the chapter.

The second aim of the studies herein was to assess structured physical activity through the Transtheoretical Model. Unfortunately relationships across all SOC were not available. In the contemplation and preparation stages, similarly to general activity, Counter Conditioning was found to be predictive of positive stage progression; in addition increased PROS during contemplation was predictive of positive movements out of contemplation in agreement with the expected relationship (Prochaska, 1994). However, in maintenance an experiential process was found predictive with increased Consciousness Raising increasing likelihood of perpetuating activity in this type of structured setting possibly as a consequence of the informationally oriented environments that pervade gyms in relation to warm up advice, posters and magazines about physical activity and its benefits. With reference to Self Efficacy, no important statistically significant relationships were evident which may be as a consequence of the reasons implied later in this discussion. The results with regard to the TTM in relation to fitness suite activity adoption and maintenance, whilst not as comprehensive as had been hoped, provide initial insight into the relationships that may be evident within this type of structured
activity along with the indication of potential differences between this and less structured activities and thus the need for different interventions in this type of activity. It is recommended that further assessment of this highly structured behaviour is undertaken as it is essential to ensure that any interventions employed are relevant to the setting, which may not be the case if traditional TTM research from the exercise domain is used. The need for this is corroborated by the increased inclusion of behaviour change modules, particularly Stages of Change in training courses for personal trainers and GP referral schemes which are often delivered in gym based settings along with the increasing use of this model in primary care settings as a basis for intervention (Ashworth, 1997).

In addition to further assessment of TTM core construct relationships, a further aim of this thesis was to compare the utility of three TTM based interventions and their efficacy for behaviour change alongside a control group. The three interventions were described more fully earlier in this work (p.140) with the experimental groups consisting of two SOC matched interventions (A= Physical Activity SOC; B= Fitness Suite Activity SOC) and one mismatched intervention. This study supported the interventions in both below and above criterion participants for promoting adoption and maintenance of physical activity when matched to Stage of Change, however when the intervention was not matched to SOC it had no more effect than receiving no intervention. These results support previous findings regarding the efficacy of stage matched interventions (Dallow & Anderson, 2003; Jones et al, 2001; Marcus et al, 1992d; Marcus et al, 1998; Petersen and Aldana, 1999; Titze et al, 2001; Woods et al, 1999b). It also allows the conclusion that it is not TTM oriented interventions per se that are efficacious in the promotion of activity but the matching of these interventions to SOC that is the crucial factor. In other words it is not the use of psychotherapy based interventions irrespective of the stage at which they are used that are the active ingredients in the success of these interventions. It could be postulated that such types of behaviour change method are the functional component of successful changes seen here. However, the results from the mismatched treatment in the intervention study indicate that it is actually the matching of these
psychotherapeutic system to the relevant Stage of Change that is the important factor.

In the Fitness Suite analysis however, those receiving the intervention matched to Fitness Suite Stage of Change were more likely to regress in Fitness Suite Stage of Change despite the positive effect it had on Physical Activity. This result is similar to that of Cardinal and Sachs (1995) who used TTM based interventions in both Structured and Lifestyle interventions. Only the Lifestyle group improved SOC significantly over the seven month intervention. These results are indicative that there may be different relationships required to facilitate SOC progression with regard to structured settings and further supports the need for more assessments of TTM and other theory relationships in structured exercise settings.

In addition to the TTM relationships discussed above, the quantitative studies also revealed that both sex and status had an effect on the likelihood of SOC adoption, maintenance or regression in both the non intervention and intervention studies. These factors will be discussed below.

Gender
There were a number of sex differences evident from both the non invasive and intervention studies. In study one, women were found to be more likely to be in lower stages of change than men for both PA and FS activity despite scoring higher than men on all experiential processes at observation 1 and Environmental Re-evaluation, Self Re-evaluation and Social Liberation at observation 2. In addition, women indicate a greater availability to Helping Relationships, Reinforcement Management and higher PROS and CONS for activity, whilst men exhibited significantly greater Self Efficacy. However, in the intervention study it appears that the matched interventions were particularly useful to women in below criterion stages of change with females being more likely to progress at least one SOC compared with men. Thus, whilst they are less likely to be undertaking criterion behaviour they are potentially more open to the suggestions to increase physical activity levels. This is an important finding as women are regularly identified as having
chronically low compliance rates in relation to health and/or fitness related levels of activity (ADNFS, 1992; DOH, 2004; Health Promotion Authority Wales, 1992; Health Survey of England, 1998; Scottish Health Survey, 1998). Woods (2000) suggested that women may be more aware of cognitively based interventions than men; with reference to these results this seems to be supported as the interventions designed for below criterion Stages of Change were predominantly of cognitive orientation.

Thus it seems that low cost mail delivered cognitively oriented written material has a positive effect on women for mobilising positive Stage of Change movements in the stages where change is most needed for health benefits. This has implications for intervention design as it may be that men and women require qualitatively different material for optimal SOC improvements in below criterion stages; this may potentially be due to differences in body image and self presentational motives for exercise which are discussed below.

Duty of Care

In both of the quantitative studies it was identified that students were more likely to regress in Stage of Change even when initially in above criterion stages. Whilst the number of participants reported on here requires caution in the conclusion formulated it is certainly something which may require further study. If this relationship was found in a different and/or larger sample then studenthood could prove to be particularly deleterious to future physical activity level and long term health as “choices made during formative periods of life carry special weight as they initiate concatenating experiences that create the pre requisites for desired futures or foreclose them” (Bandura, 1997 p. 161). A duty of care exists between an institution and its matriculated students. Whilst specific care regarding the long term health of the students post graduation is not an issue, it seems apparent that if studenthood reduces likelihood of maintaining physical activity at levels required for long term health benefits then institutions may be in breach of duty of care responsibilities if this behaviour is likely to continue indefinitely. The
disadvantages of inactivity are widespread and fully documented (DOH, 2004) and under the auspice of duty of care this could be considered a reasonably foreseeable event, which could cause long term loss or harm (JISC legal information, 2004). During this major formative period duty of care may thus be breached; particularly in light of the increasing level of mental illness in students (Wray, 2004) and the ameliorative effects of physical activity on mental illness (DOH, 2004).

Institutions provide pastoral care for students through their student services provision; it may be important to include the use of physical activity interventions within the counselling provision available for students. In addition, it may be prudent to identify the reasons why students are more likely to reduce physical activity than those who are employed, in order that particular interventions for this sub group of society can be developed and adopted into an institution’s policy of pastoral care.

