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A transtheoretical approach to exercise : self-determination, stages of change, processes of change and personal construction of exercise.

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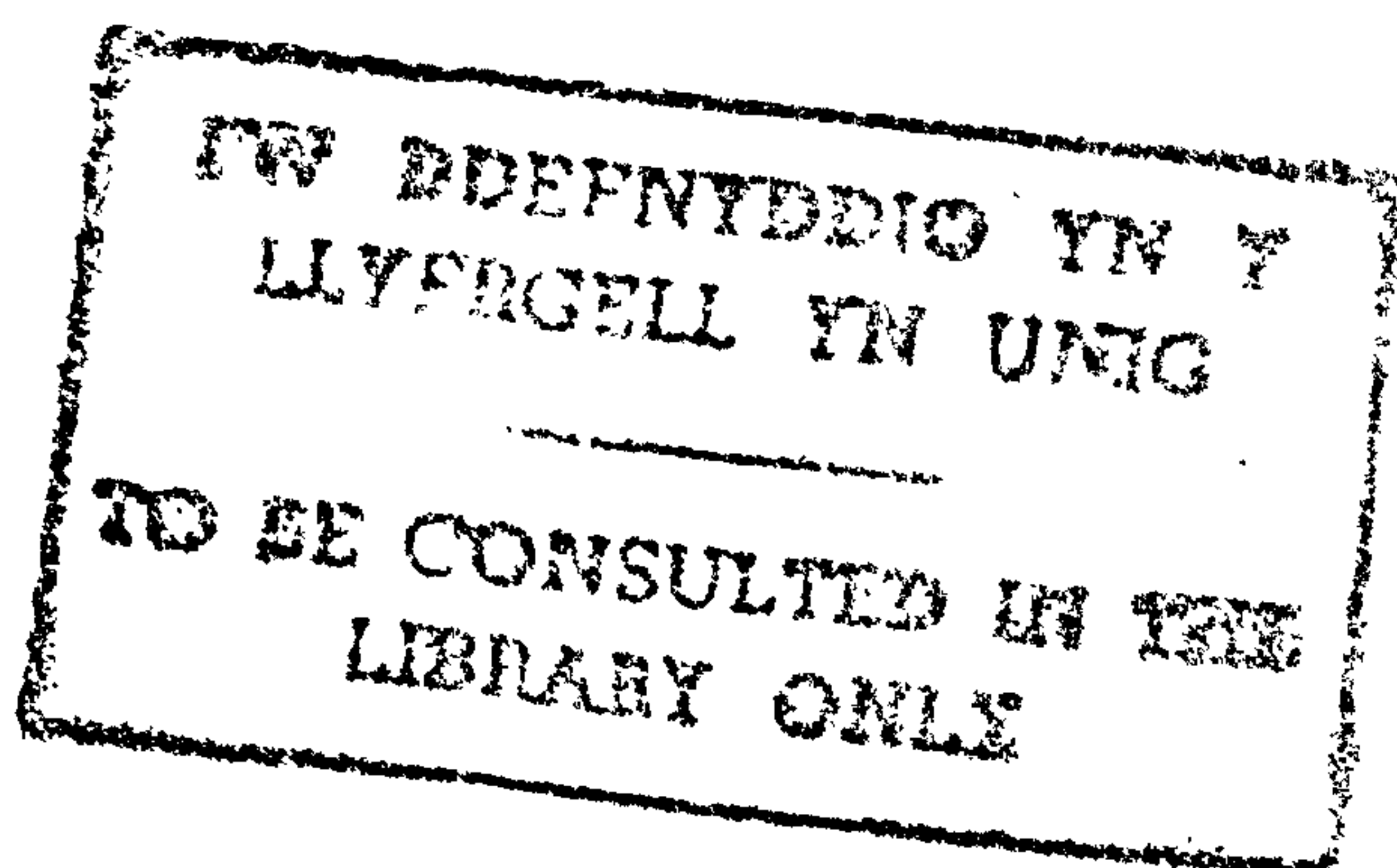
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A transtheoretical approach to exercise: Self-determination, stages of change,
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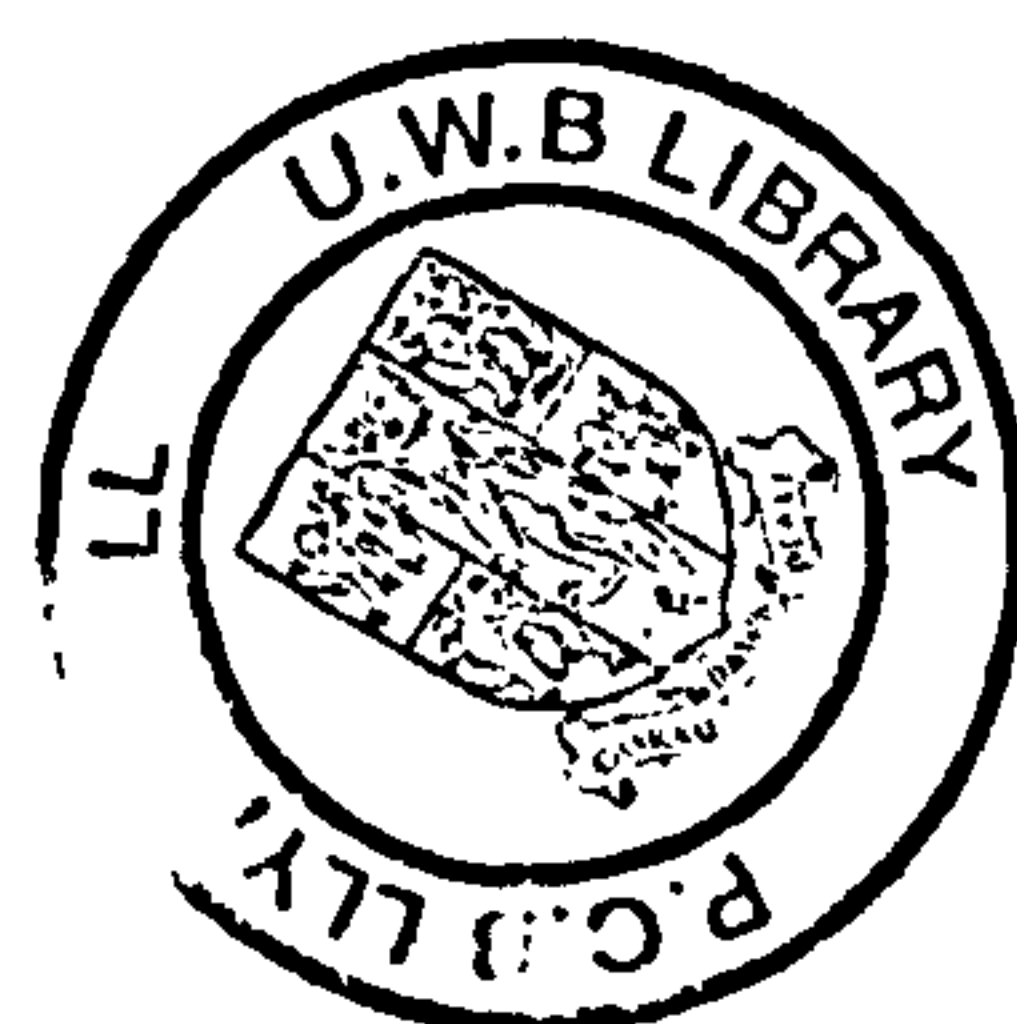
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for the degree of Doctor of Philosophy



University of Wales, Bangor
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**A transtheoretical approach to exercise: Self-determination, stages of change,
processes of change and personal construction of exercise**

Abstract

This research examined the role of motivational cognitions and belief systems in the process of exercise adoption and maintenance. Deci and Ryan (1985, 1990) outline a continuum of behavioural regulation that ranges from non-self-determined regulation (external regulation) to completely self-determined regulation (intrinsic regulation). Prochaska and DiClemente (1984) describe five stages of behaviour change that range from no thoughts of changing (precontemplation) to maintenance of change (maintenance). They also outline ten strategies and techniques for encouraging and maintaining change which are known as the processes of change. Kelly (1955, 1963) presents a personal construct theory which maintains that each of us has theories or constructs about people and events which guide beliefs and behaviour. Research, which integrated these concepts, was conducted in three phases.

A Behavioural Regulation in Exercise Questionnaire was developed in the first phase of research. Results from the second phase of research revealed that regulation of exercise behaviour was more self-determined in the later than in the earlier stages of change. This highlights the importance of motivational considerations in understanding the change process. Only five of the ten processes of change made a meaningful contribution to differentiation among the stages in females while only three of the processes made a meaningful contribution to differentiation among the stages in males. These processes showed moderate to strong correlations with those forms of behavioural regulation that are at least somewhat self-determined. In addition, those successfully changing their stage of exercise behaviour over a three month period increased their use of the counter-conditioning process. However, confirmatory factor analysis of the Processes of Change for Exercise Questionnaire brought into question the factorial validity of the measure.

The final phase of research examined personal construction of exercise as a function of stage of change and self determination for exercise. Those in the maintenance stage of change had strong opinions about and strong preferences for certain modes of exercise, while references to being too serious about exercise were strongest in the preparation and precontemplation stages. The preparation stage was marked by desire for more motivation and push to take more exercise. As self-determination decreased references to lack of time for exercise and a desire to have more motivation or put in more effort increased. This research suggests that conflict between desired self (more active and healthy) and actual self (not the fit and active type) may be greatest in the preparation and action stages of change where the act of exercising is still low in self-determination and not yet reconciled with one's sense of self.

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To my family, to Mike and
to Rosemary Lane.

CHAPTER ONE

1 Introduction

Since the early part of the century a major change in illness patterns has occurred and chronic diseases, such as heart disease and cancers, are now the major cause of disability and death (Taylor, 1995). These are diseases in which behaviour plays a major role (Matarazzo, Weiss, Herd, Miller and Weiss, 1984). The area of changing health behaviours represents a major opportunity for further improvements in health and even modest lifestyle change in the population can prove to be extremely cost effective (Matarazzo et al., 1984). The benefits of exercise are well established (see Bouchard, Shephard and Stephens, 1994; Siscovick, LaPorte and Newman, 1985) and large scale longitudinal research has shown that moderate involvement in exercise can reduce all cause mortality (Blair, 1993).

The Allied Dunbar National Fitness Survey (1992) into the physical activity involvement, lifestyle, health behaviours, exercise motives and general attitudes of 4,000 16-74 year olds in the UK found that the most commonly cited reasons for exercising were 'to improve or maintain health' and 'to feel in good shape physically'. However, research world wide has revealed that despite public awareness of the role of exercise in achieving and maintaining health, participation levels remain low; relatively few individuals in Western industrialised nations are taking advantage of the health protecting effects of regular exercise (Sallis and Hovell, 1990; Pate, Pratt, Blair, Haskett, Maccera, Bouchard, Buchner, Ettigner, Heath, King, Krista, Leon, Marcus, Morris, Paffenbarger, Patrick, Pollock, Rippe, Sallis, Wilmore, 1995). North American studies have reported that less than 10% of the population regularly participate in vigorous physical activity (Stephens, Jacobs, and White, 1985). In the UK over 70% of the population do not take enough exercise to benefit health (Allied-Dunbar National Fitness Survey, 1992). It is clear, therefore, that a very large proportion of the population are failing to reduce their risk of morbidity and mortality through sedentary living.

1.1 Definition of exercise

Exercise is a health behaviour that is well researched, but less well defined. The term exercise is used to represent physical exertion that is planned and structured, involving repetitive bodily movement, with the aim of improving or maintaining physical fitness and health (Caspersen,

Powell and Christensen, 1985). It differs from sport in that sport represents competitive physical activity. Definitions of regular exercise have tended to be synonymous with the previous American College of Sports Medicine (ACSM: 1978, 1991) exercise recommendations: for exercise to be regular it should involve three or more sessions per week of at least 20 to 60 minutes of moderate to high intensity endurance exercise. Physical activity, on the other hand, implies routine activity in compliance with the demands of daily life and, therefore, includes exercise. The definition of physical activity is more expansive than that of exercise and the focus is on energy expenditure throughout the week rather than on adherence to a prescribed programme of exercise (King, 1994). Physical activity participation can be as effective in achieving health and fitness goals as exercise participation, and in this vein King (1994, p. 188) encourages researchers to adopt broader definitions of exercise and of adherence: "It has become clear that in order to continue to advance the field of exercise behaviour, researchers must develop broader definitions of physical activity participation that extend beyond the traditional definitions of programme adherence".

Supportive anecdotal evidence prevails: The Guardian newspaper (May 6th, 1997) noted that "recent research by the Health Education Authority found that people were being put off by the idea of gyms and lycra...; the me-centred aerobics was not offering enough choice. The Health Authority shifted its campaign last year to recommend exercise that leaves you feeling warm or slightly out of breath". Wankel and Hills (1992) note that research in both Australia and the USA has shown that the concept of "physical activity" has more positive public acceptance than does the term "exercise". The ACSM have clearly taken note and recently have published a revised public health message, developed in conjunction with the Centre for Control and Prevention of Disease in the USA, the focus of which is on daily physical activity. They suggest that every adult should accumulate 30 minutes or more of moderate intensity physical activity on most, preferably all days of the week, where physical activity is defined as any body movement that results in energy expenditure (Pate et al., 1995). In this research then, the definition of exercise encompasses the focus on daily physical activity and is defined simply in the instructional set as 'any kind of physical activity you do to "get some exercise"'.

1.2 Understanding exercise adoption and adherence

There is continued interest in ascertaining the psychological determinants of exercise participation and adherence in order to increase physical activity levels in the general public and, more specifically, to improve the effectiveness of exercise intervention programmes.

Researchers have examined many social and psychological variables to explain variations in exercise behaviour such as attitudes, beliefs, intentions, normative behaviours, socio-economic status, social support, motivations (motivational orientation, goal orientations, perceptions of autonomy and locus of control), self perceptions (self esteem, physical competence, self efficacy) and attributions. Many of these are contained in popular models of health behaviour such as the Health Belief Model (Becker, 1974; Rosenstock, 1974), the Theory of Reasoned Action (Ajzen and Fishbein, 1980) and the Theory of Planned Behaviour (Ajzen, 1985, 1988). It is not the intention here to consider the individual variables and larger theories as there are numerous excellent reviews of the relevant research (e.g., Biddle, 1992b; Godin, 1993; Janz and Becker, 1984; Maddux, 1993; Sonstroem, 1988).

1.2.1 Models of exercise behaviour.

Sallis and Hovell (1990) have identified two “simplifications” that are common to much of this research: first, exercise is treated as a dichotomous variable and second, models of exercise behaviour begin at the sedentary state. Sallis and Hovell devised a stage-based model of exercise behaviour which identifies four phases in the natural history of exercise: sedentary - adoption, adoption - maintenance or drop-out, drop-out-resumption and drop-out - sedentary. This model stresses the continuous and dynamic nature of exercise; at any given time people will be distributed across all stages of the model. The model also identifies the state of drop-out (or relapse) as an alternative baseline state. Stage based models have also emerged from the addictive behaviours literature (e.g., DiClemente and Prochaska, 1982; Marlatt and Gordon, 1985; Rosen and Shipley, 1983) and most agree that at least three fundamental stages of behaviour change exist: decision and commitment to change, initial change and maintenance of change (Brownell, Marlatt, Lichtenstein and Wilson, 1986). Horn (1976) outlined four stages of smoking cessation: contemplating change, deciding to change, short term change and long term change. Prochaska (1979) and Prochaska and DiClemente (1982, 1983, 1984, 1992) have done the most thorough work in this area by evaluating stage models of smoking cessation and

psychotherapeutic change in general (Brownell et al, 1986). From this, they too devised a stage-based model of change which proposes five stages of behaviour change and is part of the larger transtheoretical model (TM: Prochaska and DiClemente, 1984). Prochaska and DiClemente's stages of change model, as it is commonly known, has become the most influential of all the stage models and has been applied to a wide variety of addiction and adoption behaviours.

1.3 The stages of change for exercise model

TM, which incorporates the stages model, was initially developed to guide the design of psychotherapeutic treatments for addictive behaviours, mainly smoking and substance abuse. The common negative relapse curve associated with cessation of addictive behaviours is similar to the pattern observed with exercise adoption (Hunt, Barnett and Branch, 1971). The focus of the stages of change for exercise model, therefore, is on meeting individual needs as defined by their stage of changing from a sedentary to an active lifestyle; treatment or intervention must be matched to a person's stage of readiness to change. Thus TM, which has guided addictive-behaviour research, may be profitable for exercise adherence research (Marcus and Simkin, 1993). The dynamic process orientation of this model is in sharp contrast to the all-or-nothing dichotomisation and predictive models of much previous exercise adherence research and as such a stage based approach should increase understanding of physical activity participation mechanisms (Sonstroem, 1988; Marcus, Selby, Niaura and Rossi, 1992). Behaviour change is not an all or nothing phenomenon; individuals who stop performing a behaviour may have intentions to start again (Sonstroem, 1988).

TM was derived from the plethora of therapy systems available in the 1970's which, as its name implies, had their roots in a diverse range of psychological theories and traditions. In the main, TM comprises a five level stages of change model and a ten factor processes of change model. The processes of change are techniques and strategies used for dealing with change and are, in effect, a synthesis of the best parts of existing therapy systems. The theory also recognises five distinct but interrelated levels of psychosocial change at which a problem may be addressed. Since its conception the self efficacy construct (Bandura, 1986) and the decisional balance model (Hoyt and Janis, 1975) have been allied to TM. Self efficacy has been found to increase across the stages of change and the balance of the pros and cons in the decision making process have been found to change as a function of stage of change. Since its

inception TM has sparked a profusion of research into addictive behaviours. Subsequently, research applying TM to the understanding of exercise adoption and exercise adherence burgeoned in the 1990's following initial work by Sonstroem (Sonstroem and Amaral, 1986 and Sonstroem, 1987) and the publication, in 1990, of the first empirical study of the stages of change in physical activity adoption and maintenance (Barké and Nicholas, 1990). The popularity of TM in exercise research, particularly the stages of change conceptualisation, has since accelerated and a chapter by Prochaska and Marcus, entitled "The transtheoretical model: Applications to exercise" appears in Rod Dishman's (1994) *Advances in Exercise Adherence*. The stages of change conceptualisation is now the dominant model of exercise behaviour change. No longer does the exerciser-non-exerciser dichotomy suffice to explain exercise behaviour.

1.4 Stages of change and self-determination for exercise

The primary contention and basis of the research reported here is that TM, despite its increasing popularity and usefulness as both a research and heuristic tool in the area of exercise adherence psychology, fails to acknowledge the significant place of motivation and self-determination in explaining or predicting exercise behaviour change. In the exercise promotion field it is accepted that success in adhering to a programme of regular exercise is, to a large extent, dependent on the reasons for which exercise is undertaken (Dishman, 1987; Duda, 1989; Biddle, 1992a,b; Biddle and Bailey, 1985; Markland and Hardy, 1993). Individuals who report exercising for reasons of enjoyment and satisfaction (intrinsic motives) typically report greater levels of adherence to exercise than those reporting exercising to achieve fitness or weight goals, to attain social or material rewards, or because of external pressure to do so (extrinsic motives: Wankel, 1985, 1993; McAuley, Wraith and Duncan, 1991). This research has its basis in Deci and Ryan's (1985) cognitive evaluation theory (CET), one of three sub-theories within the broader self-determination theory framework, which considers the influence of internal and external events on intrinsic motivation. The importance of intrinsic motivation notwithstanding, it is notable that for many in the initial stages of exercise adoption, enjoyment of and stimulation from the activity itself is insufficient to encourage continued participation (McAuley et al, 1991). Extrinsic motives, such as weight-loss and fitness gain are often the initial change catalysts which over time may enhance intrinsic interest in exercise and ultimately encourage

long-term adherence. Thus, whereas various health benefits are the principal reasons that adults take up exercise, they continue their involvement because of the enjoyment of the programme of exercise and social considerations (Wankel, 1985, 1988).

This recognition of a change in motivation over time encourages a developmental or stage based view of the relationship between motives for exercise and actual exercise involvement. In addition, Deci and Ryan (1990) have suggested that consideration of motivational forces only in dichotomous terms - intrinsic versus extrinsic motivation - may be misleading and that there are degrees of extrinsic motivation. The existence of such a motivational continuum is the central tenet of the lesser known organismic integration theory, the second of the sub-theories within the larger self-determination theory framework. This theory charts the developmental movement from extrinsic to intrinsic regulation of behaviour and outlines five stages of regulation, or degrees of self-determination on a continuum known as the behavioural regulation continuum. So, while acknowledging the importance of the CET dichotomy in understanding the need for extrinsic motives in initiating exercise involvement and the importance of intrinsic motivation in maintaining that involvement, OIT gives us a theoretical basis from which to understand the place of intermediate levels of self-determination in the day to day regulation of that exercise behaviour. That is, why it is unlikely that people will maintain a programme of regular exercise, with all the organisation and commitment it entails, purely for the intrinsic reasons of fun and enjoyment, and why, on the other hand, exercisers are unlikely to arrive at any degree of consistency in their exercise behaviour if they are regulated solely by extrinsic forces.

Given the importance of a stage based conceptualisation of exercise behaviour and the importance of considering underlying regulation of exercise behaviour, and given that both OIT and TM embrace continuum-type formulations with an inherent change dynamic, the focus of this research is on the marriage of the two theories. Several questions have guided the research: Does behavioural regulation change across the stages of change? Does self-determination increase across the stages of change? Is there a relationship between behavioural regulation and the techniques and strategies used for dealing with change? However, before such questions could be answered the issue of measurement of behavioural regulation in exercise needed to be addressed. Previous research has examined behavioural regulation only in the academic, sporting and prosocial domains. Thus a measure of behavioural regulation in exercise, the

Behavioural Regulation in Exercise Questionnaire (BREQ), was devised using confirmatory analytic techniques. Subsequently, the BREQ and existing measures of the stages of change and the processes of change for exercise were administered simultaneously. The inter-relationships between stage, processes and behavioural regulation were examined.

1.5 Intrapersonal conflicts and exercise behaviour change

TM recognises five levels at which behaviour change can occur and this levels of change model is the least known component of TM. The fifth, and most profound level of change, intrapersonal conflicts, concerns conflict between one's desired or imagined self and one's actual, core self, which may, if untreated, prevent long-term successful behaviour change. Should someone start a programme of regular exercise but, deep down, not really see him or herself as the energetic type it is possible that the intrapersonal conflict involved will prevent successful adoption of exercise. Kelly's (1955, 1963) personal construct theory considers the way in which our core beliefs about or constructions of the world around us guide our behaviour and, therefore, operates at the intrapersonal level. Kelly's related repertory grid technique allows examination of the nature and structure of these essential beliefs and constructs, and, therefore, allows examination of the essential beliefs and constructions about exercise, physical activity, exercisers, and 'active types'. With a validated measurement technique for assessing such core beliefs at the intrapersonal level of change, the research questions took form: does personal construction of exercise change across the stages of change? Does personal construction of exercise differ as a function of self-determination for exercise? A stage based view of the relationship between exercise motives and exercise involvement recognises that there is a change in motivation over time. It is likely that such change would be accompanied by a change in core beliefs about exercise and exercisers and, therefore, that those in the later stages of exercise behaviour change should differ from those in the early stages in their personal construction of exercise and exercisers. Similarly, those with more self-determined reasons for exercising are likely to be more similar in their constructions of exercise and exercisers than those with low levels of self-determination for exercising. Thus, personal construction of exercise was examined in addition to self-determination for exercise (using the BREQ) and stage of change for exercise. Again, the inter-relationships between the three elements were examined.

1.6 Summary

To summarise, the central tenet of this thesis is that degree of self-determination in the regulation of exercise behaviour and core beliefs, or personal constructs about exercise are core psychological determinants of exercise behaviour which change across the stages of change for exercise behaviour. Low levels of self-determination and intrapersonal conflict with regard to exercise behaviour mitigate against maintenance of regular exercise, while a lack of beliefs-behaviour conflict and the presence of self-determined reasons for exercising aid the establishment of a pattern of regular exercise. Taking this research as a whole, this application of TM is in contrast to much previous research whose aim, it seems, has been merely to map another type of health behaviour onto the stages of change profile. In addition, research into exercise motivations, within the greater context of exercise adherence research, has, in the past, been accused of being atheoretical or merely descriptive in nature (Biddle, 1995). This is typically because many questionnaires assessing exercise motives are developed specifically to meet the requirements of a single study, or to assess the psychological attributes of a specific population and they typically conceptualise motivation in dichotomous terms: intrinsic versus extrinsic (e.g., Gauvin, 1990; McAuley, Wraith and Duncan, 1991; Ashford, Biddle and Goudas, 1993; Fredrick and Ryan, 1995). This research aims to demonstrate the applicability of a continuum-like conceptualisation of motivation to exercise, to highlight the importance of motivation and underlying self-determination in a transtheoretical model of behaviour change and to further elucidate the nature of each stage of exercise behaviour change through examination of personal constructions of exercise.

CHAPTER TWO

2. A transtheoretical model of behaviour change.

The transtheoretical model (Prochaska and DiClemente, 1982, 1984) is the result of a search for the structure of change that underlies both treatment-mediated and self-mediated change of problem behaviour, which focuses on intentional as opposed to developmental, societal or imposed change (Prochaska, DiClemente and Norcross, 1992). The major impact of the transtheoretical model has been its incorporation of the fact that the decision to change is as important as the action of change itself. Furthermore, previous stage-based models (e.g., Horn, 1972, 1976) had disregarded the fact that individuals may enter therapy in very different stages of change and, therefore, benefit more from stage-of-change-specific intervention approaches than from general approaches. Prochaska, DiClemente and colleagues' model stresses the importance of doing the right thing at the right time (DiClemente, 1993). The model embraces several interrelated mini-theories which have been integrated into a model of change: a stages of change model, a processes of change model, a levels of change model, self efficacy theory and a decisional balance model, all considered necessary to adequately assess health behaviour modification (DiClemente, Prochaska, Velicer, Fairhurst, Rossi and Velasquez, 1991).

2.1 The stages of change

The TM conceptualises behaviour change in terms of a continuum ranging from no change and no thought of change to successful maintenance of change and it is postulated that individuals engaged in behaviour change pass through five stages along a continuum of behaviour change from no thought of change through to successful termination. The stages of change represent the temporal organisation of the model (Prochaska, DiClemente, Velicer and Rossi, 1993) and they are labelled precontemplation, contemplation, preparation, action and maintenance. In the precontemplation stage an individual is unaware of any problem and, therefore, is not considering change. In the contemplation stage the problem behaviour is acknowledged, the individual is seriously evaluating the benefits of lifestyle change, but has made no commitment to change. In the preparation stage the individual has made a commitment to change and may already be making small behavioural and lifestyle changes. These changes, however, are either unsuccessful or not sufficient to be regarded as decisive action. In the action stage the individual is actively engaged in behaviour change and lifestyle

modification to accommodate this change. Finally, the maintenance stage is attained after successful behaviour change persists beyond an arbitrary period of six months. In this stage individuals are working to sustain the changes they have made and avoid relapse. The progression through the stages is conceptualised as a cyclical rather than a linear process and most individuals will recycle through these stages several times before achieving sustained change (DiClemente, 1993). According to Prochaska, DiClemente, Velicer and Rossi et al. (1992) research with self-changing smokers suggests that 10 weeks is ample time for individuals to begin to take action. Progression from the action stage of change into the maintenance stage appears to follow approximately six months of sustained action.

Although the preparation stage was identified in the original model where it was labelled the decisional making stage, it was dropped for about seven years due to an apparent misinterpretation of principal components analysis and a misunderstanding of cluster analysis. It was restored when recent data could only be understood by including a stage between contemplation and action (DiClemente et al., 1991; Prochaska and DiClemente, 1992).

The model has successfully categorised stages of change in a diverse range of negative health behaviours: smoking cessation (e.g., Prochaska, Velicer, DiClemente and Fava, 1988; Owen, Wakefield, Roberts and Esterman, 1992), alcohol abuse (Budd and Rollnick, 1996), weight control/over-eating (e.g., DiClemente and Prochaska, 1985; Perry, McAllister, Jordan, McAdoo and Nezu, 1988; Curry, Kristal and Bowen, 1992), psychological distress (e.g., Prochaska and DiClemente, 1985), dietary behaviour change (Bowen Meischke and Tomoyasu, 1994), mammography screening (Rakowski, Dubé, Marcus, Prochaska, Velicer and Abrams (1992), drug abuse (e.g., Abellanas and McLellan, 1993; Werch and DiClemente, 1994), low fruit and vegetable consumption (Laforge, Greene and Prochaska, 1994) and low contraceptive use (e.g., Grimley, Riley, Bellis and Prochaska, 1993). The largest proportion of research with the stages of change model, however, has examined change in addictive behaviours, especially smoking cessation (e.g., Prochaska, 1979; DiClemente and Prochaska, 1982; Prochaska and DiClemente, 1983; DiClemente and Prochaska, 1985; Prochaska, Velicer and DiClemente, 1991; Prochaska, Rossi, Goldstein, Marcus, Rakowski, Fiore, Harlow, Redding, Rosenbloom and Rossi, 1994). As such Prochaska, DiClemente et al. (1992) admit “the criticism holds that [the model] is more likely to contribute to understanding how people can change addictive behaviour than how [behaviours are acquired]” (p. 827). Application of this addiction-based model to exercise

acquisition, however, has proven fairly successful at differentiating individuals according to their stage of change for exercise (e.g., Marcus, Rakowski and Rossi, 1992; Marcus, Rossi, Selby, Niaura and Abrams, 1992; Marcus, Selby, Niaura and Rossi, 1992; Marcus and Simkin, 1993). According to Marcus and Owen (1992) although smoking has an addictive component unparalleled in exercise, the change to an active lifestyle implies the cessation of a sedentary one.

2.2 The processes of change

The processes of change are a synthesis of over 200 techniques or principals from psychoanalytic, behavioural and humanistic psychotherapeutic orientations processes designed to aid behaviour modification in psychotherapy. The search for, identification of and evolution of the processes of change came about following a decade of growing discontent among psychotherapists about the limitations of their various orientations and an increasing realisation of the need for rapprochement and synthesis (Goldfried, 1980). Goldfried (1980) believed that “psychotherapists...typically operate from within a given theoretical framework, often to the point of being completely blind to alternative conceptualisations and potentially effective intervention procedures” (p. 991). Divergence had dominated development within the field and new therapies were being placed on the market at an unprecedented pace; Parloff (1976) described this market place as a jungle. Although divergence is essential for creativity, it can potentially lead to increasing fragmentation and confusion, and Prochaska and DiClemente (1982) believed that this would be a time of crisis or a new period of creativity for the field of psychotherapy. Fortunately, the identification of converging themes and of the need for integration became an important new trend espoused by authorities such as Bergin (1982) and Goldfried (1980, 1982). The transtheoretical model was developed within this zeitgeist of a search for synthesis (Prochaska and DiClemente, 1982).

From a review of the change principals of 18 leading behavioural, dynamic, humanistic, existential and emotional focused therapy systems, Prochaska (1979) identified five common strategies or techniques that assist behaviour change: consciousness raising, catharsis, commitment, conditional stimuli and contingency management. These are known as the processes of change and the TM proposes that transition through the stages of change is mediated in part by the use of these processes (Prochaska et al., 1994). In this regard the processes are thought to act as movement catalysts.

Consciousness raising is based on the Freudian assumption of the need to make the unconscious conscious; the need to make potential changers aware of their defences against change. Catharsis concerns the release of pent-up emotions in order to effect change (Prochaska and DiClemente, 1982). Choosing in the face of inadequate or unavailable information is known as commitment while choice in the face of many alternatives is a form of liberation (changing through choosing: Prochaska and DiClemente, 1982). Conditional stimuli, learned through classical conditioning, control our responses and thus require an approach that is antithetical to that of changing through choosing; either the response itself or the environment which stimulates it must be altered (Prochaska and DiClemente, 1982). Finally, contingency management is a process that describes the alteration of responses to anticipated consequences without altering the contingencies. The processes of consciousness raising, catharsis and choosing have been the major focus of the psychoanalytic and humanistic psychotherapies, whereas conditional stimuli and contingency management have been the preserve of the behavioural-type psychotherapies. Each of these five central processes was divided into experiential and behavioural dimensions and research by Prochaska and DiClemente (1984) yielded ten independent processes of change. The resulting ten processes embrace personal, situational and environmental characteristics and behaviour specific to the problem area and are listed in Table 2.1.

Experiential processes represent strategies concerned with increasing awareness of those environmental and personal conditions that would encourage and support behaviour change. Behavioural processes represent those techniques associated with self management and encouragement of change. In Table 2.1 the first five processes are experiential: consciousness raising, dramatic relief, environmental re-evaluation, self re-evaluation, social liberation. The remaining five are behavioural: counter-conditioning, helping relationships, reinforcement management, self liberation, stimulus control. Processes of change use has been investigated in a diverse range of health behaviours: weight control (Prochaska, Norcross, Fowler, Follick, and Abrams, 1992; Rossi, Rossi, Rossi-Delprete, Prochaska, Banspach, Carleton, 1995), psychological distress (Prochaska and DiClemente, 1985); low fat diet (Bowen, Meischke, Tomoyasu, 1994), HIV risk prevention (Schnell, Galavotti and O'Reilly, 1993), smoking (Prochaska, Velicer, DiClemente and Fava, 1988) and exercise adoption (Marcus, Rossi, Selby, Niaura, and Adams, 1992).

Table 2.1. The 10 processes of change defined

Consciousness raising: Seeking new information and gaining an understanding about the nature of the problem and self-problem relationship.

Dramatic relief: Strong affective reactions to the perception of current behaviour as a problem which may stem from, for example, a film, the TV news, or a personal event.

Environmental re-evaluation: Realisation and reappraisal of the effect of current behaviour on others, or the physical environment.

Self re-evaluation Assessment of how one thinks and feels about oneself with regard to the problem behaviour and the realisation that positive changes in self would occur if behaviour was changed. Appraisal of pros and cons of trying to overcome the problem behaviour.

Social liberation: Awareness of changes in society and workplaces and awareness of behavioural alternatives which would encourage change.

Counter-conditioning: Making critical changes in the conditional stimuli that control responses by substituting alternative behaviours, changing old responses to stimuli and learning new responses.

Helping relationships: Ability to be open and trusting with others about behaviour change and utilising social support networks.

Reinforcement management: Change the contingencies that control or maintain an existing problem behaviour. Use of self or other's reward and reinforcement techniques to encourage and maintain change.

Self liberation: Believing that change is possible. Changing through choosing: expanding thinking and becoming more aware allows increased ability to choose.

Stimulus control: Management and control of "trigger" situations, restructuring of environment to reduce occurrence of stimulus.

(Prochaska and DiClemente, 1984 Prochaska et al. 1988;
 Marcus, Rossi et al. 1992; Gorley and Gordon, 1995)

2.2.1 Processes use across the stages of change

In their initial research with self changers and therapy changers Prochaska and DiClemente (1982) found that particular processes of change tended to be used much more during particular stages of change. Prochaska, DiClemente and Norcross (1992) have confirmed this in smoking and dietary behaviour change. Prez, DiClemente and Carbonari (1996) found that smokers in the contemplation and preparation stages of quitting used more experiential and less behavioural processes while a reverse pattern was evident among quitters during the action stage. Figure 2.1 illustrates that experiential processes are most frequently used by individuals in precontemplation and contemplation whereas the behavioural processes are most often used by those in action and maintenance. In the early, contemplative stages of change people engage in much evaluation of their behaviour, their situation and their own environment which results in self re-evaluation. Movement to the later, action stages requires a realisation of the importance of the need to change and awareness of ability to prevent relapse.

Marcus, Rossi et al. (1992) found important differences between the use of the processes in smoking cessation and their use in exercise adoption. During smoking cessation the use of experiential processes peaks in the preparation stage and the use of the behavioural processes tends to decline as individuals progress from the action to maintenance stage. During exercise adoption, however, use of the behavioural processes was maintained from the action to the maintenance stages and that the use of experiential processes peaked one stage later, in the action stage, followed by decreased use in the maintenance stage. The authors call for further study to determine whether these departures from the model are due to differences in usage of the processes between acquisition and cessation behaviours: Do those attempting to begin or maintain a programme of regular physical activity experience the processes of change in the same way as those attempting to quit smoking? Further analysis of this work, however, reveals that it does not actually show support for Figure 2.1. Use of all processes increased from pre-contemplation to maintenance and, contrary to expectations, those in action used the experiential processes more often than preparers. Nevertheless, preparers did use the behavioural processes more than did contemplators.

Figure 2.1. Stages of change at which particular processes of change are emphasised

Pre-contemplation	Contemplation	Preparation	Action	Maintenance
	Consciousness-raising Dramatic relief Environmental-re-evaluation	Self-re-evaluation	Self-liberation	Reinforcement management Helping relationships Counter-conditioning Stimulus control

(Prochaska, DiClemente and Norcross, 1992, p. 1109)

Note: Social liberation was not included in the original illustration.

2.3 The covariates of change

2.3.1 Decisional Balance.

Velicer, DiClemente, Prochaska and Brandenburg (1985) discovered that the pros and cons of changing behaviour varied systematically as a function of stage of change and proposed a Decision Balance construct based on Hoyt and Janis' (1975) conflict theory of decision making. Marcus, Rakowski and Rossi (1992) found that decisional balance was significantly associated with stage of change for exercise adoption; pros began to outweigh cons as individuals moved toward maintaining exercise behaviour change. The pros and cons are orthogonal, independent factors. An individual can be high or low on both as well as high on one and low on the other. Prochaska et al. (1994) have since found the decisional balance construct to be relevant to behaviour change patterns in 12 different behaviours, such as smoking cessation, weight control, delinquent behaviours, safer sex and screening, in a variety of population groups.

2.3.2 Self efficacy.

Self efficacy has been operationalised in two ways in the transtheoretical model: first as situational specific confidence in changing a problem behaviour and second as confidence to resist temptations to engage in the problem behaviour (or in the case of exercise, confidence

to overcome temptations to avoid exercising). Marcus and Owen (1992) and Christopolou, Marcus, Eaton, Rossi and Harlow (1994) found cross-sectional and longitudinal support for self efficacy as a predictor of stage of change for exercise. Armstrong, Sallis, Hovell and Hofstetter (1993) found that self efficacy for exercise scores were higher in contemplators than precontemplators. McAuley and Jacobson (1991) found self efficacy was a significant predictor of reported exercise levels, while Marcus, Selby et al. (1992) found confidence in ability to persist in the face of adverse situations significantly differentiated employees at most, but not all stages of change for exercise adoption. This research, however, has not found differences in self efficacy between each of the five stages of change.

2.4 The theoretical basis of TM

The origins of the TM in theoretical and applied psychotherapy leave it open to the influence of many theories. Although the theory-based decisional balance and self efficacy constructs have added support to the model's predictive abilities, the model cannot explain behaviour. Davidson (1992) criticised the model for its apparent atheoretical nature; it lacks the strong theoretical base to allow much more than a description of current behaviour. This provoked a resolute response from Prochaska, DiClemente et al. (1992) expounding the motivational, social learning and relapse theories reflected in the model and proclaimed in its *transtheoretical* title. Taking the middle ground Heather (1992) praised the model for making sense of marked differences in motivation to change behaviour by outlining degrees of preparedness, so to speak, for action; heretofore lack of overt behaviour change has been dismissed as denial. In this regard, Heather believes the resulting model provides a heuristic framework for the study of behaviour change and intervention (Heather, 1992, p. 827). Perhaps consensus could be reached by acknowledging the model's evident cognitive and behavioural theoretical underpinnings but also by realising its failure to incorporate and test the specific tenets and propositions inherent in the currently favoured theories and models of human behaviour. Although Prochaska, DiClemente et al. (1992) admit that "there are not enough data to justify commitment to [the] model" (p. 827), this heuristic framework is potentially a powerful base for the incorporation of social-cognitive theories of behaviour. These are discussed below.

2.4.1 TM and social-cognitive models of behaviours.

TM gives as much weight to the decision process or pre-change state as to the active process of changing and maintaining and in this regard underlines the fact that a major part of the change process involves an individual deciding whether or not it is in his/her best interests to change (Stockwell, 1992). Thus, the stages of change conceptualisation could be seen as a graded measure of behavioural intention.

The Theory of Reasoned Action (TRA: Ajzen and Fishbien, 1980; Ajzen, 1988) and the Theory of Planned Behaviour (TPB: Ajzen, 1985; Ajzen, 1988) are founded on the premise that intentional behaviour change is fundamentally based on this decision process and that intention is the most immediate determinant of an action. The theories outline the behavioural determinants that affect intention to perform or not to perform an action. In brief, TRA proposes that behavioural beliefs (attitude to behaviour) and attitudes of significant others (subjective norm) determine intention for action. TBP, building on TRA, takes into consideration some of the realistic constraints of adopting a behaviour and includes an additional variable, perceived behavioural control. Courneya (1995a) examined whether stage of change for exercise was related to each of the main TPB constructs and found a significant linear relationship between each TPB construct and stage of change. Courneya also found a direct relationship between perceived behaviour control and stage of change; scores on the construct discriminated between individuals at various stages of change. The perceived behavioural control variable in TPB is very similar to the concept of self efficacy and, as noted previously, self efficacy has been found to increase as individuals progress from the precontemplation to action stages of change.

Werch and DiClemente (1994) outlined constructs from three social cognitive models which they believe may influence acquisition and modification of drug use: the perceived threat and perceived benefits and barriers constructs from the Health Belief Model (Becker, 1974; Rosenstock, 1974), self control, self regulation and self reinforcement from Behavioural Self Control Theory (Kanfer, 1975) and many personal and situational factors identified in Social Cognitive Theory (Bandura, 1986). The links, however, are purely supposed. They have never been formally tested nor have the constructs, save self efficacy, been formally integrated into the transtheoretical model. Courneya (1995b) found that the perceived severity (of a health threat) construct from the Health Belief Model and Protection Motivation Theory (Rogers, 1975, 1983) could discriminate those in the precontemplation stage from those in the contemplation stage of change for exercise behaviour. Courneya

suggested that the main function of perceived severity of physical inactivity is to motivate people to seriously consider their sedentary existence and contemplate becoming more physically active. Though not a major breakthrough in increasing our understanding of exercise adoption process, this finding does lend theoretical backing to the processes of change, in particular those experiential processes utilised in the initial stages to raise awareness of the negative effects of the problem behaviour.

Courneya (1995a) concluded that “social-cognitive constructs from other theoretical models would benefit from an integration with the stages of change model...; integration may help clarify the theoretical relationship between particular constructs and behaviour change” (p. 448). In this regard, the stages of change conceptualisation demonstrates good potential as a base for identifying other cognitive factors which may influence an individual’s path of change. This proposition will be discussed further, with specific reference to motivation for change, in the next chapter.

2.5 Measuring the stages of change

McConnaughty, Prochaska and Velicer (1983) first developed the Stages of Change Questionnaire, a 32 item measure which yields scale scores on each of four dimensions corresponding to four stages of change (the preparation stage is not represented). Principal components analyses produced a four factor solution that was corroborated by McConnaughty, DiClemente, Prochaska and Velicer (1989). The validity of this measure has been queried on the basis of strong correlations between non-adjacent stages (e.g., a correlation of .50 between contemplation and action: Abellanas and McLellan, 1993; Sutton, 1996). Furthermore, its answer format, which requires respondents to rate the applicability, to themselves, of all stages of change categories, is potentially confusing and may result in category identification problems.

Prochaska and DiClemente (1983) and Marcus, Selby et al. (1992) developed a four item, categorical measure of stage of change; each item exclusively defines one stage of change. The measure is based on a staging algorithm which defines each stage in terms of the intention to reach a behavioural criterion, regular exercise. Initially, each item was rated on a five point Likert-type scale but, subsequently, Marcus and Simkin (1993) have adopted a true/false rather than a Likert format. The five items in the stages of change for exercise measure are listed below in Table 2.2. Due to its ease of administration and analysis the

categorical measure has proven more popular in exercise research than the 32-item questionnaire.

Table 2.2. Stages of change for exercise measure (from Marcus, Selby et al. 1992).

Stage	Item
Precontemplation	I currently do not exercise and I do not intend to start in the next six months.
Contemplation	I currently do not exercise but I am thinking about starting to exercise in the next six months.
Preparation	I currently exercise some but not regularly*.
Action	I currently exercise regularly, but I have only begun doing so within the last six months
Maintenance	I currently exercise regularly and have done so for longer than six months.

Note: The six month time plan was chosen because it was felt that it was about as far into the future as people plan, at least for change behaviours (Prochaska et al., 1994).

* Regular exercise = 20 mins exercise , three or more times per week

Recently investigators have begun to use a visual-analogue stage of change measure. Beiner and Adams (1991) developed the Contemplation Ladder because of dissatisfaction with the categorical indication scoring system required by the traditional questionnaire. The tool measures an individual's readiness to quit smoking on an 11 point continuum of readiness presented in the form of a ladder. Five of the rungs represent anchored stages of change which range from no thoughts of quitting (precontemplation), on the bottom rung, to maintenance of change on the top rung. Individuals simply choose the point on the 11 point scale that best describes their current state of exercise behaviour. The advantage of the ladder format lies in its visual impact and implied upward progression towards achieving sustained change. Beiner and Adams believe that the information yielded by a continuous measure is more useful as an outcome variable than that yielded by the dichotomous or

ordered categories formats of the traditional questionnaire. Several authors have applied the accepted stages of change for exercise items to the ladder format (Marcus, Rakowski and Rossi, 1992; Marcus and Owen, 1992 ; Marcus, Eaton et al, 1994; Marcus, Pinto et al. 1994). The anchored labels represent the minimum requirements for membership of a particular stage of change and each stage typically includes the above two or three rungs. The stages of change used in Beiner and Adams' measure, however, differs from those defined in the transtheoretical model: there are no maintenance or preparation stages.

Marcus and Simkin (1993) tested the concurrent validity of the stages of change measure by comparing scores to ratings of US adults on the seven-day Physical Activity Recall questionnaire (PAR: Blair, 1984). They found scores on the stages of change measure significantly differentiated between reported levels of physical activity participation in the expected direction, but only when the stages of change items were collapsed across three levels of stage: precontemplation/contemplation (PC/C), preparation (P) and action/maintenance (A/M). However, individuals in the supposedly sedentary precontemplation/contemplation stages reported engaging in between 40 min and 3hr 30min of exercise per week. Rather than supporting the validity of the stages of change measure this brings its validity into question. Similarly, Lee (1993) reported that Australian adults in the PC and C stages of change for exercise engaged in a large number of exercise sessions per week. Furthermore, there was no significant difference in session length or intensity between what should be non-exercising adults and those in an active stage of exercise involvement (the action stage).