In addition to the empirical results discussed above, a number of factors emerged from the qualitative study which may have a significant impact upon the utility of the TTM in the exercise setting with regard to factors that are not routinely included within behaviour change TTM research in this domain. These include Goal Setting theory and Body Image factors that may impact upon intervention design, along with issues surrounding the items currently used for assessment of TTM constructs within the exercise domain.

Goal Setting

Goal setting was identified as a suitable intervention method for those in contemplation onwards during the qualitative analysis; this method has previously been found useful as a TTM addition through qualitative assessments in a British population (Woods, 2000). Goal setting is a form of self regulation which has a moderating affect on thought, affect, attention and behaviour via deliberate use of mechanisms and skills. These processes enable the guidance of goal directed activities over time and across
circumstantial changes in the individual (Behncke, 2002). Goal theory is regarded as a useful intervention in self efficacy improvement via motivational mediating processes, whereby the moulding of behaviour occurs through the translation of forethought into incentives and guides for reasoned action through cognised goals. Thus, future goals are adapted into contemporary facilitators by cognitive representation in the present (Bandura, 1997). However, whilst the adoption of a goal may cause people to act, in order to realise it, if there is no perceived way to attain the goal, then individuals may not initiate the goal directed behaviours; thus self efficacy is the moderator of goal setting and attainment initiation behaviour (Bandura, 1997; Behncke, 2002). In this instance cognitive motivation is facilitated by forethought as a means of motivating and guiding anticipatory actions and from these cognitions efficacy beliefs are formulated which influence goal level, strength of commitment and mobilisation of effort enabling the development of a plan of action to realise valued outcomes and avoid aversive ones (Bandura, 1997).

Motivation is dependent on the cognitive process of comparison between perceived abilities and perceived required ability to meet goals set. If self efficacy is high enough, action is likely to occur. In order to do this effectively there is a need to identify the required standard along with personal level as the adoption of goals without knowing current levels does not have lasting effects (Bandura & Carvone, 1983; Becker et al, 1978; Strang, Lawrence & Fowler, 1978). This discrepancy assessment will either lead to likelihood of persistence (high SE) or potential drop out (low SE) as efficacy beliefs affect what challenges we adopt, how much effort to expend and how long to persevere in the face of difficulty (Bandura, 1986; Bandura, 1991). Suitable goals can aid self motivation and help to determine persistence and effort. However, whilst goals may have some pursuasory power on efficacy beliefs, personal efficacy customises the goals with the influential message produced potentiating the effect and the belief that you 'have got what it takes' being the conveyor of the effect (Bandura, 1997).
Therefore, Self Efficacy and its improvement should have a lasting impact upon motivation and commitment with an individual who wishes to change behaviour. With references to TTM this form of efficacy assessment will potentially have impact upon SL (choice, commitment and belief) along with SO (awareness, availability and acceptance) as some form of social comparison will occur in the assessment and setting of perceived efficacious goals. In addition, the setting of attainable sub goals will further improve perceived efficacy and self satisfaction with the use of RM (changing controlling contingencies) acting as a reinforcement mechanism to further enhance the motivation of the individual to intensify and persevere with their effort (Bandura, 1997).

Body Image

Body image is a psychosocial phenomenon that occurs as a response to the interaction between societal factors and the individual (Grogan, 1999). The body is the "critical point at which the social meets the individual and from which the self is created" (Gimlin, 2002 p.3). Within the interviews there were some indications that men and women differed in their body image and how it affected their attitudes towards physical activity independent of Stage of Change. Women appeared to view physical activity in the context of how others viewed them which may cause anxiety; whilst men did not express these views so overtly they did have body image issues that were more related to the need for suitable models that would not place too much pressure on their ego and thus, self efficacy. Furthermore, there was a need to ensure that any models (or Helping Relationships) they engaged with did not out perform them.

Previous research has revealed gender differences in bodily self perception. Using silhouette studies women perceived that the ideal body image was slimmer than their perceived actual silhouette, whilst mens' perceptions of the ideal silhouette were either thinner or more muscular than their perceived actual body size and shape (Grogan, 1999; Mishkind et al, 1986). With regard
to physical activity, whilst both men and women exhibited body image issues, their motivations for exercise differed (Grogan, 1999).

Physical activity is a self presentational behaviour and with regard to motivations for physical activity two areas reflect self presentational motives a) physical appearance b) social identity (Leary, 1992). Furnham and Graves (1994) identified that women were more likely than men to cite exercising for weight control, altering body shape, attractiveness and health, with women being more likely than men to engage in groups aspiring to alter the body (Gimlin, 2002). Men, however, are more affected by peer pressure, the need to fit in with friends and the necessity of being of equal musculature (Furnham & Graves, 1994). This level of explicit competitiveness was rarely evident when talking to women (Grogan et al, 1997). In this thesis body image seems to be a potent barrier and motivator, however it appears to manifest in different ways in a similar way to the differences discussed above. Thus, with regard to self presentational motives for exercise it may be that women’s motives are mediated by efficacy in relation to personal appearances whilst men’s motives are mediated by social identity.

With regard to women, within this self presentational framework, the affective responses to exercise and sport experienced by individuals may include Social Physique Anxiety (SPA). This factor stems from social anxiety which reflects the discrepancy between perceived social standards and perceptions of personal efficacy to fulfil them (Alden, Bieling & Wallace, 1994; Leary, 1983; Schlenker & Leary, 1982; Wallace & Alden, 1991). This discrepancy may act as a motivator or barrier dependent on the individual and their propensity for social anxiety as the socially anxious generally differ in their efficacy beliefs as opposed to their actual ability (Glasgow & Arkowitz, 1975). The outcome of social anxiety may range from reduction in emotional rewards of activity to the active avoidance of threatening self presentational behaviours such as physical activity as a means to counteract the socially induced anxiety (Leary, 1992). The SPA and exercise behaviour relationship is not fully understood but it appears that it can act as both a barrier and incentive (Martin, Ginnis & Leary, 2004). It has been suggested that self
presentational efficacy mediates this relationship (Sinder, Martin, Ginnis & Angrove, 2003).

Experimentally, improvements in self efficacy and fitness have been shown to be significant predictors of reduced SPA (McAuley, Marquez, Jerome, Blissmer & Katula, 2002). If SPA mediated self efficacy is also a potent barrier, what mechanisms do we need to employ to increase self efficacy to the critical level that transforms SPA from a barrier to a facilitator, if there is such a level? Self Efficacy is mediated by four processes: cognitive, motivational, selective and affective (Bandura, 1997). With reference to SPA, due to its psychological basis, it may be that cognitive and affective processes are of greatest importance in its initial attenuation. On a cognitive level self appraisal can be influenced by anxiety induced by a comparison of perceived personal attributes and ability and those attributes deemed necessary for the task. These efficacy based thought patterns can subsequently undermine likelihood of actual performance “where people harried by self doubts anticipate the futility of efforts to modify their life situation” (Bandura, 1997 p.121). With regard to affective processes self efficacy has a pivotal role in self regulating affective states; whilst people are capable of regulating what they think and thus influencing how they feel and act, efficacy mediates the behaviour in that a higher sense of efficacy enables individuals to take on problematic situations that induce anxiety. Thus, “the stronger the perceived efficacy to exercise behavioural, cognitive and affective control, the weaker the anxious expectations” (Bandura, 1997 p.153).

So in order to reduce SPA to a manageable level that facilitates rather than precludes activity, cognitive and affective control of SPA needs to occur potentially through such POC as CR, DR and SR to aid in the development of self efficacy. There are four forms of efficacy influence available:

1. Mastery Experiences
2. Vicarious Experiences
3. Verbal Persuasion
4. Physiological / Affective States

(Bandura, 1997).
The strength of effect of these influences has generally been expressed in the above order, however, the power of any mode can be influenced dependent on the strength of other modes. The relative power of different modes of efficacy influence and their potency may be more relevant to the specificity of the efficacy interactions (Bandura, 1997). In this instance it may be that despite successful mastery experiences (i.e. Jessica exercises regularly at home), SPA is still a significant barrier here as it precludes enjoyment of physical activity experiences outside the home.

In women, when examining SPA it may be that the influence of physiological and affective states and intervention at this level are most appropriate. Thus, by enhancing physical status, reducing perceived stress levels and attenuating negative emotional tendencies, efficacy beliefs can be altered to a level that will increase likelihood of eliminating further emotional reactions, via mastery experiences where SPA is no longer debilitative but facilitative as in the case of Jules. These factors all affect self efficacy through cognitive processing. In particular, mood states such as anxiety can distort attention and affect the interpretation, cognitive storage and memory retrieval of events (Bandura, 1997; Bower, 1981; Bower 1983; Eich, 1995; Isen, 1987). This cognitive aspect may explain the greater improvement in SOC for women in below criterion stages who were receiving one of the more cognitively based interventions when compared with men in similar stages; particularly if SPA and its inoculation through cognitive processes is sex based. Thus, it may be that the pre-criterion stage interventions which were more relevant for improving efficacy and thus SOC do so through the buffering of SPA in women.

With regard to men, the self presentational aspect of physical activity may reflect the need for social identity (Leary, 1992); with the effect of peer pressure, muscular equality and fitting in with friends being more apparent in their physical activity rationales and barriers (Furnham & Grave, 1994). In this instance, again, self efficacy is an issue, however, it seems that the intervention needs are different. In males it may be that modelling or vicarious experience are of particular importance despite past mastery experiences.
Modelling serves as a useful tool in promoting personal efficacy; with peers serving as a useful gauge of success via social comparison, which is a primary operative in the self appraisal of capabilities (Festinger, 1954; Goethals & Darley, 1977; Sul & Miller, 1977). In the case of both male case by case analyses the need for Helping Relationships to be like them and equal in ability was expressed and it has been identified that perceived self efficacy varies substantially dependent on the ability of those chosen for social comparative purposes (Bandura, 1997; Bandura & Jourden, 1991; Wood, 1989). The capabilities of others perceived as similar are assessed as characteristic of personal capabilities, thus, observing someone similar to yourself regularly engaging in physical activity and performing successfully raises efficacy beliefs whereby the observer believes they are capable of doing the same (Bandura, 1982; Schunk, Hanson & Cox, 1987). Therefore, the identification and enlisting of suitable helping relationships based upon perceived physical and ability characteristics may be a key in encouraging men to adopt and maintain regularly active lifestyles with the more closely the assumed similarity increasing the persuasiveness of the model (Bandura, 1997).

Thus, self presentational efficacy in men is likely to be related to social identity with similarly characterised training partners (HR) having the most pronounced effect on improving self efficacy. Modelling not only conveys the idea that if someone similar is capable then so too are you, it also boosts efficacy through the learning of effective skills and coping strategies to manage environmental demands and reduce perceptions of task difficulty. This perceived improved task manageability and altered perceptions of the difficulty of adopting and maintaining regular activity enables the observer to change their belief in their own capability to adopt and eventually maintain regular physical activity (Bandura, 1997).

Therefore, in men, modelling may offer a particularly efficacious method of improving self presentational efficacy; particularly in light of the previously cited need for peer review and their competitive nature when compared with women (Grogan et al, 1997). Thus, the promotion of adoption and
maintenance of physical activity through efficacy raising in this manner will not only provide a suitable opportunity to identify useful helping relationships but also provide a number of positive Process of Change improvements. Suitable modelling observation would potentially affect CR, SL, SO and ER directly and would also enable the identification of potential strategies for use in processes such as SC, CC and RM. Whilst it would seem apparent that this would also be of value to women wishing to change behaviour it may initially be necessary to reduce SPA in order for them to be willing to enter anxiety inducing environments to gain the modelling experience.

In summary, both sexes exhibit self presentational body image issues, which may be particularly relevant to physical activity due to its nature when compared with other behaviour changes. However, these body image issues seem to diverge based upon gender, with women needing to reduce anxiety through self efficacy boosting methods; whilst men need to increase social identity through efficacious methods. These propositions are however, based upon a small number of cases and in order to develop these ideas for potential additionality to the TTM in physical activity research and intervention more extensive qualitative assessments of these proposed gender differences are needed.

Self Efficacy

Self Efficacy development has been highlighted as a key motivational and affective component in the enablement of Stage of Change progression and also a key factor in the implementation of all Processes of Change to allow the development of commitment and belief in the change process through goal setting, attenuation of SPA and utilisation of modelling. However, the quantitative elements of this thesis did not identify that Self Efficacy had any positive effects on SOC progression although SE did increased stage by stage in cross sectional SOC analysis. It is surmised that in this case and with regard to the specifics of the self efficacy interventions required as discussed previously that the operationalisation of this construct within the current study was inadequate. The items (Appendix E-1) in this instance seem to relate more to the efficacy to overcome common barriers to physical activity
adoption and maintenance rather than efficacy related to the actual behaviour in question in particular its self presentational and motivational aspects. As a result future research in this area should attempt to discover or develop suitable measures to assess the specifics of efficacy beliefs more thoroughly particularly as they are hypothesised to have such an impact on the adoption and maintenance of physical activity within this study.