Recently several researchers have questioned the validity of these categorical stages of change for exercise measures due to the dearth of research examining their validity and reliability (Dishman, 1994; Buxton, Wyse, Mercer and Hale, 1995; Wyse, Mercer, Ashford, Buxton and Gleeson, 1995). As a result, Buxton et al. (1995) used the Stanford 'usual' physical activity questionnaire (Sallis, Haskell, Wood, Fortman, Roger, Blair, Paffenbarger, 1985) and the PAR to examine the self-reported physical activity levels of a UK worksite sample and the stage measure's concurrent validity. The sample was classified into the three stage categories used by Markus and Simkin (1993) and significant differences between the A/M and P stages and between the A/M and PC/C stages were found. However, the full results of this study have not yet been presented. Wyse et al. (1995) found that scores on the Godin Leisure Time Physical Activity Questionnaire (Godin and Shephard, 1985) significantly varied across the PC/C, P and A/M stages of change in young British adults and

similar research by Naylor, McKenna, Barnes and Christopher (1995) with a sample of UK university students support these findings.

Exercise research, then, supports only a three-level stages of change model. Further confirmation of the validity of the five-stage model is necessary before conceptual and predictive advances can be made with the transtheoretical model. To date there is only one published test-retest reliability check of the stages of change measure. Marcus, Selby et al. (1992) found a reliability coefficient of 0.78 in support of the reliability of the measure over a two week period. However, this study had only a sample size of 20. On a more fundamental level, Stockwell (1992) believes that "the notion of there being discrete stages of change is always going to be an over-simplification" (p. 831) and declared that he could more comfortably live with a continuum of preparedness to change. Concern has also been expressed by the authors of the model; "are the stages discrete steps or do they operate more as a continuum?" (DiClemente, 1993, p. 105). The majority of previous research using the stage of change formulation has measured and defined individuals' stages of change as a discrete steps. Investigators' more recent use of the visual-analogue ladders conceptualisation of the stages (e.g., Biener and Abrams, 1991; Marcus, Rakowski and Rossi, 1992) may lead to a more general acceptance of a continuum of stage of change rather than discrete stage of change. Davidson (1992) has queried the transtheoretical model proposition that individuals must pass in an ordered manner through each of the stages in turn. Change, it seems, may also be sparked by non-contemplative factors such as a significant life event, change in functional significance and ageing (Orford, Somers, Daniels, and Kirby, 1992; Davidson, 1992). Orford et al. (1992) cite evidence of much non-contemplative change among moderately risky drinkers newly admitted to hospital.

2.6 Measuring the processes of change

Prior to 1982, individual's usage of the processes of change had been measured by a lengthy and inefficient interview that did not demonstrate adequate psychometric properties (DiClemente and Prochaska, 1982). Prochaska et al. (1988) were the first to develop, validate and publish a paper and pencil measure of the processes of change, the PCQ for smoking cessation. The instrument was developed from a pool of 65 items and 13 possible processes. Ten factors, each measured by three or four items, were identified through principal components analysis. The stability of the factor structure was confirmed in cross sample-cross format tests. DiClemente et al. (1991) and Kristeller, Rossi, Ockene, Goldberg

and Prochaska (1992) have since shown empirical support for the applicability of these items to smoking cessation behaviours. Subsequent measures of processes of change use in other health behaviours have kept the original items, only modifying them to reflect the relevant activity.

Marcus, Rossi et al. (1992) also used these items to developed the 10 factor 42 item processes of change for exercise questionnaire (PCEQ). Although they found support for the test-retest reliability and convergent validity of the measure, closer examination of their work raises questions about its construct validity. Results from their confirmatory factor analysis of the measure show that a ten correlated factors model exhibited a very poor fit to the data. This indicates that the processes may not be as differentiated as expected and that items may not be tapping their intended latent process. Marcus, Rossi et al. also tested the applicability of a second order, experiential and behavioural processes categories to exercise behaviour change and found a very high correlation (.908) between the two higher-order factors. Furthermore, Marcus, Rossi et al. do not present the fit of these higher-order models so we cannot know whether or not they actually represent a better fit to the data than the basic, 10-factors model. Such transgressions, however, are not without precedent.

Prochaska et al. (1988) report allowing error terms to correlate within factors in their confirmatory factor analysis of the 40-item measure in order to improve its goodness of fit. Including correlated error terms in a model, without substantial theoretical justification, is a violation of structural equation modelling assumptions (Jöreskog, 1993). This underscores the need for further study of the applicability of the processes of change to exercise behaviour.

The appropriateness of the higher-order, experiential and behavioural categories in the exercise domain, then, is disputable. In addition, research by Prochaska et al. (1988) and Rossi, Rossi, Velicer and Prochaska (1994) questions the validity of the distinction in smoking cessation and weight control respectively: They found correlations of .77 and .76 respectively, between the two factors. Most processes were found to reflect both categories, their labels expressing only their most dominant theme. Marcus, Rossi et al's. (1992) study, like much previous research in the exercise domain with the transtheoretical model (e.g., Marcus, Rakowski et al., 1992; Marcus, Pinto et al. 1994; Marcus, Simkin, Rossi and Pinto, 1996) used a US worksite sample involved in a workplace health promotion programme. Since such samples may not be representative of the population as a whole, or of non-US populations,;it may be germane to examine the components of the TM with a broader range

of population samples to gain a more complete understanding of the nature of the exercise behaviour change process and, in particular, the use of the processes of change (Gorely and Gordon, 1995).

2.7 The processes of change: Conceptual issues

The processes of change formulation has been accused of being insufficient to explain behaviour change while some processes have been found to be irrelevant to behaviour change. On the one hand, Prochaska, Norcross et al. (1992) found that the 10 processes of change were not sufficiently representative of the coping strategies used during a time of change. According to the authors, previous research (Folkman and Lazarus, 1985; Norcross and Prochaska, 1986a,b) had determined that the coping strategies wishful thinking, self blame and minimising threat were routinely employed during a time of change but were not assessed by any PCQ. Therefore, 15 items from the Ways of Coping Checklist (Folkman and Lazarus, 1980) which measured these coping strategies, were added to the PCQ items. Prochaska and DiClemente (1984) state, however, that “it is not assumed...that the processes identified are a complete compendium of change activity” (p. 44). On the other hand, Gorley and Gordon (1995) found that five of the ten processes of change were inapplicable within a context of exercise behaviour change in 50-65 year old adults. Five processes did not enter a discriminant function (reinforcement management, helping relationships, environmental re-evaluation, social re-evaluation and dramatic relief), suggesting that only five processes make a significant and independent contribution across the stages of exercise change. Gorley and Gordon propose that the apparent irrelevance of the social liberation and environmental re-evaluation processes indicates that middle aged adults may not see a sedentary lifestyle as problematic or inactivity as having a social cost. The authors note that discriminant function analysis has not previously been utilised with the stages and processes of change and that its use may produce similar findings in other domains. Close inspection of the focus of each PCQ and PCEQ item reveals that the PCQ and PCEQ measure motivation and cues to action as well as coping strategies. Subsuming motivation under the general heading of processes of change does not do justice to the importance of motivation and underlying behavioural regulation in directing the behaviour change process. It may be this tendency toward being too all-encompassing that renders some processes irrelevant yet the total number of processes insufficient.

2.8 Causal links between the stages and processes of change

There is a dearth of research examining the causal links between stages and processes of change. This lack of an empirical basis is compounded by an additional lack of a theoretical basis for presuming and investigating a cause-effect model within the TM. Courneya (1995a) maintains that

“the selection of a coherent and well developed theoretical framework, as opposed to a collection of constructs from different theories [the TM], has the added advantage [of explaining] relationships amongst constructs rather than solely between the constructs and the stage of readiness” (p. 81).

Furthermore, the greater portion of previous research has been cross-sectional in nature, resulting in a lack of indication of causal links and temporal order patterns between the various components of the Transtheoretical Model. We do not know why, for instance, there is a greater emphasis on certain processes at particular stages of change. Of a sample of 24 studies, examining all elements of TM in exercise settings, comprising the greater part of research to date in this area, only one employed a longitudinal design (Marcus et al. ,1996) and two others an intervention design (Cardinal and Sachs, 1995; Marcus, Banspach et al.,1994). Marcus, Pinto, Simkin, Audrain and Taylor (1996) followed exercise uptakers for a six month period. Four patterns of stage emerged -adopters, relapsers, stable sedentary and stable active - and the processes of change were used differentially across these four groups. This gives valuable information about the temporal relationship between the stages and process of change, perhaps establishing a precedent for a causal direction, information which could not be gained from cross-sectional research.

Researchers should not merely be concerned with the mapping of a diverse range of negative health behaviours onto the transtheoretical profile, worthy though that has been in establishing the validity and generalisability of the model. We need to understand why it is that behaviour appears to follow such a structured path of change (precontemplation to action), albeit in a decidedly non-linear manner, and what factors cause individuals to relapse in their progress across the stages. The combined stages and processes of change conceptualisation has great potential as a basis for identifying those cognitive-behavioural factors which differentiate individuals across the stages of change.

2.9 The levels of change

An additional and lesser known component of the transtheoretical model (TM) addresses the context in which the problem behaviour occurs. This component is known as the levels of change and represents the content of change, that is, *what* it is that needs to be changed in order for individuals to overcome their problem behaviour (Prochaska and DiClemente, 1984) and therefore, the context underlying the stages and processes of change. Thus far in this chapter the levels of change dimension of TM has neither been formally presented nor discussed in terms of its relationships with the stages and processes of change because of the limited understanding of, awareness of and application of this dimension outside of TM, and the lack of empirical support for its relationships with the stages and processes of change. Recent reviews of TM in relation to the major areas of change have not mentioned the levels of change dimension (for example, Prochaska, DiClemente and Norcross, 1992, and DiClemente, 1993, concerning addictive behaviours; Prochaska et al., 1994, concerning HIV prevention and O'Connor, 1994, and Prochaska and Marcus, 1994, concerning exercise promotion).

Prochaska and DiClemente (1984) have delineated five potential problem areas, representing five distinct but interrelated levels of psychosocial change which may be addressed in treatment: symptom/situational, maladaptive cognitions, interpersonal and intrapersonal conflicts, and family systems conflicts. The processes and stages of change are hypothesised to interact as previously discussed at each level of change, and Prochaska and DiClemente (1984) describe this as “a model for intervening hierarchically and systematically across a broad range of therapeutic content” (p. 62). It is considered essential that programmes for change be matched to an individual's perceived problem level (Prochaska and DiClemente, 1986) and the model predicts that the greater the number of levels involved in the cause or control of a person's problem behaviour the longer and more difficult will be the process of behaviour change (Prochaska, DiClemente, 1992).

Prochaska and DiClemente (1984) present only a limited account of the content of each level of change, being more concerned with challenging the traditional systems of psychotherapy by establishing the need to consider such levels. Greater attention is given, however, to the integration of the three dimensions of TM, the stages, processes and levels of change and it is only here that an understanding of each level of change is gained. The symptom/situational level is concerned with change only at the level of the situational determinants and stimuli that immediately precede or follow behaviour (Prochaska and

DiClemente, 1984). The focus is on changing the general environment or particular situations that control the behaviour. For example, a weight problem may be the result of long term overindulgence in chocolate during times of depression, which is exacerbated by a sedentary lifestyle. Treatment, then, would involve use of counter-conditioning, stimulus control and reinforcement management strategies to encourage substitution of a more positive response at such times, such as taking some exercise, with the aim of effectively replacing the eating response.

Clearly though, such a problem requires a response at more than the situational/symptom level. Rather than viewing overeating alone as the cause of the weight problem, intervention at the maladaptive cognitions level of change also involves changing the beliefs or cognitions that are controlling the overeating and inactivity. Focus here is on changing the beliefs rather than the behaviour. Treatment involves encouraging realistic alternatives by using the self re-evaluation and self liberation processes of change. In the current example, the underlying reason for turning to food as a comfort in times of depression may be the belief that eating elevates depression. Such a belief would mitigate against the success of situational/symptom level interventions. Counter-conditioning and reinforcement management strategies would fail in the long term because they are not in accordance with the underlying belief. Evidently the problem presented in the example once again involves more than an irrational belief and may be explained by the next level of change, interpersonal conflicts.

Prochaska and DiClemente (1984) maintain that “the most common content issues at the interpersonal level are communication and control (p.68)”. Each party believes that it is not his-herself but the other who is the problem and, therefore, who needs to change. In the example, the overweight individual is married to a tall, slim, athletic and sporty individual who is increasingly perceived to regard the overweight spouse with an air of disgust and disdain. Depressive affect and overeating, then, are used as a coercive strategy to gain attention, transfer blame and to force the other to change their ways. The result, of course, is a downward spiral of circular causality. Use of self re-evaluation and self liberation strategies by both parties may help to break this cycle, while counter-conditioning strategies work at “substituting intentional and responsible messages for blaming and controlling (ones)” (Prochaska and DiClemente, 1984, p.69). Lack of progress at this level may be due to unresolved family conflicts, the next level of change.

The overweight individual in the example is the youngest of four, with overweight, sedentary parents. Treatment at the family/systems level of change is concerned with breaking patterns of behaviour that have been passed from one generation to the next and which prevent the offspring from becoming independent from his/her family. In this family food was used as reward for good behaviour, overindulgence was encouraged and physical exertion of any kind discouraged. Parental love and concern is expressed through gifts of confectionery. The presence of other, happy and accomplished, sedentary and over-weight individuals in the extended family leads to acceptance of body size and promotes the view that the responsibility for body size is not under personal control. Intervention requires raising awareness (consciousness raising) of the extent of the emotional bond to family members and of the behavioural patterns being repeated over generations, followed by a re-evaluation of these relationships and of recurrent behaviour patterns. Finally, change at the fifth level of change, the intrapersonal level, can be the most painful. Problems can no longer be attributed to circumstance, others or attitudes, rather it becomes increasingly clear that something at the core of one's self is causing chronic and recurring conflicts (Prochaska and DiClemente, 1984). In this example something fundamental to the belief system of the individual is perpetuating an inactive and over-indulgent lifestyle.

Prochaska and DiClemente (1984) present these five levels of change in the context of psychotherapeutic change in cases of sexual dysfunction. The levels of change represent levels of insight into the problem, the processes of change are the intervention techniques employed by both therapist and client to alleviate the problem at this level and the stages of change apply to the use of the processes of change within each level of change. Extrapolation from the psychotherapeutic domain is pertinent given that the content of psychotherapy consists of psychological problems and such problems are often the concomitants of negative health behaviours, (smoking, alcoholism, over weight and sedentary living). The levels of change, therefore, are equally applicable to a wide range of negative health behaviours and it is apparent that negative health behaviours can only be completely changed at the appropriate level of change. Prochaska and DiClemente (1984) express the hope that "therapy research will progress to the point where we will know that a specific level or levels of intervention is the most effective with particular types of patients having particular types of problems" (p. 63).

2.10 Levels of change and exercise behaviour

Despite the successful application of the other dimensions of TM to a wide range of negative health behaviours, the levels of change dimension has received little or no attention outside of its original presentation by Prochaska and DiClemente (1984, 1986). To date no research has examined the influence of level of change on the change process in exercise, or in any other health behaviour. Given the complexity of this dimension of change, this is not surprising. An examination of the influence of levels of change on adoption of exercise, for instance, would require baseline and follow up psychotherapeutic evaluations of each individual's level of change in order to identify the appropriate level for intervention. Consequently, it is neither realistic nor appropriate to investigate the role of the levels of change in health behaviour change in a manner similar to that adopted for investigation of the role of the other elements of TM: cross-sectional, retrospective, large sample, questionnaire research. In addition, there is no evidence to suggest that the levels of change support similar underlying principals, or properties to those of the stages of change: distinct levels, united by an underlying continuum, through all of which one must pass. And, although a sense of 'order' to the levels of change is implied by the notion of a hierarchy, there is no evidence to suggest that such order is equally applicable across all health behaviours or indeed equally applicable across individuals. Thus it may be more profitable to regard the levels of change, and the proposed links between the levels, the processes and the stages of change, as a holistic process rather than focusing on the individual levels of change and their relationship to specific stages and processes of change. The worth of a levels of change approach to understanding exercise behaviour, then, lies not in the categorisation of various exercise or sedentary behaviours as representing particular levels of change but the understanding of the complete change process from a levels of change view point. Much research has, albeit inadvertently, already examined exercise behaviour change from various levels of change.

✘ Exercise adherence research has confirmed that situational factors play a large part in our decision to take exercise. Family commitments, proximity of facilities, social-environmental factors and lack of time are often cited as reasons for inactivity (Pate et al., 1995). Lack of time is the most commonly cited barrier to participation (Pate et al., 1995; Owen and Bauman, 1992). Much of this research has shown that it is often the case that despite acceptance of the importance of physical activity, levels of participation are disappointingly low (Allied-Dunbar Fitness Survey, 1992). Research which has applied the

TM dimensions of stages and processes of change to exercise behaviour change has also been directed predominantly at the symptom/situational level of change. A consideration of the items contained in the processes of change for exercise questionnaire (Marcus, Rossi et al., 1992) confirms the symptom/situational level approach of the measure. Items measuring the experiential processes of change refer purely to raising awareness of the need for change, the benefits of change and the possibilities for change. The behavioural processes of change for exercise concern the use of strategies and techniques to manage or implement change: controlling stimulus-response patterns, use of rewards and support from others. Exercise adherence research has also embraced the importance of such cognitive variables as motivation, self efficacy, perceived choice, and the balance between barriers to and benefits of exercise in understanding exercise adoption and adherence which by definition embrace the maladaptive cognitions level of change. Limited research within the TM framework has been conducted at the level of maladaptive cognitions. Courneya (1995a) found that the psychological constructs contained within the theory of planned behaviour (Ajzen, 1988) were related to stage of readiness for physical activity. Perceived social pressure, attitude, perceived control and intention could distinguish among the stages of change. Courneya (1995b) found that the perceived seriousness of health threat construct from the Health Belief Model (Becker, 1974; Rosenstock, 1974) and protection motivation theory (Rogers, 1975, 1983) also varied across the stages of change.

Research in the wider arena of the self has identified that how we view our selves and the value judgements we attach to this view affects our choice and persistence in behaviour. Research has found that physical self esteem, or physical competence influences the degree and type of involvement in sport and exercise (Duda, 1988; Fox and Corbin, 1989; Page, Ashford, Fox and Biddle, 1993; Sonstroem, Harlow and Josephs, 1994; Weiss, 1987). There are many common links between this view of the self, particularly with regard to exercise behaviour, and the fifth level of change, intrapersonal conflicts: both concern the essence or core of one's being, both have an evaluative component and both are affected by disharmonies and disunities within this self. Indeed, this intrapersonal view of the self is similar to that expressed by self-schema theory (Markus, 1977) and the self-schema approach to understanding exercise behaviour.

Self-schemata are "cognitive generalisations about the self derived from past experience that organise and guide the processing of the self related information contained in an individual's social experience" (Markus, 1977, p.63). According to the theory these

frames of references are the sieves through which information about the self is filtered and the cradle from which behaviour emerges. Self-determination theory (Deci and Ryan, 1985) maintains that when behaviour is autonomously initiated for reasons of interest and enjoyment this behaviour is compatible with our competencies and capabilities. Such predilections would also be influenced by our self-schema because, according to Markus (1977), self-schema represent the way in which the self is “differentiated and articulated in memory” (p. 64). Thus our self-schema affect our interpretations, perceptions and expectations in a process of “biased self-perception” (Markus, Hamill and Sentis, 1987, p. 50) in much the same way as intrapersonal conflicts underlie symptom/situational conflicts, maladaptive cognitions, interpersonal and intrapersonal conflicts, and family systems conflicts. Consideration of exercise adoption and adherence from the point of view of the fifth level of change, intrapersonal conflicts, then, may extend our awareness of the involvement of self variables and help us understand why a programme of daily or regular physical activity cannot be incorporated into a person’s daily routine in a manner that will ensure continuing adherence.

CHAPTER THREE

3. Motivation, behavioural regulation and the transtheoretical model

The Transtheoretical Model proposes that one's degree of intentional behaviour change depends on perceived ability to cause change (self efficacy) and cope with change (behavioural processes of change), the salience of environmental cues throughout the period of change (experiential processes of change) and pros versus cons of change (decisional balance). Here I propose that change also depends on the underlying reasons, or motives for change and on the existence of feelings of autonomy versus lack of autonomy over the regulation of behaviour. The transtheoretical model (TM) does not consider the role of motivation in determining intention to change and regulation of change behaviour. Prochaska et al. (1994) however, have noted that behavioural change "requires movement through discrete motivational stages over time" (p. 471). Thus underlying motivation for action may influence current stage of change and affect movement to a subsequent stage.

Current awareness of the role of motivational factors in exercise behaviour draws much of its understanding from Deci and Ryan's (1985, 1990) self-determination theory (SDT). SDT is an organismic theory of human motivation that deals with the concept of intention, specifically autonomous versus controlled types of intentional behaviour. According to Deci and Ryan (1985) individuals have an innate predilection to be autonomous, that is, to be self determining, which leads them to engage in interesting behaviours and to do so based on choice rather than coercion or obligation. A central proposition of SDT is that events which encourage autonomy, competence and relatedness¹ will facilitate a perception of motivation for the activity being self determined rather than being controlled (Deci et al, 1992). The theory comprises three mini-theories; Cognitive Evaluation Theory (CET), Organismic Integration Theory (OIT) and Causality Orientations Theory. Two of these mini-theories, CET and OIT will be discussed here.

3.1 Cognitive Evaluation Theory

Cognitive Evaluation Theory (CET: Deci, 1975, 1980; Deci and Ryan, 1980, 1985) is concerned with the impact of factors involved in the initiation and regulation of behaviour on intrinsic motivation through their effects on perceptions of self-determination and

¹ Though an integral factor in the greater SDT, the notion of relatedness (the feeling of connectedness to significant others: Vallerand, 1997) receives little direct attention in cognitive evaluation theory and, thus, will not be discussed here.

competence. The concepts of intrinsic motivation, extrinsic motivation and locus of causality are central to the predictions of this theory. An individual is *intrinsically* motivated for a behaviour when it is undertaken in the absence of contingency, reward or control and, therefore, purely for the pleasure, enjoyment and satisfaction derived from participation (Deci and Ryan, 1985). There is no pressure to act; action is not based on the desire, or need to achieve a particular outcome. Intrinsically motivated behaviour, therefore, is an end in itself and is completely self-determined. *Extrinsically* motivated behaviour, on the other hand, refers to behaviour undertaken in the absence of intrinsic and self determined interest in the activity itself. Behaviour is a means of achieving an end, not an end in itself, and typically arises from the desire to achieve a social or material reward, or to avoid recrimination. From a stages of change perspective, two exercise adoptees in the preparation stage for exercise behaviour change may report similar levels of exercise behaviour (e.g., exercise once per week), their levels of adherence to this programme of exercise, however, may differ as a function of their motivation for exercise. A person exercising to achieve fitness or weight goals (extrinsic motives) may be more likely to relapse in the near future whereas someone exercising for reasons of enjoyment and satisfaction (intrinsic motives) may be more likely to progress to the action and maintenance stages of change.

Action can also be *amotivated*, that is not intentional and neither intrinsically nor extrinsically motivated (Deci and Ryan, 1990). Amotivated individuals perceive a lack of contingency between outcomes and their own actions and can no longer see a reason for continuing with an activity (Pelletier, Fortier, Vallerand, Tuson, Brière and Blais, 1995). The result is listless and apathetic behaviour. Amotivational, non-contingent events reduce intrinsic motivation by their apparent unmasterable nature and lack of feedback regarding competence or autonomy. The amotivational function of events is not well researched, however, and receives little consideration in CET. *Locus of causality* refers to whether the perceived source, or 'cause' of initiation and regulation of behaviours is within oneself, that is, self determined, or outside of oneself, that is, controlled. An internal locus of causality represents fully autonomous, self-determined action, whereas an external locus of causality represent external, controlled, non-self-determined action.

According to CET variations in perceptions of competence and locus of causality will produce variations in intrinsic motivation. Displays of competence through mastery of tasks or behaviours which are optimally challenging results in increased intrinsic motivation for those behaviours, while failure to display competence can undermine intrinsic motivation.

Prolonged negative feedback signifying incompetence and the resulting denial of self-determination and can also lead to an amotivated state. According to Deci and Ryan (1985) reactance to loss of self-determination will gradually decrease over time and individuals may fall into a state of amotivation wherein they experience reduced effectiveness and reach a state of learned helplessness (see Seligman, 1975). Events in which one feels pressured to act, that is, where perceived locus of causality is external, will also undermine self-determination and thus reduce intrinsic motivation. On the other hand, events in which one feels fully self determined, that is, where locus of causality is internal, will enhance intrinsic motivation. However, it is not the event per se but how the event is perceived that determines its influence on intrinsic motivation. Pressuring oneself to act can be as detrimental to intrinsic motivation as similar pressure from others or deadlines. Internal regulation does not ensure self-determination and an internal locus of causality. Intrapersonal events can have similar effects on intrinsic motivation as have external events; individuals are also vulnerable to being controlled by internal forces. The important issue, then, is not the source of the control but whether one perceives one is being controlled (Deci and Ryan, 1985).

Motivational evaluations can occur prior to, during, or following any event and in this regard CET is remarkably distinguishable from the retrospective evaluation inherent in Weiner's (1979, 1985) Attributional Theory of Achievement Motivation and Emotion. Furthermore, control, as it is conceptualised in locus of causality, is essentially different from the concept of control inherent in Rotter's (1966) Locus of Control. Locus of control refers to expectations about whether or not behaviours are reliably linked to outcomes, whereas locus of causality concerns perceptions of control over the initiation and determination of behaviour.

3.2 Motivation in exercise behaviour

CET has been the prime paradigm in the study of intrinsic motivation and has resulted in a large body of research (800 or more publication over a 25 year span: Vallerand, 1997). Intrinsic motivation has received particular attention in the sport and exercise fields where the issue of choice, control and competence parameters on adherence and drop out are of considerable consequence. Research has largely focused on the effects of contextual factors (e.g., Vallerand and Brawley, 1984: choice; Plant and Ryan, 1985: task; Vallerand, Gauvin and Halliwell, 1986 a,b: competitive structure) or internal factors (Ryan, 1982: task and ego

goal orientations; Vallerand and Reid, 1984, 1988: competence perceptions) on levels of intrinsic motivation. In the exercise field Whitehead and Corbin (1991), for instance, showed that students' perceptions of competence following a physical fitness test mediated the influence of both positive and negative feedback on their intrinsic motivation: strong perceptions of competence buffered the potentially detrimental effect of negative feedback on intrinsic motivation. Frederick and Ryan (1993) examined the differences in participants' motives in sports (individual sports e.g., tennis and sailing) versus exercise settings (running, weight training and aerobics) and their subsequent effect on actual participation. They found that individuals involved in sports displayed higher competitive and interest-enjoyment motivation than those involved in exercise whereas exercisers displayed higher body-related motivation than sports persons. A positive correlation was found between both competitive and interest-enjoyment motives and hours of weekly participation while body-related motivation was negatively correlated with participation variables. Thompson and Wankel (1980) found that increasing feelings of choice (self-determination) increased participation in an adult fitness programme. Individuals were led to believe that their preferences had either been or had not been taken into consideration in the design of the two exercise programmes. In reality both programmes were identical, only the participants' perceptions of choice differed. Over the course of six weeks the perceived choice group had significantly higher programme attendance.

While examination of individuals' motivation may be useful in explaining their current behavioural state, there is a dearth of research examining motivational change during a time of intentional behaviour change. Motivation is a dynamic phenomenon; during times of behaviour change it is likely that motivations will also change in conjunction with the stage of that change. Such shifts in locus of causality may be useful in explaining why individuals are in a certain stage of change with regard to their exercise behaviour and why there is a greater emphasis on certain processes of change at particular stages of change. However, while intrinsic motivation appears to be fundamental to exercise adherence, for many in the initial stages of exercise adoption the enjoyment of and stimulation from the activity itself may be insufficient to encourage continued participation (Morgan, Shephard and Finucane, 1984; Dishman, 1987; McAuley, Wraith and Duncan, 1991). Extrinsic motives, such as improved fitness, health, or weight loss, are often the initial change catalysts which, over time, may lead to intrinsic interest in exercise and ultimately encourage long-term adherence. There is nothing inherently negative about extrinsic motives only that

they are dependent on the attainment of external outcomes for the maintenance of behaviour and researchers have recognised their role in motivating initial exercise involvement (Morgan et al. 1984; Dishman, 1987; McAuley et al., 1991). Indeed, Deci and Ryan (1985) do not deny the role of extrinsic motives in enhancing persistence and adherence. Overall, however, CET tends to portray extrinsic motivation in a negative light.

3.3 CET limitations

In CET locus of causality and, therefore, motivation, comprise separate dichotomised dimensions which are mutually exclusive: internal versus external causality, and intrinsic versus extrinsic motivation. The definitions of intrinsic and extrinsic motivation advocated in CET leaves us with a motivational dichotomy of extremes wherein actions are engaged in either purely for pleasure, or because of considerable pressure (internal or external) to achieve a given outcome. Many behaviours cannot be categorised in such dichotomous terms; there are clearly other reasons for behaviour that fall between these two extremes. As a result Deci and Ryan (1990), have suggested that the “simple internal/external dichotomy (has) in a sense outlived its usefulness” and, furthermore, that the “undifferentiated approach of pitting external motivation against internal motivation is misleading” (p. 250). They now accept that the characterisation of all extrinsically motivated behaviour as having an external locus of causality, that is as being non-self-determined, is incorrect. Extrinsically motivated action can range from having either a relatively internal or relatively external locus of causality, that is, range from being somewhat self-determined to being completely non self-determined. Thus Deci and Ryan (1990) and Deci, Vallerand, Pelletier, and Ryan (1991) have reconceptualised the often restrictive internal-external dichotomy and formulated a motivational continuum that ranges from extrinsic (non-self-determined) to intrinsic (completely self-determined). This has its roots in another of the three sub-theories within the greater SDT, organismic integration theory (OIT). OIT follows on from and upholds the proposals of the CET and addresses the issue of the coexistence of several qualitatively different types of extrinsic motivation and several different degrees of self-determination in the context of the development of internal regulation of behaviour.

3.4 Organismic integration theory

Organismic integration theory (OIT) presents a stage theory of internal regulation which deals with the way in which individuals transform regulation by external contingencies (external prompting and reinforcement) into regulation by internal processes

(internalisation). Many of our daily activities constitute non-intrinsically interesting behaviours. Rarely are routine daily activities undertaken spontaneously for purely intrinsic reasons (fun, enjoyment), yet neither can it be said that we do these things solely to attain reward and recognition for our efforts; such tasks are merely instrumental for effective social functioning but must be reconciled with our quest for greater competence and self-determined functioning (Deci and Ryan, 1985). The theory outlines several degrees of integration or internalisation of extrinsically motivated behaviours that manifest varying degrees of self-determination and sit on a continuum of behavioural regulation. As one becomes more internalised regulation of behaviour becomes more autonomous and self-determined and one begins to integrate the various regulatory sources and degrees of self-determination for different activities or roles into an internal unified structure of the self (Deci and Ryan, 1985). Thus, the notion of internalisation “allows people to be self-determining with respect to extrinsic motivation” (Deci and Ryan, 1991, p. 257). The continuum conceptualisation of motivation allows more meaningful understanding of how one can simultaneously be extrinsically motivated for exercise (do it to improve appearance, maintain fitness or lose weight) yet feel quite self-determined in the regulation of exercise behaviour; this was not possible with the intrinsic-extrinsic dichotomy.

The concepts of integration and organisation, and assimilation and accommodation prevalent in the child perceptual and cognitive developmental literature (e.g. Piaget, Loevinger, Elkind) have provided the structure for this stage theory of internal regulation. The theory outlines four levels, or stages of self-determination through which one passes in the quest for internalisation: external regulation (non-self-determination), introjected regulation (limited self-determination), identified regulation (moderate self-determination) and integrated regulation (complete self-determination).

Behaviour which is externally regulated is undertaken because of pressure from significant others (such as family, friends, or doctor), or the desire to avoid the negative consequences of inaction (such as the disapproval of others). This, for example, would typically be the result of coercion by the medical profession who had prescribed exercise as the antidote to impending ill-health or for rehabilitation purposes. Behaviour, therefore, is completely non-self determined. In the case of exercise this would represent the ‘I’ll exercise if I really must’ approach (Biddle, 1994). Introjected regulation of behaviour follows internalisation of external control which is then applied to the self through the administration of sanctions, pressures and other self-controlling behaviours (Deci and Ryan, 1985). The self

coercion inherent in introjected regulation precludes free choice, “I’ll feel guilty if I don’t” is frequently given as a reason for behaviour and although there is no external pressure, such a person is still, in a sense, “being regulated” (Deci and Ryan, 1991). This form of regulation is very low in self-determination and although the regulation is internal it bears more resemblance to external control than to other self determined forms of regulation (Deci and Ryan 1990; Deci et al. 1991). Action undertaken because of the value, importance or usefulness of that action to the individual is evidence of identified regulation. Regulation is more fully a part of the self and therefore more acceptable (Deci et al. 1991). There is less experience of pressure and guilt, greater flexibility and action is taken more willingly. In this case a person would exercise because he or she values its benefits. Although motivation remains extrinsic in nature, identified regulation involves a greater degree of self-determination than introjected regulation (Deci and Ryan 1990; Deci et al. 1991).

Finally, the arrival of integrated regulation unifies and integrates all of one’s different behavioural regulations into one’s sense of self. Integrated regulation is fully self-determined; action is undertaken willingly and with no sense of coercion (Deci and Ryan, 1990). Integrated regulation is, consequently, very similar to the concept of intrinsic motivation which also represents fully self determined regulation. Both intrinsic and integrated behaviours represent autonomous self regulation but integrated regulation is characterised by an activity’s being personally salient and necessary for a valued outcome whereas intrinsic motivation is characterised by inherent interest in, stimulation from or enjoyment of the activity itself (Deci et al. 1991). Even though integrated regulation represents complete self-determination, it remains, in essence, an externally motivated behaviour because it is characterised by motives of worth, value, importance and utility. So, someone exercising for integrated reasons would do so because exercising is part of what they are and therefore, maintenance of fitness, say, is of utmost importance to them. Someone exercising for intrinsic reasons, on the other hand, would do so for the enjoyment and stimulation gained from exercising. Measures of behavioural regulation have tapped the intrinsic rather than the integrated form of regulation.

3.5 OIT research and measurement

The emphasis of OIT lies strongly on the nature of development of self-regulation and internalisation processes in children. Not surprisingly the theory’s primary empirical application has been in the area of educational psychology. Several researchers have

examined academic achievement motivation (Ryan and Connell, 1989; Deci, Vallerand, Pelletier and Ryan, 1991; Vallerand, Pelletier, Blais, Brière, Sénécal and Vallières, 1992), while others have examined motivation for prosocial behaviour (Ryan and Connell, 1989), motivation for inflating competence beliefs (Connell and Illardi, 1987), motivation for elementary school studies (Grolnick and Ryan, 1987, 1989) and motivation for persisting with college studies (Vallerand and Bissonnette, 1992). This research has supported the worth and validity of the differentiated conceptualisation of extrinsic motivation. The robustness of the continuum of behavioural regulation has also been demonstrated by its proven relevance to couple happiness (Blais, Sabourin, Boucher and Vallerand, 1990), to the elderly (Vallerand and O'Connor, 1989), to sports participation (Pelletier, Fortier, Vallerand, Tuson, Brière and Blais, 1995), to religion (Ryan, Rigby and King, 1993), to use of alcohol (Ryan, Plant and O'Malley, 1995) and weight control (Williams, Grow, Freedman, Ryan, and Deci, 1996).

Several measures of regulatory source have emerged from this literature. Ryan and Connell (1989) developed the 26 item Academic Self Regulation Questionnaire (SRQ-A) to assess children's motivation for school based tasks and a 25 item measure for prosocial behaviour (SRQ-P). Both have been widely employed in elementary school settings. The SRQ-A measures four types of motivation: extrinsic, introjected, identified and intrinsic. The SRQ-P does not measure intrinsic prosocial orientation because it made no sense to say one restrains from hitting or keeps a promise because "it is fun". From these initial measures by Ryan and Connell came the 26 item Treatment Self Regulation Questionnaire (TSRQ: Williams, Grow, Freedman, Ryan, and Deci, 1996) and the 26 item Treatment Motivation Questionnaire (TMQ: Ryan, Plant and O'Malley, 1995). The TSRQ assesses two factors: autonomous and controlled reasons for staying in a weight loss programme. The TMQ is loosely based on Deci and Ryan's (1985) framework and assesses four types of motivation for entering and remaining in alcohol treatment: internalised motivation, external motivation, seeking help and confidence in treatment. Vallerand and colleagues have also developed scales which are similar in conceptualisation to those of Ryan and Connell. The Academic Motivation Scale (AMS: Vallerand et al., 1992) measures seven types of motivation: intrinsic motivation to know, to accomplish and to experience stimulation, amotivation, identified regulation, introjected regulation, and external regulation. Pelletier et al. (1995) have recently developed the Sport Motivation Scale (SMS) to examine behavioural regulation in the sport domain which also measures seven forms of regulation. Both measures have

demonstrated satisfactory psychometric properties with college age students.

The placement of amotivation, an important factor in both the AMS and SMS, along the continuum of behavioural regulation is not altogether clear (Biddle, 1994). The amotivational function of events is not well researched and its application to the domain of health and exercise behaviours is uncertain. Exercise is normally a free-choice recreational activity which, unlike involvement in competitive sport or attendance at school, does not demand regular participation. In addition, exercise is generally not perceived as a requirement for successful daily existence. It is possible, then, that exercise may not attract amotivated individuals and it is doubtful whether exercisers would sustain any degree of regular involvement if the perceived functional significance of exercise becomes amotivating.

3.5.1 A simplex pattern of intercorrelations.

Ryan and Connell (1989) describe the different forms of behavioural regulation as “distinct classes of reasons for acting that in turn have a lawful internal ordering” (p. 752). They proposed that the continuum model for describing self regulation would conform to a simplex-like pattern of ordered correlations wherein variables are ordered in terms of conceptual similarity. In this model, concepts which are adjacent should display a greater positive correlation than those which are farther apart, reflecting constructs that differ in kind and degree. In their model Ryan and Connell found greater correlations between adjacent factors than those lying at either end of the continuum. Pelletier et al. (1995) also found a simplex pattern of correlations among SMS scales. Vallerand et al. (1992) however, did not test for such a pattern among their seven AMS factors. Simplex-type pattern of ordered correlations have also been found by Connell and Illardi (1987), Blais, Sabourin and Boucher (1990) and Goudas, Biddle and Fox (1994).

3.5.2 The Relative Autonomy Index.

A weighted sum of the categories of regulation was developed by Connell and Ryan (1984; 1987) to allow results on the SRQ to be summarised as a single score that taps the degree to which an individual is more or less self determined in a given domain. This score is known as the Relative Autonomy Index (RAI) and is computed by initially applying a weighting to each behavioural regulation sub-scale as follows: amotivation (-3), external (-2), introjected (-1), identified (+1) intrinsic (+2) (Ryan and Connell, 1989; Goudas, Biddle and Fox, 1994). The RAI is then computed by summing the products of these weighted sub-scale scores.

Self-determined regulation is indicated by high positive scores and lack of self-determination by low negative scores.

3.5.3 Measurement issues.

This differentiated conceptualisation of behavioural regulation is also not an easy one to operationally define. This is evident in the variation in items between the various measures developed to assess motivation across the continuum and owes much to the difficulty in determining degree of self-determination from reported motives for action. OIT outlines the varying degrees of self-determination that can be involved in the regulation of a behaviour, which impacts on motivation for that behaviour. But what it does not do, or claim to do, is the inverse of this, namely, outline the degree of self-determination involved in actual motives for undertaking a behaviour. Outward motive for action is distinct from, though related to, perceptions of self-determination in the regulation of that action, and it is the underlying regulatory source that is of concern. Knowing a person's reasons for undertaking a behaviour does not pin point that regulatory source. Exercise for purposes of weight control could be regulated by importance and value of keeping trim, by guilt at failure to expend calories, or for medical reasons. Therefore, it is unwise to gauge degree of self-determination from such specific motives. However, many of the operational definitions of behavioural regulation developed by Vallerand and colleagues do just that. Many items are statements of outward motive: doing x to gain y, e.g., I go to College in order to get a more prestigious job later on (Vallerand et al. 1992; Pelletier et al. 1995). Questionnaire assessment of self-determination in the regulation of behaviour should avoid any direct reference to actual, outcome orientated, motives for action, such as exercising to lose weight or to improve fitness. Simultaneous assessment of actual motives for behaviour (using, for example, in the exercise domain, the Exercise Motivations Inventory: Markland and Hardy, 1993; Markland and Ingledew, 1997) may allow clarification of the relationship between actual motives for behaviour and their underlying regulatory source.

There is much to be gained from developing a valid and reliable tool for assessing self-determination in the regulation of exercise behaviour. We know from previous research (Robertson and Mutrie, 1990; Allied-Dunbar, 1992; Wankle, 1985, 1988, 1993; Biddle, 1992 a,b) that ill-health avoidance, weight control, enjoyment, stress management, fitness improvement and social interaction are salient outward participation motives in the recreational sport and exercise settings. This research has defined these motives as either

extrinsically or intrinsically orientated. In the face of the multidimensional conceptualisation of motivation professed by OIT this level of classification seems rather crude. Examination from the point of view of the continuum would allow a finer analysis of these motivational forces.

3.6 Uniting the transtheoretical model and self-determination theory

The transtheoretical model argues that behavioural change is best conceptualised as occurring in stages and the OIT continuum-type representation of the development of internalisation, entailing a movement from extrinsic to intrinsic motivation, underlines this point. In addition, overall self-determination theory, and OIT in particular, suggests that long lasting behaviour change depends on integrated, fully autonomous regulation of behaviour. That is, accepting the regulation of change as one's own and not merely relying on continued compliance with necessary external demands (Williams et al., 1996). Assessing the extent to which peoples' reasons for action are self determined is necessary, therefore, for the adaptive and developmental process of behaviour change to be understood and predicted. Prochaska et al. (1992) have outlined the importance of certain processes of change at certain stages of behaviour change from their commonly reported usage at the various stages of change. On close examination, the strategies and techniques which make up the processes of change appear to encompass motivation, cues to action and coping strategies. Subsuming motivation under the general heading of processes of change does not do justice to its importance in directing the behaviour change process.

Personal motives for exercise play a crucial part in the exercise uptake and adherence equation and such motives also change over time; initial reasons for exercising are often not the same as reasons for continuing to exercise (Heinzelmann and Bagley, 1970). Initial involvement is often related to desire to obtain some external benefits, such as improved health and fitness, or weight loss, whereas continued involvement is more dependent on internal factors such as enjoyment, intrinsic interest and skill acquisition (McAuley, Duncan and Tammen, 1989). It seems then, that movement from initial adoption of exercise to eventual maintenance of exercise involves a movement from primarily extrinsic to more intrinsic reasons for exercise. This reported change in outward motive for exercise may involve a change, over time, in underlying behavioural regulation, that is, from less to more self determined forms of behavioural regulation. The basic premise of OIT is that the internalisation of behavioural regulation requires a developmental movement, over time,

from non-self determined regulation, or extrinsic regulation of an initially extrinsically motivated behaviour toward increasingly self determined, intrinsic regulation of this behaviour. This period of time can be represented by the stages of change and this developmental movement has clear parallels with the process of introducing a new behaviour or eliminating a problem behaviour. The likelihood of exercise adoptees reaching the maintenance stage of change, therefore, may depend on the degree to which their behaviour is self determined (Deci and Ryan, 1985). Uniting OIT with the stages of change model would allow investigation of the influence of behavioural regulation on the outcome (stage) of any behaviour change.

The Transtheoretical Model is founded on the principal of intentional behaviour change. Prochaska and DiClemente (1984) in considering the type of environment needed to produce intentional change believe that only under conditions of personal freedom (freedom to act and freedom from pressure) are individuals likely to proceed through the stages of change. Prochaska and DiClemente define freedom at two levels. First, there is the freedom as seen in spontaneous, independent and totally unbounded acts performed for no personal advantage. This is akin to Deci and Ryan's notion of intrinsic motivation. Second, there is freedom within personal regulation of behaviour and this can only be achieved when behaviour is in harmony with and is essentially part of one's sense of self. The definition of this personal freedom encapsulates the essence of OIT's identified regulation: importance, value and identification with the fundamental principals from which the act flows. Thus perceived freedom is similar to the notion of perceived self-determination.

According to Prochaska and DiClemente (1984) progression through the stages of change can be aided by recognising and restructuring the forces that pressure one to act and then identifying with those forces. A longitudinal study of weight control by Prochaska, Norcross et al. (1992) found that 13% of the variation in number of sessions attended could be predicted by a group of factors assessed pre-treatment: percentage overweight, pounds one wished to lose, number of previous attempts and internal reasons. It is the "internal reasons" factor, which is undefined, that is of interest here as it is suggestive of regulation of weight loss behaviour. Unfortunately this was not discussed by Prochaska, Norcross et al. as it was secondary to the main focus of their study. In OIT the process of internalisation leads to increasing self-determination and involves restructuring and identifying with the forces that pressure one to act. For instance, increasing awareness of a lifestyle problem, such a lack of exercise for instance, is usually cued by an external force (TV, doctor, documentary,

etc.). Building up to the decision to take up exercise, where there had initially been a lack of interest in lifestyle change, is likely to require internalisation of these external cues.

Continuance of change may depend on this introjected regulation giving way to regulation by values and importance (identified regulation) and then enjoyment and stimulation (intrinsic regulation).

3.6.1 Hypothesised links between OIT and TM.

The dynamic inherent in the stages and processes of change conceptualisation is particularly appealing for an examination of the evolution of self regulatory behaviour. The continuum-style conceptualisation and developmental origins of OIT suggest the likelihood of continual change in the source of behavioural regulation. It is intuitively appealing, then, to suppose that individuals, across a time of behaviour change, would move from feeling externally pressured by a behaviour that they are in the precontemplation and contemplation stages of modifying, to feeling a greater sense of self-determination for the behaviour when they reach the action or maintenance stages of change. Seeing current behaviour as a problem and heightening awareness of the nature of that problem usually occurs at the hand of an external force or cue such as doctor, family member, TV documentary, health pamphlet, etc. It is expected that self-determination for action is lower in these initial contemplative stages (contemplation and preparation) where use of the experiential processes of change is more prominent. Having made the decision to change, management of behaviour through the use of the behavioural process of change strategies becomes increasingly important and it is expected that the regulation of behaviour becomes increasingly self determined. When a behaviour has been incorporated into one's daily life and change is being successfully maintained this typically coincides with a belief that the behaviour is important, worthwhile and enjoyable. Such reasons are indicative of a large degree of self-determination in its regulation. Therefore, it is proposed that in the initial stages of change individuals are likely to evidence low levels of self-determination. As they progress from occasionally taking a little exercise to taking regular exercise they will become increasingly more self-determined in the regulation of their exercise behaviour. Levels of self-determination are expected to be highest in the maintenance stage of change. It is important to note, however, that while organismic integration theory implies a progression from non- to fully self-determined regulation over the course of the internalisation of a non-intrinsically motivated behaviour

there is no explicit presumption of any temporal or sequential pattern to the achievement of self determined behavioural regulation.