Questionnaire

During the qualitative analysis carried out as part of this thesis a number of factors were discussed with regard to the items used to measure the TTM constructs for assessment of this theory's explanation and intervention utility on physical activity. During these discussions a number of issues came to light; in particular, potential tautological and teleological issues. The interviewees believed that not only were some of the questions used repetitive and therefore redundant, they also perceived that the questions themselves were confusing, in some cases irrelevant and potentially motivating. Gordon and Gorely (1995) identified that in an Australian study a number of comments were received regarding the items used in the study and suggested re-assessment of the measures. In essence, a questionnaire is a data collection instrument that collects information that can be expressed numerically (Thomas & Nelson, 2001). The most important factor in the design of a questionnaire is the accuracy of its measures with regard to reliability (consistent reproducible results across different situations) and validity (the instrument measures the true value of the target variables) (Thomas & Nelson, 2001). With regard to reliability the instrument does seem to be reliable due to the testimony of the similarities between these data and that from past research across different age groups and countries. However, the validity of the questionnaire is, it seems, in question. In particular, the triangulation of the qualitative to quantitative data highlighted important differences in item measurement values and the lived experience accounts in concurrent samples. In addition, the reactive effects of testing may be compromised due to its perceived motivation leanings thus, making groups more receptive to treatment as a consequence of testing. This could relate to
the Hawthorne effect eliciting a desired social response (Thomas & Nelson, 2001) to the testing or in combination with the treatment therefore, the testing becomes in effect part of the treatment. This factor has been alluded to previously where disparity between observations and the effect that different processes had on measures collected were equated to a need to further examine and validate the inventories utilised (Plotnikoff et al, 2001) which is supported in this thesis.

In summary this research attempted to answer a number of outstanding questions in relation to TTM development and implementation in exercise based research. In particular it assessed the longitudinal predictive relationships of TTM constructs on the adoption and uptake of physical activity. In addition it assessed these relationships in the growing exercise base of structured activity specifically in a fitness suite setting. Furthermore, it assessed the utility of TTM based interventions for both physical activity and fitness suite activity across all five stages of change alongside the utility of TTM based interventions that were delivered mismatched to current SOC. Alongside the quantitative aspect a qualitative element was incorporated that utilised case by case analyses to assess the lived experience of physical activity Stage of Change across all five stages. These results have led to the proposition of a number of directions to advance the use of the Transtheoretical Model in research within the activity domain which are summarised below.

6.3 Future Directions
The literature regarding behaviour change and specifically the TTM and its impact on exercise behaviour is substantial, however, there are still areas for future development that have the potential to aid its impact and efficacy within the exercise domain. Below are a number of recommendations for future research that have been developed as a result of the findings within this thesis.

The longitudinal quantitative data explored which TTM constructs positively and negatively affected SOC transitions; however it did not differentiate
between those who regressed and those who remained stagnant. This area of TTM research is as important as identifying the positive associations with regard to the development of this model of behaviour change. In particular, it will help to explain those factors that should be avoided, to prevent relapse, and will enable the development of recommendations regarding the prevention of relapse on a stage matched basis.

The impact of studenthood appears to be detrimental to taking up and maintaining an active lifestyle; though the low numbers reported upon here do require caution in the findings, as they may be peculiar to the sample tested. However, as a result it appears that this relationship is worthy of further study either within the institution or through cross institution research. If it is found through subsequent research that students require some form of physical activity intervention as part of the institution's remit to its duty of care during this major formative life period, then these findings could have far reaching implications.

Differences between the sexes were exhibited with regard to cognitive process use. In addition females exhibited greater stage progression compared with men when receiving more cognitively oriented interventions, thus indicating that women may be more receptive to this form of intervention than men. Future research needs to test whether men and women exhibit different intervention effects as a response to its cognitive or behavioural orientation. This is particularly relevant in light of the next recommendation.

The quantitative data supported previous findings that behavioural processes are of utility in the inactive Stages of Change (Plotnikoff et al, 2001; Woods et al, 1999a). Furthermore, these findings were supported by the case by case analysis of those in the lower Stages of Change. The interventions assessed to date and within this thesis have been developed on early TTM research, which suggests that cognitive based interventions are most prudent in lower SOC. Future research needs to develop and assess the utility of interventions based on the recommendations within this research to establish whether more behaviourally oriented interventions based on the TTM constructs identified
will out perform interventions developed on past TTM relationship recommendations.

The interviews have highlighted a number of factors regarding the utility of the TTM in this cross sectional study. To further enhance these findings and to assess their accuracy, future research is needed into the relationships of TTM constructs through longitudinal case studies to qualitatively assess changes in variables as behaviour either changes both positively and negatively or remains unchanged. In addition to the rich data that will be available regarding the lived experience of behaviour change it may also provide validation for the qualitative differences in stages at those points where measurable behaviour does not change which is a common criticism levied at this model (Bandura, 1997; Davison, 1992; Sutton, 1996).

There were two major findings within this research:

Firstly the qualitative assessments identified potential additions to the model. These additions highlight the importance of self efficacy and identify how efficacy can be increased with the use of motivational goal setting techniques and how efficacy may buffer negative body image conceptions through the use of modelling in men and cognitive processing in women to improve self presentational efficacy. Future research needs to test the efficacy of these factors as a means of model improvement to determine whether the predictive and intervention capabilities of the model improve and to further assess potential sex differences in the operationalisation of the self efficacy construct in relation to Self Presentation Theory.

However, prior to further development and testing of the model this research has highlighted the need to address the validity of the measures used to assess the TTM in the exercise literature. Whilst this study demonstrated comparability with numerous previous studies the quantitative assessments identified that typical respondents to the measures perceived them as motivational, confusing, repetitive and at times irrelevant. This calls into question the validity of the questionnaires currently developed to test this theory particularly in light of the disparity between the concurrent qualitative
and quantitative results discussed previously. It is imperative that this issue is assessed and remedied as soon as possible to ensure that future research findings are valid.
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WORLD HEALTH ORGANIZATION 2003. European Health for All database; fadb.who.dk/hfa/


Appendices
Level 4

**SHORT CIRCUIT**

Men should aim to complete the task in 20 minutes.
Women 22 minutes.

Complete
* 1km Run
* 1.5 km Cycle
* 500m Row
* 75m Step Climb
* 10 Dips

The circuit may be completed in any order, however your final time must also include the time taken to move to and from each machine.
TO: ALL STAFF E-MAIL
FROM: RachelKettle1/students/UWCN
Subject: Call for Volunteers for postgraduate research project

Message:

Dear All,

I am running a project trying to find out why people do and do not exercise. It will involve the completion of 4 questionnaires (see attached) over the next 18 months. If you want to get involved either complete and return the questionnaire or e-mail me back for more information.

I look forward to hearing from you.

Regards,

Rachel

Rachel Kettle
SCARAB Research centre
University of Wales, Newport
Caerleon Campus
PO Box 179
Newport
NP18 3YG
Dear Sir / Madam,

I am a PhD research student at the University of Wales College, Newport in the Department of Sport Studies and I am currently recruiting for a study into the reasons why people do and do not participate in regular exercise. You are under no obligation to take part in this study, however, the completion of these questionnaires will aid greatly in my research.

I currently have a number of staff and student questionnaires completed and would like to add as many public members as possible to my cohort in order to assess differences across populations. The study will involve the completion of 4 questionnaires over the next 18 months (the 1st of which is enclosed within). Those of you wishing to be involved in the study please complete the enclose questionnaire (in the course of study field please enter your occupation); and return it to me in the pre-paid envelope provided.

Those of you who do not currently exercise regularly are just as important to the study as regular exercisers. All completed questionnaires will be treated with the strictest of confidence and your name will only be used to collate questionnaires across observations. All information gathered from the study whilst being used for publishing purposes will be used anonymously.

I would like to thank you for taking the time to read this letter and in anticipation of your response. If you have any queries regarding this study please do not hesitate to contact me (see below for details).

Many regards,

Rachel Kettle BSc, MSc.

SCARAB Research Centre
U.W.C.N.
Caerleon Campus
PO BOX 179
Newport
NP18 3YD

e-mail: rachel.kettle1@newport.ac.uk
telephone: 01633 433142
C(1) Letters requesting volunteers for an intervention study.

Rachel Kettle
SCARAB Research Centre
U.W.C.N.
Caerleon Campus
PO BOX 179
Newport
NP18 3YD

«FirstName» «LastName»
«Address1»
«Address2»
«City»
«PostalCode»

Dear «FirstName»,

You may recall completing a questionnaire for me whilst either registering on your course at the beginning of the year or you responded to a letter/e-mail I sent out asking for volunteers. As I explained when I asked you to complete the original questionnaire there would be four in total it is now time for number 2 as I would like to assess whether any changes have occurred in your current or intended exercise status.

The study will involve the completion of 3 questionnaires over the next 6 months (the 1st of which is enclosed within). Please complete the enclosed questionnaire; and return it to me either via the internal mail system (main reception at both campuses), hand it in at the sport centre reception or use the prepaid envelope provided.

In addition to the questionnaire you will find enclosed an Informed Consent sheet this will outline the rest of the study to you. I need this to be signed and returned along with the questionnaire if you consent to take part in the rest of the study.

Please be aware that those of you who do not currently exercise regularly are just as important to the study as regular exercisers. Also be aware that all completed questionnaires will be treated with the strictest of confidence and your name will only be used to collate questionnaires across observations. All information gathered from the study whilst being used for publishing purposes will be used anonymously.

I would like to thank you for taking the time to read this letter and in anticipation of your response. If you have any queries regarding this study please do not hesitate to contact me (see below for details).

Regards,

Rachel Kettle BSc, MSc.

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telephone: 01633 433142
C (2) Informed Consent for an intervention study

University of Wales, Newport

Informed Consent
SCARAB Research Centre, School of Humanities and Science.

Participant: Name: ____________________________ Sex: ____________________________
Date of Birth: ____________________________ Tel: ____________________________
E-mail Address: ____________________________

Supervisors: Dr. H.E Matheson and Dr. D. Smith
Investigator: Rachel E. Kettle
Title: A Transtheoretical Approach: Explaining, Predicting and Modifying Physical Activity and Fitness Suite Behaviour.

Purpose and Brief Description of Procedures:

The purpose of the study is to investigate how effective interventions based on the Transtheoretical Model are for modifying Physical Activity and Fitness Suite Activity in Staff, Students and local residents of a Welsh University.

The method involves completion of three identical questionnaires over a six-month period. This will take approximately 10 minutes of your time on each occasion. Following the collection of baseline questionnaires (attached) each participant will be randomly selected into either an intervention or control group. If you are in the control group all you will receive for the course of the research are questionnaires. If you are stratified into an intervention group in addition to the questionnaires you will receive mail delivered leaflets that contain information about physical activity and/or fitness suite activity between each round of data collection. Whatever your pattern of physical activity, it is still important for you complete the study as this data is still extremely important to us.

All information gathered will be treated in strict confidence. Your name is only used to match data collected at different time periods. Data collected may be published in scientific journals without revealing you identity.

Statement by Participant:

I fully understand what is involved in taking part in this study and have had any questions about the study, or my participation in it answered to my satisfaction. I understand that I am free to withdraw from the study at any time. It has been made clear that if I find any reason to question the conduct of the investigator or the nature of the investigation, and the investigator fails to answer my queries satisfactorily, then I should inform the chair of the University Research Committee who will undertake to investigate my complaint.

Signed: ____________________________ Date: ________ / ________ / ________

Statement by Investigator:

I certify that the details of this study have been fully explained and described to ____________________________, and have been understood by him/her.

Signed: ____________________________ Date: ________ / ________ / ________
C (3) Midpoint study letter (Matched B Intervention).

Rachel Kettle
SCARAB Research Centre
University of Wales College,
Newport
Caerleon Campus
Newport
PO Box 179
NP18 3YD

Dear ,

Thank you for completing and returning my questionnaire, your help with my research is much appreciated.

With reference to some of the information you supplied me please find enclosed a leaflet aimed at providing hints and tips on physical activity that should be relevant to your current exercise habits. I would also like to remind you of the benefits of utilising a gym or fitness suite to exercise. They are air conditioned and comfortable during both the cold winter and warm summer months; in addition they are safe environments during the dark evenings. Free expert advice is on hand at all times too. I hope that you find the enclosed leaflet of interest and if you feel you would like any further information please don’t hesitate to contact me.

Just to let you know what’s going on at the fitness suite. They have a few promotions at the moment (find enclosed a token for two free sessions). You’ll find that they’ve got some fun competitions going on aimed at all levels and age groups with excellent prizes on offer; you can win personal training sessions, t-shirts and some small pieces of equipment. They are also hoping to start a healthy lifestyle club in the near future so why don’t you pop in and find out what’s happening.