In keeping with the postulated link between behavioural regulation and the stages of change it is also expected that self-determination in the regulation of behaviour is linked to the use of different processes of change. The previous discussion has established that less self determined forms of behaviour regulation may be more common in the early than in the later stages of change and being linked with these early stages of change the experiential processes of change therefore, may also be related to less self determined forms of behavioural regulation while the behavioural processes of change may be related to more self determined behavioural regulation. However, although there is support for the stage-dependant use of the processes of change (Prochaska and DiClemente, 1983; Prochaska et al., 1991; DiClemente, 1993), thus far only one study (Marcus, Rossi et al., 1992), has examined the use of the processes of change across the stages of change for exercise behaviour. In addition, only this study has tested the appropriateness of the proposed second order, experiential and behavioural categories in explaining exercise behaviour change. Previous discussion (Chapter 2), has questioned the relevance of these higher-order groupings of the processes of change for exercise given their very large correlation. Furthermore, the stages and processes of change for exercise model has not been tested longitudinally. Therefore, despite the intuitive appeal of the stages and process link and the distinction between experiential and behavioural processes, there is scant empirical support for both propositions in the exercise domain.

The following research questions have emerged from the previous discussion linking underlying behavioural regulation with the stages and processes of change.

- Does self-determination increase from the contemplative to the action stages of exercise behaviour change such that those in the initial stages are more likely to use the external and introjected forms of behavioural regulation whereas those in the later stages are more likely to use the identified and intrinsic forms of regulation?
- Does self-determination affect exercise behaviour change such that greater self-determination in the regulation of exercise behaviour promotes maintenance of, or improvement in stage of change while less self-determined regulation results in relapse to an earlier stage?

- How are the experiential and behavioural processes of change used across the stages of exercise behaviour change?
- Do the experiential and behavioural processes represent two clearly differentiated higher order processes of exercise behaviour change?
- Is there a link between self-determination in the regulation of exercise behaviour and the use of processes of exercise behaviour change?
- Does consistent or increased use of the processes of change over a time of exercise behaviour change lead to positive change or maintenance of change and is a decrease in use of the processes linked to relapse?

The research conducted to address these questions is reported in the following two chapters.

CHAPTER FOUR

4. The development of the Behavioural Regulation in Exercise Questionnaire (BREQ)[†]

This chapter describes the development of a measure of self-determination in the regulation of exercise behaviour in order to determine the applicability of the continuum of self-determination to the exercise domain. Previous research has found gender differences in behavioural regulation among college and university aged students, in sport and academic contexts (Fortier, Vallerand, Brière and Provencher, 1995; Pelletier et al., 1995; Vallerand et al., 1992) and among the elderly (Vallerand and O'Connor, 1989). In all cases females reported higher levels of intrinsic and identified regulation and lower levels of external regulation than did males. This is supported by the motivational orientations literature which has found that females are often more intrinsically motivated, or more mastery orientated in their motivation than males (Weiss and Chaumeton, 1992). Duda (1988), in one of the few motivation orientation studies in the exercise as opposed to sports domain, found that male undergraduate recreational volleyball and basketball players were more ego, or social comparison orientated than female players. Females tended to be more task mastery orientated. In order, then, to confirm the equality of the factor structure across gender the factor structure of the resulting measure is cross-validated with a second sample and its factorial invariance is examined using multisample factor analytic procedures.

It was hypothesised that a five-factor model (representing the extrinsic, introjected, identified, intrinsic and amotivated forms of behavioural regulation) would adequately explain the data and display acceptable convergent and divergent validity. It was also hypothesised, as proposed by Ryan and Connell (1989), that the pattern of intercorrelations between the different forms of behavioural regulation would conform to a simplex-like pattern, or ordered correlation structure, wherein forms of behavioural regulation that are nearer in conception, and thus closer on the behavioural regulation continuum, display a greater positive correlation than those deemed more discrepant and farther apart on the continuum.

[†] The studies presented here have been published: Mullan, Markland & Ingledew (1997). A graded conceptualisation of self-determination in the regulation of exercise behaviour: Development of a measure using confirmatory analytic procedures. *Personality and Individual Differences*, 23, 745-752.

4.1 Instrument development

4.1.1 Item generation

Items were derived from the AMS (Vallerand et al., 1992) and SRQ academic and prosocial scale (Ryan and Connell, 1989) with item wording modified to reflect reasons for exercise. Items such as “(I do my class work because) it is important to me to work on my class work” from the SRQ and “I cannot come to see why I go to college and frankly I don’t give a damn” from the AMS, were changed to “it is important to me to exercise regularly” and “I can’t see why I should bother exercising” respectively. Initially a pool of 53 such items was identified measuring extrinsic, introjected, identified, intrinsic and amotivated forms of behavioural regulation; introjected regulation has not been operationalised in the AMS or SRQ. 30 items were retained for testing from this initial pool based on their relationship to theory, their correspondence with items in other measures and their applicability to exercise. Seven of these items measured introjected regulation, six items measured each of the external, identified and intrinsic forms of regulation and five items measured amotivation. Content validity was established by a doctoral-level judge accomplished in the area of motivation and behavioural regulation. Comprehensibility of items and the instructional set was verified by ten regular exercisers who were also familiar with the questionnaire development process. Suggested improvements were noted and appropriate steps taken to improve the measure. Items were scored on a five point Likert-type scale ranging from *not true for me* (0), through *sometimes true for me* (2), to *very true for me* (4). The 30-item questionnaire can be seen in Appendix 1.

4.1.2 Method: Rationale and strategy for model testing

Given that an a priori model of the behavioural regulation continuum was hypothesised data were subjected to confirmatory factor analysis (CFA) with both LISREL 8.12 (Jöreskog and Sörbom, 1993a) and EQS (Bentler, 1995) statistical packages. The PRELIS2 (Jöreskog and Sörbom, 1993b) pre-processor package was used to generate the required matrices that were used as input for the LISREL programme. Model testing involved three stages of analysis, as recommended by Jöreskog (1993). In the first stage each sub-scale was examined individually in order to retain only those items which were good indicators of their underlying latent variable. In the second stage each sub-scale was paired with every other sub-scale in order to eliminate any ambiguously loading items. Finally, in the third stage, the fit of the full model, following item deletion, was examined. This three step method allows

for the establishment of a measurement model in which all items are good indicators of their underlying latent variables, before proceeding to assess the overall fit of the complete model. In stages two and three all factors were allowed to correlate freely. The internal consistency and discriminant validity of each sub-scale was examined in the final stage. A three-step approach of specification, and modification and respecification was employed in all stages, as endorsed by Anderson and Gerbing (1987) and Jöreskog (1993). Although item responses were made on a Likert-type scale representing five ordered categories, these were considered to reflect an underlying continuum. Therefore, the data were treated as continuous.

In the first two stages an item was considered for deletion if it displayed large standardised residuals ($> \pm 2$), had a low factor loading ($< .40$), incorporated an error term which was highly correlated with that of another item, or if there were indications that it would cross load on to a non-intended factor. The latter two criteria were appraised from LISREL's modification indices. The modification indices indicate the predicted decrease in chi-square that would be obtained by allowing items to load on to other factors (lambda-X modification indices) or allowing error terms to correlate (theta-delta modification indices). As measurement models were specified a priori, modification indices were consulted only to determine that the items had adequate convergent and discriminant validity. Error terms were not allowed to correlate in order to gain improvements in fit (see Anderson and Gerbing, 1988; Jöreskog, 1993; Byrne, 1994). Standardised residuals indicate the degree of overestimation (large negative residuals) or underestimation (large positive residuals) of the observed covariances by the model. An item assigned to an incorrect factor will likely have a pattern of large negative residuals with other indicators of the factor to which it has been assigned, representing over-fitting. The presence of a pattern of large positive residuals between an item and the indicators of a factor on which it should belong represents underfitting and indicates the likely presence of another factor (Anderson and Gerbing, 1988).

4.1.2.1 Assessment of fit.

Model fit was assessed with the chi-square statistic, the goodness of fit index (GFI: Jöreskog & Sörbom, 1981), the root mean square error of approximation (RMSEA: Steiger, 1990), and the non-normed fit index (NNFI: Tucker and Lewis, 1973). Chi-square provides a test of whether residual differences between the fitted population covariance matrix and the

sample covariance matrix converge (Marsh, Balla and McDonald, 1988). Chi-square is best regarded as an indicator of goodness (or badness) of fit, evaluated in relation to its degrees of freedom, where small values would indicate a good fit and large values a bad fit (Jöreskog and Sörbom, 1989). GFI, an index of absolute fit, indicates the amount of observed variance and covariance accounted for by a model. NNFI, an incremental fit index, attests to the degree to which the fit of the target model is better than that of a zero factor model (Hoyle and Panter, 1993; Marsh et al., 1988). For both the GFI and NNFI it is desirable to have values as close as possible to 1.0. RMSEA assesses the lack of fit of the model to the population covariance matrix expressed in terms of discrepancy per degree of freedom (Browne and Cudeck, 1993). A value of less than 0.05 indicates a close fit of the model, less than 0.08 a reasonable error of approximation, but an RMSEA of greater than 0.1 is generally considered unacceptable (Browne and Cudeck, 1993). The related confidence interval allows assessment of the precision of the estimate.

4.1.2.2 Method of estimation.

Examination of skewness and kurtosis values indicated that the data were non-normally distributed. Tests of zero multivariate skewness and zero multivariate kurtosis from PRELIS2 indicated significant multivariate skewness (122.80, $p < .001$) and multivariate kurtosis (39.80, $p < .001$; Mardia's coefficient = 391.79). Several items had univariate skewness values greater than three and kurtosis values greater than 10, most noticeably in the five-item amotivation sub-scale. These results suggested a multivariately non-normal distribution. Multivariate normality is a requirement for the normal theory estimators maximum likelihood (ML) and generalised least squares, and serious errors can occur when non-normal data are used: chi-square becomes increasingly large as data become increasingly non-normal, fit indices may be underestimated, standard errors are unreliable and factor loadings may also be underestimated (Pedhazur and Pedhazur-Schmelkin, 1991; Jöreskog, 1993; West, Finch and Curran, 1995). Accordingly the data were analysed with the asymptotic distribution free (ADF) weighted least squares (WLS) estimator. ADF follows arbitrary distribution theory and does not presume a multivariate normal distribution (Browne, 1984; Bollen, 1989). WLS uses an asymptotic covariance matrix as input data, which, in this case, was created from a matrix of polychoric correlations. These correlations are estimated population values based on the observed variables (Jöreskog and Sörbom, 1989).

Normal theory estimators can summarise normally distributed data in terms of their means, variances and covariances but the ADF estimator requires a fourth source of information, kurtosis values, to completely summarise non-normal data; this is computationally expensive to obtain (Tanaka, 1987). Thus, generation of the weight matrix and production of reliable fit estimates, factor loadings and loadings for the non-normal sample necessitates a very large sample size (Anderson and Gerbing, 1988). Of course, what is meant by “large” varies with model complexity; sample sizes close to 1000 seem to be required even with relatively simple models (West et al., 1995). In fact West et al. (1995) advise that with greater than 20-25 measured variables the computational requirements of asymptotic methodology implementation may be impractical for most modern high speed computers. But Bentler (1995) is far more circumspect and recommends a ratio of sample size to number of free parameters to be estimated of at least 10:1 for ADF, while noting that there is little experience on which to base such a recommendation. Larger ratios, he recommends, will be needed to obtain correct chi-square probabilities for model evaluations. Jöreskog and Sörbom (1993b), however, define minimum sample size for ADF estimation as $K(K-1)/2$, where k equals number of observed variables, but caution that this does not necessarily guarantee good estimates of the asymptotic variances and covariances. By this definition sample size in the present study was considered sufficient for WLS estimation at all stages of analysis.

However, while testing the complete model in stage three computational problems were encountered (negative factor loadings and nonpositive definiteness in the covariance matrix for the relationship between the factors). The nature of these problems suggested the cause was a too small sample size rather than any misspecification of the model. Bentler and Chou (1987) note that such computational problems are an inverse function of sample size and question the appropriateness of using the large size ADF theory with small and moderate sample sizes (as is the case here). Indeed, several Monte Carlo studies (e.g., Hu, Bentler and Kano, 1992; Muthén and Kaplan 1985, 1992; Chou, Bentler and Satorra 1991) have contrasted normal theory estimators with ADF methods of estimation and authors have expressed concerns about the poor performance of ADF with small sample sizes. Jöreskog and Sörbom (1989) believe that a poorly estimated WLS asymptotic covariance matrix, such as that estimated from a small sample, can do more harm than good. In fact, they maintain that it may be better to use normal theory estimators when sample size is not large. As a result, the third and final stage of analysis in the present study employed normal theory ML

estimation rather than WLS estimation in the EQS statistical package because of the availability of the “Robust” statistics option. This option provides statistics which are more trustworthy than normal ML output when the distributional assumptions underlying the normal theory ML estimation method have not been met (Bentler, 1995). The option calculates the Satorra-Bentler scaled chi-square, a scaling correction computed on the basis of estimation method, model and sample kurtosis values. Under violation of distributional assumptions the scaled chi-square statistic has been shown to more closely approximate chi-square distribution than the uncorrected statistic, to have more trustworthy standard errors and to perform as well as, if not better than ADF methods (Bentler, 1995; Hu et al. 1992; Byrne, 1994; Hu and Bentler, 1995).

To summarise, data was examined in three stages: examination of single sub-scales, examination of sub-scales pairs and examination of the complete model. Multivariate non-normality required the use of an asymptotic distribution free estimator, WLS in LISREL. Sample size restrictions meant that this estimator could only be used in the first two stages of analysis. The third stage was conducted in EQS using ML estimation with the ‘robust’ statistics option to correct for multivariate non-normality.

4.1.3 Sample

Respondents were 253 attendees of a local sports centre and 45 members of a local academic institution. (As the measure is intended to be equally applicable to regular exercisers and non-exercisers alike - subsequent research investigates changes in behavioural regulation across all the stages of change for exercise - it was necessary to ensure a heterogeneous sample with regard to exercise behaviour.) 68% of the sample were female (M age = 29.98, SD = 9.18) and 32% male (M age = 30.38, SD = 8.84). Males and females did not significantly differ on age ($t(296) = .36, p > .05$). 36% were university students, 37.5% professional workers, 16% clerical/managerial workers, 7% home carers, 2% manual workers, and 1.6% of no stated occupation. Over half of subjects (52.3%) reported being regular exercisers for more than six months, while 44% of respondents had either become regular exercisers in the past six months, or were only irregular exercisers. The remaining 3.7% did not exercise.

4.1.3 Measures

The Stages of Change for Exercise Behaviour

A newly modified visual-analogue stage of change measure, the Contemplation Ladder (Beiner and Adams, 1991) was developed for use in the next stage of research but was administered here in order to test its comprehensibility. The Contemplation Ladder measures an individual's readiness to quit smoking on an 11 point continuum of readiness presented in the form of a ladder (see Appendix 1). Five of the rungs represent anchored stages of change which range from no thoughts of quitting (pre-contemplation) on the bottom rung, to maintenance of change on the top rung. The anchored labels represent the minimum requirements for membership of a particular stage of change and each stage typically includes the above two or three rungs. In this study ratings on the ladder were used to indicate the level of exercise involvement of the study sample.

4.1.4 Procedure

Respondents were approached either before or after an exercise class at the sports centre. Each was briefly informed that the questionnaires examined level of exercise involvement and reasons for exercising, took approximately five minutes to complete and would be answered anonymously. Verbal consent was obtained and individuals were referred to the instructional sets for instructions on how to complete the questionnaires, which they did either immediately prior to or following their exercise class. 45 questionnaires were randomly distributed to clerical staff and post-graduate students at the academic institution. The majority were completed immediately following the procedure outlined above and the remaining few were collected the following day.

4.1.6 Results

4.1.6.1 Stage 1: Examination of single sub-scales.

The five amotivated regulation items exhibited high levels of skewness (range = 1.14 - 4.62; $M = 3.03$) and kurtosis (range = 6.50-22.13; $M = 12.93$). Skewness indicated that the majority of respondents found that the amotivated items were not true for them. Thus, the five-item amotivation sub-scale may be irrelevant for the current sample and was, therefore, eliminated from further consideration. In the first stage, single factor models for each of the four sub-scales were examined. Following examination of goodness of fit statistics, standardised residuals, factor loadings and modification indices, one confounding item was

deleted from each of the external regulation (EXT), identified regulation (ID) and intrinsic regulation (IM) scales. Table 4.1 shows the improved fit for each re-specified model. The introjected (IJ) sub-scale proved to be problematic. Analysis of the IJ sub-scale revealed large standardised residuals, a distorted residual plot, large error term correlations, poorly loading items and a very poor fit (see Table 4.1). The pattern of residuals and modification indices indicated the likely presence of a second latent variable underlying the observed covariances. Three-items displayed a distinct pattern of large negative residuals with the other four indicators of the factor. Separate single factor analyses of these three-items and of the remaining four items supported the separation of the seven-item sub-scale into three-item and four-item groupings. Goodness of fit criteria revealed satisfactory fits for both single factor models and can be seen in Table 4.2. Items and their factor loadings for both groupings can be seen in Appendix 1. The correlation between the three-item and four-item grouping was extremely small (.02). The intercorrelations between each IJ grouping and the other three sub-scales are displayed in Table 4.3. Reference to theory and item content resulted in the selection of three-item grouping which appeared to better capture the true meaning of introjected regulation. The four-item group was, therefore, eliminated from further consideration.

Table 4.1. Fit indices for single sub-scales following item deletion at stage one.

Sub-scale	χ^2 (<i>df</i>), <i>p</i> value	RMSEA, CI, <i>p</i> value	GFI	NNFI
External	5.165 (5), .396	.010, .0-.081, .737	.994	.998
Introjected	120.185 (14), 00	.159, * .151	.917	.604
Identified	9.265 (5), .098	.053, .1-.106, .388	.995	.993
Intrinsic	1.255 (5), .939	.000, .0-.017, .987	.998	1.020

Note: RMSEA = Root mean square error of approximation; CI = 95% confidence interval for RMSEA; *p* value for RMSEA = probability that RMSEA > .05; GFI = Goodness of fit index; NNFI = Non-normed fit index.

* Confidence interval could not be computed due to too small *p* value for chi-square

Table 4.2. Sub-scale item loadings and fit indices for the complete introjected regulation sub-scale and the three- and four-item groupings within.

Introjected	χ^2 (df), <i>p</i> value	RMSEA, CI., <i>p</i> value	GFI	NNFI
All items	120.185 (14), .939	.159, * .151	.917	.604
3-item group	4.855 (2), .088	.069, 0 - .150, .254	.992	.978
4-item group	3.217 (2), .200	.045, 0 - .132, .419	.995	.980

Note: RMSEA = Root Mean Square Error of Approximation; CI = 95% confidence interval for RMSEA; *p* value for RMSEA = probability that RMSEA > .05; GFI = Goodness of fit Index; NNFI = Non-Normed Fit Index.

Table 4.3 Intercorrelations (standard errors) between each grouping and the other three BREQ sub-scales.

Introjected	External	Identified	Intrinsic
3-item group	.12 (.06)	.67 (.05)	.35 (.06)
4-item group	.44 (.06)	-.44 (.07)	-.67 (.05)

4.1.6.2 Stage 2: sub-scale pairings.

Subsequently, each shortened sub-scale was paired with each of the other sub-scales in two-factor oblique models in order to examine the behaviour of the factor structure in the presence of another related factor. The aim was to retain only those items that clearly load on only one factor and to delete any ambiguously loading items. The Lambda-X modification index reveals factorially ambiguous items by indicating the improvements in fit that would result if such items were also allowed to cross-load on the non-intended factor. A further item was thus deleted from each of the EXT, ID and IM scales. Fit indices for factor pairings pre- and post-item elimination can be seen in Appendix 1. A complete list of all items removed and retained can also be seen in Appendix 1.

4.1.6.3 Stage 3: Analysis of the complete model.

The first two stages allowed for the selection of those items in each sub-scale which best represented its underlying latent variable. In the final stage a 15-item, four-factor oblique model (EXT, IJ, ID, IM,) was analysed. Sample size was considered too small for full model testing with an ADF estimator so the full model was tested with a ML estimator in the EQS package using the “Robust” option. Goodness-of-fit indices can be seen in Table 4.4 and Table 4.5 displays factor loadings, standard errors and associated T-values for each item on its hypothesised factor. Standard errors are estimates of the precision of each factor loading. The T-values represent the ratio between the factor loadings and the standard errors, that is, estimates divided by error. When there are only three items in a scale the relationship between observed variables and the number of parameters to be estimated results in zero degrees of freedom and a saturated model with $\chi^2 = 0$. This is the case with the three-item IJ scale. In order to reduce the number of parameters to be estimated and thereby increase the degrees of freedom, the relationship between the indicators and their underlying construct were constrained to equality.

Table 4.4. Goodness-of-fit indices for four-factor model.

χ^2	S-B χ^2	<i>df</i>	RMSEA**	GFI	NNFI
239.28*	184.16*	84	.079	.907	.911

Note: RMSEA = Root mean square error of approximation; GFI = Goodness of fit index; NNFI = Non-normed fit index.

* $p < .001$

** Confidence intervals or p value could not be computed due to too small p value for χ^2 .

Table 4.5. Items, factor loadings, 'Robust' standard errors and T-values for the four-factor model.

Factors and items	Factor loadings	SE	T-value*
<i>External regulation</i>			
I exercise because other people say I should	.668	.047	10.77
I take part in exercise because my friends/family/spouse say I should	.772	.060	8.44
I exercise because others will not be pleased with me if I don't	.560	.080	4.80
I feel under pressure from my friends/family to exercise	.759	.044	10.09
<i>Introjected regulation</i>			
I feel guilty when I don't exercise	.670	.074	11.26
I feel ashamed when I miss an exercise session	.756	.063	16.12
I feel like a failure when I haven't exercised in a while	.743	.066	14.75
<i>Identified regulation</i>			
I value the benefits of exercise	.639	.053	9.39
It's important to me to exercise regularly	.726	.070	10.50
I think it is important to make the effort to exercise regularly	.744	.064	10.86
I get restless if I don't exercise regularly	.732	.055	17.72
<i>Intrinsic regulation</i>			
I exercise because it's fun	.747	.060	12.69
I enjoy my exercise sessions	.888	.059	13.27
I find exercise a pleasurable activity	.871	.063	12.89
I get pleasure and satisfaction from participating in exercise	.856	.063	12.91

4.1.6.4 Sub-scale intercorrelations: simplex pattern.

Sub-scale intercorrelations were examined to investigate the existence of the simplex pattern. Correlations were mostly as expected with the notable exception of the IJ intercorrelations. Table 4.13 shows that IJ was more strongly correlated with the more self-determined factor ID (.68) than with the less self-determined external scale (.12). As expected the IM sub-scale revealed a pattern of decreasing positive and increasing negative correlations with those scales representing increasingly less self-determined forms of behavioural regulation. EXT, at the other end of the continuum, evidenced a similar pattern with the more self-determined modes of behavioural regulation further along the continuum. ID was more positively correlated with its adjacent factors, IM and ID, than it was with EXT further along the continuum, with which it displayed a negative correlation (-.27).

Table 4.6. Four-factor model: Sub-scale intercorrelations with 'Robust' standard errors.

Sub-scale	External	Introjected	Identified	Intrinsic
External	--			
Introjected	.12 (.06)	--		
Identified	-.22 (.07)	.67 (.05)	--	
Intrinsic	-.27 (.07)	.35 (.06)	.79 (.03)	--

4.1.7 Convergent and discriminant validity

Adequate convergent validity, which measures the degree to which observed indicators are measuring the same construct, is indicated by the significant factor loadings that have been obtained for each of the EXT, IJ, ID, and IM sub-scales. Discriminant validity reflects the degree to which measures of different constructs are in fact measuring different constructs. This is usually evidenced by weak correlations between the measures of these different constructs. To establish discriminant validity by confirmatory factor analytic procedures it is necessary to show that when correlations between factors (the phi parameters) are constrained to unity, that is, forced to equal 1.0, the fit of the restricted model is inferior to that of the unrestricted model, wherein phi is free to be estimated. It is preferable to test pairs of measurement models at a time rather than simultaneously testing all pairs in the full structural model because a non-significant difference between one pair can be obscured by

the presence of many significant differences between other pairs (Anderson and Gerbing, 1988). To test the claim of divergence among the four BREQ sub-scales each was paired with each of the other sub-scales in two-factor models first with the phi parameters constrained to unity and then with phi free to be estimated. The fit of each constrained and unconstrained model was compared using a χ^2 difference test. Table 4.14 shows that the difference between the χ^2 values for the two models was significant for all sub-scales, indicating imperfectly correlated factors and, thus, divergent sub-scales.

Table 4.7. Chi-square values for sub-scale pairings with phi constrained to equality and phi unconstrained, and the resulting χ^2 difference.

Models	Constrained χ^2 (df)	Unconstrained χ^2 (df)	χ^2 difference (df)
External X Introjected	123.24 (14)	32.70 (13)	90.54 (1) *
External X Identified	247.26 (20)	37.41 (19)	209.85 (1) *
External X Intrinsic	263.43 (20)	47.07 (19)	216.36 (1) *
Introjected X Identified	52.78 (14)	24.45 (13)	28.33 (1) *
Introjected X Intrinsic	113.73 (14)	35.68 (13)	78.05 (1) *
Identified X Intrinsic	73.08 (20)	40.41 (19)	32.67 (1) *

Note: * $p < .001$

Anderson and Gerbing (1988) recommend an additional test of discriminant validity in which confidence intervals are established to ensure that factor intercorrelations are less than unity. Table 4.6 shows the intercorrelations and standard errors for the final four-factor model. The 95% confidence intervals for these intercorrelations are displayed in Table 4.8 and demonstrate that no case was the upper bound of the confidence interval greater than unity. Thus the factors are distinct and the discriminant validity of the four sub-scales is again supported.

4.1.8 Internal consistency of sub-scales

The internal consistency of the four sub-scales was assessed with Cronbach's alpha coefficient. The four sub-scales demonstrated acceptable reliability levels (EXT = .789; IJ = .763; ID = .786; IM = .903) and are thus internally consistent.

Table 4.8. Sub-scale intercorrelations with confidence intervals.

Sub-scale pairs	Correlations (SE)	lowest interval	highest interval
External X Introjected	.12 (.06)	.06	.18
External X Identified	-.22 (.07)	-.15	-.29
External X Intrinsic	-.27 (.07)	-.20	-.34
Introjected X Identified	.67 (.05)	.62	.73
Introjected X Intrinsic	.35 (.06)	.29	.41
Identified X Intrinsic	.79 (.03)	.76	.82

4.2 Confirmatory Factor Analysis of the BREQ

The aim of this phase of the analysis was to cross-validate the factor structure of the BREQ. A list of items and sub-scales retained and removed from the original 30-item questionnaire and the new 15-item questionnaire can be seen in Appendix 1. The EQS statistics programme was used.

4.2.1 Sample

314 individuals, 156 females (M age = 36.04; SD = 11.07; 28 did not report age) and 158 males (M age = 39.07; SD = 11.45; 12 did not report age) from the county and city of Waterford, Ireland, completed self administered questionnaires. 56.4% were blue collar workers, 34% were white collar workers and 9% were retired or full-time home carers.

4.2.2 Procedure

Questionnaires were distributed to employees at three work sites (two white collar, one blue collar) and to members of a local Bridge Club as previously described. Blue collar workers completed questionnaires during their break; these were collected immediately. Completed questionnaires were collected from white collar workers and Bridge Club members within the following week.

4.2.3 Results

Tests of multivariate skewness and kurtosis showed the data were non-normally distributed. Skewness values ranged from -0.01 to 3.28 and kurtosis values ranged from 0.074 to 13.20 (Mardia's multivariate kurtosis coefficient = 100.822). Accordingly, data were analysed with

ML estimation in conjunction with the “Robust” option. Table 4.9 shows the goodness of fit indices for the complete model. The fit obtained was acceptable and similar to that found in the previous study. All factor loadings were moderate to high (see Appendix 1). Residuals were small (average absolute standardised residual = .041) indicating good estimation of the observed covariances by the model. Table 4.10 shows the factor intercorrelations. These conform to the expected simplex pattern but differ somewhat from that found in the first study. Alpha reliabilities were adequate: EXT = .79, IJ = .78, ID = .79, IM = .90.

Table 4.9 Goodness-of-fit indices for BREQ.

χ^2	S-B χ^2	<i>df</i>	RMSEA**	GFI	NNFI
227.197*	172.933*	84	.076	.910	.920

Note: S-B χ^2 = Satorra-Bentler χ^2 ; RMSEA = Root Mean Square Error of Approximation; GFI = Goodness of fit Index; NNFI = Non-Normed Fit Index.

* $p < .001$

** Confidence intervals or p value could not be computed due to too small p value for χ^2 .

Table 4.10. Sub-scale intercorrelations with “Robust” standard errors.

	External	Introjected	Identified	Intrinsic
External	--			
Introjected	.307 (.085)	--		
Identified	.013 (.064)	.582 (.044)	--	
Intrinsic	-.082 (.068)	.364 (.053)	.840 (.027)	--

4.3 Test of factorial invariance of BREQ across gender using multisample analysis

The majority of the BREQ development sample were female. This may have implications for the factor structure of the four-factor model given the findings of past research into gender differences in motivational orientation. In order to confirm the invariance of the factor

structure of the BREQ across gender, factorial invariance was tested with multisample factor analytic procedures in EQS.

4.3.1 Method: Rationale and strategy for model testing

A test of factorial invariance is a powerful test of the generalisability of factor analytic solutions across groups for which there are parallel data (Marsh, 1993). The procedure involves the examination of the combined goodness-of-fit of increasingly restrictive models, with invariance constraints being successively imposed on the model's parameters. Although there may be many groups in the analysis, there is only one chi-square goodness of fit test to evaluate the equality proposition for each model. There is a lack of consensus regarding the order in which the increasing equality constraints are to be imposed (Marsh, 1993). In this study, the complete model was examined first for males and females separately to establish the adequacy of the baseline model. At the next level of testing the equivalence of the factor loadings for both groups was tested. At the third level, equivalence of factor loadings and factor variances and correlations was examined. Finally, equivalence of factor loadings, factor variances and correlations and measurement errors was tested.

4.3.1.1 Assessment of fit.

Multisample procedures in EQS generate a smaller range of fit statistics than does the confirmatory factor analysis procedure, and the Satorra-Bentler scaled chi-square and the robust standard errors are not available. Tests of invariance were, therefore, evaluated with the chi-square statistic, the NNFI, the comparative fit index (CFI: Bentler, 1990) and the parsimony normed fit index (PNFI: James, Mulaik and Brett, 1982; this was calculated by hand). The CFI is an incremental fit index that measures how much better a restricted model (in which a structure is imposed on the data) fits the data than a null model in which all correlations among variables are zero (Byrne, 1994). Values above .93 indicate a good fit of the model to the data (Byrne, 1994). A notable decrease in chi-square, CFI and NNFI following the imposition of equality constraints is evidence of inequality of the model parameters across groups. The PNFI is an adjustment of the normed fit index (NFI: Bentler and Bonnett, 1980) which takes model complexity into account by multiplying the NFI by a parsimony ratio (the degrees of freedom for the restricted model divided by the degrees of freedom for the null model). The PNFI, therefore, compensates for the improvements in fit that are gained by increasing model complexity and decreasing degrees of freedom (Mulaik,

James, Van Alstine, Bennett, Lind and Stilwell, 1989). A more constrained model should show higher PNFI values, that is, be more parsimonious, than one that is less constrained. In sum, a model with more constraints should not show a notable decrease in goodness-of-fit and should have higher PNFI values than its less constrained counterparts.

4.3.2 Results

Table 4.11 shows the fit indices for the male and female data separately and for the increasing invariance constraints applied to the combined male and female data. In support of the invariance constraints, goodness of fit was acceptable at each level of constraint, fit did not decrease when factor variances and correlations were constrained in addition to factor loadings and PNFI values increased as constraints increased. Although there was a clear decrement in fit when measurement errors were constrained to equality, equality of measurement error across groups is a stringent requirement that is also a less important invariance constraint than either invariance of factor loadings or factor variances and covariances (Marsh, 1993). Factor loadings were moderate to good and did not differ notably between males and females.

Table 4.11. Fit statistics for complete model for males and females separately and for equality constrained models for combined male and female data.

	χ^2 (df),	NNFI	CFI	PNFI
Males only	180.69 (84) *	.89	.91	
Females only	152.20 (84) *	.93	.94	
FL invariant	377.50 (183)*	.90	.91	.74
FL, FCr, FV invariant	385.97 (188)*	.90	.91	.75
FL, FCr, FV, ME invariant	496.26 (203)*	.86	.87	.77

Note: NNFI = Nonnormed Fit Index; CFI = Comparative Fit Index; PNFI = Parsimony Normed Fit Index; FL = factor loadings; FCr = factor correlations; FV = factor variances; ME = measurement error.

* = $p < .001$

4.4 Discussion

The aims of this research were to develop a measure of behavioural regulation in exercise, to cross-validate the resulting factor structure using another sample and to demonstrate the equality of the factor structure across gender using multisample analysis. The findings supported the factorial validity of the differentiated concept of motivation in the exercise domain and resulted in the development of a brief measure of behavioural regulation in exercise, the BREQ. The initial factor structure and alpha reliabilities were supported in a second study, confirming the validity and reliability of the questionnaire. Simplex patterns of intercorrelations were found in both studies which offer some support for the construct validity of the BREQ. In addition, multisample factor analyses showed that the four-factor structure of the BREQ does not differ for males and females.

4.4.1 The amotivated regulation factor

The major modification to the target model was the removal of the amotivation factor. According to Deci and Ryan, amotivation occurs when one perceives oneself to be unable to master situations or events and to be incompetent to achieve a desired outcome. This is typically the result of repeated failure, persistent negative feedback about performance and a belief that outcomes are not contingent upon performance (Deci and Ryan, 1985). Although theory (Deci and Ryan, 1985) and previous use (Vallerand et al., 1992; Pelletier et al., 1995) have established the significance of this factor in other contexts, high levels of skewness testify to its irrelevance to the current sample. Amotivated reasons for exercise such as ‘I can’t see why I should have to exercise’, or ‘I can’t see why I should bother exercising’ are likely to be irrelevant for those freely choosing exercise, where regular exercising is not an external requirement, as it is, say, in fire fighting (job requirement), or coronary rehabilitation (prevention of relapse) settings. The amotivation items were derived from questionnaires examining behavioural regulation in academic settings where attendance is an external requirement and, therefore, where amotivation may be a common experience. The final four-factor model, measuring extrinsic, introjected, identified, and intrinsic regulation is consistent, however, with Ryan and Connell’s (1989) model of behavioural regulation.

4.4.2 Pattern of intercorrelations

Ryan and Connell (1989) proposed that the behavioural regulation continuum would conform to a simplex-like pattern, or ordered correlation structure, wherein adjacent

elements display a greater positive correlation than those which are more discrepant and, therefore, farther apart on the continuum. The pattern of intercorrelations found is an ordered pattern reflecting an underlying continuum rather than an underlying dichotomy. This offers some support for the construct validity of the BREQ. According to Ryan and Connell (1989) introjected regulation represents low self-determination and it should, therefore, be highly correlated with external regulation. In the first study the introjected sub-scale displayed a far greater correlation with the more self-determined identified sub-scale (.67). than it did with the less self-determined external scale (.12). In the cross-validation study external and introjected regulation displayed a stronger relationship (.30) while the relationship between introjected and identified regulation was weaker (.58). However, it is imperative to ask what constitutes a normal simplex pattern before commenting on the possible non-normality of the current findings and findings from previous research in this regard have been mixed. Goudas et al. (1994) found a correlation of .10 between IJ and EXT and a correlation of .42 between IJ and ID when children were questioned on motivation for playing football and netball. These intercorrelations were .23 and .35 respectively when the sport of focus was gymnastics. In complete contrast, Blais et al. (1990) found EXT and IJ were correlated at .55 while IJ and ID only displayed a correlation of .10. Closer inspection of Ryan and Connell's (1989) results reveals that EXT and IJ correlated at .54 when the sample was rural and .04 when it was suburban, IJ and ID correlations were .56 and .46 respectively. It appears, then, that while the ordering of correlations across the continuum generally conforms to a simplex pattern, the actual size of the correlations between adjacent pairs may differ in different contexts. In this study the intercorrelational variations between the initial and cross-validational studies may be due to sample differences. The first sample was predominantly female (68%) and it may be that females experience somewhat more self-determination than males when exercising for reasons of guilt and failure avoidance. However, subsequent invariance analysis found that the factor structure, and therefore factor correlations, do not differ between males and females.

4.4.3 The introjected regulation factor

During analysis of the hypothesised introjected regulation sub-scale two latent variables were identified as underlying the seven items. According to Deci and Ryan (1990) introjection "involves establishing 'shoulds' or rules for action that are associated with, or

enforced by, expectations of self approval, or of avoiding guilts and anxieties” (p. 256). Introjected regulation may, therefore, have two clearly discernible components: internalisation of rules, and enforcement, or regulation, of behaviour. The items in the three-item grouping (the introjected scale) concern exercising because of feelings of guilt, shame, or failure, that is, regulation by guilt-avoidance. Those in the four-item grouping (subsequently deleted) represent the internalisation of exercise as a required or necessary effort: ‘I feel I ought to’, ‘exercise is a bind but has to be done’, ‘I have to push myself’, and ‘it is a real effort’. The three- and four-item groupings, however, were uncorrelated (.01). It appears, therefore, that although all seven items are in accord with the concept of introjection, empirically the two components are unrelated and not, in fact, measuring the same construct. Examination of the intercorrelations between the four-item grouping and the other BREQ sub-scales (Table 4.3) indicated a moderately strong positive correlation with the external regulation factor (.65) but a moderately strong negative correlation with identified regulation (-.57). The three-item introjected scale, on the other hand, was unrelated to external regulation (.02) but strongly related to identified regulation (.74). These intercorrelations show that the four-item grouping is tapping a form of regulation that is less self-determining than would be expected of introjected regulation while the three-item introjected sub-scale is tapping a form of regulation that is more self-determined than the underlying construct definition would suppose. Perhaps a combination of the self pressure to exercise and guilt avoidance items in an introjected sub-scale would result in a more balanced pattern of intercorrelations that is more supportive of Ryan and Connell’s (1989) original research.

For the current sample internalisation of exercise as a required or necessary effort appears to be a less self-determined motive for exercise than exercising to avoid feelings of guilt, failure and shame. Furthermore, it may be that pressurising oneself to exercise is a precursor to the guilt-avoidance motive. Self pressure to take action may result in guilt if the action is not taken, such that the guilt response may then replace self pressure as the predominant motive for action. The introjected response could therefore be labelled “self-recrimination avoidance” because regulation of behaviour with feelings of “having to” may be undertaken in order to stem feelings of guilt, shame or failure. Whether or not these two elements are separated by temporal or cause-effect considerations, or whether they should represent separate points on the behavioural regulation continuum, requires further detailed research.

Vallerand et al. (1992) have set a precedent in construct sub-division by postulating a tripartite taxonomy of intrinsic motivation: intrinsic motivation to know, to accomplish and to experience stimulation. Such a procedure could perhaps be applied to the other elements in the behavioural continuum. Introjection, as I have suggested, might involve self pressure and guilt portions. In a similar vein, identified regulation could comprise tripartite portions: regulation by importance of values held, importance of achieving valued outcomes and importance of avoiding negative consequences. External regulation may comprise pressure from others to avoid immediate consequences and to avoid future consequences. In fact, all suggested sub-divisions are in keeping with theoretical definitions (see Deci and Ryan, 1985, 1990; Deci, et al., 1991). The process of construct sub-division could have positive implications for the development of operational definitions of these constructs and subsequent development of construct indicators. Indeed, the introjected regulation conceptual quandary highlights the need for rigorous definition of such constructs. This is essential for consistency among measures of such ephemeral constructs and there is much disparity in the operational definitions among the current measures of behavioural regulation.

4.4.4 Measurement of behavioural regulation: different approaches

The two main approaches to the measurement of behavioural regulation, the Self Regulation Questionnaire in Academic settings (SRQ-A: Ryan and Connell, 1989) and the Academic Motivation Scale (AMS: Vallerand et al., 1992), vary greatly. Although both approaches are based on Deci and Ryan's (1985) Organismic Integration Theory (OIT) graded conceptualisation of self-determination, Ryan and Connell's (1989) SRQ-A introjected scale, for instance, comprises statements such as "I will feel bad if..." "I will feel guilty if....", "I will feel ashamed if...." and "it bothers me if..." which connote avoidance of internal contingencies such as guilt and anxiety. The Vallerand et al. (1992; Pelletier et al. 1995) approach to measuring introjection, on the other hand, tends to focus on outcome: "because it is absolutely necessary to do sports if one wants to be in shape" (SMS), "because people around me think it is important to be in shape" (SMS), "because I want to show myself that I can succeed in my studies" (AMS), "to prove to myself that I can do better than just a high school degree" (AMS). Similarly, there are differences in the approach to measurement of identified regulation in academic domains. Ryan and Connell's (1989) SRQ-A asks if "it is very important to me to work on my classwork", while Vallerand et al.'s (1992) AMS asks if "it will eventually allow me to enter the job market in a field that I like", again appearing

to focus on outcomes. Previous discussion (Chapter 3) has noted the importance of distinguishing between outward motive for action and regulation of that action. This has implications for the construct validity of the AMS. Nevertheless, both AMS and SMS have been developed for and validated with college age students, while the SRQ-A was developed to assess children's behavioural regulation, so variation in item content is to be expected, if not required.

Vallerand et al (1992) claim that their study confirmed the seven-factor structure of the AMS and further, that the "operational definition of the AMS directly reflects the conceptual definition of extrinsic/intrinsic motivation" (p. 1016). However, Vallerand et al. (1992) added 26 correlated residuals to their model in order to gain improvements in fit (resulting in a χ^2/df ratio reduction from 3.73 to 2.47). It is a violation of the assumptions of and a widespread misuse of structural equation modelling to include correlated error terms in a model for the sole purpose of obtaining a better fit to the data (Jöreskog, 1993). No reason was offered for this strategy and, as such, it amounts to capitalising on chance factors in seeking a better fit (Byrne, 1994) and may mask the true underlying factor structure (Anderson and Gerbing, 1988). Byrne (1994) finds the inclusion of error terms unacceptable without strong empirical or substantive rationale, such as item response characteristics as a result of response format. No such rationale was presented by Vallerand et al. In addition, Vallerand et al. do not comment on the normality of their data's distribution, nor do they mention the method of estimation used in assessing the fit of their model. However, Pelletier et al. (1995) also use the seven-factor structure for their model of behavioural regulation in sport but they clearly stated that the normality of their data was verified before using ML estimation. The psychometric properties of the SRQ, on the other hand, have not yet been fully presented despite its accepted use (Connell and Illardi, 1987; Grolnick and Ryan, 1987; Goudas et al., 1994). Ryan and Connell (1989) used only exploratory factor analysis to develop their four-factor model of behavioural regulation. To conclude, more consistency among construct indicators is needed which requires detailed attention, both empirical and theoretical, to construct definition.

4.4.5 Measurement of behavioural regulation: estimators and fit indices

Several Monte Carlo studies have shown that one can end up with completely different models of the same observed variables by virtue of using different sample sizes and different methods of estimation (e.g, Hu et al., 1992; Hu and Bentler, 1995; Jöreskog and Sörbom,

1989). Multivariate normality is often an unreasonable and restrictive requirement for social sciences data (Bentler, 1995; Martin, 1987). Although ADF estimation is recommended for use with non-normal data (Jöreskog and Sörbom, 1989) and developers of psychometric tools have begun to take note (e.g., Li and Harmer, 1996) the problems associated with this method of estimation, apropos sample size and subsequent over-estimation of χ^2 , are now becoming more widely realised (Anderson and Gerbing, 1988; Hu et al., 1992; Hu and Bentler, 1995). The alternative to ADF estimation, the Satorra-Bentler scaled χ^2 , does not have such stringent sample size requirements and seems more promising in the light of recent support (Hu et al., 1992; Byrne, 1994; Hu and Bentler, 1995). The “Robust” estimation method, however, which uses the scaled χ^2 is only available in the EQS statistical package and can only be run in conjunction with ML estimation therein. Hu et al. (1992) have found that in conjunction with GLS estimation it produced more reliable results.

There is now a plethora of fit indices from which to choose to evaluate model fit. The decision to accept or re-specify a model is largely based on the degree of fit indicated by the chosen fit indices and all indices are effected, to a greater or lesser extent, by either sample size, number of parameters to be estimated relative to degrees of freedom, degree of dependence among underlying variables and interactions between all these variables (see Anderson and Gerbing, 1984; Marsh et al., 1988; Bentler, 1990; Bollen, 1989; Browne and Cudeck, 1993; Hoyle and Panter, 1993; Hu and Bentler, 1995). In summary, it appears that there is a large variety of factors mitigating against achieving the “perfect” measure of behavioural regulation. Construct definition, demographics of the development sample, relevant construct indicators, sample size, normality of data, method of estimation and choice of goodness-of-fit indices determine the model retained and resulting patterns of intercorrelations. Psychometric perfection is elusive and this is adeptly expressed by Ryan (1992: personal communication).

“Since the intent of a scale is to capture a construct, i.e., to assess some psychological phenomenon or dimension and no scale does this perfectly, reification is a constant danger. If you have an interest in the idea of autonomy or internalisation then you already understand how imperfect and merely heuristic these current scales are. I therefore encourage changes, adaptations and especially improvements”

The BREQ, an application of the self-determination continuum to the exercise domain, should be evaluated in this light.

4.4.6 Conclusion

The BREQ may allow finer analysis of the motivational forces at play in exercise adoption and maintenance situations. Such analysis can be conducted with equal confidence in the validity of findings for both males and females. It is noteworthy, however, that the predominant mode of exercise undertaken by the majority of those in the developmental sample was organised aerobics and circuit training-style classes. It is often the case, however, that those involved in more self-directed activities, such as running, swimming, or cycling, are in training for a competitive purpose and, as such, may have different motives for exercise. In this regard Fortier et al. (1995) note that further research is needed to determine whether it is the type of exercise structure that influences motivation, or whether it is existing regulation that influences choice of exercise structure.

A focus on underlying, source level motives for exercise, as represented by the behavioural regulation continuum, rather than surface level motives (such as weight control, socialisation, and fitness) may increase our understanding of the way in which perceived self-determination for action influences behaviour. The scale's implied continuum and developmental basis makes it ideally suited to examining motivational change across a period of exercise behaviour change. To this end the BREQ was used in the next study to examine the links between self-determination in the regulation of exercise behaviour and the central tenets of the transtheoretical model (Prochaska and DiClemente, 1984), the stages and processes of change.

CHAPTER FIVE

5. Behavioural regulation, self-determination and the stages and processes of change: Uniting organismic integration theory and the transtheoretical model¹

Five phases of data analysis were conducted. First, in order to highlight the role of motivational considerations in the change process, levels of self-determination and mode of behavioural regulation were examined across the stages of change. Second, the Processes of Change for Exercise Questionnaire was subjected to confirmatory factor analysis and the existence of the higher order behavioural and experiential processes of change was tested. Third, the use of the processes of change across the stages of exercise behaviour change were examined in order to ascertain how the experiential and behavioural processes are used across the stages. Fourth, the links between the processes that were found to be relevant to exercise behaviour change and self-determination in the regulation of the exercise behaviour were examined. Finally, follow up data from a percentage of respondents was examined for changes in behavioural regulation, stages of change and processes of change over a three month period in order to determine whether consistent or increased use of the processes of change and increased self-determination resulted in positive change or maintenance of change. Each phase of analysis, outlining the specific hypotheses to be tested and the analysis employed, is presented and discussed separately.

5.1 Method

5.1.1 Sample and procedure

314 individuals (156 females and 158 males) participated in this research. Sample particulars and procedure are reported in the previous chapter. In addition, white collar workers and Bridge Club members (137 of the initial respondents) were asked in a section at the end of the initial questionnaire (see Appendix 2) if they would be prepared to complete the questionnaires again in three months time. Recruitment of follow up data from the blue collar workers was not possible due to access restrictions. Those who agreed to continue their participation were asked to provide a staff number (white collar workers) or other means of identification, such as a telephone number (bridge club), for purposes of administration. 109 respondents agreed and 73 (67.8%) completed the questionnaires again

¹ Part of this chapter has been published: Mullan, E. & Markland, D. (1997). Variations in self-determination across the stages of change for exercise in adults. *Motivation and Emotion*, 21, 349-362.

three months later (37 male, 36 female; mean age = 46.0 yrs; SD = 13.3). 60.8% of follow up respondents were white collar workers and 39.2% home carers and retired persons.

5.1.3 Measures

The Stages of Change for Exercise Ladder

This measure is outlined in the previous chapter and can be seen in Appendix 1.

Processes of Change for Exercise Questionnaire (PCEQ)

The PCEQ (Marcus, Rossi et al., 1992) measures ten processes of change: consciousness raising, dramatic relief, environmental re-evaluation, self re-evaluation, social liberation, counter-conditioning, helping relationships, self liberation, reinforcement management, stimulus control. Each sub-scale has four items, except for the dramatic relief sub-scale which has only three. Several changes were made to this questionnaire for the purposes of this research. Two of the items measuring the social liberation process of change were deemed inapplicable to and therefore irrelevant for the current sample: “I notice that more businesses are encouraging their employees to exercise by offering fitness courses and time off to work out”, “I am aware that many health clubs now provide free baby sitting services to their members”. It is uncommon for Irish, or even UK businesses and companies to offer fitness courses and time off to work out and this was the case at the businesses and companies involved in this research. Similarly, none of the local leisure centres offered baby-sitting services, free or otherwise, to their members. Three additional items were added to the remaining two and these can be seen in Table 6.1. Two additional items were also added to the three-item dramatic relief scale because of an admitted administrative error on the part of Marcus, Rossi et al. (1992) who omitted the fourth item from the intended four-item scale. These additional items can also be seen in Table 5.1. A complete list of all PCEQ items (those retained and removed) and the questionnaire as administered can be seen in Appendix 2.

The Behavioural Regulation in Exercise Questionnaire

This measure is outlined at length in the previous chapter and can be seen in Appendix 2.

Table 5.1. Changes made to the social liberation and dramatic relief sub-scales of the PCEQ.

Social liberation	
Retained items	
<ul style="list-style-type: none"> • I find society changing in ways that make it easier for the exerciser • I am aware of more and more people encouraging me to exercise these days 	
Added items	
<ul style="list-style-type: none"> • It is more acceptable to want to take time to exercise these days • I notice that more and more people are exercising these days • I notice that more and more leisure centres and exercise facilities are being built 	
Dramatic relief	
Existing items	
<ul style="list-style-type: none"> • Warnings about the health hazards of inactivity move me emotionally • Dramatic portrayals of the evils of inactivity move me emotionally • I react emotionally to warnings about an inactive lifestyle. 	
Added items	
<ul style="list-style-type: none"> • TV programmes or magazine items about the effects of inactivity disturb me • It bothers me when I hear about or read about how being inactive is bad for your health 	

5.2 Self-determination in the regulation of exercise

across the stages of change

This phase of analysis unites the continuum-type formulations proposed by both the OIT and TM to explore the relationships between self-determination, behavioural regulation and stage of change. It is hypothesised that self-determination in the regulation of exercise behaviour will increase across the stages of change for exercise. In light of the gender differences in motivational variables outlined in the previous chapter, gender differences in self-determination across the stages of change were also examined and it was hypothesised that females would be more self-determined in the regulation of their exercise behaviour, at all stages of change, than males.

5.2.1 Analysis

There were two complementary parts to the analysis. First, discriminant function analysis was used to determine whether the stages of change groups could be discriminated on the basis of BREQ sub-scale scores. Male and female data were analysed separately. In discriminant analysis group membership of each stage of change is predicted by examining the characteristics of scores across the questionnaire sub-scales. Linear combinations of these scores (called predictor variables) serve as the basis for classifying cases into one of

the groups (SPSS Professional Statistics, 1993). In general if there are K groups, K-1 such combinations can be obtained; they are known as discriminant functions and they are uncorrelated with each other (SPSS Professional Statistics, 1993). Wilks' lambda, and its associated significance level, indicates whether each discriminant function accounts for separate, additional population differences and not merely random variation. The results of a discriminant analysis are interpreted with reference to the structure coefficients and the group centroids. Structure coefficients indicate the importance of variables to the prediction of group membership. The variables with the largest coefficients are said to define the overall discriminant function (the actual signs of the coefficients are arbitrary). In this study only variables with a structure coefficient above .30 were considered to be sufficiently discriminatory (Pedhazur, 1982). The mean score for a group on each discriminant function is known as the group centroid. Stage of change group differences were evaluated by examining the values of the discriminant functions at the group centroids. Positive values indicate that a group scores high on the function while negative values indicate that a group has a low score on that function. This study's sample size to total number of variables ratio (314:9) is sufficient to ensure that standardised coefficients and correlations are stable, and thus to ensure that results obtained in one sample will hold up in another sample from the same population (Stevens, 1992).

In the second stage of analysis an index of self-determination (the Relative Autonomy Index, RAI: Ryan and Connell, 1989) was calculated for each person's scores and compared across each of the four stages of change. The RAI is an aggregated self-determination score that is calculated for each individual by applying a weighting formula to each set of behavioural regulation scores as follows: $-2(\text{EXT}) + -1(\text{IJ}) + 1(\text{ID}) + 2(\text{IM}) = \text{RAI}$. Differences in relative autonomy across the four groups were examined by a two factor (gender by stage of change group) ANOVA.

5.2.2 Results

15 (4.7%) individuals reported being in the precontemplation stage, 33 (10.5%) in the contemplation stage of change for exercise behaviour, 117 (37.2%) in the preparation stage, 45 (14.3%) in the action stage and 104 (33.1%) in the maintenance stage. Due to the small numbers in the first two stages the two were combined to form a single stage which was labelled prepreparation. Mean scores for each type of behavioural regulation and the RAI can be seen in Table 5.2. All tests were examined at the $p < .05$ level. Tests of homogeneity

of variance revealed that group covariances were unequal for both males (Box's $M(30, 21151.7) = 127.597$) and females (Box's $M(30, 25126.5) = 59.534$).

Table 5.2. Types of behavioural regulation and RAI by group: means (standard deviations).

Group	External	Introjected	Identified	Intrinsic	RAI
Prepreparation					
Males	.31 (.40)	.72 (.97)	1.59 (.95)	1.51 (1.02)	3.41 (2.56)
Females	.57 (.92)	.66 (.77)	1.31 (.92)	.81 (.88)	1.25 (2.44)
Preparation					
Males	.48 (.75)	1.13 (1.05)	2.29 (.86)	2.21 (1.04)	4.91 (3.22)
Females	.40 (.64)	1.12 (1.07)	2.13 (.83)	2.06 (.95)	4.59 (2.71)
Action					
Males	.32 (.46)	1.20 (.66)	2.80 (.52)	2.89 (.62)	7.06 (1.86)
Females	.23 (.46)	1.40 (1.15)	2.98 (.70)	2.86 (.70)	7.15 (1.83)
Maintenance					
Males	.06 (.21)	1.52 (1.23)	3.22 (.67)	3.20 (.83)	8.28 (2.16)
Females	.25 (.62)	1.43 (1.36)	3.12 (.91)	3.06 (.97)	6.19 (3.16)

Note: RAI = Relative Autonomy Index.

One discriminant function was significant for males (canonical $r = .628$; Wilks' $\lambda = .577$, $df = 12$) and reflected a strong emphasis on ID and IM. This function accounted for 87.85% of the variance in group membership. Table 5.3 shows that on this function, males in action and maintenance were moderate (.38) and high (.95) respectively (group centroids) while those in preparation and prepreparation were negative (-.45, -1.28). It is noteworthy that the structure coefficient for introjected regulation only just reached the conventional cut off criterion of .30 (Pedhazur, 1982). One discriminant function was also significant for females (canonical $r = .666$; Wilks' $\lambda = .539$, $df = 12$) and was also dominated by IM and ID. This function accounted for 90.85% of the variance in group membership. IJ did not feature in the discriminant function for females. Again Table 5.3 shows that action and maintenance

groups scored highly and positively (.76, .79) while preparation and prepreparation groups scored negatively (-.32, -1.65).

Table 5.3 Discriminant function analysis using type of behavioural regulation to differentiate between stage of change groupings.

Discriminating Variable	Structure coefficients	
	Males	Females
Intrinsic	.81	.85
Identified	.88	.86
Introjected	.30	-.29
External	-.29	-.11

Group	Value of discriminant function at group centroids	
	Pre-preparation	-1.28 (n=23)
Preparation	-.46 (n=62)	-.32 (n=55)
Action	.38 (n=22)	.77 (n=23)
Maintenance	.95 (n=52)	.80 (n=53)

The RAI by stage of change and gender ANOVA revealed significant main effects for both stage ($F_{3,303} = 50.11$) and gender ($F_{1,303} = 7.86$). There was no significant interaction ($F_{3,303} = 2.04$: ANOVA tables can be seen in Appendix 2). Follow up Tukey's comparison of RAI across stage of change revealed that those in preparation had significantly greater RAI scores than those in prepreparation while those in action and in maintenance had significantly higher RAI scores than those in preparation and preparation. There was no significant difference between RAI scores in action and maintenance. Overall, males had significantly higher RAI scores than females.

5.2.3 Discussion of results: Self-determination in behavioural regulation across the stages of change

Tests of homogeneity of variance revealed that group covariances were unequal for both males and females. Box's M test is sensitive to departures from multivariate normality, that

is, it calls matrices unequal if the normality assumption is violated (SPSS Professional Statistics, 1993). The normality of distributions of the each of the four stage groupings was examined separately. Examination of the skewness and kurtosis indicated that the external regulation variable was notably skewed and kurtotic for both males (skew = 2.601; kurtosis = 7.687) and females (skew = 2.248; kurtosis = 4.898) but in both males and females the introjected, identified and intrinsic regulation variables displayed only mild skewness and kurtosis (values of less than 1.0). A highly skewed and kurtotic external regulation variable may, therefore, be the cause of the lack of multivariate homogeneity of variance. Results then, should be interpreted with caution as the probability of misclassification into stage of change on the basis of behavioural regulation scores is increased because of unequal covariances. However, Stevens (1992) believes that the linear form of discriminant function analysis (which was conducted here) is more reliable than the quadratic form (recommended when covariances are unequal) when normality does not hold.

The objective of this study was to examine whether behavioural regulation varies across the stages of change such that self-determination is higher in the active stages of change. Results from discriminant analyses showed that the use of the more self-determined identified and intrinsic forms of behavioural regulation distinguished those in the action and maintenance stages of change from those in pre-preparation and preparation stages. Complementary examination of the RAI across the stages of change showed support for the proposal that behavioural regulation becomes more self-determined across the stages of change: those in the action stage of change, who had recently begun exercising and those more regular exercisers in the maintenance stage of change evidenced a significantly higher index of self-determination (RAI) than did their infrequent or irregular exercising counterparts. Results from both discriminant function analysis and analysis of variance supported the hypothesis that self-determination in the regulation of exercise behaviour increases across the stages of change. Contrary to the original hypothesis, however, results showed that, overall, males were more self-determined than females; there was no significant stage by gender interaction. Thus, in contrast to previous research, females in this sample had less self-determined reasons for exercising and contemplating exercise than did males.

5.3 Confirmatory factor analysis of the PCEQ

As previously discussed (Chapters 2 and 3), only the Marcus, Rossi et al. (1992) study has examined the factor structure of the PCEQ. In addition there is little support for the

existence of the high-order experiential and behavioural factors. The aim of this study, then, was to use confirmatory factor analytic procedures to test this model before proceeding to examine process use across the stages of change.

5.3.1 Analysis

Confirmatory factor analysis was conducted with the LISREL 8.13 (Jöreskog and Sörbom, 1993a) programme. Tests of zero multivariate skewness and zero multivariate kurtosis indicated the data were non-normally distributed. There was significant multivariate skewness (Mardia's coefficient = 36.856, $p < .001$) and multivariate kurtosis (Mardia's coefficient = 15.287, $p < .001$) which would suggest the use of a distribution-free estimator. However, discussion in Chapter Four has indicated that given the number of variables to be analysed and the relatively small sample size, such estimation would be unreliable. Indeed, Bentler and Chou (1987) believe that "one can be assured by the simulation evidence that indicates that normal theory ML estimators are almost always acceptable even when data are non-normally distributed" (p. 89). Accordingly, the data were analysed with normal theory ML estimation. Several competing models were examined:

- i) A ten-correlated-factors model. In this first order model the ten processes of change were allowed to correlate.
- ii) Two separate five-correlated-factors models of the five experiential processes of change and the five behavioural processes of change.
- iii) A one-higher order factor model. In this higher order model correlations among the ten processes of change sub-scales are explained by a single higher order factor.
- iv) A two-higher order-uncorrelated-factors model. This model suggests that the processes of change are best represented by two independent, higher order factors, the behavioural and experiential processes of change.
- v) A two-higher order-correlated-factors model. This model is similar to the previous model except that the two higher order factors are correlated. Prochaska et al. (1988) and Marcus, Rossi et al. (1992) report that this model fits their data better than the competing models (models i and iii above). This is, therefore, the target model.

Finally, Cronbach's alpha reliability coefficient was computed for each sub-scale.

5.3.2 Results

5.3.2.1 First order models.

Initial first order analysis of all 10 factors and 42 items revealed violations of positive definiteness in the structure of the covariance matrix. Non-positive definiteness occurs when a certain linear combination of variables has a negative variance (Wothke, 1993). It renders the solution inadmissible, iterations stop and a fatal error message is printed. According to Wothke (1993) non-positive definiteness may be related to the underlying assumptions of covariance matrices: they must be square, symmetric and have positive values on the diagonal (variances). These variance values restrict those possible in the off-diagonals (covariances) such that the covariances cannot be larger than the variances. In addition, triplets of correlation coefficients must meet the triangular inequality condition wherein the range of a correlation between two variables is co-determined by the correlation of all other variables with those two variables; this limits the permissible values for the correlation coefficients (Wothke, 1993). However, none of the covariances were found to be larger than the variances. Bentler and Chou (1987) suggest that negative eigen values may cause non-positive definiteness but LISREL's inbuilt smoothing procedures (which involve multiplying the diagonal of the matrix by a constant to combat negative eigen values: Bentler and Chou, 1987; Wothke, 1993) did not remedy the indefiniteness in the matrix.

Linearly dependency may also be to blame (Bentler and Chou, 1987). In an attempt to identify the offending linearly dependent variables each of the 10 sub-scales was examined individually. Linear dependency would be evidenced by poor item loadings on the intended factor and a pattern of large negative residuals. It was expected that analyses of some sub-scales would result in an inadmissible solution due to non-positive definiteness and that those sub-scales, or items within, would have to be removed in order to restore positive definiteness and permit an admissible solution. Surprisingly, proper solutions were obtained for all individual sub-scales, but some sub-scales exhibited an extremely poor fit to the data. Following examination of goodness of fit statistics, standardised residuals, parameter estimates and modification indices for the theta-delta matrix, one item was deleted from the five-item dramatic relief, social liberation, consciousness raising, environmental re-evaluation, helping relationships, reinforcement management and stimulus control sub-scales, reducing item numbers from four to three. Re-specification of the seven modified measurement models resulted in much improved indices of fit. The remaining three sub-scales demonstrated an acceptable fit with their original four items.

Only the generation of a new covariance matrix from the remaining 35 items would permit an admissible solution to be obtained for the first order, 10 factor model. Simply selecting out the offending variables in the command file did not correct the indefiniteness. Resulting goodness of fit can be seen in Table 5.4. Fit was quite poor and the Phi matrix (covariance matrix of the relationship between the latent variables) was non-positive definite. Standardised residuals were large, both positively and negatively, indicating a mis-specified measurement model. Factor loadings for many items were low (loadings ranged from .412 to .805) and modification indices indicated that many items would load strongly on to other, non-intended factors. First order models were also examined for both the five experiential and five behavioural sub-scales separately. Again Table 5.4 shows a poor fit for both models. An evaluation of chi-square in relation to degrees of freedom shows that goodness of fit for these five-correlated-factors was worse than for the previous ten-correlated-factors model. A similar pattern of results was also revealed: large residuals, large modification indices and cross loadings. Factor loadings were acceptable with few low loadings and ranged from .465 to .790 for the experiential factors and from .536 to .821 for the behavioural factors.

5.3.2.2 Higher order models.

The solutions for both the one hierarchical factor and the two correlated hierarchical factors models were found to be non-admissible after 20 iterations. Preliminary solutions were obtained which indicated that in both cases the Psi matrices (covariance matrix for the relationship between the measurement errors for the first order factors) were not positive definite. The occurrence of such problems may be explained by the large number of parameters to be estimated in these hierarchical models given the available sample size. Inadequate convergence of the solution, as is the case here, can also be the result of a too small sample size (Bentler and Chou, 1987). To improve the ratio of parameters to be estimated to available sample size and to improve the accuracy of model estimation, the measurement part of each higher order model was eliminated by creating scale or mean scores for each sub-scale. These scale scores were computed for each sub-scale and entered in place of the measurement models for each sub-scale thus removing the Psi matrix. Each first-order latent variable was now represented by a single score, the mean score. As a result, the higher-order models were now just latent variable models that approximated higher-order models.

Table 5.4. Goodness-of-fit indices for the competing PCEQ models

Models	Fit indices					
	χ^2	<i>df</i>	RMSEA ¹	GFI	NNFI	PNFI
<i>First-order models</i>						
10 correlated factors	1208.256 *	515	.066	.816	.839	.678
5 experiential factors	320.280 *	125	.071	.897	.898	-
5 behavioural factors	291.695 *	109	.073	.898	.870	-
<i>Higher-order models</i>						
1 factor	267.843 *	35	.159	.825	.794	.638
2 uncorrelated factors	589.534 *	35	.246	.750	.509	.472
2 correlated factors	267.806 *	34	.162	.825	.787	.620

Note: RMSEA = Root Mean Square Error of Approximation; GFI = Goodness of fit Index; NNFI = Non-Normed Fit Index; PNFI = Parsimony Normed Fit Index.

¹ Confidence intervals or p value could not be computed due to too small p value for χ^2 .

* $p < .001$.

With scale scores the one-higher-order factor model produced a fully admissible solution. The goodness of fit of this model was poor (see Table 5.4), standardised residuals were large and modification indices indicated that many error terms would be highly correlated. Similarly the goodness of fit of both two-factor higher-order models was extremely poor. In the correlated factors model there were high cross loadings for the majority of scales and a large expected improvement in goodness of fit if the dramatic relief scale were allowed to load on the behavioural rather than the experiential factor. The two hierarchical factors were perfectly correlated ($r = 1.0$; $SE = .016$) and the Phi matrix was non-positive definite. In the two-uncorrelated higher-order factor model standardised residuals were large, there were many high cross-loadings and modification indices suggested large expected improvements in goodness of fit if the behavioural self re-evaluation and experiential reinforcement management scales were allowed to load on the opposite factors. Surprisingly, despite this catalogue of bad fitting models, factor loadings were good in all three higher-order models, except for the social liberation sub-scale which,

in all three models, loaded somewhat poorly on its underlying behavioural factor (range .488 to .512). Factor loadings can be seen in Appendix 2.

5.3.2.3 Internal consistency of sub-scales.

The internal consistency of the ten sub-scales was examined with Cronbach's alpha coefficient because results of confirmatory factor analysis suggested that some sub-scales may not be internally consistent. Each sub-scale was examined with all of its items. Table 5.5 shows that internal consistency levels were generally acceptable. However, reinforcement management and stimulus control failed to reach the conventional internal reliability criterion of .70 (Nunnally, 1978). Overall, the results confirm the existence of and basis for the ten processes of change for exercise, each of which, despite the cross loadings, high standard residuals and high modification indices previously found, seem to hang together well and are internally consistent.

Table 5.5. PCEQ sub-scale internal consistency

Sub-scale	Cronbach's alpha	No. items
Consciousness Raising	.797	4
Dramatic Relief	.834	5
Environmental Re-evaluation	.740	4
Self Re-evaluation	.764	4
Social Liberation	.744	5
Counter-conditioning	.766	4
Helping Relationships	.767	4
Reinforcement Management	.653	4
Self Liberation	.717	4
Stimulus Control	.629	4

5.3.3 Discussion of results: confirmatory factor analysis of the PCEQ

Results of confirmatory factor analysis offer little support for higher order conceptualisation of the processes of change for exercise. Both the one higher-order factor and the target two-correlated-higher order factors models showed similarly bad fits to the data and the experiential and behavioural factors were perfectly correlated. Use of scale scores in the

assessment of the higher order models, while item scores were used in the computation of the first order models, prevents comparison of goodness of fit indices with the latent variable models.

In their examination of the factor structure of the PCEQ Marcus, Rossi et al. (1992) tested first-order and higher-order models. They reported that the 10-correlated first-order factors model “provided the best fit to the data” (p. 590). Examination of the reported fit statistics ($\chi^2_{657} = 1913$, GFI = .843, RMR = .048) shows that this represents a barely acceptable fit to the data and, in fact, the current data provides a somewhat better fit. Marcus, Rossi et al. do not present the fit of the higher order models and, thus, there is no source of comparison for current findings. We are merely told that the two-hierarchical factors model “fits the data significantly better than the one-hierarchical-factor model, $\chi^2_1 = 109.61$, $p < .001$ (χ^2 difference test)” (p. 390). However, if the fit of the ‘best’ first order model is unacceptable, this does not bode well for the fit of the two-hierarchical-factor model. Prochaska et al’s. (1988) fit statistics for their two -higher order factor model of processes use in smoking cessation also does not provide an accurate source of comparison for the current findings. They allowed the error terms to correlate within each factor in their confirmatory factor analysis of the 40-item questionnaire. Including correlated error terms in a model amounts, at best, to capitalising on chance factors in seeking a better fit (Byrne, 1994), may actually mask the true underlying factor structure (Anderson and Gerbing, 1988) and is unacceptable without strong empirical or substantive rationale (Byrne, 1994).

Marcus, Rossi et al. (1992) questioned the appropriateness of the second order experiential and behavioural factors given the high correlation between the two higher-order factors found in their study and the Prochaska et al. (1988) study (.91 and .77 respectively). In this study these factors were perfectly correlated. Indeed, Marcus et al. conclude that it is unlikely that the two-factor conceptualisation adds any further substantive meaning to the existing transtheoretical model and call for further research before a decision is made regarding the worth of the hierarchical distinction for the area of exercise adoption.

Acceptable coefficient alpha levels for the 10 sub-scales showed that there seems to be internal consistency within each PCEQ sub-scale. However, according to Cortina (1993), care should be taken in interpreting coefficient alpha. Although alpha is a function of internal consistency (the degree of inter-relatedness among items), a set of items can be relatively interrelated yet multidimensional (Cortina, 1993). Alpha is strongly influenced by the number of items in a sub-scale and an average of four per sub-scale in this study is too small to

disguise low item intercorrelations. But this does not counter the presence of more than one dimension per scale (Cortina, 1993). The current findings of cross loadings, large standardised residuals and large modification indices may reflect multidimensional processes of exercise behaviour change: some processes may combine with others to form composite processes of change.

In conclusion, serious doubt has been cast over the psychometric integrity of the PCEQ. Results suggest that the processes of change for exercise as operationalised here may differ from the processes of change as conceptualised in the addictions literature. In this regard, the next stage of analysis examines whether the processes of change behave in the exercise setting as operationalised in addictive behaviour settings.

5.4 Use of processes of change across the stages of change for exercise

The importance and pattern of usage of the experiential and behavioural processes of change in exercise behaviour change is not well established. This study examines their reported use across the stages of change. It is hypothesised, based on the empirical evidence (Marcus, Rossi et al., 1992; Prochaska and DiClemente, 1983; Prochaska et al., 1994) that the five experiential processes of change will be used predominantly in the early stages of change while use of the five behavioural processes will be foremost in the later stages. To test this hypothesis discriminant function analysis was used to determine whether individuals could be classified into one of the four stages of change on the basis of their usage of the processes of change. Gender differences in the use of the processes of change were also examined given the gender differences found in the previous study.

5.4.1 Results

Table 5.6 presents mean scores for each of the processes of change at each stage of change for males and females separately. All tests are examined at the $p < .05$ level. Tests of homogeneity of variance showed that covariances were multivariately unequal for females (Box's $M = 514$, approx. $F = 2.65$; $df = 165$, 19530.8,) but equal for males. Among females the helping relationships sub-scale was highly skewed (10.14) and extremely kurtotic (116.03). This sub-scale is likely to have significantly contributed to the overall lack of homogeneity of variance in females' data and, as a result, there is an increased risk that females have not been correctly classified into groups on the basis of their scores on the

PCEQ. Both the consciousness raising and self liberation sub-scales also exhibited notable kurtosis (8.94 and 9.82 respectively). For males, in contrast, all ten sub-scales exhibited very mild (< 1.0) skewness and kurtosis.

Table 5.6. Means (standard deviations) for PCEQ sub-scales across the four stage of change groupings for males and females.

Sub-scales	Prepreparation	Preparation	Action	Maintenance
Consciousness raising				
Males	1.02 (.84)	.91 (.77)	1.17 (.84)	1.32 (1.12)
Females	1.06 (2.0)	1.46 (1.13)	1.50 (1.11)	1.50 (1.35)
Dramatic relief				
Males	1.09 (1.08)	1.12 (.77)	1.0 (.94)	.98 (1.00)
Females	1.07 (.91)	1.46 (.97)	1.42 (.84)	1.55 (1.19)
Environmental re-evaluation				
Males	1.18 (.69)	1.04 (.79)	1.06 (1.12)	.96 (.88)
Females	.94 (.91)	1.12 (.99)	1.34 (1.12)	1.30 (1.00)
Self re-evaluation				
Males	1.10 (1.10)	1.83 (.90)	1.78 (.75)	1.98 (.95)
Females	1.20 (.95)	2.11 (1.00)	2.55 (1.09)	2.45 (1.17)
Social liberation				
Males	1.81 (.88)	2.16 (.74)	2.23 (.78)	2.18 (1.10)
Females	1.94 (1.14)	2.53 (.79)	2.83 (.87)	2.58 (.95)
Counter-conditioning				
Males	1.11 (.79)	1.92 (.84)	2.38 (.74)	2.80 (.92)
Females	.96 (.95)	1.98 (.82)	2.81 (.91)	2.80 (.97)
Helping relationships				
Males	.69 (.71)	.59 (.68)	.88 (.88)	.72 (.82)
Females	.75 (.92)	1.36 (4.76)	1.30 (1.41)	1.11 (1.14)

Table continued over.

Table 5.6 continued.

Sub-scales	Prepreparation	Preparation	Action	Maintenance
Reinforcement management				
Males	.90 (.80)	1.32 (.68)	1.40 (.78)	1.45 (.93)
Females	1.14 (1.009)	1.66 (.81)	2.08 (1.07)	1.83 (1.08)
Self liberation				
Males	1.40 (.93)	1.83 (.77)	2.40 (.84)	2.23 (1.03)
Females	1.38 (1.10)	2.23 (1.42)	2.75 (1.01)	2.52 (1.11)
Stimulus control				
Males	.50 (.45)	.68 (.56)	.70 (.66)	.76 (.730)
Females	.46 (.58)	.94 (.81)	.99 (.860)	1.00 (1.190)

One discriminant function was significant for males (canonical $r = .604$; Wilks' $\lambda = .543$, $df = 30$) and featured counter-conditioning, self liberation and self re-evaluation in decreasing order of importance. Table 5.7 shows that on this function, action and maintenance were respectively moderate (.37) and high (.82), while preparation and prepreparation were negative (-.31, -1.43). One discriminant function was also significant for females (canonical $r = .633$; Wilks' $\lambda = .543$, $df = 30$) and was dominated by five factors: counter-conditioning, self re-evaluation, self liberation, reinforcement management and social liberation. Table 5.7 shows that those in action and maintenance scored moderately to highly (.66, .76) while those in preparation and prepreparation scored negatively (-.26, -1.50).

Table 5.7. Discriminant function analysis using the 10 processes of change to differentiate between stages of change.

Discriminating Variable	Structure coefficients	
	Males	Females
Counter-conditioning	.82	.91
Self Liberation	.41	.42
Self Re-evaluation	.33	.51
Stimulus Control	.16	.26
Helping Relationships	.07	.04
Consciousness Raising	.20	.12
Dramatic Relief	-.08	.17
Reinforcement Management	.27	.37
Social Liberation	.16	.31
Environmental Re-evaluation	-.10	.16

Group	Value of discriminant function at group centroid	
	Males	Females
Pre-preparation	-1.43 (n=22)	-1.50 (n=25)
Preparation	-.31 (n=63)	-.26 (n=55)
Action	.37 (n=22)	.66 (n=22)
Maintenance	.82 (n=52)	.76 (n=49)

5.4.2 Discussion of results: Processes use across the stages of change

Results revealed that in this sample, only five processes of change made a meaningful contribution to differentiation among the four stages of exercise behaviour change. Only three out of the ten processes of change could distinguish among the four stages of change for males (counter-conditioning, self liberation and self re-evaluation) and only five processes could do so for females (counter-conditioning, self re-evaluation, self liberation, reinforcement management and social liberation). Self re-evaluation and social liberation are experiential processes, while counter-conditioning, self-liberation and reinforcement management are behavioural processes. Table 5.6 shows a general increase in use of these processes from prepreparation to action and/or maintenance and this is confirmed by the

values for the discriminant function increasing from preparation to maintenance for males and females. These results correspond with those of Marcus, Rossi et al. (1992) who found that pre-contemplators used all of the processes substantially less than all other stage of change groups (see Chapter 2). Neither the current results nor those of Marcus et al. can show any support for the proposal that the experiential processes are used primarily in the early stages and the behavioural processes in the later stages (see Prochaska and DiClemente, 1982; Prochaska, DiClemente and Norcross, 1992). However, the lack of support for a higher-order conceptualisation of the processes of change for exercise in the previous phase of analysis queries the existence of such a distinction.

Marcus et al. also conducted a discriminant analysis (as a MANOVA follow up) to determine whether the ten processes of change, seven demographic variables (e.g., age, income, education) or a measure of perceived stress would best predict stage of adoption. The resulting discriminant function accounted for 53% of the variance. Using the .30 cut off criterion only six of the processes featured in this function (however, Marcus et al. do not examine the components of the discriminant function in this manner). These processes are, in order of importance of contribution, counter-conditioning, self-liberation, reinforcement management, consciousness raising, self-re-evaluation and stimulus control. None of the demographic variables or the stress measure contributed to the function. It is important to note that scant reporting of all their results hinders their full appraisal and accurate summary. It is not clear whether reported stage group differences in processes were actually tested statistically. That aside, it seems that there is a large degree of similarity between the discriminating processes found in the current study and the Marcus et al. study. Counter-conditioning, self-liberation, reinforcement management, consciousness raising and self-re-evaluation made significant contributions to the discriminant functions in both studies. Although Marcus et al. do not differentiate process use between the sexes, in this study three of these processes were common to both females and males: counter-conditioning, self re-evaluation and self liberation.

In conclusion, it appears that the processes of change do not behave in the exercise setting as operationalised in addictive behaviour settings. Many may not be relevant for exercise behaviour change and in this regard only the five processes of change found to be applicable to the current sample were included in the two subsequent stages of analyses.

5.5 The relationship between processes of change and self-determination in the regulation of exercise behaviour

As the processes of change represent various strategies and techniques for coping with, or managing change, it is intuitive to suppose that they would be related to underlying regulation of exercise behaviour. The relationship between those processes found to be relevant to exercise behaviour change in the current sample (counter-conditioning, self re-evaluation, self liberation, reinforcement management and social liberation) and the four forms of behavioural regulation were examined using bi-variate correlations and the Pearson correlation coefficient. Alpha was set at .001 because of the large number of correlations. This investigation was exploratory in nature.

5.5.1 Results

Pearson correlation coefficients for the five processes of change and the four forms of behavioural regulation are presented in Table 5.8. Self re-evaluation displayed moderate correlations with the introjected and identified forms of regulation (IJ and ID). Counter-conditioning showed the largest of all correlations; it was strongly related to ID (.73) and moderately related to intrinsic motivation (IM:.66). Social liberation and reinforcement management displayed poor correlations with all BREQ sub-scales. Self-liberation was moderately correlated with ID (.55). It is noteworthy that the lowest and non-significant correlations were found between the five processes and external regulation.

Table 5.8. Pearson correlation coefficients for correlations between five PCEQ sub-scales of the PCEQ and the BREQ. All, except *, are significant.

Behavioural regulation	Processes of change				
	Self-re-evaluation	Social liberation	Counter-conditioning	Reinforcement management	Self-liberation
External	.20	.17*	.03*	.29	.12*
Introjected	.56	.34	.44	.42	.40
Identified	.57	.40	.73	.44	.55
Intrinsic	.30	.30	.66	.31	.39

Note: * $p > .001$

5.5.2 Discussion of results: The relationship between processes of change and exercise behavioural regulation

The results suggest a link between the five processes of change and those forms of regulation that are at least somewhat self-determined. This may be due to the low likelihood of externally regulated, non-self-determined persons attaining any degree of regularity in their exercise behaviour for which they would require these strategies. Counter-conditioning displayed the strongest links with underlying behavioural regulation. It involves restructuring old responses to stimuli, or situations, in favour of positive behaviour change, e.g., “when I am tired I make myself exercise anyway because I know I’ll feel better afterwards”. This requires breaking the learned stimulus-response cycle by substituting alternative positive, change-promoting behaviours for old negative responses. Thus the exercise adoptee must try to do some sort of physical activity instead of remaining inactive and, from a self-determination perspective, must see this activity as important or enjoyable (e.g., as a way of relaxing or relieving tension) rather than as another chore to get out of the way. The current results support this interpretation. Self re-evaluation was moderately related to the introjected and identified forms of regulation. Self re-evaluation is a process used in raising awareness of the need to change and the positive effects it will bring. Self re-evaluation for exercise behaviour involves continued reappraisal of the personal pros and cons of exercise. Such a process may initially require regulation through guilt-avoidance and self-enforcement of rules (introjected regulation) but may lead to regulation based on the value and importance of that activity (identified regulation). Self liberation was moderately related to identified regulation. This describes a process of increasing awareness and expanding thinking which increases one’s belief that change is possible and in turn increases one’s ability to choose to change. Again, the link with identified regulation can be established: expanding thinking and increasing commitment to change goes hand in hand with increasing awareness of the value of exercise.

In conclusion, some support has been found in this sample for a relationship between underlying self-determination in the regulation of exercise behaviour and the techniques and strategies relevant to the management of that behaviour. It seems that only when regulation becomes somewhat self-determined is there a link between behavioural regulation and the change strategies.

5.6 Change in stage, process use and self-determination over three months

109 of the white collar workers and Bridge Club members (n=137) consented to complete the questionnaires again in three months time. 73 did so and the follow up data was examined for change in stage of change, change in behavioural regulation and change in use of the five processes of change. Based on the finding that self-determination increased significantly and linearly across the stages of change for exercise it was hypothesised that those who maintained or improved their stage of change would evidence a significantly greater increase in their self-determination than those who regressed in their stage of change. Based on the finding that counter-conditioning, self re-evaluation, self liberation, reinforcement management and social liberation were relevant processes of change for females, and based on the transtheoretical model's proposal that increasing use of the processes of change aids behaviour change, use of these processes was hypothesised to have increased more among those who improved or maintained their stage of change than among those who regressed. Similarly, males were hypothesised to differ in this way in their use of the counter-conditioning, self re-evaluation and self liberation processes of change.

5.6.1 Analysis

Frequency counts were used to examine the movements across all five stages of change over the three month period. The relative autonomy index (RAI) was calculated by computing weighted sums of the four BREQ sub-scales as previous described. Residualised variables, representing change over time for the processes of change and self-determination were created by regressing follow up variables on their baseline counterparts. Hypothesised differences in self-determination and processes of change use over time were examined with a one factor (change in stage of change) ANOVA for males and females separately. Correlations between the baseline and follow up scores are examined in order to ensure that the baseline and follow up scores are indeed related.

5.6.2 Results

At baseline, seven of 73 follow up respondents (9.6%) were in the prepreparation stage, 28 (38.3%) were in the preparation stage, six (8.2%) were in the action stage and 32 (43.8%) were in the maintenance stage of change. 48 (65.7 %) remained in the same stage, 13 (17.8%) moved forward and 12 (16.43%) regressed. Thus three groups were created to

represent this change: no-changers, improvers and regressers. Maintenance emerged as the most stable stage retaining 25 of the original 32 members at follow up; most of the no change group were in the maintenance stage. Of those who improved (13) the majority (9) moved from the preparation stage to either action or maintenance, while of those who regressed (12) the majority (7) moved from the maintenance stage to either action or preparation. In order to be sure that follow up respondents were representative of those asked to complete a second questionnaire, a brief examination of the characteristics of non-responders (those who did not agree to complete the questionnaires again and those who did agree but did not return completed questionnaires: $n=64$) was carried out. Responders comprised 37 males and 36 females (mean age = 46 yrs, $SD = 13.3$). Non-responders comprised 32 males and 32 females (mean age = 36 yrs; $SD = 11.48$). At baseline 30 non-responders (46.9%) were in the action stage of change and 34 (53.12%) were in the maintenance stage of change. Overall, non-respondents were younger than respondents and more likely to be in the later stages of change.

Table 5.9 presents means for the residualised RAI and processes of change variables for each of the three groups and for males and females separately. Positive values indicate increased use or relevance of processes and negative values indicate decreased use. Correlations between baseline and follow up scores for the RAI and the five processes of change were acceptable: RAI = .81, counter-conditioning = .65, self re-evaluation = .54, self liberation = .60, reinforcement management = .51, social liberation = .56. All tests were examined at the $p < .05$ level. Among females only the use of the counter-conditioning process of change varied across the three change groups ($F_{2,34} = 3.17$). There was no significant difference in levels of self-determination across the groups. A follow up Tukey test found that females who did not change their stage used this process significantly more than those who regressed. Among males use of counter-conditioning ($F_{2,33} = 4.32$) and self-liberation processes ($F_{2,33} = 4.53$) significantly differed across the three change groups. Again, the groups did not differ in their self-determination. Follow up Tukey tests found that improvers used counter-conditioning significantly more than no-changers and that improvers used self-liberation significantly more than no-changers and regressers. ANOVA tables can be found in Appendix 2.

Table 5.9. Means (standard deviations) and group size for RAI and the five processes of change residualised variables for each level of change and for males and females.

Residualised variables	Means (SD) <i>n</i>								
	Improvers			Regressors			No-changers		
RAI									
Male	3.632	(9.099)	8	-4.965	(3.408)	4	2.374	(7.041)	24
Female	-5.231	(3.954)	5	-1.474	(11.498)	8	-1.180	(6.395)	24
Counter-conditioning									
Male	2.327	(2.796)	8	-2.297	(4.592)	4	.481	(2.095)	24
Female	-1.193	(2.547)	5	1.409	(1.992)	8	-.569	(2.658)	24
Self re-evaluation									
Male	.637	(3.011)	8	.761	(2.466)	4	.498	(2.860)	24
Female	-.874	(5.303)	5	.578	(4.521)	8	-.838	(2.336)	24
Social liberation									
Male	1.947	(2.032)	8	.107	(1.733)	4	.439	(3.999)	24
Female	-.119	(2.358)	5	.063	(2.632)	8	-1.102	(2.68)	24
Self-liberation									
Male	3.441	(2.956)	8	-1.873	(4.422)	4	-.196	(3.333)	24
Female	-.233	(4.080)	5	.874	(2.866)	8	-.884	(2.336)	24
Reinforcement management									
Male	2.516	(3.717)	8	-3.549	(4.176)	4	.237	(2.380)	24
Female	1.013	(1.150)	5	.928	(1.890)	8	-1.004	(2.654)	24

Note: RAI = Relative Autonomy Index.

5.6.3 Discussion of results: Change in stage, process use and self-determination over a three month period

The hypothesis that those improving or maintaining their stage of change would have greater levels of self-determination in the regulation of their exercise behaviour than those regressing during the three month follow up period was not supported and there was only limited support for the beneficial effect of use of the processes of change. Males and females who successfully changed their stage of exercise behaviour change increased their use of the

counter-conditioning process. Increased use of self-liberation also distinguished improving from both maintaining and regressing males. However, there are serious problems with this study which may have mitigated against finding support for the hypotheses.

The small sample is likely to have limited the power of the study to find any significant differences between the change groups. This was exacerbated by unequal group sizes (there were 24 male and 24 female no-changers but only eight female and four male regressors). Furthermore, Table 5.9 shows that for each of the residualised mean scores the standard deviations are large. This indicates a large degree of variability in self-determination and in the use of the processes of change in all three groups. Finally, collapsing all changes within the stages of change into three levels of change groupings is a rather crude categorisation of movement and/or stability along the stages of change continuum, and this may have contributed to lack of concordance with hypotheses. Individuals who moved within the active stages (action and maintenance) were grouped with those who moved within the contemplative stages (precontemplation, contemplation and preparation). Research has suggested that use of processes of change is dependent on stage of change and that those in the later or active stages of change primarily use the behavioural processes, whereas those in the early and contemplation stages of change tend to rely on the experiential processes of change. Therefore, grouping active changers with contemplative changers may also have mitigated against finding support for the hypothesised change in use of the processes of change. Ideally, groups representing improvement, regression and no change should have been created for each stage of change separately. This would have allowed for a more accurate and detailed assessment of change in self-determination and use of the processes of change as a result of change, or lack thereof, in stage of change. In sum, the accumulation of a small sample size, large standard deviations and collapsing all manner of change into three crude groupings may have resulted in unreliable, unrepresentative data. The results should be evaluated in this light.

5.7 General discussion

The purposes of this study were to examine the relationship between stages of change for exercise and exercise behavioural regulation, between the stages and processes of change and between the processes of change and behavioural regulation. In addition, the Processes of Change for Exercise Questionnaire (PCEQ) was subjected to a confirmatory analysis of the first order and higher order models and the change in use of the processes of change and

level of self-determination was examined with follow up data from a small sub-sample of initial respondents. Support was shown for the proposal that self-determination increases across the stages of change: those in the later stages of change were more self-determined in the regulation of their exercise behaviour than those in the early stages. Males and females could be distinguished in their stage of change by their use of the counter-conditioning, self re-evaluation and self liberation processes while females could also be discriminated by the use of reinforcement management and social liberation. Moderate to strong correlations were found between these processes of change and the introjected, identified and intrinsic forms of behavioural regulation. Higher order confirmatory factor analysis of the PCEQ failed to show support for the existence of the two higher order correlated factors, the behavioural and experiential processes of change. The higher order experiential and behavioural factors were perfectly correlated. Follow up data did not show support for the proposal that improvers and no changers increased their self-determination and increased their use of the processes of change over a three month period.

5.7.1 The processes of change for exercise

The use of the processes of change across the stages of change in this sample was not in accordance with previous empirical evidence (Marcus, Rossi et al., 1992; Prochaska et al., 1994; Prochaska and DiClemente, 1983; Prochaska, DiClemente and Norcross et al., 1992). In fact seven processes of change did not discriminate among the stages of change in males while five of the processes did not discriminate among the stages in females. However, such findings are not wholly without precedent. Gorely and Gordon (1995), also using discriminant analysis in an exercise setting, found that only five of the processes of change could predict stage of change: counter-conditioning, self liberation, self re-evaluation, consciousness raising and stimulus control. Indeed, as previously noted, in a follow-up discriminant analysis by Marcus, Rossi et al. (1992) only six of the processes appeared to predict stage of exercise adoption: counter-conditioning, self-liberation, reinforcement management, consciousness raising, self-re-evaluation and stimulus control. (This result was not referred to by Marcus, Rossi et al.). When the results of these three discriminant analyses (this study, Gorely and Gordon, 1995, and Marcus, Rossi et al., 1992) are compared, counter-conditioning, self liberation and self re-evaluation emerge as significant predictors in all three, reinforcement management is common to this study and the Gorely and Gordon study and consciousness raising and stimulus control are common to the Marcus et al. and

Gorely and Gordon studies. In addition, those processes that significantly contributed to the discriminant function in all three studies are also those that were common to both males and females in this study.

Sutton (1996) questioned the research findings that have linked certain processes of change to certain stages of change. In particular he challenged the conclusions of cross-sectional research which examined process use across the stages of change for smoking behaviour and highlighted the discrepant findings in these studies. Prochaska et al. (1991) found that consciousness raising was a central, facilitatory process in the contemplation stage, while research by Prochaska, DiClemente, Velicer, Ginpil and Norcross (1985) showed that its frequent use in the contemplation stage adversely affected change. Sutton examined cross sectional research by Prochaska and DiClemente (1983) which investigated stage and processes interactions and asked "if...a given processes is emphasised in one stage but not the next, how can we tell whether this is helping or hindering movement across stages?" (p. 200). Such criticism also applies to cross-sectional examination of the stages-processes link by Marcus, Rossi et al. (1992), the only research that has examined this link in the area of exercise behaviour change. Thus, Sutton concludes, there is no strong support for the proposal that the use of certain processes in certain stages promotes movement to subsequent stages.