Don’t forget if you want to know about anything going on you are more than welcome to contact me for information and I can point you in the right direction.

Thanks again for getting involved.

Rachel Kettle
01633 433142.
rachel.kettle1@newport.ac.uk
C (4) Final Data Collection Letter.

Rachel Kettle
SCARAB Research Centre
University of Wales College,
Newport
Caerleon Campus
Newport
PO Box 179
NP18 3YD

Dear ,

OK guys this is it... the final questionnaire, I think I hear a collective sigh of relief! As always there a number of ways to get it back to me, including the pre-paid envelope provided (internal mail, drop boxes in the university sport centre reception or main receptions).

I would really like to thank you for your commitment to my research I couldn’t have done it without you. I hope that you have found the study interesting and as always if you would like any information please get in touch.

I have included an extra sheet with the questionnaire, this is for you include comments about the study, information you have received or the questionnaire itself please feel free to include any comments you like good and bad as they are all important.

Once again thanks...

Many regards,

Rachel Kettle
01633 433142.
rachel.kettle1@newport.ac.uk
The Following pages contain copies of all interventions.

D (1) – Precontemplation “Physical Activity... Not Interested”

D (2) – Contemplation “Physical Activity... Interested but still not done anything”

D (3) – Preparation “Physical Activity... What can I do???”

D (4) – Action “Physical Activity... and we’re off”

D (5) – Maintenance “Physical Activity... now the lifes journey begins”
Many activities can seem too ordinary to be of benefit but you wrong.... your health can benefit dramatically from a more active lifestyle. Keeping physically active also helps keep you mentally alert and feeling good.

Research shows regular physical activity benefits you in several ways.

- Keeps you mobile and supple
- Strengthens muscles, joints and bones
- Reduces Blood Pressure
- Protects against Heart Disease
- Relieves Stress and Depression
- Reduces Cancer Risks
- Gives you more energy
- Provides opportunities to make new friends
- Time to yourself
- Sense of achievement
- A lift if you are feeling low
- Improved sleep patterns

Whilst reading this leaflet you may have decided there is no harm in finding out more about the benefits of increasing your habitual activity. Have you made any decisions, if so write them down below.

To Do:

1. 
2. 
3. 
4. 

Further information;
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01633 433142

Why Walking For Health:

Walking is an almost perfect activity as it requires no equipment and costs nothing whilst conveying the same benefits as other activities. Remember any walking (activity) is better than none begin with a gentle stroll. Aim to have fun... to find out more pick up a walking for health leaflet from the UWCN Sport Centre reception.

Display this list in a prominent position
So you don’t want to exercise. Many don’t feel the need for exercise just as Elizabeth didn’t. She was almost 175lbs with high blood pressure and diabetes, exercise just wasn’t for her and she was 40 after all. . . however, whilst on holiday in Italy she almost fainted trying to follow her group up hundreds of steps to see the spectacular views. Breathing heavily she had to rest before walking back down the hillside with her partner (having spoiled his excursion too) to wait for the return of the group. She wasn’t happy about missing out and decided to speak to her GP who advised increasing her habitual physical activity and weight loss. Whilst not jumping straight in and signing up to a gym (after all she’s not the ‘sporty type’ never has been) she did begin to think about activity and its benefits to her.

It can be said with certainty that most of the leading killers in the developed world such as heart disease and cancer are partially caused by lifestyle factors such as low levels of physical activity; and before you think...no need for me to worry at my age; research has unequivocally found that prevention is better than cure.

Consider this questions:

1. If your chosen behaviour eventually kills you would you consider this normal and hope your family realise that you lived your life the way that you wanted to?

DARE YOU ANSWER ????

SO WHAT ARE THE BENEFITS ????

Take a minute to complete two lists:

> What are the benefits of physical activity?

1. 
2. 
3. 
4. 

> What’s stopping you?

1. 
2. 
3. 
4. 

The list you've just made can be very effective. If you listed more obstacles than benefits then read on.

If you feel the benefits outweigh the drawbacks then you've made an important step. At least you have started thinking about physical activity in a positive light WELL DONE...read on the information to follow may help further.

SO WHAT IS STOPPING YOU???

> LACK OF TIME...there’s no need to set aside specific time, you've probably got a busy life already you could just try to build activity into your existing routines (take the stairs instead of lift, walk an extra stop in morning and/or evening, walk the dog)

> ITS TOO MUCH LIKE HARD WORK....physical activity should feel agreeable, gratifying and enjoyable. If it's painful you're overdoing it.

> BORING... there are so many different activities available try them all, make enquiries see if you can get some free taster sessions

> I'M NOT FIT ENOUGH, LACK WILLPOWER AND ITS TOO EXPENSIVE .... You can be more active without incurring expense (walking is free) if you build up slowly and integrate it into your daily life you'll hardly notice you're doing it but your body will.

> MOST OF THE YEAR THE WEATHER IN WALES IS TOO BAD....the weather can put you off but you can be more active indoors (dancing or swimming). If it's really bad then try to avoid long periods of inactivity...take active breaks...make a drink during commercial breaks...do the ironing you've been putting off.
Great benefits can be made from the small benefits detailed overleaf and with regular increases in exercise building up to 30 minutes of physical activity per day all of the benefit listed below can be yours.

Research shows regular physical activity benefits you in several ways.

- Keeps you mobile and supple
- Strengthens muscles, joints and bones
- Reduces Blood Pressure
- Protects against Heart Disease
- Relieves Stress and Depression
- Reduces Cancer Risks
- Gives you more energy
- Provides opportunities to make new friends
- Time to yourself
- Sense of achievement
- A lift if you are feeling low
- Improved sleep patterns

Whilst reading this leaflet you may have decided there is no harm in trying out some small changes in your habitual activity. Have you made any decisions, if so write them down below.

To Do:

1. 
2. 
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Further information;
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So you don't currently exercise but you are thinking of starting. Stuart (age 26) was in your position 6 months ago and spent lots of time thinking about changing his physical activity habits. He had read all of the information available to him but still hadn't taken the plunge. His father who hadn't been feeling well for a while was diagnosed with diabetes. At this point Stuart and his family began to look into diabetes and alarmingly Stuart found that diabetes had a large hereditary component. He also discovered that exercise was of great benefit not only in helping the control of this major health problem (for his father) but also as a means of prevention (for himself). Whilst not jumping straight in and beginning a heavy running program (after all his body wasn't prepared for this) he did begin to make small changes to his lifestyle activity levels. He also gained advice from a professional on what is the right levels of activity and he and his father decided to try to help each other along the testing but fruitful journey into increased physical activity.