The processes of change were developed from popular systems of change in the psychotherapy domain in the 1970s. These systems were designed to aid cessation of addictive behaviours and have subsequently been applied to adoption behaviours. The issue of concern, then, is whether processes derived from a theory of cessation behaviours is applicable or transferable to the exercise domain. Categorisation and definition of cessation behaviour is clear cut; focus is on the product (units of alcohol or number of cigarettes). The definition of exercise adoption, on the other hand, is unclear and is being continually debated. This is discussed in the final chapter. It may be that an adoption behaviour, such as exercise, cannot be "mapped" onto the stages and processes of behaviour change in a similar way to a cessation behaviour such as smoking. In addition, there is a limited research base to validate the applicability of the processes of change to exercise adoption. The primacy of the two correlated higher order factors model in explaining the structure of the Processes of Change for Exercise Questionnaire was not supported and seven items were removed from the full model in order to reach even basic standards in sub-scale goodness of fit. The Processes of Change for Smoking Questionnaire (Prochaska et al., 1988) was the first paper

and pencil measure of process usage and sub-scale items were more or less directly transferred from this questionnaire to the PCEQ; wording was merely changed to reflect exercise behaviour. Although this is the preferred practice when applying existing questionnaires to other, related areas, in order to maintain sub-scale reliabilities and model structure, there are clearly enough differences between cessation behaviours and adoption behaviours to lead to concern about measurement incongruence. It is noteworthy, then, that Gorely and Gordon (1995), in the discussion of their results, remark that some participants indicated that some PCEQ items were difficult to interpret or were perceived as irrelevant. Indeed, several items were removed from the PCEQ prior to its use in this study because of predicted non-relevance to the current sample. This non-relevance may also have its origins in the fact that the PCEQ was developed with a large American worksite sample from a large retail outlet and industrial manufacturer. At each worksite health promotion programmes were in place which allowed individuals access to, and time off work to attend worksite exercise facilities. Clearly, further research is needed to examine the construct validity of the PCEQ.

In summary, it is unclear whether those attempting to begin or maintain a programme of regular physical activity experience the processes of change in the same way as has been found previously in the domains of smoking cessation, weight loss and psychotherapy. Research appears to indicate that all ten processes of change do not make significant and independent contributions to movement across the stages of change for exercise.

5.7.2 Behavioural regulation and TM

The transtheoretical model suggests that behavioural change is best conceptualised as occurring in stages and the organismic integration theory (OIT) continuum-type representation of the development of internalisation, entailing a movement from extrinsic to intrinsic motivation, supports this point. OIT concerns the process of developing internal regulation of initially externally regulated behaviours and TM concerns the process of ceasing addictive behaviours or acquiring positive behaviours. This association should be more than just enlightening in its relevance. Although TM recognises that behavioural change “requires movement through discrete motivational stages over time” (Prochaska, Redding, Harlow, Rossi and Velicer, 1994, p. 471) it does not explicitly consider the role of motivation in determining intention to change and regulating change behaviour. The dynamic stages-of-change conceptualisation displays good capacity as a base for integrating the

behavioural regulation continuum and, similarly, the concept of self-determination also provides a base from which to understand the underlying cognitions that foster an individual's path of change. This study has established a link between self-determination in the regulation of exercise behaviour and stage of change for exercise behaviour change. Those in the action and maintenance stages of change were more self-determined than those in the preliminary stages of change. Use of the five relevant processes of change was also linked with some degree of self-determination.

Caution must be exercised, however, in generalising from the present findings given the cross sectional nature of the study and the fact that only self report measures were used to quantify stage of change.

CHAPTER SIX

6. Uniting level of change, personal construct theory and self-determination

The Allied-Dunbar Fitness Survey (1992) found that 24% of men and women were put off exercise because they did not consider themselves to be 'sporty', 'exercise types'. This demonstrates the impact of our fundamental belief system on our health behaviour choices. But what is it about exercise and exercisers that is discouraging to some people?

The levels of change dimension of the TM proposes that behaviour change should occur at the level from which an individual perceives their problem to stem. Five hierarchical levels of change are outlined which range from the situational factors level to the more complex intrapersonal conflicts level. In chapter two, which outlines TM, exercise adoption and adherence research is considered from the point of view of the five levels of change. The majority of the present research has been conducted at levels similar to or approximating the first two levels of change: the situational factors level and the maladaptive cognitions level. This research tells us little about the meaning of exercise to people. The TM, as a model of psychotherapeutic change, views the fifth level of change, intrapersonal conflicts, in terms of the potential conflicts residing within the person: something at the core of one's being is causing recurring conflicts that are preventing behaviour change. When applied to the study of adoption behaviours, in particular the adoption of regular exercise, the conflicts occurring at the intrapersonal level of change can be seen in a different light: something at the core of one's belief system leads one person to exercise regularly and another to remain sedentary.

In a psychotherapeutic setting a therapist can probe the nature and source of intrapersonal conflicts with a mind to resolving them and allowing acceptance of behaviour change. An exercise adopter, on the other hand, does not have any such resource to aid the resolution of any internal conflicts that may mitigate against behaviour change. This self-changer must work within the boundaries of his or her existing belief system or ideology which dictates the appropriateness of and consequence of adopting or adhering to a programme of regular exercise. As the most profound of the levels of change, the interpersonal conflicts level represents the most complex and entrenched, and therefore, the most resistant to change. The transtheoretical model predicts that the more complex the level of change involved in the cause or control of a person's problem behaviour the longer and more difficult will be the process of

behaviour change (Prochaska and DiClemente, 1986; Gorley and Gordon, 1993). Thus, those who experience disharmony between how they would like to be (fit, active and healthy) and their quintessential belief system (not the fit and active type) may have great difficulty making any permanent change in their exercise behaviour. An investigation and comparison of the beliefs of those contemplating and those regularly taking exercise is, therefore, a worthy enquiry. A theoretical basis or structure is necessary to give direction to and organise any such investigation but because of the lack of application of and research into the levels of change the TM cannot supply this foundation. Kelly's (1955, 1963) personal construct theory (PCT) operates at this interpersonal, or core level of self. It gives an insight into how a person's beliefs about, or constructions of events guide his or her behaviour and, by so doing, details the way in which we construct our view of the world. Kelly developed a technique, repertory grid technique (RGT), for examining the nature and structure of these beliefs. RGT provides a methodology for obtaining a map, so to speak, of an individual's construct system; it "is an attempt to stand in another's shoes, to see their world as they see it, to understand their concerns" (Fransella and Bannister, 1977, p.5). RGT is thus informed by the epistemological tradition of constructivism which holds that we interpret all information through a sieve of past experiences, traditions, interpretations and understandings. I will now briefly consider PCT and its related methodology.

6.1 Personal construct theory

Kelly's (1955, 1963) personal construct psychology "is an attempt to understand the way in which each of us experiences the world, to understand our behaviour in terms of what it is designed to signify and to explore how we negotiate our realities with others" (Kelly, 1963, p.27). Kelly's intention was to develop a new psychology rather than present a theory within the framework of orthodox psychology; he did not believe the person should be split into constituent motivational, memory, emotional, perceptive and cognitive parts (Bannister and Fransella, 1986). PCT takes as its subject the whole person rather than some fragment of a person's psychological functioning (Winter, 1992). According to Fransella and Bannister (1986) the theory was deliberately stated in very abstract terms in an attempt to avoid the limitations of a particular time and culture and to avoid tying the theory to one concept or phenomenon; it is "not a theory of 'learning', of 'interpersonal relationships', of 'development', of 'perception'

(and) it is certainly not a ‘cognitive’ theory” (Fransella and Bannister, 1986, p. 4). As a theory which aspires to be an alternative to existing psychology however, the language in which his 1955 magnum opus is couched is unfamiliar and a little strange in that it is devoid of typical psychological terminologies (Winter, 1992). The reader will find “no *ego*, no *emotion*, no *motivation*, no *reinforcement*, no *drive*, no *unconscious* and no *need*” (Kelly, 1955, p. x. italics in original). It is also typical of the 1950’s pre-political correctness era in its use of sexist language; the female voice also has no presence in Kelly’s work.

Kelly believed that each of us has “theories” (construct sub-systems) about, say, the weather, friendships, God, romantic relationships, accountants etc., through which we filter information and each is linked to a ‘grand theory’ known as our personal construct system (Fransella and Bannister, 1977). “Since events do not carry their own meaning ‘engraved on their backs’, it must be the construction which we impose on them which endows them with whatever significance they may have in relation to our own acts” (Addams-Webber, 1979, p.1). PCT then, concerns the fundamental issue of construing, that is, the act of making an interpretation (Kelly, 1963). Construing is an on-going, active process in which we each constantly try to give meaning to our world and thus predict future events (Winter, 1992). In this process Kelly believes that we act like scientists: we make hypotheses, test them out and revise them on the basis of evidence to the contrary. A construct is not an attitude, a personality measure, or a concept (Fransella and Bannister, 1977). The word construct does not necessarily imply conscious awareness and it is not strictly a verbal label. Bannister and Fransella (1986) note that constructs can be pre-verbal (created before a child has a labelling system) or partially verbal (wherein one pole has a label but the other has no name tag). Beyond any such construct labels lies a network of relationships (similarities and differences) between constructs of which an individual will not be consciously aware. Kelly considers our personal constructs to be the eyes through which we regard the world about us and through which we strive for personal meaning.

PCT is presented as a complete, formally stated theory with a fundamental postulate and 11 corollaries. It is not the intention here to fully describe the content of PCT by expounding each corollary, rather the aim is merely to present an overview of PCT by illustrating its organisation and arrangement. The fundamental postulate states that “ a person’s processes are psychologically channelised by the ways in which he anticipates events” (Kelly, 1963, p.46). The

word “channelised” connotes a structured network of pathways which both determine and restrict a person’s actions (Kelly, 1963). This contends that individuals’ understanding of the nature of the world and of their own nature is tested by how well it guides them and enables foresight, or anticipation. It suggests that we seek to understand in order to involve ourselves with our world and to act upon it (Fransella and Bannister, 1986). The theory explicitly states its psychological assumptions: ours is not an interpretation-free reality; all facts are wholly subject to alternative constructions; all perceptions are open to questioning and reconsideration.

Several of the corollaries are crucial to understanding the totality of PCQ. The individuality corollary states that we each have different constructions of events because we each see the world “through the goggles of our own personal construct system” (Bannister and Fransella, 1986, p.10). The construction corollary states that we make sense of the world by continually detecting and categorising repeated themes and evolving constructs from them to guide our behaviour (Kelly, 1963). The experience corollary maintains that constructs are modified, or developed through experience over time and that all our present interpretations, or constructions are subject to replacement or revision as a result of experience (Kelly, 1963). When predictions of events or people are found wanting the relevant construct is amended to include the new information (Bannister and Fransella, 1986). Finally, the dichotomy corollary states that our construction systems are composed of a finite number of dichotomous constructs (Kelly, 1963). Kelly argues that we make sense of the world by simultaneously noting likenesses and differences. Thus constructs are expressions of contrast as well as of similarity and, therefore, not unipolar. Unipolar concepts can only include or exclude one another; the notion of bi-polarity allows us to view constructs in terms of the relationships between them (Bannister and Fransella, 1986,). A construct is, thus, a discrimination (Fransella and Bannister, 1977). This dichotomy corollary brings us to consider the methodology for exploring and researching individuals’ personal constructs: the repertory grid technique (RGT).

6.1.1 Repertory grid technique.

A repertory grid represents a finite system of cross references between entities and personal constructs (Kelly, 1963). Briefly, the technique is essentially a semi-structured interview which involves the gradual build up of a list of bi-polar constructs across areas of life or aspects of self (“elements”). The result is a “map of the construct system of an individual” (Fransella and

Bannister, 1977, p.3) from which the structure and content of the implicit 'theories' that, both consciously and unconsciously, guide our judgements can be explored (Fransella and Bannister, 1986). First, elements are chosen (either by researcher or participant) to represent the area in which construing is to be investigated. If, for example, personal construction of body weight and attractiveness were to be examined, the elements might consist of: a very attractive person, a slim woman, a slim man, me as I would like to be, me as I was 10 years ago, a tall woman, an overweight man, etc. Thus elements are aspects of a particular experience or domain and may involve people, relationships, facets of self, or any of these elements at different points in time, also situations, parts of the body, pictures, types of jobs etc. (Winter, 1992). The next step involves the derivation of the related constructs. The discriminant and bi-polar nature of constructs is of significance here as one's personal construct system is explored by considering the way in which two of the aforementioned elements are similar yet different from a third element (Kelly, 1963). The resulting response, expressed in bi-polar terms, is a construct and is added to the grid, or table. This is the standard procedure for eliciting bi-polar constructs and is known as Kelly's triadic method. There is nothing sacrosanct about the triadic method however, and with less intelligent participants, dyadic comparisons, or single element discussion can be used (Winter, 1992). Finally, the participant is then asked to assign a number (score) to each cell which represents how each element is regarded in terms of that construct (Gammack and Stephens, 1994). The resulting matrix can be used to determine the relationship between constructs (Fransella and Bannister, 1977). RGT is more akin to a conversation than a standard psychometric test despite its formal and mathematical structure (Fransella and Bannister, 1977). PCT guides the use of RGT and should not be divorced from its methodology

6.2 PCT in exercise research

There have been very few applications of PCT and the related RGT in the exercise and sport domains. Russell and Salmela (1992) used the repertory grid methodology in a single case study to relate different types of sport problems and experiences to the six major performance strategies habitually employed to rectify them. Furham, Titman and Leeman, (1994) examined the effect of exercise on women's perceptions of body shapes and their own body image satisfaction. Nine sketches of naked females shapes, ranging from anorexic to extremely muscular, represented the elements and were scored on ten constructs, or attributes derived in

pilot work using Kelly's triadic method. Jones and Harris (1996) used RGT as part of an evaluation of an exercise prescription scheme because of the failure of psychological measures such as self efficacy and optimism to predict compliance with such programmes. Their study aimed to establish whether participant's ratings of exercise constructs on a range of self and other elements could be used to predict compliance with the prescription and whether these ratings changed over the period of the programme. Elements included aspects of self, the self before and after the exercise programme, significant persons and fit or healthy others. Three constructs were also supplied to all subjects to ensure that the common areas of fitness, confidence and similarity to self were investigated in all interviews. A number of constructs were elicited which were strongly correlated with the supplied fitness construct: confidence, happy, attractive and motivated/intense. In conclusion, Jones and Harris felt that the repertory grid research revealed a wider range of variables which were linked to exercise and which some people expected to change in line with improved fitness. Jones and Harris believe that although such expectations may not be realistic they may not be taken into consideration by those who supervise such exercise programmes.

6.3 Personal construction, stages of change and self-determination

In a similar vein to the research of Jones and Harris this study investigates the world of exercise: perceptions of exercisers, beliefs about exercise and exercisers, the experience of physical exercise and the place of exercise in one's life. These beliefs will encompass societal and media images and those resulting from personal experience. In accordance with the experience corollary, which states that constructs are modified through experience over time, beliefs about, or construals of exercise are expected to change as one gains more experience of exercise, exercisers, exercise settings and the related physiological state. It is expected then, that one's construction of exercise and the self-exercise relationship will vary more distinctly across individuals with different commitments to exercise than among individuals with a similar interest in exercise. Therefore, personal construction of exercise should vary across the five stages of change for exercise behaviour. Research has found that decisional balance for exercise changes with stage of change such that the pros of exercising increase and the cons diminish as one progresses through the stages of change (Marcus, Rakowski and Rossi, 1992). In a similar way,

it is expected that personal construction of exercise would become more positive and exercise a more integral part of self as stage of change increases.

If our personal constructs are the goggles through which we regard the world around us then our self-determination for action is the vessel that conveys us through that world. Our underlying 'theories' about exercise, exercisers and physical activity are likely to affect our exercise motives and, therefore, to affect our underlying regulation of exercise behaviour. For example, a person who sees exercise as a relaxing recreational pursuit that 'gets them out of the house' may be more likely to be high in their level of self-determination for exercise behaviour. On the other hand, a person who sees exercise as requiring a lot of effort and commitment may be more likely to regulate his or her exercise behaviour more by guilt-avoidance and importance than by intrinsic enjoyment. Thus, those with similar levels of self-determination in the regulation of their exercise behaviour are likely to have similar constructions of exercise. The previous study has shown that self-determination for exercise increases from the contemplation to action stages of change. Similarly, it is intuitively appealing to suppose that perceived self-determination in the regulation of exercise behaviour is related to personal construction of exercise. Thus, level of self-determination may be uniformly altered by the goggles through which one sees exercise and other exercisers: how you see yourself with regard to exercise may be linked to how you regulate your exercise behaviour.

The following research questions guided the investigation of the relationship between personal construct theory and both stages of change and self-determination. This investigation is purely exploratory.

- Does personal construction of exercise change across the stages of change?
- Are there similarities in construal at each stage?
- Is there a link between personal construction of exercise and self-determination for exercise?
- What is the difference in construction of exercise between those with a high level and those with a low level of self-determination?

The remainder of this chapter presents the repertory grid technique (RGT) methodology as a basis for and background to the final study. A thorough understanding of the concepts involved and the options available is necessary for proper and appropriate application of RGT.

6.4 Repertory grid technique methodology

The RGT is derived from Kelly's (1955) role construct repertory test, the aim of which was to provide some insight into the way in which an individual construes their personal environment. A repertory test is used when the researcher is only interested in the content of the participants constructs; it terminates following construct elicitation. The grid form of the test (as implied in the name RGT) is used when the researcher is interested in examining the structure of a participant's construct system as well as construct content. There are a multiplicity of ways in which RGT can be employed and some are apparent in the previous brief review of pertinent literature. Principally, variations in RGT involve supplying some or all of the elements and/or constructs versus eliciting them from the individual participant. In the purest, qualitative form of the methodology both elements and constructs are supplied by the individual. When used as a simple quantitative product, both elements and constructs are supplied by the researcher allowing statistical comparison across individuals or groups. According to Fransella and Bannister (1977) the general argument is that elicited constructs can be used in a more structured way and more consistently than supplied constructs. There is considerable evidence that the constructs elicited from participants individually are more personally meaningful to them than are constructs supplied to them by the researcher (Addams-Webber, 1979). Furthermore, in eliciting constructs "there is no fear of being confronted with everlasting pages of an infinite personal directory (as) grids are delving into a limited repertoire of constructs which the subjects has available" (Bannister and Mair, 1968, p.158). It appears to be better, then, to elicit rather than supply constructs.

Strictly speaking, however, constructs cannot be 'supplied' because a construct is not just a verbal label. Kelly describes a verbal label as "a handy hook for carrying constructs about with" (Fransella and Bannister, 1977, p.133) and, as such, all that can be supplied is a label to which people attach their own constructs (Bannister and Fransella, 1986). Researchers must bear in mind that such supplied labels may carry a very different meaning for the participant than they do for the investigator (Winter, 1992). Familiarity with the verbal labels (constructs) and their centrality to the area of concern, therefore, are critical factors in the supply of constructs. Kelly's range of convenience rule is a principal rule of grid construction that underscores this point. It states that there is a finite number of elements to which a construct can be applied. Additional issues of concern for the repertory grid researcher are the nature of the elements to

be used, form of construct elicitation and determination of the opposite pole, the form in which the participant is to 'score' the matrix (ranks or ratings) and the method of analysing the grid data.

6.4.1 Defining the elements.

There are no limits to what constitutes an element or a construct; constructs and elements are interchangeable: "there is no such thing as an element that is *only* an element or a construct that is *nothing but* a construct" (Fransella and Bannister, 1977, p.11). There are two important factors that must be noted when selecting the type of element to be used in a grid. First, the elements must be within the range of convenience of the constructs to be used. For instance, older people should not appear among the elements involved in eliciting youth-of-today constructs. Second, elements must be sufficiently representative of the area under investigation otherwise they will be very difficult to interpret. If elements are not drawn with a clear purpose in mind, they merely produce statistical error (Winter, 1992).

6.4.2 Eliciting bi-polar constructs.

Kelly (1955) described six ways in which constructs can be elicited using the triadic method of construct elicitation. These include sequential presentation of elements (for example, having been presented with elements 1, 2 and 3, number 1 is removed and number 4 substituted for it and so on), the inclusion of the element 'myself' in each triad and the use of hypothetical scenarios in the presentation of elements. Typically individuals are asked how two elements are the same and different from the third; an ideal answer would supply both poles of a construct. It is common, however, for researchers to have to request the contrast pole because the participant does not supply it. In such cases Fransella and Bannister (1977) recommend utilising the word 'opposite' and referring specifically to the stated likeness. Individuals therefore, would be asked how two elements are alike and in what way the third element is the opposite of the stated likeness. It is important to elicit the construct opposite and not just the conventional opposite as the focus is on constructs and their interactions, not just verbal labels.

Kelly (1963) cites an example that was elicited from an element triad in order to illustrate the significance of the issue: "Mary and Alice have gentle dispositions but neither is as attractive as Jane" (p.117). On first hearing it would appear that the participant is evoking two

different constructs in order to avoid mentioning the bi-polar opposite of one of them and this would lead to interpretational problems for the researcher. The participant, however, may have in mind a single construct that functions as a gentleness-attractiveness continuum; the labels may have been linked through experience and never subsequently differentiated (Kelly, 1963). Jones and Harris (1996) found that some triads produced several constructs while later triads produced repetitious constructs. Individuals would often spontaneously generate both poles of the construct in one statement while on other occasions the researchers had to ask participants to give an opposite (Jones and Harris, 1996). If faced with repetition of constructs Fransella and Bannister (1977) advise encouraging variety. Fransella and Bannister (1977) also recommend that opposites be elicited for supplied constructs since this is part of the definition of the construct.

6.4.3 Scoring and analysis.

A qualitative content-analysis of constructs can be carried out following construct elicitation and this, in fact, is the only type of analysis that can be applied to repertory test data. The most commonly employed system of construct categorisation is Landfield's (1971) classification of construct poles in terms of 22 categories. This system classifies construct statements into categories such as self sufficiency, status, tenderness, imagination and external appearance. External appearance, for example, is classified as "any statement describing a person's appearance which may be either more objective or more subjective" (Landfield, 1971). Status is classified as "any statement wherein references are made to either status striving or to high prestige status symbols, or to lack of status striving or to low prestige status symbols" (Landfield, 1971).

The grid form of the technique requires the scoring of constructs by elements. The resulting matrix can then be statistically analysed. Fransella and Bannister (1977) outline two methods for scoring and analysing grid data: ranking and rating. In a rank order grid, all element cards are laid out in front of the participant. A card containing one elicited construct is placed in front of the participant and he/she is asked to name or point to that element which is best described by the construct. That element card is given a rank of one, then removed and the same question posed with reference to the remaining cards until only one remains. This process is repeated for all the construct cards and the rank orders are placed in the appropriate cells in the

grid matrix. In a rating grid, instead of ranking elements in terms of constructs each element is rated on a scale defined by the two construct poles. According to Shaw (1980) the ranking method contains 'hidden dangers' and is less commonly used than the rating method. The rating method also allows more flexibility in response than does the ranking method. If an element is beyond the construct's range of convenience the rating grid allows the possibility of not applying the construct by giving it a mid-point rating; this is not possible with rankings. When scoring the grid/matrix, whether using ranks or ratings, participants must be given the opportunity to say that an element does not apply if it lies outside their range of convenience for that construct.

Analysis of repertory grids is, in effect, an application of the commonality corollary, which states that similarity reflects similarity of psychological processes; people are similar with respect to certain events because they construe them in similar ways (Bannister and Fransella, 1986). Caution must be exercised in the application of this corollary and in interpretation of results; similarity of verbal labels does not necessarily imply similarity of construing. In the end the crucial factor is the interpretation of the analysis and the onus is on the researcher to find out "the level of *statistical significance* that is *psychologically significant*" (Fransella and Bannister, 1977, p.59, italics in original). Principal components analysis and cluster analysis are used to derive those components which explain the largest proportion of variance in the grid. The other constructs can then be plotted in terms of their correlations with these two components. Multidimensional scaling analysis can also construct a map of the locations of constructs relative to each other from the data contained in the grid matrix that specifies how different the constructs are. This can be done separately for each grid or for several different grids simultaneously. Although all these procedures can be carried out in standard statistical packages, such as SPSS, there are now many computer packages available to carry out principal components, cluster analysis or multidimensional scaling of grid data, for example, INGRID (Slater, 1972), CIRCUMGRIDS (Chambers and Grice, 1986), REPGRID (Shaw, 1980), FLEXIGRID (Tschudi, 1993).

The research that uses RGT is presented in the next chapter. Statistical analysis is carried out with the FLEXIGRID computer package and procedures for data collection and analysis are outlined in detail.

CHAPTER SEVEN

7. Personal construction of exercise across the stages of change:

The intrapersonal conflicts level of change.

This study explores the construction of the meaning of exercise by those at various stages of change for exercise and examines whether links can be made with the degree of self-determination evidenced in the regulation of exercise behaviour. Although repertory grid technique (RGT) is essentially individualistic and subjective, in this study grids will be compiled across stage of change and degree of self-determination. There are no explicit hypotheses. However, it was tentatively proposed that there would be some commonality between the constructs of those at similar stages of change, although each participant's grids will be largely based on different elicited constructs.

7.1 Pilot study

A pilot study was conducted with a small sample of regular ($n = 4$) and irregular ($n = 4$) exercisers to confirm the relevance, comprehensibility and clarity of a set of 12 predefined elements and the comprehensibility of the RGT methodology. Participants were solicited by a general request to postgraduate colleagues to assist in the development of a RGT methodology. None had prior knowledge of the methodology. Participants were informed that this assistance would involve a card sort task which would take approximately 15 minutes during which comments, complaints and suggestions would be openly encouraged. Four regular exercisers and four infrequent, or non-exercising individuals were interviewed. At the outset each was given the Stages of Change for Exercise Ladder to complete. Exercise was defined in the instructional set as "any type of physical activity you do to 'get some exercise'". Competitive sport as exercise was allowable by this definition. In addition, each participant was informed that for exercise to be considered regular he or she must have been exercising for a similar number of times per week continually for at least the past six months.

7.1.1 Elements and construct derivation

Prior to the pilot study twelve elements were derived and modified from those used and cited by Fransella and Bannister (1977), Smith (1995) and Jones and Harris (1996). Table 7.1 lists the three types of elements chosen. These elements were printed on individual cards from which constructs were elicited using the triadic method. In this form of elicitation, as previously described, participants are asked to pick three cards, study them, then suggest a way in which two of the elements are alike but the opposite of the third. Thus a bi-polar construct is derived. Because this is an unfamiliar procedure that is not straightforward for participants, an easier version of the task, in the form of two somewhat trivial examples, was used to familiarise participants with the methodology prior to construct elicitation from the element cards. First, individuals were presented with a sheet containing the names Margaret Thatcher, Tina Turner and the Queen. They were asked to consider the images that came to mind (occupation, dress, personality etc.) and say how they thought two of these people were alike and in what way the third person was the opposite of this stated likeness. It was expected that constructs referring to age, beauty or career would be suggested initially. To encourage focus on less superficial attributes a second example containing the words, Conservative, Labour and Liberal Democrats was presented, accompanied by the same instruction. It was expected that individuals would find this request more challenging and that constructs elicited would be less superficial.

Table 7.1. Elements supplied to individuals in pilot study

Self	Persons and feelings relevant to exercise	Significant others
Me now	A fit person	Mother
Me as I would like to be	A healthy person	Father
Me as I fear becoming	A regular exerciser that I know	Other people my age
Me in 5 years time	Feelings about exertion and being sweaty	Spouse, boy/girlfriend

Thereafter, approximately three or four constructs were elicited from the 12 element cards using the triadic elicitation method. The method of recording the resultant expression of comparison and difference on a table, or grid and the method of scoring each grid was explained to each participant. Each grid had the 12 elements (cards) listed along the top row and 11 blank spaces in the left hand column in which the bi-polar constructs were recorded. This grid was returned to the participants following construct elicitation in order for them to give each element (along the top row) a score based on each recorded construct in the left hand column as per the instructional set of the repertory grid. (see Appendix 3 for an example of a completed grid).

7.1.2 Pilot study results.

The elements 'me in five years time' and 'feelings about exertion and being sweaty' were found to be difficult to interpret; the elements 'Mother' and 'Father' were perceived to be redundant in the presence of one another; and finally the constructs implied by the elements 'a fit person' and 'a healthy person' hindered elicitation of further constructs. These elements were removed from the list. Additional elements were suggested by participants which, they felt, would more easily evoke more diffuse constructs: 'people in an aerobics class', 'my old school PE teacher', 'the Gladiators' and, as a counterbalance to the more familiar images, 'a well balanced person'. Table 7.2 shows the revised set of elements used in the main study. The 'Mother' and 'Father' elements were combined to form a single element: 'My parents: Mum or Dad' and 'Me as I was' was included in the self elements in acknowledgement of the contribution of past experiences to present constructions.

Table 7.2. The revised set of elements supplied to individuals in the main study.

Self	Persons/situations relevant to exercise	Significant others
Me now	A well balanced person	My parent(s); Mum or Dad
Me as I would like to be	People in an aerobics class	My old school PE teacher
Me as I fear becoming	A regular exerciser that I know	Other people my age
Me as I was	The Gladiators	My spouse, boy/girlfriend

7.2 Main study

7.2.1 Sample

20 females (M age = 35.4, SD = 9.6, range = 23 to 61) and 10 males (M age = 41.1, SD = 16.51, range = 24 to 74) were recruited from poster advertisements for 'points of view on active-types, sporty people and exercisers' which were sent to all the main non-academic departments at the University of Wales, Bangor (e.g. residential services, porters, careers, information services). Posters briefly outlined the nature of the interview (card task and short questionnaire), stated the expected duration of the interview (45/50 minutes) and informed interviewees that they would be paid seven pounds for their participation. The sample comprised clerical workers (19), professional workers (7) and postgraduate students (4).

7.2.2 Measures

Individuals were required to complete the Stages of Change for Exercise Ladder and the 15 item Behavioural Regulation in Exercise Questionnaire (BREQ). These are explained at length in chapters four and five.

7.2.3 Procedure

Interviews were time-tabled following telephone calls from interested individuals and were held in a small quiet room. Written informed consent was obtained from each participant prior to their interview (see Appendix 3). Individuals were told that the context of the interview was exercise, exercising people and beliefs about exercise and were also informed that the investigation was being conducted as part of my doctoral research. Following this the card comparison task was explained to participants using the two warm-up examples of Tina Turner et al. and the Liberal Democrats et al. as previously outlined. Participants then completed the stages of change for exercise ladder before returning to the card comparison task with the 12 element cards. The 12 cards were placed face down on the table and mixed about. Participants were asked to select three cards, consider the images derived by each and say how two were alike and how the third was the opposite of this. The recording of each expression of similarity and difference (bi-polar construct) on the grid and the participant's eventual scoring of the constructs and elements were explained. The recording of each construct was done in consultation with the participant to ensure that what was recorded on the grid summarised the

intended meaning. As often as possible the actual words used by participants were those recorded. However, consideration of likeness and contrast among card trios often resulted in elaborate and verbose explanations that contained several apparently different constructs. The ensuing discussions, involving requests for explanation, clarification and elaboration, were an integral part of the elicitation and recording process. Approximately ten constructs were elicited from each participant and this section of the interview took approximately 30 minutes.

Following construct elicitation the grid was returned to the participant who was asked (as per instructional set) to assign a rating of between one and five to each element listed along the top of the grid based on the elicited constructs. This took approximately 10 minutes. Participants were advised that if they deemed a construct to be irrelevant for a particular element they could leave the cell blank rather than give a score that was meaningless and unsuitable. The resulting missing data led to some computational problems and this is discussed at a later stage. Finally, participants were asked to complete the 15 item BREQ. All participants were thanked and paid their fee on completion of this questionnaire. A short debriefing followed which outlined the rationale for the study as a quest for deeper knowledge of peoples' beliefs about and attitudes to exercise and physical activity using a more individualistic methodology that was expected to provide a greater wealth of views than was typically gleaned from questionnaires. The expected existence of wide and varying points of view was stressed so participants did not leave the interview feeling that what they had said was somehow peculiar, or non-normal. Once a participant had left the interview room the salient themes expressed, the tone of the conversation (negative, positive, hopeful etc.) and any problems encountered in construct elicitation were immediately recorded. This information was used to confirm and substantiate the evaluations of the grid analysis output. This analysis is outlined below.

7.2.4 Quantitative analysis with FLEXIGRID

Each repertory grid was analysed separately using principal components analysis (PCA) within the specialised repertory grid analysis package FLEXIGRID 5.21 (Tschudi, 1993). Although principal component analysis is available on most mainstream statistical packages such packages only allow analysis of one correlation matrix from the grid. That is, one must choose between inputting a correlation matrix of elements or a correlation matrix of constructs; in either case there is substantial loss of grid information. FLEXIGRID, on the other hand, allows input of

both constructs and elements. It derives the principal components from a correlation matrix of constructs but can jointly plot elements and constructs on the resultant components based on their factor loadings. PCA is the only form of factor analysis available in FLEXIGRID. A two-dimensional principal component solution was computed from the construct correlation matrix using the eigenvalue >1 criterion, and the plot of VARIMAX rotated components constituted the interpretational basis of each grid. Examples of such plots can be seen in Figures 7.1 and 7.4. PCA does not always lead to an interpretable solution and constructs may have high loadings on both components. Therefore, an orthogonal rotation procedure was performed to increase interpretability by forcing the two components to load high on some constructs but low on others. VARIMAX rotation is the only form of rotation available in FLEXIGRID

Only those constructs which were clearly discriminated by the principal components were used to interpret the components. A criterion was devised: constructs required loadings of greater than .75 on one component and of less than .20 on the other. No attempt was made to label these principal components as this would involve the application of a higher level researcher-based construct to another's construct system. Interpretation of these components required corroboration with the construct correlation matrix, the percentages of variance accounted for by constructs and elements and the FLEXIGRID index of the distance (DIST) of each element and construct from the centre of the plot, or origo. Distance from the origo is indicative of the usefulness, or meaningfulness of a construct or element: those close to the origo are peripheral to the construct system while those farthest away are more central and, thus, a more meaningful part of the construct system. The relationship between elements and constructs was determined within each quadrant by their relative proximity and their distance from the origo. Plots were transposed at the computation stage so that the most positive factor scores would always be the top right quadrant while the most negative factor scores would always be the bottom left. This was done without any loss or transformation of data.

7.2.4.1 Teaching Appraisal by Repertory Grid Elicitation Technique (TARGET).

A self evaluation analysis, developed by Keen (1979), is included in the PCA output. The analysis is formally known as the Teaching Appraisal by Repertory Grid Elicitation (TARGET) and grew out of Keen's long-standing interest in teacher evaluation. The aim of a TARGET evaluation is to make explicit certain aspects of an individual's world that have been submerged

by other analyses, such as PCA (Tschudi, 1993). Prior to running the FLEXIGRID PCA programme three elements must be designated typical, ideal and worst elements. These elements are then plotted in bar chart form (using the rotated factor loadings) on the positive and negative poles of the two principal components. In this study the elements 'me now', 'me as I would like to be' and 'me as I fear becoming' were designated the typical, best and worst elements respectively. Ideally, 'me as I fear becoming' (or worst element) should feature strongly on the negative part of a component while 'me now' and 'me as I would like to be' (the typical and best elements) should feature strongly on the positive end. Thus, in true Kellyan form, self is evaluated according to one's own criteria (Tschudi, 1993). TARGET bar chart outputs can be seen in Figures 7.1, 7.3, 7.5, 7.7 and 7.9.

7.2.4.2 Missing values.

Kelly's range of convenience corollary states that a construct is relevant only for a finite range of events. The grid scoring procedure, therefore, allowed participants to ignore any elements that they deemed to be irrelevant to, or inappropriate for a particular construct. This resulted in a small proportion of missing data in several grids which is problematic in FLEXIGRID PCA. Missing values prevent the complete description of the data by correlations and thus the accurate summarisation of the linear combinations with PCA. Although the majority of grids with missing data lacked just one or two cells, other than remove the entire construct, resulting in much loss of data, the only other option was to substitute the construct mean score for these more random missing cells. However, in three cases particular elements had several missing values indicating that the element may be more systematically irrelevant for several constructs. These elements were deleted prior to PCA. Similarly, in four cases one construct appeared to be irrelevant to several elements (and in one of these cases two constructs were deemed irrelevant). These constructs were deleted.

7.2.5 Qualitative evaluation and content analysis

Following a summary of the quantitative key points of each PCA plot and TARGET a more subjective and qualitative evaluation took place. The meaning of the relative proximity of constructs and elements on each plot was interpreted and deciphered in the light of the TARGET output and corroborated by the post-interview notes. A synopsis of the quantitative

results and bi-polar principal components, the qualitative discussion of results and a summary of post interview notes was compiled for each grid and comprised approximately two sides of A4 paper. These summaries were then sorted by stage of change and a content analysis was conducted on the principal components.

Initial piloting of Landfield's (1971) construct classification system with the current data was not satisfactory. Landfield devised 22 categories for classifying construct poles each of which is illustrated with numerous examples. For example "Organisation (high or low): Any statement denoting either the state of or processes of structuring, planning or organising, or the opposite. The statement should indicate that person either has or lacks a general trait of structuring, organising or planning ability, or can be described as organised, structured, disorganised or unstructured"; "Tenderness (high or low): Any statement denoting susceptibility to softer feelings towards others such as love, compassion, gentleness, kindness, considerateness, or the opposite." Many of these categories were found to be irrelevant for the type of principal components elicited in this study and many additional categories would have been required to adequately classify the principal components. Jones and Harris (1996) employed Landfield's classification system and found that only six of the 22 categories were relevant to the constructs elicited, thus they added an additional two categories (fitness and health, and weight) to enable more accurate classification. Only five of Landfield's categories were found to be relevant to the current data but were deemed to be too all-consuming. That is, apparently different constructs were, by necessity, classified under the same heading, thus obscuring the more subtle differences between them. In all, content analysis with Landfield's classification system did not appear to yield any insightful or meaningful information.

As a result an independent system of classification was devised for this study. Principal components were grouped according to similarity of content and new groupings were devised as required to represent the views expressed. This was achieved for each stage of change by noting down an initial bi-polar principal component, deciding whether a subsequent principal component expressed a similar point of view to the previous one and either noting this next component underneath the previous one, in order to form a content grouping, or noting it alongside, in order to form a separate grouping. The categorisations were then clarified and labelled. The themes from the quantitative summary and post-interview notes were noted for

each stage but were not subject to a content analysis. Categories and themes were compared across the stages of change for similarities and differences in breadth of content.

7.2.6 Construal of exercise and self-determination

An index of self-determination, the Relative Autonomy Index (RAI: Ryan and Connell, 1989) was calculated for each participant as outlined previously. RAI scores were compared across stage of change with a Kruskal-Wallis one-way ANOVA and Mann-Whitney follow-ups. The lowest possible RAI score from the BREQ is -12.00 and the highest is 12.00. The summaries of quantitative and qualitative research were sorted by RAI score and divided into three broad groups: low (-12.00 to 5.00), moderate (5.00 to 8.00) and high (8.00 to 12.00). The summaries were then categorised into the classifications derived from the previous content analysis of principal components by stage of change.

7.3 Results

Three individuals were in the precontemplation stage of change, six in contemplation, seven in preparation, four in action and ten in maintenance. Two principal components were derived from each grid and accounted for a mean percentage of variance of 51.90% (SD = 12.62; range = 35.51% to 89.21%) and 27.12% (SD = 7.23; range 14.67% to 39.53%) respectively. Together they accounted for an average of 77.21% (SD = 5.95; range = 66.24% to 89.52%). Although research questions were examined with aggregated data, an example PCA plot and TARGET bar chart (taken directly from the FLEXIGRID output) and interpretation is presented from each stage of change order to indicate the nature of the constructs elicited, the output obtained and the way in which this output was interpreted and evaluated. There was great variety in the constructs elicited within each stage of change and those presented were chosen for their representativeness, in terms of constructs elicited, and for their comprehensibility, in terms of the clarity in and balance of the principal component plots and TARGET outputs. All names have been changed to maintain anonymity.

7.3.1 Example 1: Ron in the precontemplation stage of change

Ron is a non-exerciser aged 34. He suffers with arthritis of the spine and is required by the hospital physiotherapists to do daily spine mobility exercise to prevent increasing spinal rigidity. He is completely mobile and would benefit from doing physical activity in addition to the recommended exercises. Ron, however, strongly dislikes exercise and cannot understand why anyone would freely want to exercise. Two components were extracted from Ron's data and can be seen in the TARGET self-evaluation bar chart (Figure 7.1). Components accounted for 36% and 33% of the variance respectively. The horizontal bars in Figure 7.1 represent weighted sums of raw scores on the same scale as used in grid scoring and are evaluated by their rating on either the positive or the negative pole. The bar chart shows us that Ron is how he would like to be in being free to chose whether or not to partake in exercise, in not being serious about it or caught up in it and not wanting to get sweaty or to exert himself. Although he is currently apathetic about exercise, he fears becoming the opposite of this: obsessed with exercise. The two-dimensional plot of Ron's exercise constructs and the supplied elements is shown in Figure 7.2.

Figure 7.1. TARGET output for Ron, precontemplation.

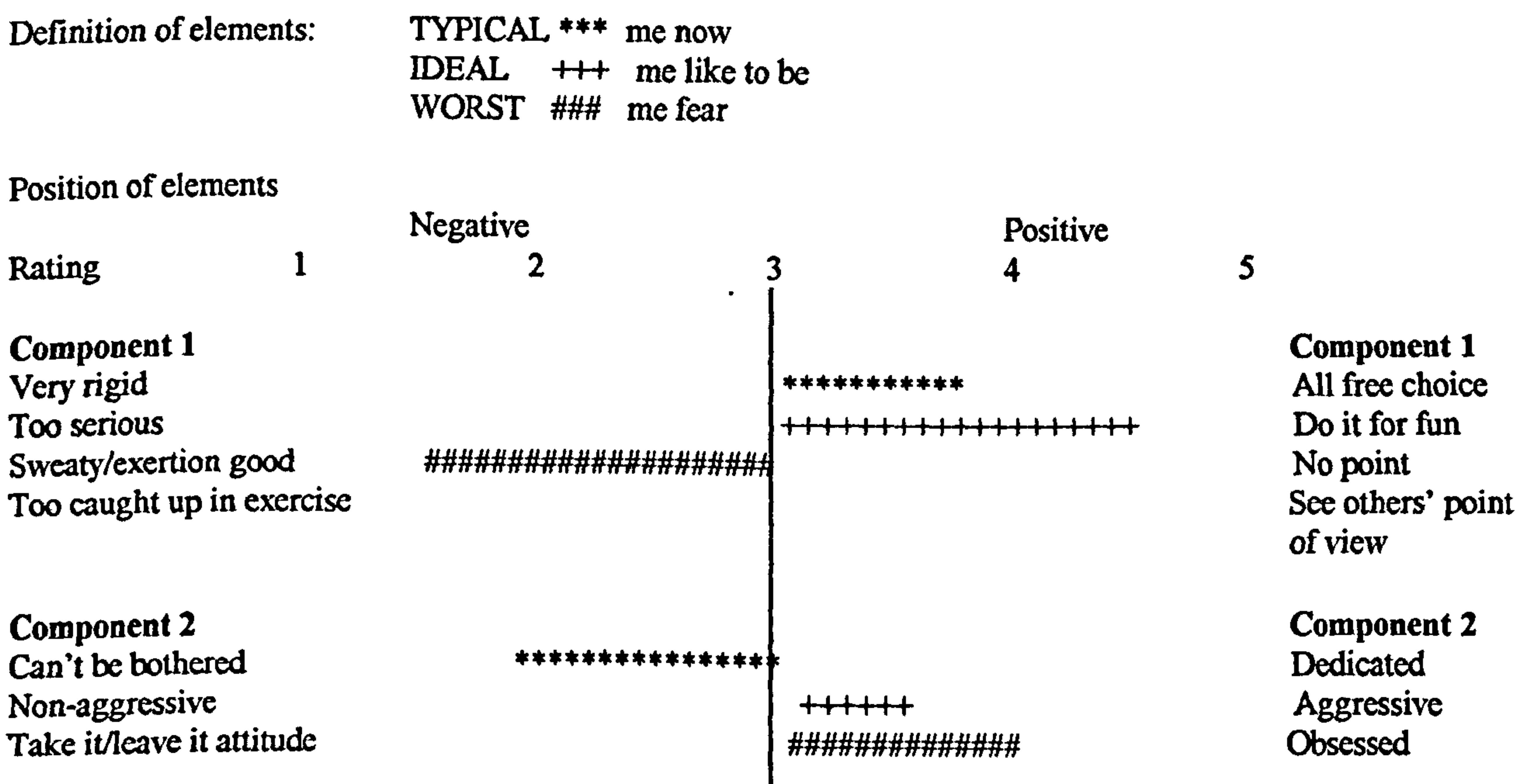
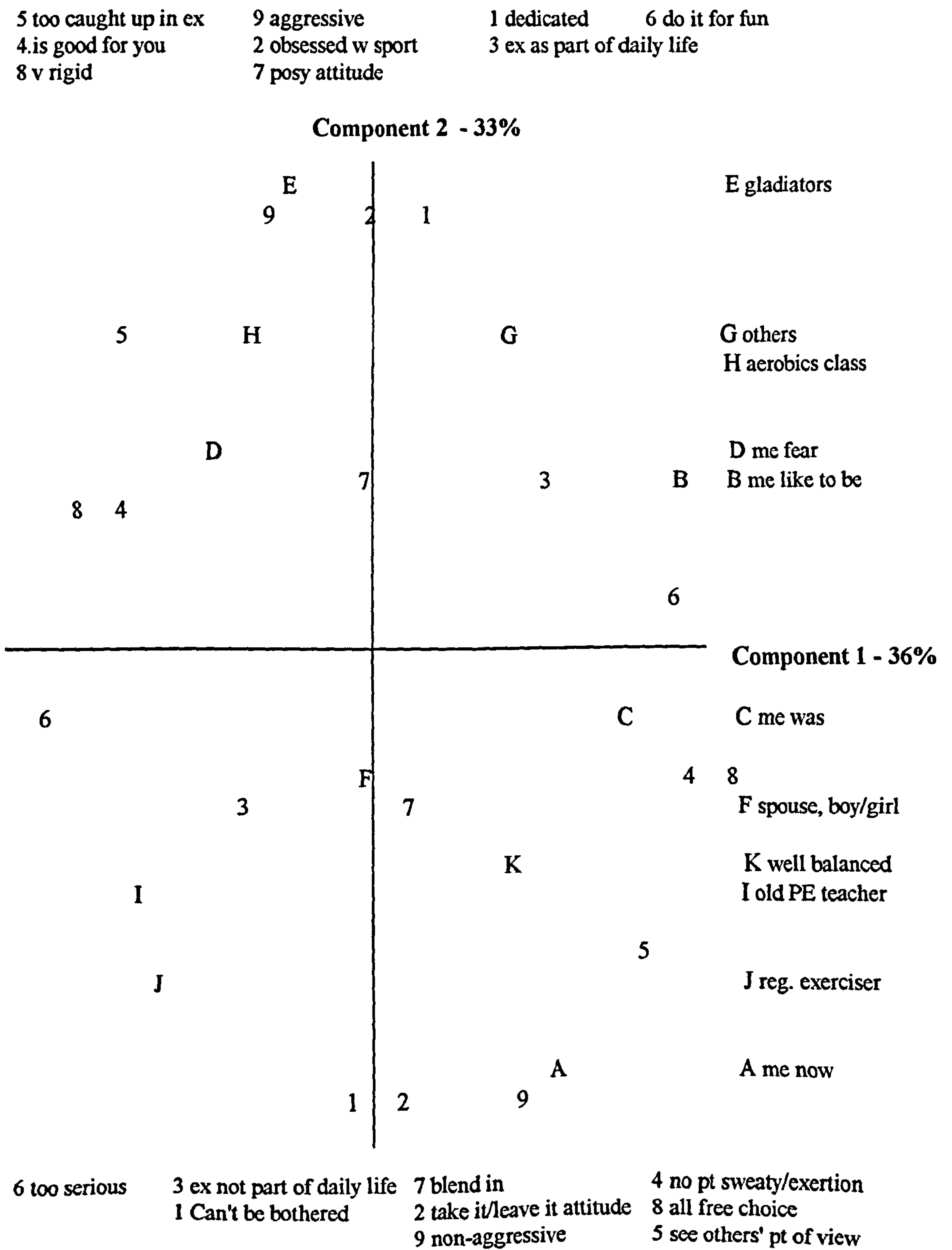


Figure 7.2. Principal component plot of rotated constructs and elements - Ron, precontemplation

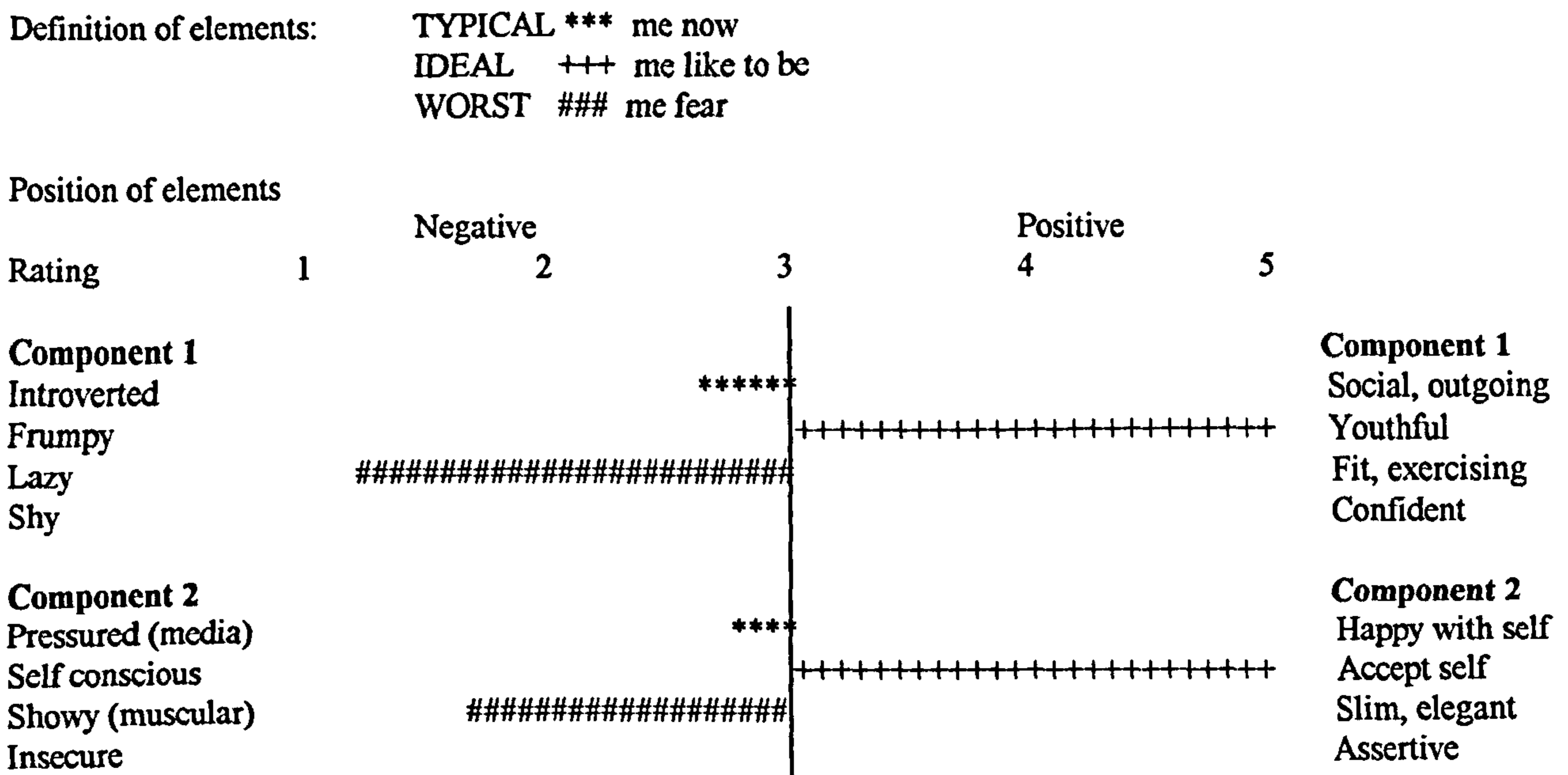


In Figure 7.2 the orthogonal axes represent the two components. Constructs are represented by the numbers 1 to 9 and elements by the letters A to K. The top left quadrant shows that Ron views the Gladiators (E) as aggressive and obsessed with sport and he fears becoming (D) like people in aerobics classes (H): too caught up in exercise, very rigid, believing exertion and getting sweaty are good things and having a posy attitude. Progressing clockwise, we see that Ron would like (B) to see exercise as a part of daily life as opposed to a chore (reflecting his having to do exercises for his arthritis) and he thinks other people his age (G) also have this view. Ron now (A) has a take-it-or-leave it attitude to exercise and does not perceive himself to be an aggressive type of person. He also (now A and in the past C) believes in free choice, in seeing others' points of view and does not see the point in physical exertion and getting sweaty. He views these beliefs as characteristic of a well balanced person (K). Finally, the bottom left hand quadrant shows us that Ron sees a regular exerciser that he knows (J) and his old school PE teacher (I) as being too serious about exercise and not incorporating it into their daily lives. The element spouse, boy or girlfriend (F) is close to the origo and may not be a relevant one for Ron.

7.3.2 Example 2: Helen in the contemplation stage of change

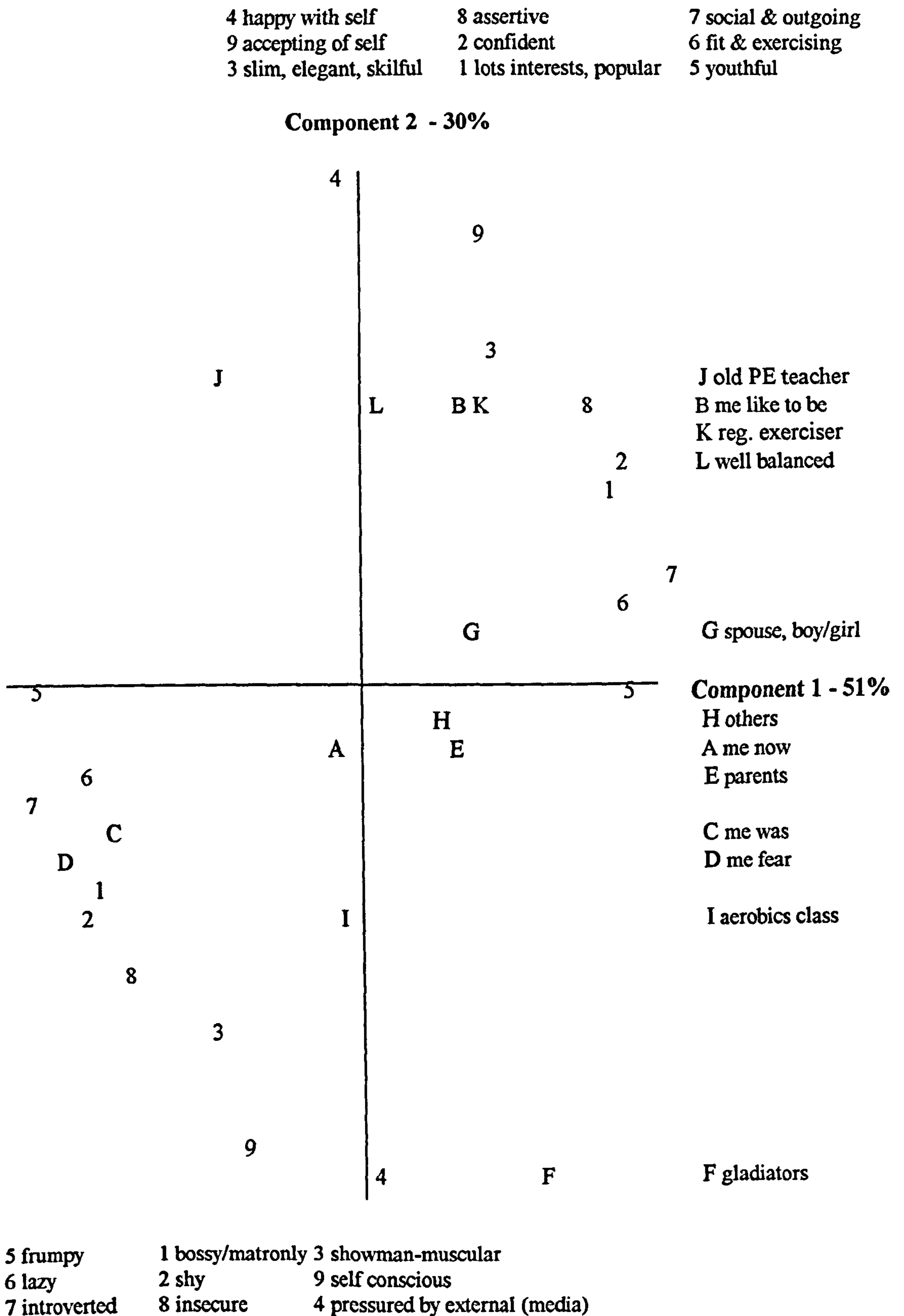
Helen, aged 33, is thinking about starting to exercise in the next six months. Two components were derived from the grid data the content of which can be seen in the TARGET output in Figure 7.3 below. They explained 51% and 31% of the variance respectively. We can see from the TARGET output that Helen has a strong fear of becoming introverted, frumpy, shy and lazy and unfortunately she feels somewhat like this at the moment. She would very much like to be a social, outgoing, youthful, confident and exercising person. Helen also believes that she manifests a little of what she fears becoming: pressured by media images and self-conscious. Helen would like to be assertive and slim, elegant and skilful, happy with and accepting of herself. It would appear that her main psychological barrier to exercise is her view that all exercisers are confident and out-going; she feels she is neither.

Figure 7.3. TARGET output for Helen, contemplation.



The plot of the relationship between her constructs and the elements can be seen in Figure 7.4. In the top right quadrant the elements 'well balanced' (L), 'me as I would like to be' (B) and 'a regular exerciser that I know' (K) are adjacent and therefore related, and are particularly close to the constructs 'slim/elegant/skilful', 'assertive', 'confident' and 'lots of interests/popular'. Accepting of self sits above this cluster. Helen would clearly like to possess these attributes and sees them as belonging to a regular exerciser (K) and a well balanced person (L). The clustering of the constructs social and outgoing, fit and exercising and youthful echoes a similar theme derived from TARGET. The proximity of the elements 'my spouse, boy/girlfriend (G)', other people my age (H)', 'my parents (E)' and 'me now (A)' to the origo indicates that they are peripheral to her construal of exercise. The bottom left hand quadrant is a reflection of the constructs in the top right hand quadrant. It contains the negative aspects of these constructs along with the elements 'me as I was (C)' and 'me as I fear becoming (D)'. Helen does not want to become how she perceives that she was in the past: bossy and matronly, shy, introverted, lazy, insecure and frumpy. The constructs 'showman/muscular' and 'self conscious' lie outside this cluster and therefore are not so strongly related to these elements.

Figure 7.4. Principal component plot of rotated constructs and elements - Helen, contemplation.



7.3.3 Example 3: Jill in the preparation stage of change

Jill, aged 35, exercises a little but not regularly. Two components were extracted from her grid data and their constituent constructs are listed in the TARGET output in Figure 7.5. The components explained 41% and 34% of the variance respectively. Jill currently sees herself becoming what she fears: physically introverted, too eager to please and likely to die from lung cancer (because of smoking). She would like to be more confident, to be more outgoing with regard to her body and to give up smoking. She would also like to be more open minded, more at peace with herself and use her common sense more. Although she feels that she is very much like this at the moment she has a strong fear of becoming the opposite: narrow minded, restricted by social norms and lacking sense.

Figure 7.5. TARGET output for Jill, Preparation.

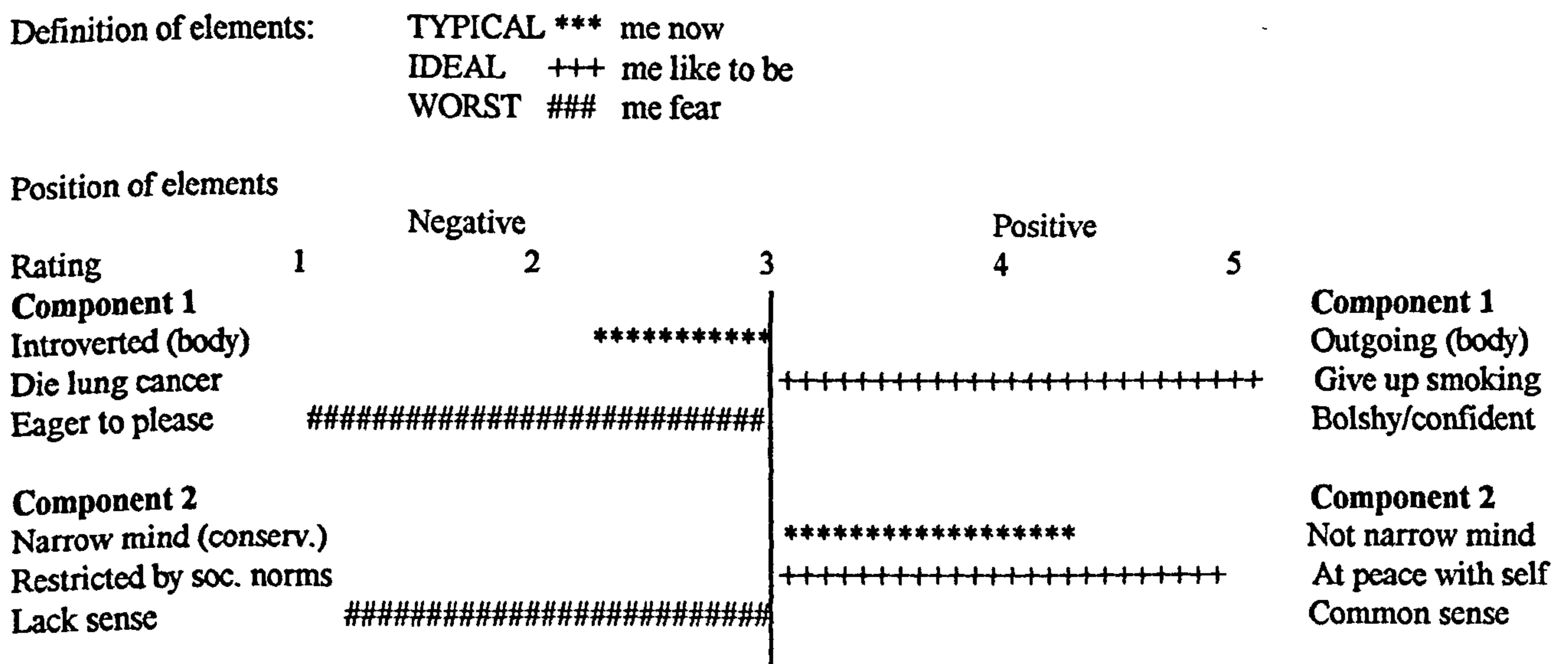
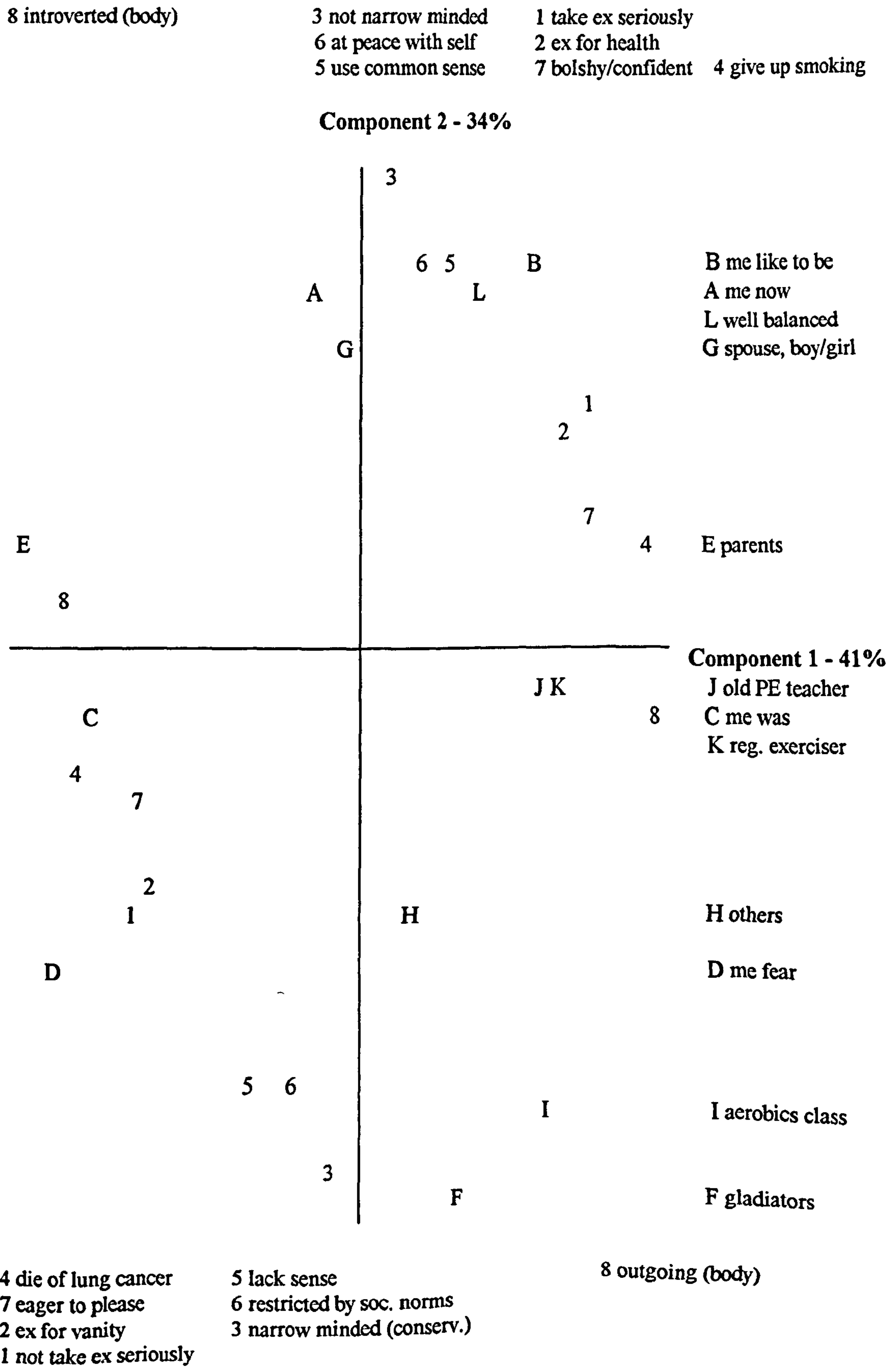


Figure 7.6 illustrates the plot of Jill's constructs and supplied elements. Beginning in the top right hand quadrant and progressing clockwise we can see that the elements 'well balanced person' (L) and 'me as I would like to be' (B) are clustered with the constructs 'not narrow minded', 'at peace with self' and 'use common sense'. This is in keeping with the TARGET output and also tell us that this is how Jill views a well balanced person. Taking exercise seriously and exercising for health are adjacent and close to bolshy/confident and giving up smoking. Jill's old school PE teacher (J) and a regular exerciser that she knows (K) are outgoing with regard to their bodies as are other people (H), people in an aerobics class (I) and the gladiators (F). Lack of confidence, then, appears to be a main barrier to Jill's taking more regular exercise; exercise images are associated with confidence while she feels she lacks confidence.

Smoking is also a big barrier to regular exercise for her and dying of lung cancer a big fear. Jill also fears reverting to how she used to be: eager to please, exercising for vanity and not taking exercise seriously. Lacking sense, being restricted by social norms and being narrow minded are closely related characteristics that Jill also fears developing. It appears from the final quadrant that Jill's lack of confidence in her body may be linked to her parents whom she closely associated with being introverted. She believes that her spouse shares her views and attributes and although the relationship between these elements and her personal constructs is unclear from the plot, the TARGET output tells us that Jill believes that she is not narrow minded, uses her common sense and is at peace with herself.

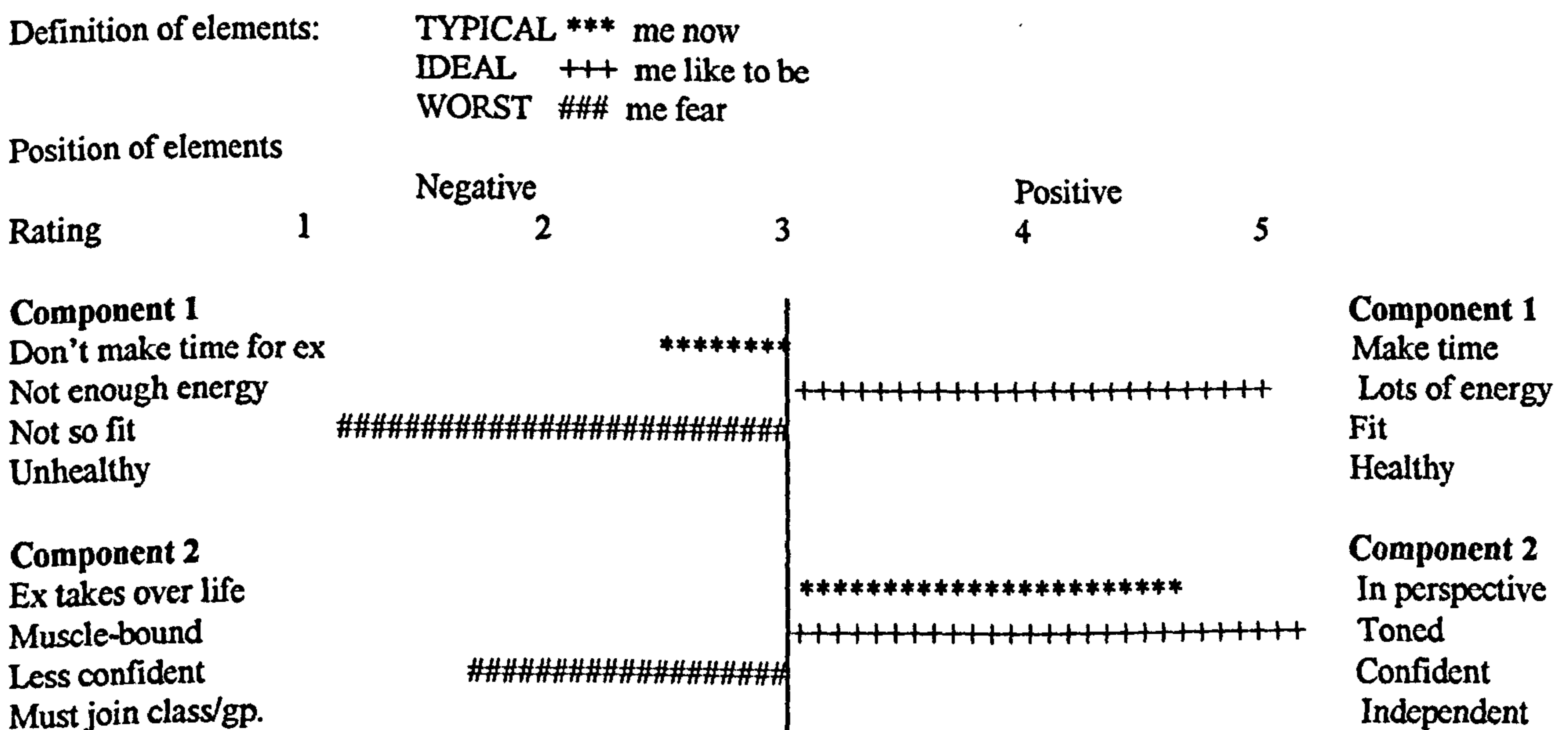
Figure 7.6. Principal component plot of rotated constructs and elements - Jill, Preparation.



7.3.4 Example 4: Jenny in the action stage of change

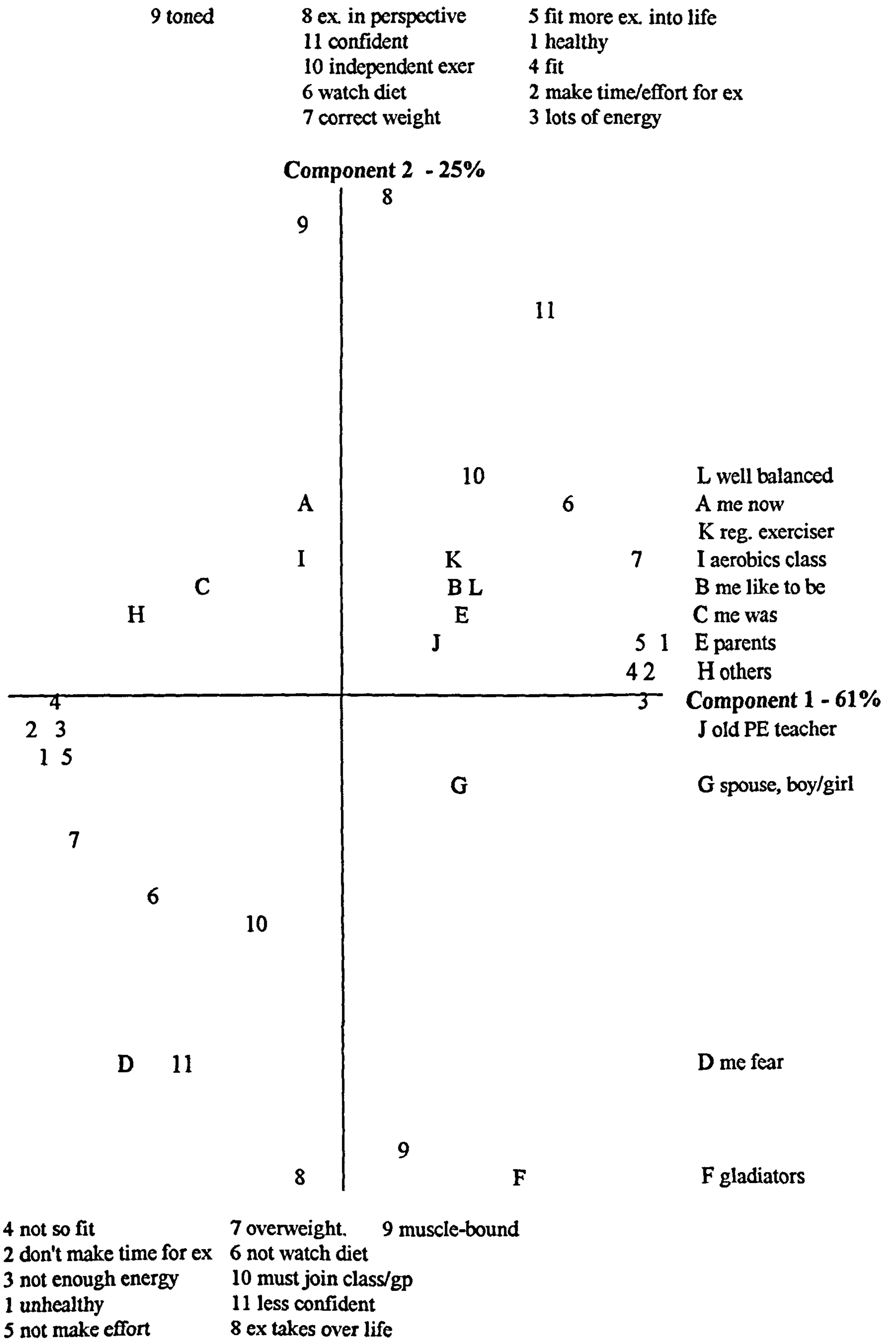
The two components extracted from Jenny's data accounted for 61% and 24% of the variance respectively and can be seen in the TARGET output in Figure 7.7. This output shows us that Jenny, aged 40, feels that she does not make enough time for exercise, often lacks energy and is not as fit or healthy as she would like to be. She strongly fears a worsening of this state of affairs and would very much like things to be to the contrary; make more time/effort for exercise, have lots of energy and be fit and healthy. On a more positive note, Jenny's believes that she keeps her need for exercise in perspective (it does not rule her life), she feels confident, she believes her body is well toned and she is not dependent on exercise classes or groups for her exercise needs. Post-interview notes reveal that Jenny believes that exercise is hugely important at middle age so that one can enjoy a healthy retirement. She would like to have more time to exercise but does see the danger of becoming too caught up in exercise programmes and feeling that she 'has' to exercise.

Figure 7.7 TARGET output for Jenny, Action.



Moving to the plot, Figure 7.8, and beginning in the top right hand quadrant in the plot we can see a tight cluster of elements and a tight cluster of constructs. A regular exerciser that she knows (K), how she would like to be (B), a well balanced person (L) her parents (E) and her old school PE teacher (J) are closely grouped and therefore perceived as similar. The constructs 'right perspective' and 'independent exerciser' are close by and clearly represent these elements. Closely clustered together near the component 1 axis are the constructs 'fit more exercise into life', 'healthy', 'lots of energy', 'fit' and 'make time/effort for exercise'. The negative aspects of these constructs are similarly bunched on the far end of the same axis in the opposite quadrant. They share the quadrant with the 'fear becoming' element and the constructs 'overweight', 'not watch diet' and 'less confident'. The remaining quadrants offer little in the way of explanation of the data however and this may be due to the fact that the first component accounted for 60.85% of the variance in the grid data. This indicates a simple rather than complex construction (Tschudi, 1995) and has resulted in the clustering of the majority of constructs and elements into two quadrants. Under such conditions a two-dimensional plot illustration of the data does not appear to facilitate evaluation and interpretation. In addition, nine of the twelve elements are positioned rather close to the origo; only the gladiators (F) me as I fear becoming (D) and other people my age (H) appear to be useful elements in her exercise construct system. This example highlights the importance of using an additional form of analysis, in this case the TARGET self-evaluation, in order to evaluate the data.

Figure 7.8. Principal component plot of rotated constructs and elements -Jenny, Action.



The TARGET information is supported by the plot in Figure 7.10. Beginning in the top right hand quadrant we see that a regular exerciser that Caroline knows (K), her spouse, boy/girlfriend (G), how she would like to be (B) and how she sees herself now (A) are working at their own pace, happy, confident about their fitness, encouraging and eating sensibly. These people share similarities with her view of a well balanced person (L): happy with his or her weight, fit, healthy and well. Progressing clockwise we see that other people her age (H) and the gladiators (F) are perceived as being concerned with trying to improve their image, while her old school PE teacher (J) and people in an aerobics class (I) are perceived as being fitness fanatics who believe that their worth is in their looks. This emphasis on exercise for image enhancement and weight control is contrary to Caroline's philosophy on exercising for health. Caroline fears (D) having health problems, being diseased and not eating sensibly ('anorexics') and was (C) this way in the past. A lack of confidence in her fitness and downgrading rather than encouraging others would make her miserable. Finally, she sees her parents (E) as happy with themselves, as loving her for what she is and being overweight. However given the distance between this element and those constructs the interrelationships are not strong.

Figure 7.10. Principal component plot of rotated constructs and elements - Caroline, Maintenance

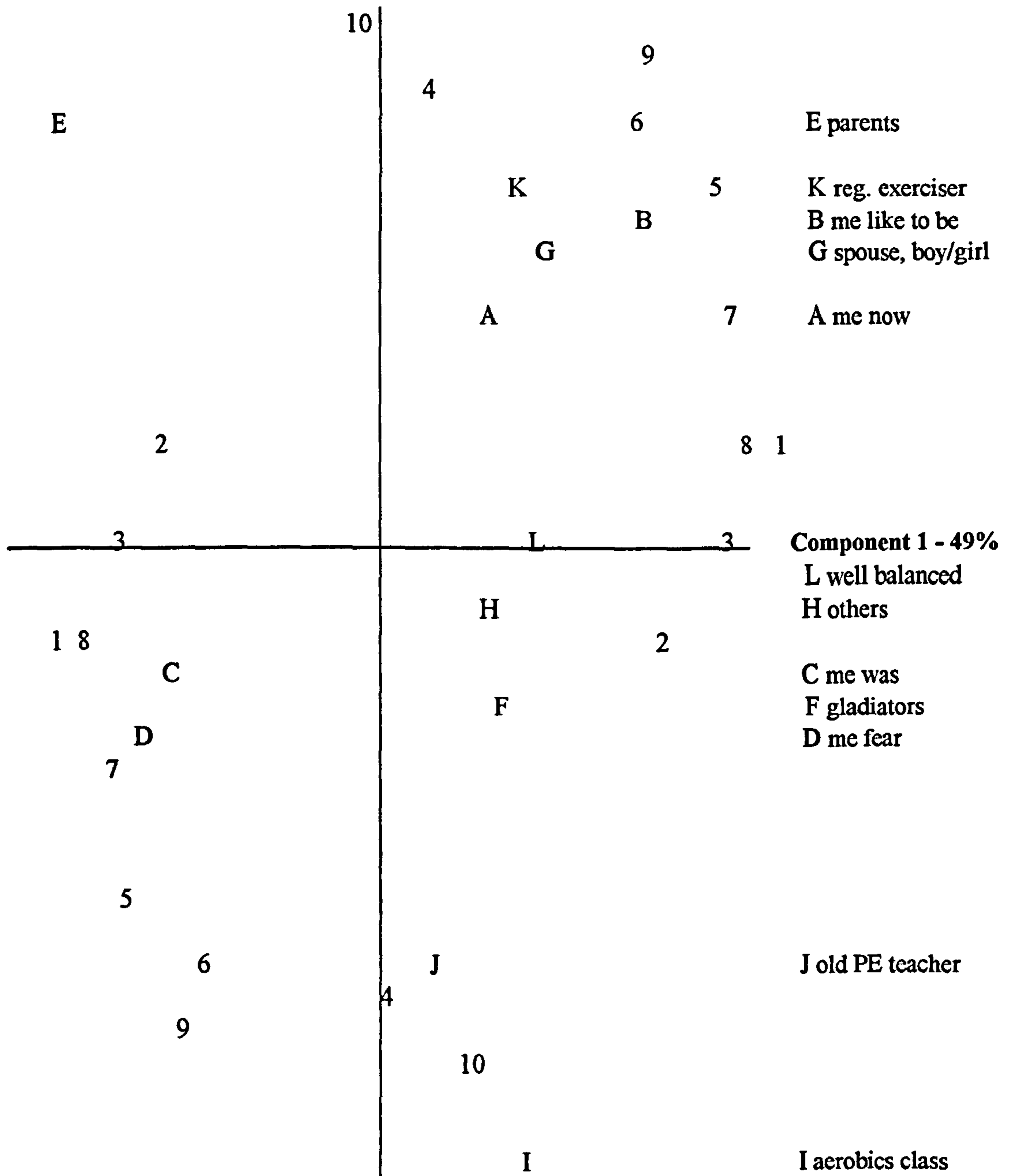
2 happy with self
3 overweight

10 love me for what I am

4 working at own pace
9 happy
6 confident (fit)

5 encouraging
7 sensible eating
8 fit & healthy
1 healthy & well

Component 2 - 27%



Component 1 - 49%
L well balanced
H others

C me was
F gladiators
D me fear

J old PE teacher

I aerobics class

1 health probs
8 diseased
7 'anorexics'
5 downgrading

6 lack of confidence
4 fitness madness
9 miserable

10 love me for looks

3 happy with weight
2 trying to ↑ image

7.3.6 Stage of change and construal of exercise

Principal components from each grid analysis were grouped by stage of change and five categories of construct were identified following content analysis. These were labelled personality, exercise philosophy, body, energy and balance. References to fitness and health were relatively uncommon and merely expressed the obvious fit/unfit, healthy/unhealthy dichotomy. The personality category referred to factors such as stress (e.g. clear minded / nerves jangling), mind-set (narrow minded and conservative / adventurous), sensitivity (e.g. insensitive and bossy / sensitive and caring,) power (e.g. powerful and challenging / grey and fading) and confidence (e.g. over-confident / happy and normal confidence). The exercise philosophy category referred to expressions of deep felt preferences for or beliefs about particular modes of exercise (e.g. single exerciser / team orientated; indoors / outdoors) and about exercising characters (e.g. a fake / genuinely sporty; exercise for sweat / exercise for enjoyment). The body category contained references to body shape and size (e.g. right weight / overweight; big and muscular / strong and slim). The energy category contained references to motivation for exercise (e.g. lack own motivation / have inner drive), activity level (e.g. active / vegetative; lazy / making good use of time) and time pressure (e.g. have time for exercise / guilty no time). Finally, the balance category contained reference to having or not having balance in one's approach to exercise (e.g. exercise as a 'god' that takes over your life / right perspective; serious and competitive / light hearted). These categories were compared across the stages of change for similarities and differences in breadth of content. It is important to note that the subjective nature of the data means that the categories are not definitive and their composition varies somewhat across stages.

Construals of exercise appeared to be more alike than different across the stages; there was as much variation in constructs within stages as there was across stages. However, those in maintenance uniquely expressed strong preferences for particular modes of exercise (exercise philosophy). This is to be expected given that they have been exercising for at least six months during which time they will have developed favoured modes of exercise. Reference here to mode of exercise does not simply refer to a preference, say, for swimming over cycling, rather, it refers to a preferences for indoor versus outdoor activity, or organised versus self-directed exercise. Although there was no predominant preference within the group, the expression of any preference is itself notable because there were no such expressions in the other stages and

because maintenance comprised the largest stage grouping and thus had the largest scope for diversity in construal. There was also a notable lack of reference to time pressure within the maintenance stage. Reference to lack of free time for exercise, or to being too tired or too busy for exercise were common in the action and preparation stages. In the preparation stage constructs categorised as constituting 'exercise philosophy' differed from those in the maintenance stage in that they referred to attitude to, or beliefs about exercisers rather than preferences for particular types of exercise. Constructs such as standing out versus blending it, doing things for show versus doing things for self and being genuinely sporty versus being a fake comprised this exercise philosophy category. References to personality variables were common and similar across all stages. For example, with regard to the sub-category power, those in maintenance spoke of being challenging versus being grey and fading, those in action of being versus not being personally confident, those in preparation of being outgoing versus being introverted and those in contemplation of being accepting of self versus being self conscious and finally those in precontemplation mentioned aggression and lack thereof. Reference to body shape and size were common in all but the precontemplation stage (the sample size of three is likely to be the explanation for this rather than the unimportance of constructs of body shape and size). Balance, or lack thereof, in one's approach to exercise featured across the stages. References to being too serious about exercise appeared in all stages: fanatical / not bothered, (precontemplation stage), too focused / balance, serious and competitive / light hearted, obsessive / natural outlook (contemplation), obsessional / go with the flow, easy going / driven (preparation stage), exercise take over life / right perspective (action) and addicted / easy going (maintenance).

The themes recorded in qualitative summaries and post interview notes were also compared across stage to determine whether or not there were any threads of commonality in construal of exercise across the stages of change. Themes appeared to move from an actual dislike of exercise in the precontemplation stage (e.g., exercise is far too energetic, you're fighting nature and there's no point), through expressions of a wish for more motivation and push to take more exercise in the intermediate stages (e.g., lack the will power and drive to keep up an exercise regime), to extolling the physical and mental benefits of exercise in the maintenance stage (e.g. exercise makes you feel strong, empowered, confident). Those in maintenance expressed the wish to avoid seeing exercise as a chore, slipping into a routine and

becoming obsessive about it. Those in contemplation seemed particularly concerned with the physical barriers to exercise (lack of time, lack of facilities and lack of exercising friends), while those in preparation were more aware of the motivational barriers (lacking in willpower, drive and 'push'). Finally, the three individuals in precontemplation are united in their lack of interest in exercise: they cannot be bothered with it and could not see what all the fuss was about.

7.3.7 Self-determination and construal of exercise

Results summaries were sorted by RAI score into low (-3.00 - 4.83) moderate (5.17 - 7.50) and high (8.17 - 11.25) groups. Both previous and current studies found that it is relatively unusual to attain a negative RAI score hence the unequal range of scores across groups. It was clear from looking at the spread of RAI scores across the stages that self-determination does not necessarily increase with increasing stage of change. Preparation had the biggest range of RAI scores (.50 to 11.25) and also the highest score of all (11.25: see Appendix 3). Table 7.3 shows the mean (SD) RAI score for each stage of change and overall these means significantly differed across the stages ($\chi^2_4 = 9.51, p < .05$). However follow up tests with an adjusted alpha (.01, 1-tailed) found that only maintenance was significantly greater than precontemplation and action greater than contemplation.

Table 7.3. Mean (SD) RAI score for each stage of change.

Stage of change	Mean (SD)
Precontemplation	.19 (2.82)
Contemplation	3.75 (4.60)
Preparation	6.50 (3.54)
Action	7.87 (1.46)
Maintenance	7.69 (2.68)

Principal components were categorised into one of the five categories derived from the previous stage specific content analyses (philosophy, personality, body, energy and balance categories) and the content of each category was then compared across the low, moderate and high levels of RAI. The themes from the quantitative summary and post-interview notes were also compared across each RAI grouping. There was clear variation in the principal components derived across the RAI groups with regard to the 'philosophy' category. The high RAI group expressed clear preferences for mode of exercise - some preferred independent, outdoor fitness activities, others preferring organised, indoor classes - and had clear underlying principles which guided them in their actions (e.g. aspire to own goals, adventurous, variety in life). Those with moderate to high levels of RAI also had a clear underlying doctrine (e.g., keep fit as a virtue, exercise for leisure, keep variety in life, not be set in my ways). While those with moderate-low RAI did not directly express preferences or principles concerning exercise, many constructs implied underlying fundamental beliefs. For example, showy / do something without a fuss, competitive and performance driven / self driven, love me for what I am / love me for my looks. There was no expression of deep rooted preferences or principals among those with low RAI.

Concerning expressions of 'energy', the number of references to having a lack of time for exercise and a wish to have more motivation (e.g. lack own motivation/have inner drive), or put in more effort (e.g. put in effort / don't) increased as self-determination decreased. Among those with the lowest levels of self-determination constructs referring to making the first move or getting involved in the first place (e.g. all talk/no action) became more prevalent. Those with high and moderately-high levels of self-determination expressed an aversion to those whom they perceived to be obsessive or over-the-top in their exercise involvement ('balance' category) which was not echoed by their moderately-low and low RAI scoring counterparts. There was no difference in the content and scope of both the 'body' and 'personality' categories across the RAI groups; there was equal representation of constructs identifying slobby, overweight, toned and muscular figures and constructs recognising outgoing / thoughtful and neurotic / rational figures.

A comparison of themes from the qualitative summary and post interview notes revealed that the 'excuses' seem to begin at an RAI of 7. Excuses for low exercise levels such as a lack of facilities or clubs, injury and lack of time increasingly dominated the main points noted for those with moderate and low RAI scores. These 'excuses' seemed to become 'justifications' for

low activity levels as self-determination score lowered (e.g. quite happy as I am, not bothered and exercisers are all confident and outgoing). In keeping with the principal component content analysis results, the high RAI score group expressed strong preferences for mode of exercise (e.g. hate organised exercise classes and exercise for sake of sweat) and unlike the other groupings they exalted the benefits of exercise while recognising the importance of having a balanced approach.

7.4 Discussion

This study used Kelly's (1955, 1963) personal construct theory (PCT) and repertory grid technique (RGT) to search for commonalities in construal of exercise across the stages of change and across varying degrees of self-determination. Research was conducted from the perspective of the fifth and most profound level of change: intrapersonal conflicts. This study arose from the question of whether one's core beliefs about exercise, exercisers and physical activity would change as one gains more experience of exercise and whether such beliefs about, or construals of exercise would affect exercise motives and, thus, regulation of exercise behaviour.

Contrary to expectations there was as much variation in constructs within stages as across stages, though this would support the PCT perspective. However analyses found that those in maintenance were more likely to have strong opinions and preferences concerning mode of exercise and less likely to be concerned with time pressures preventing exercise involvement than those in any other stages of change. Those in the early stages of change, on the other hand, had little interest in exercise and believed that exercisers were too serious and obsessive about physical activity. Between precontemplation and maintenance themes moved from expressions of a lack of interest in and dislike of exercise to expressions of a wish for more motivation to increase exercise involvement and finally to acclaiming the physical and mental benefits of exercise. Those in maintenance uniquely expressed the wish to avoid seeing exercise as a chore and becoming too involved in it. These results support previous findings that reasons for exercising change over time (Hienzelmann and Bagley, 1970; McAuley, Duncan and Tammen, 1989; Ingledew, Markland and Medley, In Press). In addition the results support the contention, which was the basis for the previous study, that movement from initial adoption of exercise to eventual maintenance of exercise involves a movement from primarily extrinsic to

more intrinsic reasons for exercise. This is supported by an increase in self-determination scores from the precontemplation to the maintenance stage of change.