It can be said with certainty that most of the leading killers in the developed world such as heart disease and cancer are partially caused by lifestyle factors such as low levels of physical activity; and before you think...no need for me to worry at my age; research has unequivocally found that prevention is better than cure.

The current recommendations are to “accumulate 30 minutes or more of moderate intensity physical activity on most, preferably all days of the week” (Pate et al, 1995).

TIPS ON ACTIVITY.......

- Start slowly and build up gradually
- Try to include some changes into your daily life. Use stairs instead of lifts, leave the car in the garage for short journeys or get off the bus a couple of stops early.
- Leave a minimum of 1 hour following a meal before engaging in exercise
- The right intensity should leave you feeling breathless but not gasping. Continue until you feel pleasantly tired and don't push yourself to exhaustion.
- If you're going for a more vigorous sporting activity such as badminton make sure you warm up and cool down properly and include a few stretches.
- Don't ignore pain it’s your body’s way of saying stop.
- The right intensity should leave you feeling breathless but not gasping. Continue until you feel pleasantly tired and don’t push yourself to exhaustion.

If you haven't taken any exercise over 30 and have either recently been ill or have any joint or chronic health problems (i.e diabetes, asthma, heart disease) then please check with your GP before starting any strenuous activity.

Imagine how you will feel 6 months from now if you have started to be more physically active. And all of the benefits listed overleaf are now yours.

Before you begin the next section stop what you’re doing and take a 2 minute walk around the block.

Feeling Refreshed??????

Now take some time to complete two lists:

- What do you value about exercise

1. 
2. 
3. 

- What will be better about your life if you begin to exercise?

1. 
2. 
3. 

The lists you’ve just made can be very effective.

Remember you don’t need to explore every aspect of physical activity before you give it a try….you can learn on the way.

Begin slowly and build up...there will be no magic moments.

CARPE DIEM: Seize the day!
In addition to increasing everyday activity such as stair climbing vs. lifts and gardening there are a wide range of activities available out there.

Some of the questions you may be asking are....
Will I enjoy it....can I fit it in regularly...is it convenient and can I afford it????

It may be worth trying out a few activities and selecting the one that fits in best with you although you can mix and match as the mood takes you or the weather determines.

Here are some examples:

Walking free, natural, can fit easily into everyday routine, mixes well with other activities
Swimming excellent for general fitness, body weight is supported reducing injury risk, possible concessionary rates for students and its suitable for all ages and abilities.
Fitness suite can work on specific aspects of fitness (strength or stamina), You can follow your own program and it’s a clean, safe and warm/indoor environment.
Classes Various types are available to suit the individual, they are expert led and usually graded for ability. They provide a safe environment and are aimed at all-round workouts.

Have you made any decisions whilst reading this leaflet, if so write them down below.

To Do:
1. 
2. 
3. 
4. 

Further information;
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Display your SMART goals in a prominent position.
Janet prepares...she knew she had to make a big commitment but she planned her next moves well. She firstly decided on an activity she wanted to follow. Next she enlisted the help of her partner and friends (asking her currently exercising friends for further advice). She decided on both her long and short-term goals and wrote them down in a plan, showing this plan to her partner and friends. She then decided on a date when her plan was put into action.

DETAILED BELOW ARE TIPS ON HOW TO DEVELOP A GOAL SETTING PLAN.

BE S.M.A.R.T

Specific
Measurable
Adjustable
Realistic
Time-based

Specific: think exactly what you want to do i.e. “I want to walk 30 minutes per day five times per week by...(date)”

Measurable: use an activity log.

Adjustable: You may need to alter goals depending on how quickly you progress this can be especially important in the face of injury/illness.

Realistic: you need challenging but achievable goals...if you never manage to achieve a goal you will lose confidence or give up trying.

Time-based: set a target date when you are going to begin and a date by which to achieve the goal, this should help with motivation.

WHAT ARE YOUR GOALS???

My SMART goals are:

Main Goal (long-term [4-5weeks])

__________________________

__________________________

Completion date _____/_____/______

Sub-goals (short-term goals to reach on the way to my long-term goal)

1. 

2. 

3. 

4. 

The list you’ve just made can be very effective. You have now created a personalised action plan. WELL DONE you CAN do it.

Show this plan to your partner and/or friends and ask them to help and encourage you to meet these goals.

TIPS TO HELP KEEP IT GOING...

> write down and keep in a prominent position how you will feel about yourself when you change your physical activity habits

> don’t be too ambitious...trying to make huge changes all at once may mean you will find it hard to stick to your plan

> gradually build up your activity and become more active in your day to day life before starting a strenuous exercise plan. Add a more active commitment over time

> Don’t try to incorporate too many parts into your main goal if necessary select two main goals and stagger them 4-5 weeks apart.

> Read your goals daily and if too hard or easy adjust them up or down

> Re-visit your overall goals every 4-5 weeks and make the changes you wish to.
Tips on staying active

- Read your goals daily and if too hard or easy adjust them up or down
- Re-visit your overall goals every 4-5 weeks and make any changes needed.
- Avoid situations or people who encourage you to be inactive
- Leave your workout clothes and/or walking shoes in a prominent position in the workplace or home
- Add your planned activity into your daily To Do lists
- Use a calendar to schedule sessions
- Compromise with friends...arrange to meet them later...after your exercise session
- Reward yourself for sticking with the program (new clothes/special meal)
- Remember 1 missed session is not the end of the world...don't give up on yourself
- Keep progress charts of mileage covered or weights lifted. Include how you feel following sessions and compare this to earlier reports.

Have you made any decisions whilst reading this leaflet, if so write them down below.

To Do:
1. 
2. 
3. 
4. 

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Display your SMART goals and contingency strategies in a prominent position.
Excellent you're a regular exerciser now..... so how do you keep it going???

Mark followed a carefully written plan to increase his physical activity. Initially increasing day-day activity until he had eventually built up to walking 15 minutes each lunchtime and to and from central station instead of catching the bus before and after work (40-45 mins/day; 5 times per week). In four weeks he hadn't missed a single planned activity session and he was really proud of himself. However, he knew tough times were ahead with a holiday insight as well as the inclement weather of autumn

**BE SMART**

- **Specific:** think exactly what you want to do i.e. “I want to walk 30 minutes per day five times per week by...(date)”
- **Measurable:** use an activity log
- **Adjustable:** you may need to alter goals if your progress is either faster or slower than initially thought
- **Realistic:** you need challenging but achievable goals....if you never manage to reach a goal you will lose confidence or give up trying.
- **Time-based:** set a target date to begin your changes and a date by which you wish to achieve the goal.