Comparison of principal components and themes derived from those at low, moderate and high levels of self-determination revealed a tendency for those with the lowest levels of self-determination to express a lack of concern for exercise or a need for an initial impetus to begin exercising. The moderate level self-determination group saw a prevalence of excuses for lower than desirable levels of exercise. This was paralleled by an increase in the number of references to the desire for more motivation and more time for exercise as self-determination decreased. Finally, a well defined ideology and strong aversion to certain modes of exercise and a lack of balance in approach to exercise characterised those with high levels of self-determination. These results are consistent with the forms of behavioural regulation, outlined by organismic integration, through which one will pass on the path to internalisation.

Although results must be evaluated in the light of the subjective nature of the analysis, the small sample size and the unequal numbers in each of the stages of change they nevertheless allow the compilation of construct system profiles across the stages of change. This amounts to a tentative sketch of the goggles through which those in the early, middle and final stages of change for exercise see the world of exercise. The word 'results' must be used here with caution. Personal constructs are belief systems that are not open to question and strictly speaking, should not be compared across individuals as the terms of reference are person dependent. Nevertheless, Kelly's commonality corollary maintains that similarity in construal is indicative of similarity in psychological processes. Due to the lack of specific differences between each of the five stages of change the change continuum will be discussed in terms of early, middle and final stages. Precontemplation and contemplation represent the early stages, preparation and action the middle stages and action and maintenance the final stages. Action appears in both later and middle stages as it was observed that many who reported exercising for longer than six months but did not consider it 'regular' enough checked one of rungs 8 or 9 that indicated the action stage on the stages of change ladder. This discrepancy highlights one of the many measurement problems/issues surrounding the accurate measurement of stage of change for exercise in research generally and within this study specifically. This issue will be considered at length in the final chapter.

Those in the earlier and later stage of change were oddly similar in their relaxed attitude to exercise. The former were quite content with their near sedentary lives while the latter saw exercise as a natural and normal part of their everyday lives. Those in action and maintenance exhibited moderate to high levels of self-determination in their approach to exercise that coincided with their deep felt beliefs or preferences for certain types of exercise. They fought less with time constraints in the regulation of their exercise behaviour because exercise was an integral part of their lives - the expressed dislike for organised exercise classes, exercise for the sake of sweat and exercise as routine among many of those in the later stages supports this view. It seems that deep seated preferences for mode of exercise develop when exercise is already a priority and the battle to win time to take exercise has already been fought and won. Here there appear to be few intrapersonal conflicts concerning exercise and the main conflict was between maintaining active lives but not letting exercise take over leisure time. However such a clear underlying philosophy may be in evidence among many individuals in maintenance because they may have been exercising for many years. They have successfully changed their exercise behaviour and are not in a stage of *change* any more.

Those in the middle stages of change (notably the preparation stage) seem to experience a lot of conflict between their desired level of exercise involvement and their actual level of exercise involvement. As a result they seem to subject themselves to 'more' regulation than those in the higher and lower stages respectively and subsequently experience much intrapersonal conflict in their fight to make exercise a priority, to find more time for it and 'get motivated'. They have high expectations of a programme of exercise (losing weight, gaining muscle tone, confidence, skill, fitness) and thus see it as something detached from, or distinct from their everyday lives - a compartmentalised rather than an integrated part of their lives. Those who perceived friction between how they would like to be (fit and active and therefore slim and healthy) and their core ideology (not the energetic type, haven't got enough will power) were in the middle stages. Preparation had the widest range of RAI scores of all the stages and it is clear that not all members of the group regulate their exercise behaviour in the same way. Some exercised primarily for fun and enjoyment, some because they felt they should, and others to appease a guilty conscience. Preparation then, may be a transitional stage, a half-way house for those who have exercised regularly in the past but who, due to life circumstances, have relapsed, and also for those who are adopting exercise but have not yet reached the action

stage. Consequently, motives for exercise, and therefore underlying regulation of exercise behaviour, would be expected to vary considerably within this stage.

Many of the principal components and themes derived from those in the early stages of change (notably the precontemplation stage) had a primarily negative bias: negative views of exercisers as too serious and too pressured and negative evaluations of self vis à vis activity levels, energy levels, and lack of self discipline. Eves, Mant and Clarke (1995) examined the barriers to exercise at various stages of change and found that the major barrier to exercise in the contemplation and precontemplation stages of change was a dislike of exercise and a preference for other activities. In the words of Eves et al., “exercise may indeed be fun when one asks those who exercise regularly but associated with negative feelings when one poses the same question to those who do not participate in regular activity” (p.469). Gibbons and Eggleston (1996) suggest a social image explanation for smoker behaviour which may also apply to exercise behaviour. According to Gibbons and Eggleston “the more favourable a person’s image (of a health behaviour) the more likely he or she is to intend to engage in the behaviour and to do the behaviour should the opportunity arise” (p. 469). A person’s image of a health behaviour reflects the perceived social consequences of partaking in that behaviour. People realise that once they engage in a particular (health) behaviour in public they are likely to be labelled and identified as being a member of a particular group (Gibbons and Eggleston, 1996). The negative exercise and self-exercise images of those in the early stages of change offer some support for a social image explanation of exercise behaviour

7.4.1 Critique: How valid are these results?

How much of the information reported here (repertory grid case studies and analyses) is actually representative of respondents’ innermost belief systems and how much is contrivance of the repertory grid technique (RGT), the quantitative and qualitative analyses and a result of researcher expectations or bias? The question in psychometric terms is: how valid are these results? The shortcomings of the analyses are less complex than those of RGT and will be addressed first.

7.4.1.1 Quantitative and qualitative analysis.

In the quantitative principal component analysis only two principal components were derived from each grid using the eigenvalue greater than one criteria. Although two components will rarely, if ever, give a perfect representation of a raw grid because they generally account for less than 100% of the variance, should these components account for at least 70% of the variance they may be sufficient to explain the data (Tschudi, 1993; Stevens, 1992). In this study, the two principal components accounted for an average of 77.21% of the variance thus adequately fulfilling the requirements and satisfactorily explaining the grid data. However, only an orthogonal rotation of these components was possible in FLEXIGRID. Although orthogonal rotation gives a maximally 'pure' description of components in that components are uncorrelated, component unrelatedness is likely to be an unreasonable assumption of the current data given its personalised nature. An orthogonal solution then, is not the preferred representation of the underlying principal components of a repertory grid which are inevitably correlated.

The content analysis performed on the data was not based on any accepted method of categorisation of construct poles nor was there any confirmation of the reliability of this content analysis. This analysis therefore, must answer to accusations of researcher bias which may have unduly influenced the results derived and conclusions reached. The rationale for not using Landfield's method has been presented in the analysis section where its inadequacy for the purposes of this research were made clear. I believe that rather than prejudicing the content analysis in any way, this researcher's involvement in the initial recording of constructs assisted in the categorisation of these constructs and their categorisation. The 'genuine' meaning of the labels used to convey the constructs was clearer to this researcher than it would have been to any outsider not involved in elicitation of constructs who would invariably have been misled by, or overly concerned with semantics.

7.4.1.2 Repertory grid technique.

Usability of the RGT methodology is related to its comprehensibility and meaningfulness (Winter, 1992) and there are several methodological issues surrounding the operation of RGT which I believe may have limited the authenticity and legitimacy of the findings. The first of these concerns the scoring of grids. Following construct elicitation each participant scored the

12 elements on the elicited constructs with a five point scale ranging from the construct pole (1) to the contrast (5). Construct poles and contrasts can be positive or negative characteristics and typically are a mix of both. This continual change in negative/positive focus of pole and contrasts, and, therefore, of scores one to five, led to confusion in scoring for some respondents. Although with guidance and explanation this problem was resolved it appears that a consistency in recording, say, positive aspects as construct pole (1) followed by their more negative complement as contrast (5) would aid eventual scoring. However, Fransella and Bannister (1977) and Tschudi (1993) state that that which constitutes the similarity between two of the three card comparison should be designated the construct pole and that which constitutes the opposite to this similarity (derived from the third card) is the contrast. While this option does not necessarily resolve the positive/negative focus of the pole and contrast it suggests that extra care and monitoring of scoring is necessary to avoid misrepresentation and misinterpretation. This issue is further confounded by the often changing context within which meaning is defined. Some of the confusing results which can emerge from grids may derive from the fact that participants change the context that they have been assuming (whether given or chosen) for their judgements during the course of grid completion (Fransella and Bannister, 1977). For example, initial constructs may have been derived within the context of exercise while later constructs are derived within the context of interpersonal relations.

The second issue concerns the notion of bi-polar constructs. Difficulties were often experienced in determining whether the elicited difference constituted the construct contrast or another construct. During the first pilot study and the first two interviews in the main study participants remarked that they were having difficulty scoring some constructs because the poles were not opposing. Thus an individual faced with scoring, say, 'me now' on the construct happy-contemplative faced difficulties if both poles applied. Although such poles were elicited using the correct triadic procedure they did not readily lend themselves to accurate scoring. Subsequently, further clarification was sought as to whether the suggested opposite was in fact the opposite of the contrast pole or whether it had its own opposite, that is, was a construct in its own right. If the suggested opposite in turn had a clear opposite of its own it was also recorded as a construct pole and contrasts subsequently elicited for both. This was achieved all the while bearing in mind that the contrast need not be the dictionary-defined opposite term; often a difficult task given the fine line between a contrast and a semantic, or adjectival

opposite. Need for such adjustments was dependent on whether or not an individual focused on determining how the third card in the elicitation trio was the *opposite* to the other two cards or merely *different* to them; the latter led to unsatisfactory construct poles. This focus would shift over the course of the interview depending on the elements being compared. The problem may have its roots in the triadic method requirement that two elements are similar and different from the third element. This presumes that each element is equally representative. When this is not the case the resultant distinctions may be contrived (Gammack and Stephens, 1994). Contrived construct poles and contrasts lead to difficulties in scoring and subsequently an unclear or misleading principal component analysis.

An additional, and potentially more serious issue also has its roots in the triadic method. Gammack and Stephens (1994) expressed concern that the triadic emphasis on forcing distinctions may also result in missing important characteristics of elements and in weak distinctions between elements being made. In this study, for a small percentage of participants, the net effect of this forced distinction was that the method did not work. These participants either could not understand the requirement or it appeared to stifle their free expression of constructs which, they felt, did not easily lend themselves to being expressed in terms of similarity and contrast. Any procedure for dealing with this was necessarily person and situation specific. An apparent outright failure to grasp the concept of triadic comparison at the example and initial stages of construct elicitation led to encouragement to focus on just one or two of the cards in the triad; the opposite (contrast) was often elicited independently of the other card(s). An apparent inability to compare and contrast the three element cards in a meaningful way led to a re-direction of focus from the element that seemed to be causing confusion or distraction, or a suggestion that the participant replace the offending element card. This element was often evaluated in different terms from the other two because of a strong affective response, an image, or memory it brought to mind. Similarly, in instances of non-productivity of the method, despite previous successes with and a clear understanding of the concept, individuals were encouraged to focus on those cards which gave clear images and leave aside those that were inhibiting thought processes and/or construct expression. Expression through similarity and contrast is not in any way a 'normal' or common way of communicating. Although such problems, or concerns, may detract from rather than enhance the information derived, there is not always a satisfactory or reliable way to rectify the matter. However, the words satisfactory and reliable

imply standardisation and rigidity and this is clearly against the 'spirit' of personal construct theory (PCT) which sees the interview as a conversation and thus, such dynamics are an expected, if not an essential part of gaining an insight into a person's beliefs about or constructions of events.

Construct elicitation is also element dependent. Non-productivity of the method may also be a function of element relatedness: did the elements have anything at all in common? Degree of relatedness among any three elements is entirely participant dependent and what one will consider to share a high degree of commonality another will find diametrically and irreconcilably opposed. Element relatedness is, of course, dependent on the supply of elements. If we provide an individual with an element with which he/she is unfamiliar (e.g. "a close friend who exercises" when he/she does not know such a person), analysis of the element-construct relationship will reveal very little relationship between the elicited constructs because that element is outside the range of convenience of the individual's construct system. PCA output provides an index of the meaningfulness of elements (the DIST value and position on the plot relative to the origo). An element that scores low on this index will have little in common with the rest of the construct system and will not generate large discrimination among constructs. The worst offenders were the elements 'other people my age' and 'my spouse, boy/girl friend' which were close to the origo in 17 and 15 of the 30 PCA plots respectively. The best elements, on the other hand, were 'me as I fear becoming' and 'the gladiators'; both resided far from the origo in the majority of plots. The issue of element meaningfulness can, however, be considered from another, more positive perspective. While at first glance, some elements appear to bear little relationship to exercise or physical activity, Blowers and O'Connor (1995) note, in the clinical setting, that while people "often have a closed and well rehearsed narrative concerning their 'problem' (they) are more open and self-disclosing when discussing non-problem areas. Thus focusing on events that are unproblematic can be clinically revealing" (p. 11). Similarly, including apparently irrelevant elements in the element set can evoke crucial constructs even though the elements are later found to lack direct relevance to the construct system. It seems then, that even extraneous elements can potentially facilitate the derivation of constructs

To summarise, it appears that if a grid does not yield meaningful, or authentic information, or comprehensible information (i.e. valid constructs), any flaw lies not in the grid itself but in the application of RGT: the method of construct elicitation, the context of

elicitation, the elements supplied and the skill of the researcher in explaining and administering the technique. However, these are but surface level considerations that, individually, imply researcher control over the issue of validity. When taken together they point to a more fundamental dispute concerning the basis, or aim of the RGT methodology: what is the nature of personal constructs? Kelly (1955, 1963) asserts that all constructs are dichotomous, or bi-polar, based on a belief that a construct is a “discrimination of things being alike and yet different from others” (Blowers and O’Connor, 1995, pp.2-3). This notion of bi-polarity has a long tradition in Western philosophy of logic which says that a concept not only defines all objects which can be included within it, it also excludes all those it does not entail (Blowers and O’Connor, 1995). However, research has questioned whether constructs are indeed structured this way (Yorke, 1985; Rosch, 1978) and whether such a structure is actually representative of everyday contextual thinking (Gaines and Shaw, 1981). Eliciting bi-polar contrasts may be forcing an unnatural choice on study participants (Blowers and O’Connor, 1995). Thus the bi-polarity requirement of RGT may be at the root of any invalidity. Supporters of Kellyan thinking would counter that the existence of bi-polar constructs is supported by their elicitation using RGT. This, however, is a circular argument.

Further deliberation of the contradictions and incongruities inherent in RGT requires more profound consideration. Kelly’s PCT is based on the underlying relativist, phenomenological position of constructive alternativism. PCT and RGT uphold the distinction between elements and constructs - a distinction that is fundamental to the range of convenience corollary and the method of triadic elicitation. Blowers and O’Connor (1995) note, however, that any radical phenomenologist would challenge the notion of an element as an entity that is separate from a construct because, they would claim, any apparently objective description of a person or event was already a construction. Such reasoning could unpick the very foundations of RGT and render its product, personal constructs, merely higher order groupings or categories into which the highly subjective elements are settled. Issues of validity become relatively inconsequential in the face of such philosophical debate which is beyond the scope of this discussion. However, if we accept that RGT does indeed tap personal beliefs or constructs that are more than a mere invention, or artefact of the measurement technique, and there is much empirical and theoretical support for this conclusion (see Addams-Webber, 1979; Winter, 1992), we can evaluate the validity of the results solely in terms of the usability of the grid. The

discussion has demonstrated the difficulties that, I believe, are inherent in the technique and not merely peculiar to this application of it. Furthermore, the degree to which results are positively or negatively influenced appears to be entirely case dependent; not systematic. Fransella and Bannister (1977), in acknowledging the practical difficulties and dangers in RGT, draw particular attention to the issues identified here: the difficulties in achieving bi-polarity, the importance of relevant elements and the skill of the researcher in eliciting constructs. It is this latter point, the skill of the researcher in eliciting constructs, that, I believe, may have the greatest impact on the validity of the results.

As previously indicated, RGT is more like a conversation than a psychological measure, thus any consideration of the validity of the findings would be incomplete without considering the influence of the one at the helm in this conversation: the researcher. I recognise, in the parlance of Holstein and Gubrium (1995) that participants are not merely “vessels of answers” (p.7) from whom an objective and distant interviewer can extract valid and factual responses without any influence over those answers. Fransella and Bannister (1977, p. 108) maintain, and I agree, that “elicitation of constructs (...) is an art and not a science (therefore) the examiner must expect to have to gain experience in this art”. However, I do not agree with the ensuing assertion that the researcher “must learn to minimise his (sic) influence in determining the constructs given”. While it is a noble aspiration it is fundamentally flawed: all information is created from the action taken to obtain it and meaning is not merely conveyed, it is built up, received, interpreted and recorded by the interviewer. Kelly, in his sociality corollary, appears to uphold this view in believing that an individual needs to construe another’s construal of him or herself in order to comply with his or her demands; “construing requires the testing of constructs against the consequences of others’ reactions to the construer” (Blowers and O’Connor, 1995, p. 4). Thus, reflective appraisals or construals will have influenced these results.

7.4.1.3 Limitations

There are several serious limitations to this research which must be noted. First, a high level of researcher involvement in construct elicitation was essential and inevitable and, as a young academic of fit and healthy appearance, threats to validity such as social desirability and positive bias cannot be ruled out. Second, the stages of change for exercise measure was the

only indicator of participants' level of exercise involvement. There was no objective, or even self-reported validation of self-reported stage of change. Thus, there may be large variation in actual degree of exercise involvement among those within each of the exercising stages of preparation, action and maintenance. Furthermore, this self report measure may be particularly vulnerable to social desirability bias when used in a one-to-one context. For instance, individuals are unlikely to admit to being in the precontemplation stage of change, that is, to having no intention to exercise, ever. However, it was felt that other self report measures of physical activity involvement, such as Blair's (1984), Physical Activity Recall questionnaire (PAR), would be similarly susceptible to social desirability bias, or 'selective' recall. The PAR, in particular, employs an overly-broad definition of physical activity which includes gardening and housework. Because of this Marcus and Simkin (1993) found that those in the sedentary precontemplation and contemplation stages reported engaging in between 40 min and 3hr 30min of exercise per week. Objective confirmation of exercise involvement was not feasible. In conclusion, then, it is important to acknowledge that stage of change for exercise behaviour in this study may not be representative of actual exercise behaviour.

The third criticism acknowledges that particularly low numbers in the precontemplation and action stages (three and four persons respectively) is likely to have restricted breadth of construct and theme content therein and that inequality of sample size across the stages has hindered attempts at equitable and reliable comparison of constructs and themes across stages. In addition, results are only generalisable to those who would volunteer for a research study (and those who would be enticed by the offer of £7.00) and those who are willing to talk about their attitudes to exercise and exercising people. The final criticism recognises that the cross-sectional design does not allow us to ascertain the effect of personal construction of exercise on exercise behaviour or to suggest any cause-effect relationship. Further research should use a longitudinal design to examine whether a changing personal construction of exercise coincides with a change in stage of change for exercise.

7.4.2 Implications

The results support a relationship between beliefs about exercise and reported exercise behaviour which points to the need to consider a person's core belief system in order to fully appreciate the true extent of the change required to adopt or maintain regular physical activity.

This change is cognitive as well as behavioural. Being a regular, committed exerciser means more than just setting aside time to exercise several times per week. For the regular exerciser the 'physically active' description is part of their self-concept, part of their core identity and an important part of that core identity. Perhaps the degree to which this core identity exists is indicative of the degree to which exercise behaviour is evident. Someone who sees the exerciser identity as 'other', 'external' or 'them' is unlikely to assume that identity in the short term. In addition, perhaps the degree to which one feels the achievement of the committed exerciser description is desired may also be indicative of the degree to which a commitment to regular exercise can be achieved.

In a manner of speaking this study has put the person back into motivation. Individuals are not merely a function of their regulatory guilts and importances. It is the underlying personal construct system that determines the need for regulation and imbues it with meaning. One does not merely regulate adherence to regular sessions of exercise, one regulates a whole lifestyle that is necessary to prioritise these exercise sessions, a lifestyle that is congruous with the committed exerciser description. Those who perceive that this is at odds with their core belief system are likely to have the greatest difficulty making any *permanent* exercise behaviour change; any change will merely be behavioural, superficial and short-lived. The stages of change approach suggests that many cycles of the stages of change may be necessary to achieve long term behaviour change. Similarly many forays into the world of the exerciser may be necessary to test the 'fit' of a possible new self-description and to achieve a positive change in one's core beliefs about exercisers and exercising. This research found that barriers to exercise among those in the initial stages of change appeared to be negative feelings about the exerciser image while barriers among those in the middle stage appear to be motivational/regulatory. Experience of exercising may have meant that a negative exercise image was no longer a barrier. Further research with larger numbers and different population subgroups is necessary before any generalisations can be made. Examining benefits about and barriers to exercise (decisional balance) in conjunction with personal construction of exercise may shed some light on this speculation, while examination of core self-concept across the various stages of change as a function of personal construction of exercise may reveal a central role for self-concept beliefs.

CHAPTER EIGHT

8. Discussion

8.1 Summary of results

This research examined underlying self-determination in the regulation of exercise and personal construction of exercise across the stages of change for exercise behaviour in order to more fully understand the role of motivational cognitions in the process of exercise adoption and maintenance. The first study confirmed the existence and relevance of the behavioural regulation continuum to exercise participants and resulted in the development of a measure of behavioural regulation in exercise, the Behavioural Regulation in Exercise Questionnaire (BREQ). The BREQ measures four levels of self-determination: non-self-determined external regulation, somewhat self-determined introjected regulation, moderately self-determined identified regulation and fully self-determined intrinsic regulation. Amotivated regulation was not relevant for the study's participants. Data from the second study confirmed the factor structure of the measure and multisample analyses showed it to be equally valid for males and females.

Using the newly developed measure the second study found, as hypothesised, that those in the later stages of change were more self-determined in the regulation of their exercise behaviour than those in the earlier stages. In particular, the use of the more self-determined identified and intrinsic forms of behavioural regulation distinguished those in the action and maintenance stages of change from those in precontemplation and contemplation (pre-preparation) and preparation stages. Examination of processes use across the stages found that only five of the ten processes made a meaningful contribution to differentiation among the stages in females (counter-conditioning, self re-evaluation, self liberation, reinforcement management and social liberation) while only three processes did so among males (counter-conditioning, self re-evaluation and self liberation). These processes were correlated with those forms of behavioural regulation that are at least somewhat self-determined. The lack of support for the reported relationship between the stages and processes of change was compounded by the failure of confirmatory factor analysis to show support for the existence of the higher order, behavioural and experiential processes of change in the Processes of Change for Exercise Questionnaire. A correlation of 1.00 found between the higher order factors in this study and the correlation of .91 previously found by Marcus, Rossi et al. (1992) questions the relevance of

the distinction to the exercise domain. Behavioural regulation, stage and process of change data collected three months after baseline found only limited support for the importance of increased process use in encouraging change. Only use of the counter-conditioning process increased among male and female stage of change improvers while use of the self-liberation process increased among male non-changers and improvers. There was no support for the proposal that improvers and no changers increased their self-determination over the three months.

The final study examined personal construction of exercise as a function of stage of change and self-determination. Content analysis of principal components found that those in maintenance were more likely to express strong opinions concerning mode of exercise and attitude to exercise than those in any other stage of change. In contrast, references to being too serious about exercise were strongest in the preparation and precontemplation stages. Analysis of the themes recorded in both qualitative evaluations of the FLEXIGRID output and post interview notes found a lack of interest in and dislike of exercise in the precontemplation stage, expressions of a wish for more motivation and push to take more exercise in the contemplation and preparation stages and references to the physical and mental benefits of exercise in the maintenance stage. Maintainers expressly wished to avoid becoming obsessive about exercise and seeing it as a chore. Those in action and maintenance had significantly higher levels of self-determination (as measured by the relative autonomy index: RAI) than those in contemplation and precontemplation respectively. Those in the preparation stage evidenced the biggest range in self-determination scores and the highest self-determination score of all was found in this stage.

The principal components derived from each individual's construal of exercise were examined as a function of low, moderate and high levels of self-determination. The high and moderate RAI groups expressed clear preferences for mode of exercise and had clear underlying principals that guided them in their actions which were absent among those with a low RAI. These moderate and high RAI groups also expressed an aversion to those whom they perceived to be obsessive or over-the-top in their exercise involvement. As self-determination decreased references to lack of time for exercise and a desire to have more motivation or put in more effort increased. Those with the lowest levels of self-determination were primarily concerned with making the first move to get involved in exercise. The themes recorded from the moderate and low RAI groups were dominated by excuses for low exercise levels. These excuses seemed

to become ‘justifications’ for low exercise levels as self-determination decreased. Again, in contrast to the other two groupings, the high RAI group expressed strong preferences for mode of exercise, recognised the importance of having a balanced approach and praised the benefits of exercise.

8.2 Research philosophy

Although a debate about the nature of scientific inquiry is clearly beyond the scope of this discussion an acknowledgement of the distinct research philosophies underlying this research is warranted. The repertory grid methodology as it was employed here embraces a qualitative paradigm that is ideographic and phenomenological in nature. It considers individual case studies at length before looking for patterns across cases and is concerned with an individual’s construction of reality rather than with any objective or imposed notion of reality (Smith, 1995). This exploratory, subjective, interpretivist and researcher-involved approach is in stark contrast to the nomothetic, objective and empirically-driven approach of the first two studies where inferential statistics guided the evaluation of the data. Qualitative and quantitative research are not, and should not be considered mutually exclusive (Richardson, 1996) but the third study in this research has, in a sense, gone one step further in combining the two paradigms. Purists in both camps will inevitably attack this as an act of high treason and it is not without its problems, not least of which is the difficulty in relating highly subjective personal constructions of exercise to psychometrically determined levels of self-determination. Kelly viewed the traditional psychological measures with much disdain; he called them “tools for tyranny in pursuit of spurious precision”. It should be clear, however, that the BREQ, although psychometric, is not a trait- or personality measure. In addition, the use of inferential statistics for the interpretation of repertory grids blurs the distinction between quantitative and qualitative research.

8.3 Criticisms of the research

The main criticism that can be levelled at this research is its inability to demonstrate cause-effect relationships as a result of its cross sectional nature: the methodology is descriptive rather than explanatory. The second study found that those in the later stages of change had higher levels of self-determination than those in the early stages. Due to the single point of data collection, however, it is not possible to ascertain whether those in the later stages of change *became* more

self-determined in the regulation of their exercise behaviour over time as they increased their stage of change, or whether they reached the later stages of change *because* they were more self-determined from the outset. These successful changers may have entered the contemplation stages of exercise behaviour change because of a quest for fun and enjoyment and because of the perceived importance of exercise for health maintenance (intrinsic and identified regulation respectively). Those less successful changers in the earlier stages may be there because low levels of self-determination in the regulation of their exercise behaviour prevent them achieving any degree of regularity in their exercise behaviour.

It may be more reasonable to suppose, however, that self-determination does indeed increase over the stages of change. Organismic integration theory suggests that the achievement of fully self-determined, or internalised regulation of behaviour is a developmental process requiring experience through the preceding, less self-determined 'stages' of behavioural regulation. Such experience would be gained during the progression through the stages of change for exercise. Researchers have recognised the role of extrinsic motives in promoting initial exercise involvement, which, over time, may lead to intrinsic interest in exercise and ultimately encourage long-term adherence. (Morgan, Shephard and Finucane, 1984; Dishman, 1987; McAuley, Wraith and Duncan, 1991; Ingledew, Markland and Medley, In Press). Thus, low levels of self-determination are to be expected in the earlier stages of change and there is likely to be a shift in an individual's motivational focus from an extrinsic focus in the initial stages of exercise adoption to an increasingly internalised focus in the later stages of change. The snap shot of events presented in this research, then, is consistent with theory and may be a reflection of the regulatory processes at play in the various stages of exercise behaviour change.

An additional and equally fundamental criticism of this research concerns the lack of objective measures of exercise involvement in support of the stage of change categorisations. Chapter two notes that such research (e.g. Marcus and Simkin, 1993) rather than supporting the concurrent validity of the measure actually bring into question the underlying construct validity of the stages of change conceptualisation. However, the validity of the stage of change measure and stage of change conceptualisation should be considered within a larger framework of related issues which includes the staging algorithm that is the basis of the categorisational measure, the definition of regular exercise implicit in this algorithm and the supposed existence of discrete, sequential stages of change. These issues are considered in turn next.

8.4 The stage of change for exercise: Measurement and conceptual issues

While the notion of a continuum of change is clearly a more realistic way of conceptualising change than a mere all-or-nothing, dichotomous conceptualisation (change or no change) there are problems with the assessment of stage of change that bring into question the utility of the stages conceptualisation in understanding exercise adoption behaviour. The most common measure of stage of change for exercise, the categorical measure of stage of change for exercise (Marcus, Selby et al., 1992; Marcus and Simkin, 1993) is based on a staging algorithm which defines each stage in terms of the intention to achieve a goal or behavioural criterion: regularly exercise for at least six months. However, this procedural model for calculation of stage of change is fundamentally flawed because the behavioural criterion is inadequately defined (Clarke and Eves, 1997). In the case of addiction behaviours the behavioural criterion (complete cessation of the negative behaviour for at least six months) is clear. In the case of an adoption behaviour such as exercise, however, the behavioural criterion is less precise and more complex: regular exercise for at least six months. The enormity of the behavioural, lifestyle and physical factors that embody a definition of regular exercise (planning, frequency and intensity) leaves the criterion open to diverse interpretations and its vagueness and inadequacy results in much misclassification of stage of change, especially in the earlier stages (Clarke and Eves, 1997).

Difficulties in definition are compounded by the recent change of emphasis from regular exercise sessions to daily physical activity by the American College of Sports Medicine (ACSM: Pate et al. 1995). ACSM guidelines on types and amounts of exercise necessary to achieve health benefits play a major role in determining public health recommendations world wide. Pate et al. (1995) define physical activity as any bodily movement that results in energy expenditure and regard exercise as a close relative but a distinct subset. Exercise is defined as “planned, structured and repetitive bodily movement done to improve or maintain one or more components of physical fitness” (p. 402). In the past, the ACSM (1991) recommended three or more moderate to high intensity endurance exercise sessions per week of at least 20 to 60 minutes duration. This was based on research that concluded that this prescription was necessary to realise disease prevention benefits. Following a more recent review of the scientific evidence, the ACSM (Pate et al., 1995) have concluded that physical activity participation can be as effective in achieving health benefits as exercise participation and now recommend that every adult should accumulate 30 minutes or more of moderate intensity physical activity on

most, preferably all days of the week (Pate et al., 1995). The focus is now on achieving broadly defined, regular physical activity participation in the population rather than on achieving the traditional more narrowly defined regular exercise participation. Thus, we now have an even less exact, less specific and much broader behavioural criterion to attain: regular physical activity. Physical activity is any energetic bodily movement and ‘regular’ now denotes cumulative and daily.

It is ironic, then, that Marcus and Simkin (1993) tested the concurrent validity of the stage of change for *exercise* measure using Blair’s (1984) *Seven-Day Physical Activity Recall* questionnaire (PAR). The PAR measures vigorous and moderate physical activity and includes leisure time activities such as swimming, jogging (vigorous) and golf (moderate) as well as daily chores such as digging in the garden, chopping wood (vigorous), yard work and heavy house cleaning (moderate). The term exercise (as defined above) would not appear to be consistent with these latter daily chore activities. In fact Marcus, Eaton et al., (1994) found much over reporting of activity levels across the stages of change as a result, they suggested, of the existence of daily household chores among the list of physical activities.

In this research, the definition of exercise in the instructional set of the stages of change for exercise ladder encompassed the focus on daily physical activity by the ACSM (1995) and united it with the “exercise” terminology used in the five items from the categorical measure of stage of change for exercise (Marcus, Selby et al., 1992; Marcus and Simkin, 1993). Thus exercise was defined simply as ‘any kind of physical activity you do to “get some exercise”’. Regular was not defined; the word itself was considered sufficient to indicate habitual and frequent involvement. This broad and, to some extent, rather vague definition of exercise will not have improved the precision of the behavioural criterion in the staging algorithm, nor the validity of the measurement at each stage of this research. However, it is adequate and, in fact, has much to commend it when references to intensity levels and times per week are outdated and inappropriate, and when recourse to a more specific definition such as “any energetic bodily movement on a daily basis for at least six months” would heighten rather than alleviate any possible confusion.

Clarke and Eves (1997) note that the typically small percentage of people in the precontemplation stage of change for exercise, compared with the typical 40% found with other behaviours, can be attributed to the inexactitude of the staging algorithm. Marcus and

colleagues (Marcus and Owen, 1992; Marcus, Selby et al., 1992; Marcus, Rakowski et al., 1992 and Marcus, Pinto et al., 1994) found between 7.2% and 8.2% reported being in the precontemplation stage of change for exercise while between 21.1% and 35.9% respectively reported being in the contemplation stage. Cardinal and Sachs (1995) found .02% in precontemplation but 16% in contemplation. Similarly, research in the UK has found low levels of exercise precontemplators in the general population: Mutrie and Cadell (1994), .01%; Wyse, Mercer, Ashford, Buxton and Gleeson (1995), 8.6%; Clarke and Eves (1997), 7.4%. It may be an inevitable social desirability bias that leads people to indicate that they are at least *intending* to start exercising in the coming six months. However, given the large sedentary presence in the US population and the increasingly sedentary nature of the UK population such a result questions the ability of the staging algorithm to accurately reflect exercise intention and behaviour.

A second, related difficulty in measuring stage of change concerns the existence of, or meaningfulness of the discrete stages of change. The distinction between many of the stages of change is arbitrary. The movement from, say, action to maintenance is not marked by a particular event or a noticeable change in behaviour, rather the change comes after approximately six months of sustained behaviour (Sutton, 1996). Similarly, the distinction between precontemplation and contemplation is arbitrary and could occur within any time frame. Sutton (1996) believes that “the stages of change model can be regarded as imposing an artificial categorisation and ordering on what may be an underlying continuous process” (p.193). Furthermore, research has found only limited support for the predicted sequential movement from stage to stage during a period of behaviour change. Prochaska, Velicer, DiClemente, Guadagnoli, Rossi and DiClemente (1991) found that 84% of their sample exhibited flat or unstable patterns of change in smoking behaviour over five waves of measurement, each six months apart. That is, they either stayed in the same stage, moved backwards, or moved backwards then forwards again, or vice versa. Only 16% of the sample exclusively progressed, and then only through a maximum of two stages. Stable, progressive, stage-by-stage change, then, does not appear to be the norm amongst volunteer self changing smokers. In the exercise domain, Marcus et al. (1996) found that after six months in a work site health promotion project 46.4% of their sample exhibited a flat pattern of change, 11.2% relapsed and 22% did not fit into one of four basic profile groups (adopters, relapsers, stable

sedentary and stable active). Only 20% of the sample actually progressed from the contemplation to the action stages.

The proposed discrete and sequential nature of the stage of change is further challenged by research that found scoring patterns which were inconsistent with the proposed stage of change model. McConnaughty et al. (1983, 1989) used the 32-item Stages of Change Questionnaire (McConnaughty et al., 1983) to assess psychotherapeutic change and identified a small number of distinct client profiles, or common scoring patterns through cluster analysis. However, rather than supporting the stage of change conceptualisation, as the authors believe they do, these profiles revealed a tendency for individuals to score highly on two or more stages simultaneously. Similarly, McConnaughty et al. (1989) identified eight clusters, or profiles, several of which were characterised by high scores in both early and later stages of change. That is, participants appeared to be in two stages of change at once. Such an interpretation of these results would undermine the sequential nature of the stages of change conceptualisation (Sutton, 1996).

Thus far, discussion has primarily focus on the problems of measuring the stages of change for exercise. In summary, it appears that despite the immense intuitive appeal of the stages of change conceptualisation, its operational definition for exercise has been tried and found wanting. Three points are worthy of note in this regard. First, it is unlikely that the use of self report measures of exercise involvement can ever adequately validate the stages of change for exercise measure, itself a self report measure: comparison of like with like is tautological. Second, and more fundamentally, Clarke and Eves (1997) conclude that the staging algorithm “is a serious fault inherent in the methodology of exercise studies which needs to be addressed” and recommend that “future studies on exercise behaviour should employ algorithms that parallel the classic definitions of the transtheoretical model” (p. 205). While Clarke and Eves do not elaborate on this recommendation it is clear that their call for a return to ‘classic definitions’ entails the formulation of a cessation-type algorithm: stage would be defined in terms of the intention to cease sedentary behaviour (the behavioural criterion) rather than the intention to adopt exercise or physical activity. Although a change in staging algorithm is clearly needed, the definition of sedentary behaviour may prove to be as problematic as that of regular exercise. Third, as stages of change for exercise research is generally conducted to improve our understanding of the process of and psychological correlates of exercise participation in order,

eventually, to increase public participation in exercise and physical activity, it must adopt the revised ACSM guidelines in its operational definition. Wording the stages measure to reflect intentional, energetic daily physical activity rather than regular exercise and supplying a standardised list of examples of such daily activity may improve the precision of the behavioural criterion and thus the staging algorithm. King (1994) acknowledged the importance of encouraging involvement in physical activity as distinct from exercise and concluded that “accurate assessment of light and moderate physical activity [such as brisk walking, low level cycling] is an important challenge facing scientists interested in further evaluation of physical activity participation rates and activity-related health effects” (p.188). Similarly, devising a stages of change for physical activity measure, notably one that can incorporate the intention to cease a sedentary way of life is also an important challenge.

A final point concerns the concept that is the basis for the operational definition of the stages of change. Critical consideration of the sequential and ordered progression implied by the stages of change model has led Sutton (1996) to propose their reconceptualisation as *states* rather than *stages* of change. States, unlike stages, do not imply an invariant temporal sequence. Sutton believes that the discrete stage of change categorisations and assumed sequential progression may be an artificial representation of real life events. As such, the stages of change model may be best considered as a model of ideal change to which changers should be encouraged to aspire to rather than that which describes how they change (Sutton, 1996). Sutton’s proposed reconceptualisation of the stages of change model sits well with the demonstrated links between stage of change and behavioural regulation. Deci and Ryan (1985) formulated the concept of a behavioural regulation continuum from a developmental stand point and do not explicitly presume any temporal or sequential pattern to the achievement of self-determined behavioural regulation. Organismic integration theory, from which the continuum stems, merely implies a progression from non- to fully self-determined regulation over the course of the internalisation of an initially extrinsically motivated behaviour. Similarly, viewing the course of behaviour change, and thus the stages of change model, in developmental terms would promote the use of the stages of change conceptualisation as a model of change rather than a prescription for change.

8.5 Motivation and self-determination in exercise and physical activity

The wealth of exercise adherence research that has investigated the motivational factors involved in exercise adherence has concluded that individuals reporting intrinsic, self-determined, task-involved motives for exercise have demonstrated higher levels of adherence to programmes of exercise than those reporting exercising because of an ego-orientation, or external pressure, or non-self-determined reasons for doing so (Frederick and Ryan, 1995; Markland and Hardy, 1993; Wankel, 1985). Naturally, these findings have led to recommendations to encourage more intrinsic motivation in the new exercise participant by increasing perceptions of fun, enjoyment, choice and flexibility in the exercise class and by de-emphasising the importance of outcomes or achievements (see Wankel, 1993 for a review). Many may have prolonged their exercise involvement as a result of the implementation of such recommendations. However, while the encouragement of more self-determined regulation and intrinsic motivation in new exercise participants is a commendable endeavour, the relationship between motivation and behaviour is rather more complicated and requires greater clarification and specification. The following discussion considers several issues in this regard.

First, motivation and underlying regulation of behaviour is not a static phenomenon. Those with extrinsic motives for participation in a programme of exercise are not necessarily doomed to failure (drop out) by their lack of self-determination because self-determination for and, therefore, motivation for exercise changes across a time of behaviour change. Organismic integration theory (Deci and Ryan, 1985) maintains that the regulation of an initially non-intrinsically motivated behaviour becomes increasingly internalised over time, thus action becomes increasingly self-determined. Accordingly, the second study in this research found that regulation of behaviour was less self-determined in the initial than in the later stages of exercise behaviour change. This study also found a significant increase in the use of the less self-determined, introjected form of behavioural regulation between the earlier pre-preparation and later preparation stages of change. This supports the suggested role of extrinsic factors in motivating initial exercise involvement (see Morgan, Shephard and Finucane, 1984; Dishman, 1987; McAuley, Wraith and Duncan, 1991). However, although Deci and Ryan (1985) do not deny that extrinsic motives may enhance persistence and adherence their role as catalysts of, or promoters of behaviour change has not received empirical recognition. The limitations of this research notwithstanding it seems reasonable to propose that low self-determined, extrinsic

motivation is the norm in the initial stages of exercise involvement and that this may not necessarily be detrimental to positive change.

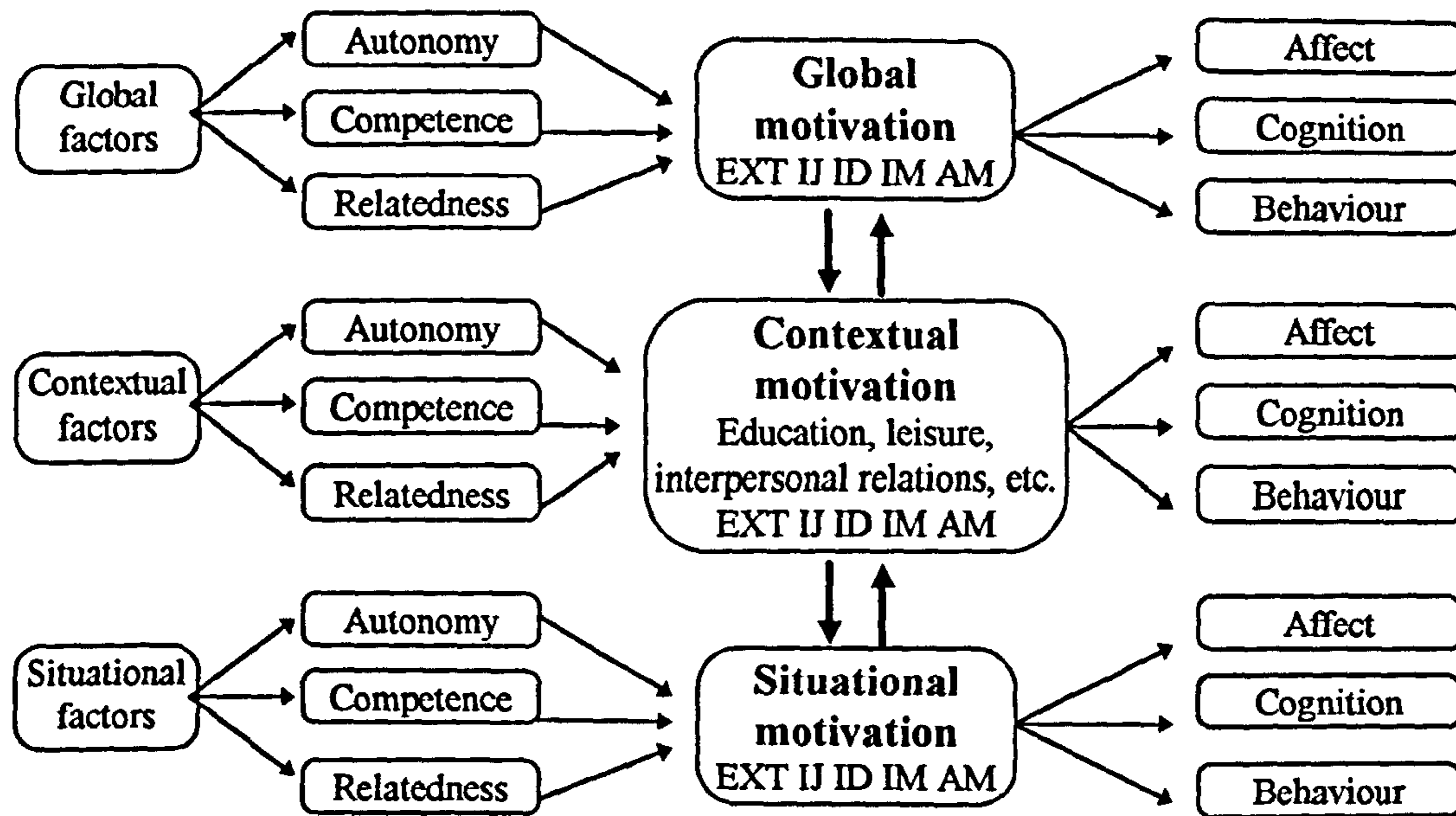
Research using Deci and Ryan's (1985) cognitive evaluation theory based intrinsic-extrinsic motivational dichotomy does not acknowledge the many levels of self-determination that lie between these motivational extremes, nor does it acknowledge that some types of extrinsic motivation can be self-determined. The intrinsic-extrinsic motivation dichotomy tends to promote the notion that intrinsic motivation is 'good' and extrinsic motivation is 'bad'. While the current research supports the role of self-determination in encouraging continued exercise participation much of this self-determined behaviour was not intrinsically motivated. A completely self-determined exerciser, that is, an entirely intrinsically motivated exerciser, should have a relative autonomy index (RAI) score of 12.00. A non-self-determined, completely extrinsically motivated exerciser should have an RAI score of -12.00. In the second study, the mean scores for all those in the action and maintenance stages were 7.11 (SD = 1.82) and 7.60 (SD = 2.78) respectively. In the final study they were 7.87 (SD = 1.46) and 7.69 (SD = 2.68) respectively. Clearly other, less self-determined motives for behaviour, such as the value and importance of regular exercise and the desire to avoid feeling guilty, are relevant and important motives for exercise that are not necessarily detrimental to exercise adherence. The continuum conceptualisation of self-determination allows an appreciation of how one can simultaneously be extrinsically motivated for exercise (do because of the importance of keeping fit or controlling weight) yet feel quite self-determined in the regulation of that behaviour.

A second point queries the emphasis on the importance of intrinsic motivation for the successful adoption and maintenance of regular physical activity (and exercise). It is unlikely that people will maintain a programme of regular exercise, with all the organisation and commitment it entails, purely for the intrinsic reasons of fun and enjoyment though it is the presence of self-determined motivation that will ultimately promote their continued engagement in physical activity on a regular basis. Is the achievement of intrinsic regulation of exercise behaviour, then, really an achievable ideal? Deci and Ryan (1985) maintain that intrinsic motivation exists only where there is complete freedom to act; in the absence of any form of pressure, internal or external. Clearly regular exercise behaviour requires some form of regulation, which begs the question is exercise behaviour ever truly intrinsically motivated? Vallerand (1997) has devised a hierarchical model of intrinsic and extrinsic motivation that may

give us a framework from which to consider the place of intrinsic motivation in the regulation of physical activity/exercise behaviour. The model recognises three levels of generality at which the behavioural regulation continuum exists: global (or personality), contextual (or life domain) and situation (or state). According to Vallerand these levels of generality “allow us to consider motivation with more precision and refinement” (1997, p. 45) and it may be that intrinsic motivation is best considered at the situational level, as a situational specific variable. The model, presented in Figure 8.1, recognises the recursive nature of the relationships between the different levels of generality (see the double arrows in the centre of Figure 8.1). That is, over time situational self-determination may affect self-determination in a related life context, which in turn may influence global self-determination. This model also considers the antecedents and consequences of motivation at each level of specificity. These parts of the model, though highlighting and clarifying the place of the psychological concomitants of motivation and addressing their effects, both of which are unclear in self-determination theory (Markland and Hardy, 1993), are not directly relevant here and will not be discussed.