Mark decided not only to include activity goals but also to plan for possible problems he may encounter such as his holiday and the weather. In addition whilst he was very proud that he had not missed a planned activity session in 4 weeks he also realised that this was probably not a realistic goal in the long-term and was prepared for a few small lapses in activity but determined that they would not become collectors

**WHAT ARE YOUR GOALS??**

My SMART goals are:

- **Main Goal** (long-term [up to 6 months])
  
  
  
  
  
  
  
  
  Completion date ___/___/____

- **Sub-goals** (short-term goals to reach on the way to my long-term goal)

  1.
  2.
  3.
  4.

The list you've just made can be very effective. You have now created a personalised action plan. WELL DONE you CAN do it.

Show this plan to your partner and/or friends and ask them to help and encourage you to meet these goals.

**SITUATIONS TO AVOID AND HOW TO GET OVER THEM**

Now take some time to complete two lists:

- Circumstances which may make it difficult for you to exercise

  1.
  2.
  3.

- Strategies you could use to counteract these situations

  1.
  2.
  3.

Carefully consider the PROS and CONS of these strategies.... Is there anyone who can help you? If so how can they help....(enlist their help in advance).
Tips on maintaining activity

- Remember regular activity is not a quick intense instantly gratifying trip but a long but ultimately satisfying haul.
- Make a list of all the things you enjoy doing and reward yourself for reaching targets and overcoming slips.
- Keep a record of your achievements and be proud of them.
- Remind yourself physical activity is not an all or none phenomenon; missed sessions are not the end of the world. Focus on your next session and remember No-One is PERFECT
- Try to help someone else take up/maintain physical activity… many find helping others is key to helping themselves.
- Make a crisis card listing the negative aspects of inactivity and keep this in your wallet/purse, read it if you’re tempted to slip.
- Read your goals daily and if too hard or easy adjust them up or down. Re-visit your overall goals every 4-5 weeks and make any changes needed.
- Avoid situations or people who encourage you to be inactive. Leave your workout clothes and/or walking shoes in a prominent position in the workplace or home
- Add your planned activity into your daily To Do lists. Use a calendar to schedule sessions

Have you made any decisions whilst reading this leaflet, if so write them down below.

To Do:

1. _________________________
2. _________________________
3. _________________________
4. _________________________

Further information;
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Display your SMART goals, Risk Situations and Commitment Cues in a prominent position.
So you've been regularly active for over six months...Excellent, well done!!! What's the next challenge?? Maintaining your activity that’s what!!!

Jayne had now been exercising regularly for SEVEN years on and off; she is currently nine months into this spell. This time, however, she has ridden out a few problems along the way (which previously would have led to a relapse into inactivity), such as the bout of flu where her GP advised her not to exercise. This time she decided to ease her way back into her routine over a couple of weeks. Here her exercise partner helped (on prompting from Jayne), by slightly tempering their activity so that Jayne didn’t feel left behind.

In addition, Jayne had a two week holiday in the sun, and whilst walking a great deal and taking a couple of early and undisturbed dips in the pool she did feel that her exercise regime had suffered. However, instead of dwelling on this as she had in the past, she decided to treat her holiday as the relaxing break she needed to re-fuel. Indeed on her return to her usual activity pattern she found she was still coping well at her previous intensity levels, yet now her batteries were fully re-charged she was enjoying it even more.

All in all Jayne is now far more confident that these small slips and any future one's won’t cause her to lapse back into inactivity. She now feels that regular activity is one of her habits... One which with work and commitment (something she failed to understand in the past), will stay with her a lifetime.

How can you ensure that exercise becomes one of your lifetime habits???

**WHAT ARE YOUR GOALS???

**BE SMART**

Specific, Measurable: use an activity log. Adjustable, Realistic and Time-based: set a target date to begin your changes and a date by which you to achieve the goal.

---

**My SMART goals are:**

Main Goal (long-term [up to 6 months])

<table>
<thead>
<tr>
<th>Completion date</th>
</tr>
</thead>
<tbody>
<tr>
<td>/ - /</td>
</tr>
</tbody>
</table>

Sub-goals (short-term goals to reach on the way to my long-term goal)

1. 
2. 

Relapse is a real danger at this point in time as the dangers of inactivity are distant, but, what you must remember is that the benefits you’ve gained can be lost quickly (much quicker and easier than you gained the benefits).

Below is a list of risk situations indicate (in the box) how likely it is you would miss an exercise session due to the situation in question. (1= big risk, 10 = no risk).

<table>
<thead>
<tr>
<th>Vacation</th>
<th>Depressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work stress</td>
<td>Watching TV</td>
</tr>
<tr>
<td>Lonely</td>
<td>Weather</td>
</tr>
</tbody>
</table>

The lists you've just made can be very effective. You have now created a personalised maintenance plan aimed at providing guidance for the future and information on possible situations you know, may tempt you into inactivity (make your own situation list if you need to). WELL DONE you CAN do it.

---

**RENEW YOUR COMMITMENT TO EXERCISE**

Now take some time to complete three lists:

- Reasons for your initial uptake of activity
  1. 
  2. 
- Difficulties you have overcome to get here
  1. 
  2. 
- What you have gained from regular physical activity
  1. 
  2. 

These lists should help you to renew your commitment to activity and show that you alone are responsible for having maintained this significantly positive behaviour... something of which you should be extremely proud.
D (6) Calculations used for probability estimates.

\[ \text{ODDS} = e^{a + bX} \]

Convert ODDS to probability (\(\hat{Y}\)):

\[ \hat{Y} = \frac{\text{ODDS}}{1 + \text{ODDS}} \]
**E (1) Self Efficacy questionnaire items (Marcus et al, 1992c)**

How confident are you that you could exercise in each of the following situations; 1 (not at all confident), 5 (extremely confident).

<table>
<thead>
<tr>
<th>Not at all confident</th>
<th>Extremely Confident</th>
</tr>
</thead>
<tbody>
<tr>
<td>When I am tired</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>When I am in bad mood</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>When I feel I don’t have time</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>When I am on vacation</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>When it is raining or snowing</td>
<td>1 2 3 4 5</td>
</tr>
</tbody>
</table>