The recursive nature of the relationship between the three levels of generality is a primary element in the model; the levels of motivation are interdependent. For instance, long term low levels of self-determination for attending swimming sessions may negatively influence self-determination for exercise in general, which may, in turn, lead to the development of generally low levels of self-determination in the regulation of all motivated behaviour. Feelings of complete enjoyment in the presence of autonomous, intrinsically motivated involvement in, say, a brisk beach walk may positively affect self-determination for engagement in other types of physical activity. Intrinsic motivation may be a state-specific variable that is not always the main regulatory source of involvement in physical activity but whose occasional, situation specific presence increases overall, domain level, self-determination for engaging in physical activity. In addition, as the model suggests, a high level of self-determined motivation in the context of physical activity may enhance self-determination in other contexts (e.g., social, career). Thus, there is a place for intrinsic motivation in the regulation of exercise behaviour but at the state, or situational level rather than at the contextual or domain level. Intrinsic motivation is unlikely to be the primary regulatory source at the domain level but may make a strong contribution to overall self-determination levels by its presence in specific situations.

Figure 8.1. A hierarchical model of intrinsic and extrinsic motivation.



Adapted from Vallerand (1997, p. 274)

Note: EXT = External regulation; IJ = Introjected regulation; ID = Identified regulation; IM = intrinsic motivation; AM = Amotivation

The final point concerns the concept of integrated regulation, its distinction from intrinsic regulation and its contribution to the understanding of exercise behaviour regulation. Integrated regulation, as its title suggests, is achieved when the regulation of a contextually specific behaviour is integrated with the regulation of behaviours in other life contexts. All behavioural regulation then coexists harmoniously and is in accord with the person's concept of self (Deci and Ryan, 1990). Behaviour is engaged in because it is an inherent part of what an individual values; "behaviour is an expression of who the individual is" (Deci et al., 1991, p. 330). Integrated regulation is the most developmentally advanced form of regulation and represents completely self-determined behavioural regulation (Deci et al, 1991). Conceptually speaking, however, integrated regulation is still extrinsically motivated. Integrated behaviour may be an expression of individual values but it is outcome orientated; intrinsically motivated behaviour is characterised by interest in the activity itself (Deci et al, 1991). Therefore, someone exercising for intrinsic reasons would do so for the fun and enjoyment of exercise, whereas someone exercising for integrated reasons would do so because maintenance of fitness, say, is

of utmost importance and exercise is a natural part of his/her life. Integrated regulation was not operationally defined in this research because other existing measures of behavioural regulation, from which the current measure was derived, have only used the concept of intrinsic motivation to represent fully self-determined regulation.

Previously I concluded that intrinsic motivation may be best considered as a state level motivation because the idea of regularly regulating exercise behaviour solely for reasons of fun and enjoyment seemed unreasonable. Integrated regulation, on the other hand, may be a more important and relevant concept for understanding exercise behaviour regulation than the concept of intrinsic motivation. Where there is fully self-determined, integrated regulation, behaviour is engaged in because it is an expression of what an individual values (Deci et al., 1991). In the final study, examination of personal construction of exercise from a self-determination viewpoint revealed that those with moderate to high levels of self-determination (as measured by the relative autonomy index: RAI) expressed clear, firmly established preferences for mode of exercise, some preferring independent exercise, others organised exercise classes, and had clear underlying principles which guided them in their actions (e.g., aspire to own goals, variety in life). Thus, exercising was an expression of these individuals' values. Investigation of personal constructs of exercise across the stages of change found that many long term exercisers felt that physical activity/exercise was a part of what they are, part of their self-concept and, therefore, a natural part of their everyday lives. In the terminology of Deci and Ryan (1985, 1990) the regulation of their exercise behaviour had become completely internalised. In fact those in the maintenance stage expressed concern at the possibility of becoming less self-determined in the regulation of their exercise behaviour by seeing exercise as a chore and becoming too involved in it. Such a description of behavioural regulation is indicative of self-determined, integrated regulation. Given the similarity between these results and the definition of integrated regulation it is clear that had integrated regulation been operationally defined in this research it is likely that such people would have scored highly.

The link between the integrated form of regulation and personal construction of exercise suggests potentially profitable ground for theoretical development and application that deserves consideration. Personal construct theory maintains that each of us has our own theories or constructions of the world through which we interpret and predict events. Research into personal construction of exercise was conducted from an intrapersonal conflicts level of change

standpoint which recognises that there may be a fundamental conflict between a person's theories, or constructions about a certain behaviour and their desire to practice this behaviour which may prevent successful behaviour change. The intrapersonal level of change was seen as that level of change which underlies all behaviour change and, therefore, movement across the stages of change. Such an approach may extend our awareness of the involvement of the personal meaning of exercise in actual exercise behaviour and help us understand why sometimes a programme of daily or regular physical activity cannot be incorporated into a person's daily routine in a manner that will ensure continuing adherence. Adoption of regular exercise not only requires cessation of a sedentary lifestyle but modification of one's self concept to include "physically active" or "sporty" into one's construction of self and a reconceptualisation of "exercise" and "physical activity" as something which is compatible with one's self concept. Intuitively this leads us back to the concept of integrated regulation wherein "behaviour is an expression of who the individual is" (Deci et al., 1991, p.330) and regulation of that behaviour is in accord with the concept of self (Deci and Ryan, 1990).

This focus on the influence of personal beliefs, or constructions of exercise, and the degree to which they are compatible with one's sense of self, is consistent with a self-schema approach to understanding exercise behaviour. Self-schemata are "structures of cognitive and affective representations that pertain to our physical characteristics, our attitudes and preferences and our behavioural regularities" (Markus, Hamill and Sentis, 1987, p.50). Markus (1977) defined them as generalisations about the self derived from past experience which affect the processing of self related information from social experiences. These self-schemata function as selective mechanisms which make sense of past behaviour, determine how much importance is attached to events and direct the course of future behaviour (Markus, 1977). Thus they interpret and guide behaviour in a way that is similar to that proposed by personal construct theory while clearly impacting on the underlying degree of perceived autonomy in the regulation of that behaviour. There is a dearth of research examining the effect of exercise self-schemata on actual exercise behaviour. However, Kendzierski (1994) found that those who viewed the athletic, or exerciser image as being very important to their self-image and self-description (exercise schematics) exercised more frequently and performed more exercise activities than those who viewed the exerciser image as being very important to their self-image, but not their

self-description (non-exerciser schematic) and those for whom the exerciser image and description were neither important nor irrelevant (aschematics).

Kendzierski suggests a motivational explanation for this finding in which exercise schematics are motivated to exercise in order to verify their self image and aschematics are amotivated because they have no such self image. The motivational explanation for the low exercise levels of the non-exercise schematics is more complicated. There may be two sub-groups among the nonschematics: those who are satisfied with and, therefore, not motivated to increase their exercise levels and those who feel motivated to increase, but have not yet increased their exercise behaviour. This latter group represents a group who have negative self-schemata, that is a group who's attributes (exercise levels) are in conflict with their desired self-image (Markus, Cross and Wurf, 1990; Wurf and Markus, 1983). Wurf (1987) believes that such negative schematic conflict marks a time of changing self-image in preparation for desired behaviour change. Thus, this type of nonschematic is motivated to increase his or her exercise/physical activity levels in accordance with a newly modified or desired self image but is not yet sufficiently active to describe him or herself as a regularly active person.

From a stages of change perspective such a person would be in the preparation stage of change. He or she has made a commitment to change, is making small behavioural and lifestyle changes but does not yet exercise regularly. This research has found that such people have only low to moderate levels of self-determination for exercise; their behaviour is not yet an integrated expression of their values or their sense of self. However, the final study in this research revealed a large range in self-determination scores among those in the preparation stage. From a self-schema view point such wide ranging perceptions of autonomy may be indicative of an on-going change in self-image and, therefore, of the on-going change in the degree to which the regulation of a behaviour is felt to be integrated within one's sense of self. Thus, a changing exercise self-schema may be a concomitant of the change in underlying regulation of exercise behaviour and this, in turn, may be a concomitant of a changing and developing personal construction of exercise. While conflicts between desired exercise behaviour change and core constructs about exercising and exercisers may lead one person to remain essentially sedentary, another, who has resolved these conflicts, may be freer, psychologically, to pursue their desired behaviour change. The preparation stage of change, mid way along the stage of change

continuum, may be a time when such conflicts emerge and, therefore, where changes are needed in self-schema in order to allow further behaviour change.

To conclude, I propose the following relationship between exercise self-schema, personal construction of exercise and intrapersonal conflict concerning exercise and stage of change for exercise in view of the belief that the adoption of regular physical activity or exercise is contingent on developing an integrated and fully self-determined sense of exercise behaviour regulation. In full recognition of its speculative nature, I propose that the achievement of fully self-determined, integrated regulation of exercise behaviour may be dependant on a favourable exercise self-schemata (exercise self-image), a favourable personal construction of exercise and the resolution of any conflict that may exist between one's desire to be more physically active and one's such behaviour. This view is in direct contrast to that expressed by early attitudinal researchers such as Festinger (1957). Festinger's cognitive dissonance theory states that attitude and behaviour change could be achieved by providing information that would create a state of mental discomfort (cognitive dissonance). The dissonant state would act as a motivator either to reject the new information or to change attitudes and behaviour accordingly (Bennet and Murphy, 1997). Here I am proposing that such a state would, in effect, act as a motivational barrier to stifle change. I believe that any conflict would be contended at the fifth and most profound of Prochaska and DiClemente's (1984) levels of change, the intrapersonal conflicts level. In keeping, therefore, with the rationale that guided the final piece of research in this work, those who experience disharmony between how they would like to be (more active and healthy) and their quintessential belief system (not the fit and active type) may have great difficulty making any permanent change in their exercise behaviour. In addition, this conflict may be greatest in the preparation stage of change where one has just begun to take a little exercise and where the act of exercising may not yet be fully reconciled with the self-image. Thus the preparation stage of change may be a watershed between the contemplative and action stages of change. The investigation of such proposals would primarily require the examination of exercise self-schema across the stage of change and their appraisal in the context of perceived self-determination for and personal constructions of exercise. If robust, findings in support of these proposals would have direct implications for behaviour change counselling techniques such as motivational interviewing (see Miller and Rollnick, 1991) the basis for which lies in Festinger's theory.

To summarise, discussion has considered the assumption that exercise behaviour can, and should, be regulated for purely intrinsic reasons. This is an oversimplification of a complex response which may be unrealistic and unattainable. The use of the intrinsic-extrinsic motivational dichotomy may have somewhat limited our understanding of motivational concerns in behaviour change and adherence and, as Vallerand (1997) stated about his model's levels of generality conceptualisation, the behavioural regulation continuum "allows us to consider motivation with more precision and refinement" (p. 45). Intrinsic regulation may be better conceptualised as a state-level variable whose presence may improve overall self-determination for exercise behaviour but is unlikely to constitute its primary regulatory source. The concept of integrated regulation, which represents extrinsic rather than intrinsic motivation, may represent a more realistic account of fully self-determined regulation in exercise behaviour. Clearly then, there is a need to operationally define the concept of integrated regulation for inclusion in the Behavioural Regulation in Exercise Questionnaire and to examine its presence across the stages of change. The apparent relationship between personal construction of exercise and degree of self-determination in its regulation was also noted. Finally, the discussion highlighted the possible link between the achievement of this integrated regulation of exercise behaviour and one's exercise self-image, or self-schema. Only when one's sense of self is in accordance with behaviour (exercise schematic) and when one's behaviour is in accordance with one's sense of self (integrated regulation) can there be long term involvement in that behaviour. The appreciation of the role of self variables (exercise self-schema and personal construction of exercise) may be necessary for a more complete understanding of the complex nature of behavioural regulation. Conflicts and concepts that reside within the self may vitally affect the achievement of fully self-determined, integrated regulation of behaviour.

8.6 Uniting the transtheoretical model and the continuum of behavioural regulation

The rationale for the research outlined in chapter three proposed a unification of the models of behaviour change (transtheoretical model: TM) and behavioural regulation (organismic integration theory) to further elucidate the regulatory processes at work in guiding exercise behaviour change and to emphasise the crucial role of motivational considerations in the change process. Although this research found that behavioural regulation varied across the stages of change for exercise behaviour, no support was found for the proposed positive influence of self-

determined regulation of behaviour on change in stage of change over a three month period. Although there may be many methodological-level explanations for these results (see Chapter 5), the very nature of the causal relationship between these so-called techniques and strategies of change and stage of change remains ambiguous. It is unclear from TM and its empirical research whether the processes of change are the antecedents or consequences of change. That is, whether the use of certain processes of change sparks movement to another stage of change or whether current stage of change is responsible for use of certain processes of change. A plausible explanation for this uncertain causal direction may be that the causal factor in the change processes differs throughout the change processes.

Research examining the processes and stages of change within the exercise domain that has conducted regression or analysis of variance type analyses, has classed stage of change as an independent variable and processes of change the dependent variables (e.g., Gorley and Gordon, 1995; Goldberger, Christopher, Aznar, Barnes, Simmonds, McKenna, Page and Naylor, 1995; Marcus, Rossi et al., 1992; Marcus et al, 1996). Classification of variables as dependant or independent variables often reflects a basis for presuming a cause-effect relationship. However, the treatment of the processes of change as dependant variables does not acknowledge that processes may often trigger movement along the change continuum; that is, they may lead to change in stage. Processes may cause the initial movement between precontemplation, contemplation and even preparation, but then the act of changing behaviour and subsequent maintenance of the behaviour change will necessarily lead to the use of behavioural processes to cope with change and the act of changing. If so, perhaps a preliminary causal model might claim that there is likely to be reciprocal relationships between a) the processes of change that trigger movement to a stage, b) those that are utilised as a result of the stage and c) the stage of change itself. That is, experiential processes may ‘trigger’ stage of change, while stage of change itself ‘causes’ use of the behavioural processes, or coping strategies: the processes cue change in stage, but stage also requires process use to cope with change.

It is likely that the source of behavioural regulation has a major influence on this relationship. In fact the perception of the processes as either “trigger” or “coping” factors may depend on underlying perception of self-determination. Low self-determination may be linked to primary use of ‘trigger’ processes while increased levels of self-determination may be linked to use of ‘coping’ processes. When self-determination is lower, as it may often be in the initial

stages of change, a new behaviour may be undertaken in response to feelings of coercion. The processes of change, particularly the experiential processes, represent these coercive influences, in fact that is their function in the early stages of change - increasing awareness of the problem and the need for change. In the later stages of change when self-determination is higher, there is an increased sense of personal causation. Here, processes are used actively to cope with this change.

There is, however, a lack of research and explicit theoretical guidance from which to establish any type of causal model that might indicate which mechanism is the agent of change and which its intermediary (mediator or moderator). While such speculation may serve a heuristic purpose, there is a primary need for further research to examine how the strategies and techniques for change that make up the processes of change are experienced by those who are trying to adopt regular physical activity. Problems encountered in the present research with the measurement of these processes highlights the need for a re-operationalisation of many of the processes in order to increase their relevance to exercise and physical activity settings. However, future research may concur with the conclusions of this research and that of Gorely and Gordon (1995) that many of the processes of change do not appear to be relevant to exercise behaviour change. Further examination of the processes of change in exercise behaviour change is particularly important in light of the emphasis on stage matched interventions which stress the importance of particular processes of change at particular stages of change (e.g., Marcus, Rossi et al., 1992; Prochaska and DiClemente, 1985; Prochaska et al., 1992; Prochaska and Marcus; 1994). According to Marcus and colleagues media based exercise campaigns have mostly been ineffective in increasing the public's participation in physical activity as a result of the mis-match between the action orientation of such campaigns and where the majority of the population is regarding readiness to change (in the precontemplation stage: Marcus and Simkin, 1993; Prochaska and Marcus, 1994). To date, only Prochaska et al. (1993) have successfully employed the processes by stage of change-based rationale in a smoking cessation programme. Prochaska and Marcus (1994) note the unavailability of data on whether common processes are involved in acquisition behaviours (such as exercise) and cessation behaviours (such as smoking). Dishman (1994) recognises that exercise as a behaviour is best studied in the context of public health but that its determinants probably differ in a number of important ways from other health-related behaviours.

8.7 Conclusion

The current research has shown much promise for the integration of the continuum of behavioural regulation and the transtheoretical model. Amendments to the measures of the underlying constructs (stages of change, processes of change and behavioural regulation) have been proposed. The staging algorithm for the stages of change for exercise questionnaire should be redefined to refer to the cessation of a sedentary lifestyle and the adoption of regular physical activity. More rigorous and relevant operationalisation of the processes of change for exercise should accompany research to determine the appropriateness of all processes to exercise behaviour change. The concept of integrated regulation should also be operationally defined for inclusion in the BREQ. Furthermore, the discovery, during the development of this questionnaire, of two unrelated forms of introjected regulation, regulation through guilt-avoidance and regulation through application of rules to self, both of which were consistent with Deci and Ryan's (1985, 1991) definition of introjected regulation, suggests the need for further research to determine whether or not these elements should represent separate points on the behavioural regulation continuum. In the light of the focus of the discussion on exercise as a primarily extrinsically motivated behaviour, the addition of another grade of external motivation to the exercise behaviour regulation continuum may be beneficial to our understanding of exercise motivation.

The discussion has also suggested a causal link between personal constructs of exercise, exercise self-schema and the achievement of fully self-determined regulation of exercise. If exercise regulation is to be internalised individuals must believe that the properties and qualities they ascribe to exercise or physical activity and those who engage in it are in keeping with their sense of self and their ideology. The marketing of exercise as an activity that can and should be incorporated into daily life, rather than as a means to achieving fitness goals, may do much to ease the incorporation of the physically active, exerciser image into the self-concept of the non-exerciser, or infrequent exerciser. This may promote the integration of exercise/physical activity with the regulation of life's other activities. An additional consideration in this regard is the apparent importance of extrinsic motives in the regulation of exercise behaviour. Without undermining the importance of fun and enjoyment perceptions to inspiring continued, long term involvement in exercise/physical activity we must accept that regulation through guilt-avoidance and desired consequences are equally important, and therefore, equally desirable motives for

being physically active, at least in the short term. The continuum conceptualisation of extrinsic motivation may do much to promote our understanding and acceptance of the significance of such motives in promoting continued and regular physical activity involvement. The stages of change conceptualisation, despite its criticisms, will release us from the constraints of the dichotomous division of exercise behaviour, previously supported in exercise adherence research, in which all non-exercisers and irregular exercisers were bunched together in opposition to all regular exercisers, presupposing a similar cognitive state for each classification. Gradations of self-determination and personal construction of exercise have been demonstrated between these two extremes.

The final comment recognises the shortcomings of a primary and exclusive focus on individual beliefs and cognitions in explaining exercise/physical activity behaviour. The effect of an individual's cognitions on their behaviour cannot be fully understood without reference to the social environment. An understanding of the motivational processes that guide exercise/physical activity behaviour should be accompanied by an easing of the physical restrictions to active daily living if it is to further the promotion of and increase public participation in exercise/physical activity. Such restrictions are real and manifold, for example, insufficient bicycle paths and lanes, the unavailability of showers in work places, traffic congestion, disappearing green belt, and the meagre funding for PE classes and extra curricular activities in schools. Too many such obstacles curtail the physical activity levels of the young and those who are their role models. Too many such obstacles hinder the development of a concept of self which encompasses the 'exerciser' or 'physically active' image. Too many such obstacles often stifle self-determination.

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APPENDIX 1

Study 1: Development of the BREQ

WHY ARE YOU EXERCISING?

The following are statements about the different reasons people sometimes have for exercising. We want to know how true each of these statements is for you. Using the scale that follows each statement please indicate, by circling the appropriate number, to what extent each of these statements is true for you.

AGE _____ GENDER _____

You are not required to put your name on this questionnaire.

<i>Example statement:</i>	Not true for me	Sometimes true for me	Very true for me
I exercise for the good of my health.....	0.....	1.....	2.....3.....4

1. I exercise because other people say I should.....0.....1.....2.....3.....4
2. I value the benefits of exercise.....0.....1.....2.....3.....4
3. I feel guilty if I don't exercise.....0.....1.....2.....3.....4
4. I exercise because it's fun.....0.....1.....2.....3.....4
5. I can't see why I should bother exercising.....0.....1.....2.....3.....4
6. I take part in exercise because my friends/
family/spouse say I should.....0.....1.....2.....3.....4
7. I enjoy my exercise sessions.....0.....1.....2.....3.....4
8. I don't see why I should have to exercise.....0.....1.....2.....3.....4
9. It is important to me to exercise regularly.....0.....1.....2.....3.....4
10. I feel ashamed when I miss an exercise session.....0.....1.....2.....3.....4
11. My doctor advised me to take some exercise.....0.....1.....2.....3.....4
12. I find exercise a pleasurable activity.....0.....1.....2.....3.....4
13. I want to take personal responsibility
for my health.....0.....1.....2.....3.....4

- | | Not true
for me | Sometimes
true for me | Very true
for me. |
|---|--------------------|--------------------------|----------------------|
| 14. I feel like a failure when I haven't exercised in a while. | 0 | 1 | 2 3 4 |
| 15. Exercise is boring..... | 0 | 1 | 2 3 4 |
| 16. I want to show myself that I can do it..... | 0 | 1 | 2 3 4 |
| 17. I exercise because others will be displeased with me if I don't..... | 0 | 1 | 2 3 4 |
| 18. I get pleasure and satisfaction from participating in exercise. | 0 | 1 | 2 3 4 |
| 19. It's a real effort to go and do some exercise..... | 0 | 1 | 2 3 4 |
| 20. I think it's important to make the effort to exercise regularly..... | 0 | 1 | 2 3 4 |
| 21. I really have to push myself to take some exercise..... | 0 | 1 | 2 3 4 |
| 22. I feel under pressure from family/friends to exercise..... | 0 | 1 | 2 3 4 |
| 23. Exercise is a waste of time..... | 0 | 1 | 2 3 4 |
| 24. I enjoy the feeling of exerting myself..... | 0 | 1 | 2 3 4 |
| 25. Having to exercise is such a bind but has to be done..... | 0 | 1 | 2 3 4 |
| 26. I don't see the point in exercising/of exercise..... | 0 | 1 | 2 3 4 |
| 27. My exercise schedule has been imposed on me..... | 0 | 1 | 2 3 4 |
| 28. I get restless if I don't exercise regularly..... | 0 | 1 | 2 3 4 |
| 29. I exercise for the enjoyment of the feeling of exercising..... | 0 | 1 | 2 3 4 |
| 30. Exercise is something I wouldn't necessarily choose to do but something I feel I ought to do..... | 0 | 1 | 2 3 4 |

EXERCISE IS ANY KIND OF PHYSICAL ACTIVITY

YOU DO TO "GET SOME EXERCISE".

HOW MUCH EXERCISE DO YOU DO?

PLEASE MARK THE APPROPRIATE RUNG ON THIS LADDER.

10	I currently exercise regularly and have been doing so for more than 6 months
9	
8	I currently exercise regularly but have begun doing so in the last 6 months
7	
6	
5	I currently exercise a little but not regularly
4	
3	
2	I currently do not exercise but I am thinking about starting in the next 6 months
1	
0	I currently do not exercise and do not intent to start in the next 6 months

Items and factor loadings (with standard errors) for the three item and four item groupings within the introjected regulation scale in stage one.

Item and grouping	Factor loading (SE)
<i>Three item grouping</i>	
I feel guilty if I don't exercise	.785 (.026)
I feel ashamed when I miss an exercise session	.785 (.026)
I feel like a failure when I haven't exercised in a while	.785 (.026)
<i>Four item grouping</i>	
It's a real effort to go and do some exercise	.540 (.063)
I really have to push myself to take some exercise	.503 (.061)
Having to exercise is such a bind but it has to be done	.363 (.060)
Exercise is something I wouldn't necessarily choose to do but something I feel I ought to do	.525 (.070)

Fit indices for factor pairings pre- and post-item elimination in stage two.

	χ^2 (df)	RMSEA,	CI,	p value.	GFI	NNFI
External X Introjected *	32.70 (13)	.071,	.041-.102,	.11	.975.	.938
External X Identified						
Pre-elimination:	57.02 (26)	.063,	.041-.085,	.14	.974	.947
Post-elimination:	37.41 (19)	.084,	.029-.084,	.31	.980	.962
External X Intrinsic						
Pre-elimination:	81.84 (26)	.085,	**	.00	.973	.953
Post-elimination:	46.07 (19)	.095,	.043-.095,	.09	.984	.971
Introjected X Identified						
Pre-elimination:	72.86 (19)	.100,	**	.00	.957	.846
Post-elimination:	24.45 (13)	.054,	.017-.087,	.37	.963	.838
Introjected X Intrinsic	46.56 (19)	.069,	.044-.195,	.09	.984	.976
Pre- elimination:						
Post elimination	35.68 (13)	.076,	.047-.107,	.06	.986	.976
Identified X Intrinsic						
Pre-elimination:	75.71 (19)	.064,	.044-.083,	.10	.980	.975
Post-elimination:	40.41 (19)	.061,	.034-.087,	.21	.986	.981

Note: RMSEA = Root Mean Square Error of Approxiamtion; CI = 95% confidence interval for RMSEA; p value for RMSEA = probability that RMSEA > .05; GFI = Goodness of fit Index; NNFI = Non-Normed Fit Index.

* No additional items were deleted from either EXT or IJ following single scale examination.

** Confidence interval could not be computed due to too small p value for chi-square.

The BREQ: Items and sub-scales retained and removed.

External regulation: Retained

I exercise because other people say I should
 I take part in exercise because my friends/family/spouse say I should.
 I exercise because others will be displeased with me if I don't.
 I feel under pressure from my family/friends to exercise.

Removed

My doctor advised me to take some regular exercise.
 My exercise schedule has been imposed on me.

Introjected regulation: Retained

I feel guilty if I don't exercise.
 I feel ashamed when I miss an exercise session.
 I feel like a failure when I haven't exercised in a while.

Removed

It's a real effort to go out and do some exercise
 I really have to push myself to take some exercise.
 Having to exercise is such a bind but has to be done.
 exercise is something that I wouldn't necessarily choose to do but something I feel I ought to do.

Identified regulation: Retained

I value the benefits of exercise.
 It is important to me to exercise regularly.
 I think it is important to make the effort to exercise regularly.
 I get restless if I don't exercise regularly.

Removed:

I want to take personal responsibility for my health
 I want to show myself that I can do it.)

Intrinsic regulation: Retained

I exercise because it's fun.
 I enjoy my exercise sessions.
 I find exercise a pleasurable activity.
 I get pleasure and satisfaction from participating in exercise.

Removed.

I enjoy the feeling of exerting myself.
 I exercising for the enjoyment of the feeling of exercising.)

Amotivation: Removed

I can't see why I should bother exercising.
 I don't see why I should have to exercise.
 Exercise is boring.
 Exercise is a waste of time
 I don't see the point in exercising/of exercise.)

WHY ARE YOU EXERCISING?

The following are statements about the different reasons people sometimes have for exercising. I want to know how true each of these statements is for you. Using the scale that follows each statement please indicate, by circling the appropriate number, to what extent each of these statements is true for you.

Age _____ Male/Female?

You do not need to put your name on this questionnaire.

<i>Example statement:</i>	Not true for me	Sometimes true for me	Very true for me
I exercise for the good of my health.....	0.....	1.....	2.....3.....4
1. I exercise because other people say I should.....	0.....	1.....	2.....3.....4
2. I value the benefits of exercise.....	0.....	1.....	2.....3.....4
3. I feel guilty if I don't exercise.....	0.....	1.....	2.....3.....4
4. I exercise because it's fun.....	0.....	1.....	2.....3.....4
5. I take part in exercise because my friends/ family/spouse say I should.....	0.....	1.....	2.....3.....4
6. I enjoy my exercise sessions.....	0.....	1.....	2.....3.....4
7. I feel ashamed when I miss an exercise session.....	0.....	1.....	2.....3.....4
8. I find exercise a pleasurable activity.....	0.....	1.....	2.....3.....4
9. I feel like a failure when I haven't exercised in a while.....	0.....	1.....	2.....3.....4
10. I exercise because others will be displeased with me if I don't.....	0.....	1.....	2.....3.....4
11. I get pleasure and satisfaction from participating in exercise.....	0.....	1.....	2.....3.....4
12. I think it's important to make the effort to exercise regularly.....	0.....	1.....	2.....3.....4
13. I feel under pressure from family/friends to exercise.....	0.....	1.....	2.....3.....4
14. I get restless if I don't exercise regularly.....	0.....	1.....	2.....3.....4
15. It is important to me to exercise regularly.....	0.....	1.....	2.....3.....4

Confirming the factor-structure of the BREQ with an additional sample: Factor loadings, "Robust" standard errors and T-values.

Items and Factors	Factor loadings	SE	T-value
External regulation			
I exercise because other people say I should	.650	.043	7.448
I take part in exercise because my friend/family/spouse say I should	.764	.071	9.206
I exercise because others will not be pleased with me if I don't	.734	.095	5.745
I feel under pressure from my friends/family to exercise	.651	.101	5.249
Introjected regulation			
I feel guilty when I don't exercise	.694	.075	13.457
I feel ashamed when I miss an exercise session	.814	.070	14.764
I feel like a failure when I haven't exercised in a while	.740	.071	13.920
Identified regulation			
I value the benefits of exercise	.672	.070	11.421
It's important to me to exercise regularly	.747	.068	13.130
I think it is important to make the effort to exercise regularly	.659	.059	16.052
I get restless if I don't exercise regularly	.801	.061	18.319
Intrinsic regulation			
I exercise because it's fun	.729	.058	17.574
I enjoy my exercise sessions	.847	.057	19.313
I find exercise a pleasurable activity	.883	.047	24.365
I get pleasure and satisfaction from participating in exercise	.909	.050	23.364

APPENDIX 2

Study 2: Behavioural regulation, self-determination and the stages and processes of change

The Processes of Change for Exercise Questionnaire (PCEQ).

Experiential Processes

Consciousness raising

I recall information people have personally given me on the benefits of exercise.
 I think about information from articles and advertisements on how to make exercise a regular part of my life.
 I read articles about exercise in an attempt to learn more about it.
 I look for information related to exercise.

Dramatic relief

Warnings about the health hazards of inactivity move me emotionally.
 Dramatic portrayals of the evils of inactivity move me emotionally.
 I react emotionally to warnings about an inactive lifestyle.

Removed

TV programmes or magazine items about the effects of inactivity disturb me.
 It bothers me when I hear about or read about how being inactive is bad for your health

Environmental re-evaluation

I feel I would be a better role model for others if I exercised regularly.
 I wonder how my inactivity affects those people who are close to me.
 I realise that I might be able to influence others to be healthier if I were to exercise more.
 Some of my close friends might exercise more if I would.

Self-re-evaluation

I am considering the idea that exercise would make me a healthier, happier person to be around.
 I think about the type of person I will be if I keep exercising.
 I get frustrated with myself when I don't exercise.
 I consider the fact that I would feel more confident with myself if I exercised regularly.

Social liberation

I find society changing in ways that make it easier for the exerciser.
 I am aware of more and more people encouraging me to exercise these days.

Removed

It is more acceptable to want to take time to exercise these days.
 I notice that more and more people are exercising these days.
 I notice that more and more leisure centres and exercise facilities are being built.

Behavioural Processes

Counter-conditioning

Instead of remaining inactive , I engage in some physical activity.

Rather than viewing exercise as simply another task to get out of the way, I try to use it as my special time to relax and recover from the day's worries.

When I feel tired, I make myself exercise anyway because I know I will feel better afterwards.

When I'm feeling tense, I find exercise a great way to relieve my worries.

Helping relationships

I have someone on whom I can depend when I am having problems with exercising.

I have a healthy friend who encourages me to exercise when I don't feel up to it.

I have somebody who points out my rationalisations for not exercising.

I have someone who provides feedback about my exercising.

Reinforcement management

I reward myself when I exercise.

I try to set realistic goals for myself rather than setting myself up for failure by expecting too much.

When I exercise, I tell myself that I am being good to myself by taking care of my body in this way.

I do something nice for myself for making efforts to exercise more.

Self-liberation

I tell myself I am able to keep exercising if I want to.

I tell myself that if I try hard enough I can keep exercising.

I make commitments to exercise.

I remind myself that I am the only one who is responsible for my health and well being and that only I can decide whether or not I will exercise.

Stimulus control

I put things around my home to remind me of exercising.

I keep things around my place of work that remind me of exercise.

I remove things that contribute to my inactivity.

I avoid spending long periods of time in environments that promote inactivity.

THINGS THAT HELP KEEP ME EXERCISING.

What encourages you to take up exercise or helps to keep you exercising regularly?

Below is a list of approaches that others have found useful.

Please indicate how often YOU use the approaches listed below.

0= never 4= a lot

	NEVER			A LOT
Warnings about the health hazards of inactivity move me emotionally.....0	1	2	3	4
I am considering the idea that regular exercise would make me a healthier, happier person to be around.....0	1	2	3	4
Instead of remaining inactive I engage in some physical activity.....0	1	2	3	4
I reward myself when I exercise.....0	1	2	3	4
I put things around my home to remind me of exercising.....0	1	2	3	4
I recall information people have personally given me on the benefits of exercise.....0	1	2	3	4
I feel I would be a better role model for other if I exercised regularly.....0	1	2	3	4
I find society changing in ways that make it easier for the exerciser.....0	1	2	3	4
I have someone on whom I can depend when I am having problems with exercising.0	1	2	3	4
I tell myself I am able to keep exercising if I want to.....0	1	2	3	4
I think about information from articles and advertisements on how to make exercise a regular part of my life.....0	1	2	3	4
It is more acceptable to want to take time to exercise these days.....0	1	2	3	4
Dramatic portrayals of the evils of inactivity move me emotionally.....0	1	2	3	4
I wonder how my inactivity effects those people who are close to me.....0	1	2	3	4
I think about the type of person I will be if I keep exercising.....0	1	2	3	4
I am aware of more and more people encouraging me to exercise these days.....0	1	2	3	4
Rather than viewing exercise as simply another task to get out of the way, I try to use it as my time to relax and recover from the day's worries.....0	1	2	3	4
I have a friend who encourages me to exercise when I don't feel up to it.....0	1	2	3	4

	NEVER			A LOT
I try to set realistic goals for myself rather than setting myself up for failure by expecting too much.....	0	1	2	3 4
I tell myself that if I try hard enough I can keep exercising.....	0	1	2	3 4
I keep things around my place of work that remind me of exercise.....	0	1	2	3 4
I react emotionally to warnings about an inactive lifestyle.....	0	1	2	3 4
I get frustrated with myself when I don't exercise.....	0	1	2	3 4
I notice that more and more people are exercising these days.....	0	1	2	3 4
When I'm tired I make myself exercise anyway because I know I'll feel better afterwards.....	0	1	2	3 4
TV programmes or magazine items about the effects of inactivity disturb me....	0	1	2	3 4
When I exercise I tell myself that I am being good to myself by taking care of my body in this way.....	0	1	2	3 4
I remove things that contribute to my inactivity.....	0	1	2	3 4
I read articles about exercise in an attempt to learn more about it.....	0	1	2	3 4
I realise that I might be able to influence others to be healthier if I were to exercise more.....	0	1	2	3 4
I notice that more and more leisure centres and exercise facilities are being built.....	0	1	2	3 4
I have someone who points out my rationalisations for not exercising.....	0	1	2	3 4
I make commitments to exercise.....	0	1	2	3 4
I look for information related to exercise.....	0	1	2	3 4
Some of my close friends might exercise more if would.....	0	1	2	3 4
I consider that fact that I would feel more confident with myself if I exercised regularly.....	0	1	2	3 4
When I am feeling tense I find exercise a great way to relieve my worries.....	0	1	2	3 4
I have someone who provides feedback about my exercising.....	0	1	2	3 4
It bothers me when I hear about or read about how being inactive is bad bad for your health.....	0	1	2	3 4
I do something nice for myself for making efforts to exercise more.....	0	1	2	3 4

	NEVER			A LOT	
I remind myself that I am the only one who is responsible for my health and well being, and that only I can decide whether or not I will exercise.....	0	1	2	3	4
I avoid spending long periods of time in environments that promote inactivity.....	0	1	2	3	4

Thank you for completing this questionnaire.

Would you be willing to complete this questionnaire again in three months time?

Yes___ No___

If yes, I need to know your staff number so that your initial and follow up questionnaires can be kept together.

Important : Your staff number will not be used to identify you.

Staff number = _____

Thank you

Behavioural regulation across the stages of change.

Introjected regulation by stage of change group ANOVA for females

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	14.1465	4.7155	3.5087	.0169
Within Groups	151	202.9388	1.3440		
Total	154	217.0853			

Multiple Range Tests: Tukey-HSD test with significance level .050

The difference between two means is significant if

$MEAN(J) - MEAN(I) \geq .8197 * RANGE * \sqrt{1/N(I) + 1/N(J)}$
with the following value(s) for RANGE: 3.68

(*) Indicates significant differences which are shown in the lower triangle

Mean	STAGEGP	PP	P	A	M
.6000	prepreparation (PP)				
1.1576	preparation (P)				
1.4058	action (A)				
1.4808	maintenance (M)	*			

Introjected regulation by stage of change group ANOVA for males

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	3	12.2405	4.0802	3.4393	.0184
Within Groups	155	183.8825	1.1863		
Total	158	196.1230			

Multiple Range Tests: Tukey-HSD test with significance level .050

The difference between two means is significant if
 $MEAN(J) - MEAN(I) \geq .7702 * RANGE * \sqrt{1/N(I) + 1/N(J)}$
 with the following value(s) for RANGE: 3.68

(*) Indicates significant differences which are shown in the lower triangle

Mean	STAGEGP	PP	P	A	M
.6957	prepreparation (PP)				
1.1613	preparation (P)				
1.2576	action (A)				
1.5513	maintenance (M)	*			

RAI by stage of change and gender ANOVA

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	1164.299	4	291.075	39.866	.000
GENDER	57.400	1	57.400	7.862	.005
STAGEGP	1097.798	3	365.933	50.119	.000
2-Way Interactions	44.657	3	14.886	2.039	.108
GENDER STAGEGP	44.657	3	14.886	2.039	.108
Explained	1227.203	7	175.315	24.011	.000
Residual	2212.295	303	7.301		
Total	3439.499	310	11.095		

Multiple Range Tests: Tukey-HSD test with significance level .050

The difference between two means is significant if

$MEAN(J) - MEAN(I) \geq 1.9350 * RANGE * \sqrt{1/N(I) + 1/N(J)}$
with the following value(s) for RANGE: 3.66

(*) Indicates significant differences which are shown in the lower triangle

Mean	STAGEGP	PP	P	A	M
2.2865	prepreparation (PP)				
4.7650	preparation (P)	*			
7.1111	action (A)	*	*		
7.5986	maintenance (M)	*	*	*	

Factor loadings, standard errors and T-values for the higher order processes of change for exercise models.

Sub-scale	Factor loadings (standard error; T-Value)		
	1 factor	2 uncorrelated factors	2 correlated factors
CR	.753 (.061; 13.926)	.717 (.065; 12.423)	.753 (.061; 13.896)
DR	.644 (.055; 11.293)	.743 (.055; 13.029)	.642 (.055; 11.244)
ER	.739 (.053; 13.569)	.752 (.055; 13.241)	.739 (.053; 13.537)
SR	.815 (.053; 15.665)	.781 (.058; 13.920)	.815 (.054; 15.591)
ScL	.512 (.057; 8.549)	.488 (.060; 7.757)	.512 (.057; 8.545)
CC	.702 (.051; 12.632)	.745 (.053; 13.092)	.701 (.652; 12.597)
HR	.672 (.052; 11.935)	.645 (.054; 10.856)	.672 (.052; 11.927)
RM	.817 (.053; 15.721)	.776 (.057; 13.839)	.817 (.053; 15.651)
SfL	.727 (.055; 13.260)	.771 (.056; 13.714)	.726 (.055; 13.215)
SC	.632 (.045; 11.016)	.613 (.048; 10.186)	.631 (.045; 11.001)

Note: CR=Consciousness Raising; DR=Dramatic Relief; ER=Environmental Re-evaluation; SR=Self Re-evaluation; ScL=Social Liberation; CC=Counter-conditioning; HR=Helping Relationships; RM=Reinforcement Management; SfL=Self Liberation; SC=Stimulus Control.

Follow-up analysis.

Change group by processes of change ANOVA for females

Univariate F-tests with (2,34) D. F.

Variable	Hypoth. SS	Error SS	Hypoth. MS	Error MS	F	Sig. of F
RES_CC	39.98495	214.29903	19.99247	6.30291	3.17194	.055
RES_RAI	68.32164	1928.66216	34.16082	56.72536	.60221	.553
RES_RM	32.59470	192.36493	16.29735	5.65779	2.88051	.070
RES_SCL	10.21527	236.36497	5.10764	6.95191	.73471	.487
RES_SFL	18.75025	249.54369	9.37512	7.33952	1.27735	.292
RES_SR	12.68273	396.30120	6.34136	11.65592	.54405	.585

Note: RES=residualised; CC=Counter-conditioning; RAI=Relative Autonomy Index; RM=Reinforcement Management; ScL=Social Liberation; SFL=Self Liberation; SR=Self Re-evaluation.

Multiple Range Tests Counter-conditioning: Tukey-HSD test with sig. level .050

The difference between two means is significant if

$$\text{MEAN}(J) - \text{MEAN}(I) \geq 1.7752 * \text{RANGE} * \text{SQRT}(1/N(I) + 1/N(J))$$

with the following value(s) for RANGE: 3.46

(*) Indicates significant differences which are shown in the lower triangle

Mean	CHANGE GP.	I	R	M
-1.1928	improvers (I)			
-1.0985	relapsers (R)			
1.4093	maintainers (M)		*	

Change group by processes of change ANOVA for males

Univariate F-tests with (2,33) D. F.

Variable	Hypoth. SS	Error SS	Hypoth. MS	Error MS	F	Sig. of F
RES_CC	57.32878	218.92842	28.66439	6.63419	4.32070	.022
RES_RAI	217.80716	1754.70849	108.90358	53.17298	2.04810	.145
RES_SFL	103.14033	375.27522	51.57016	11.37198	4.53485	.018
RES_SR	.32776	269.83192	.16388	8.17672	.02004	.980

Note: RES=residualised; CC=Counter-conditioning; RAI=Relative Autonomy Index; RM=Reinforcement Management; ScL=Social Liberation; SFL=Self Liberation; SR=Self Re-evaluation.

Multiple Range Tests Counter-conditioning: Tukey-HSD test with sig. level .050

The difference between two means is significant if

$$\text{MEAN}(J) - \text{MEAN}(I) \geq 1.8213 * \text{RANGE} * \text{SQRT}(1/N(I) + 1/N(J))$$

with the following value(s) for RANGE: 3.46

(*) Indicates significant differences which are shown in the lower triangle

Mean	CHANGE GP.	M	R	I
-2.2787	maintainers (M)			
.4815	relapsers (R)			
2.3267	improvers (I)	*		

Multiple Range Tests Self Liberation: Tukey-HSD test with sig. level .050

The difference between two means is significant if

$$\text{MEAN}(J) - \text{MEAN}(I) \geq 2.3845 * \text{RANGE} * \text{SQRT}(1/N(I) + 1/N(J))$$

with the following value(s) for RANGE: 3.46

(*) Indicates significant differences which are shown in the lower triangle

Mean	CHANGE GP.	M	R	I
-1.8733	maintainers (M)			
-.1959	relapsers (R)			
3.4408	improvers (I)	*	*	

APPENDIX 3

Study 3: Personal construction of exercise across the stages of change

Thoughts about Physical activity and exercise

Consent form

Elaine Mullan, MA

I am interested in examining how we see active, sporty people, exercisers and ourselves (past, present and future) with regard to exercise.

You will be asked to pick three cards from a bunch of 12 and then say how you think two of the cards are the same and the opposite of the third card. You will repeat this task 10-12 times and each time the response you give will be written down on a chart. Following this you will give each of the cards a score on the chart based on the responses you have given.

Finally, you will be asked to complete a short questionnaire (15 questions) concerning motivation for exercise.

You will be paid £7.00 for your participation in this study.

The total time for this interview session is expected to be 50 minutes maximum. **Your participation in this research is totally voluntary and you are free to leave the interview at any time.** All of your card-sort and questionnaire answers will be treated confidentially. This interview will not be video or tape recorded. Please do not hesitate to ask questions at any time during the interview if you are unsure about any of the procedures which will be followed.

I have read and understood the above and I agree to participate in this study.

Name _____

Signed _____ Date _____

Please give each of the of the people along the top a score from 1 to 5 based on the labels down the left hand side.

	Me as I would like to be	Me as I was	Me as I fear becoming	My parents	The gladiators	My spouse, boy/girlfriend	Other people my age	People in an aerobics class	My old school PE teacher	A regular exerciser that I know	A well balanced person
1.....3.....5	5	3	1	5	4	5	4	2	4	2	5.
neurotic — rational											
Old maid (strict) — younger more lenient	1	1	1	3	3	4	4	3	1	3	4.
Masculine — feminine	4	3	1	3	3	5	4	3	2	4	4.
"look at me" — private	1	4	1	4	1	5	3	1	4	2	4
fit & strong — wife	4	2	5	1	1	2	3	2	1	2	3
Happy with your lot — uncontented	1	3	5	2	3	1	3	5	2	2	1
athletic — couch potato	4	1	5	2	1	2	4	2	1	2	3
independant (self motivated) — need others to keep exercising	1	1	5	1	2	1	2	5	1	2	1

Stage of change at low, moderate and high RAI scores respectively

Low RAI	Stage of change	Moderate RAI	Stage of change	High RAI	Stage of change
-3.00	PC	5.17	P	8.17	P
-2.17	C	6.08	P	8.33	M
-2.17	C	6.17	M	8.42	M
.50	P	6.25	M	9.33	M
1.25	PC	6.33	M	9.33	M
1.75	M	6.50	C	9.50	P
2.33	PC	6.50	C	9.83	M
4.83	P	6.58	C	10.00	A
		6.67	A	11.17	M
		7.25	C	11.25	P
		7.33	A		
		7.50	A		

Note: PC = Precontemplation; C = Contemplation; P = Preparation; A = Action; M = maintenance; RAI = Relative autonomy index.