

### **Bangor University**

### DOCTOR OF PHILOSOPHY

### Facilitating exercise behaviour change: a self-determination theory and motivational interviewing perspective

Tobin, Vanessa J.

Award date: 2003

Awarding institution: Bangor University

Link to publication

#### **General rights**

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- · Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
  You may freely distribute the URL identifying the publication in the public portal ?

Take down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

# FACILITATING EXERCISE BEHAVIOUR CHANGE: A SELF-DETERMINATION THEORY AND MOTIVATIONAL INTERVIEWING PERSPECTIVE

Vannessa J. Tobin

# Thesis submitted for the Degree of Doctor of Philosophy at the University of Wales

# School of Sport, Health and Exercise Sciences, University of Wales, Bangor

August 2003





# CONTENTS

Page	;
List of Appendices List of Tables List of Figures Acknowledgements	i ii iii iv
Summary	1
1. Introduction Exercise uptake and adherence Motivational Interviewing Self-determination Theory The relationship between MI and SDT GP Exercise Referral Schemes Goal of research programme Structure of the thesis	3 4 8 17 24 25 26
2. Study1: Development and Validation of Tools to Assess Perceived Environmental Supportiveness and Satisfaction of the Psychological Need for Relatedness, and an Assessment of the Factorial Validity of the BREO-2	28
Introduction Methods Participants Instruments Procedure Results Discussion	28 38 40 41 46 57
3. Study1: An Examination of the Structural Relationships between Environmental Supports, Psychological Need Satisfaction, and Behavioural Regulation.	66
Introduction Model testing strategy Results Discussion	66 69 72 76
4. Study 2: Testing the Relationships between Perceived Environmental Supports and Perceived Levels of Psychological Need Satisfaction, Exercise Adherence, and Maintenance.	82

	Page
Introduction	82
Methods	84
Participants	84
Instruments	86
Procedure	88
Results	89
Discussion	94
5. Study 3: A Situational Examination of the Relationships	102
between Environmental Supports, Psychological Needs, and	
Motivational Consequences in the Context of Exercise	
Introduction	102
Methods	102
Participants	109
Instruments	110
Procedure	111
Results (measurement model)	113
Results (structural model)	123
Discussion	127
( Starley 4. The Effects of Easting and 1 Starley at an	10.0
Design of the second support of	130
Psychological and Benavioural Outcomes within the GP	
Exercise Referral Scheme Context	
Introduction	136
Methods	143
Participants	143
Instruments	144
Procedure Desults (quantitative analyses)	148
Discussion (quantitative analyses)	155
Methods (qualitative analyses)	105
Results (qualitative analyses)	171
Discussion (qualitative analyses)	187
Discussion (quantative analyses)	107
7. General Discussion	190
Summary	190
Theoretical implications	193
Applied implications	198
Limitations	199
Future research	201
References	203
Appendices	223

# LIST OF APPENDICES

Арре	endix 1	Page 223
1.A - 1.B - 1.C - 1.D - 1.E - 1.F -	Introductory page of the PESQ / Psychological Need Satisfaction questionnaire Consent form included in the questionnaire booklet The main section of the PESQ/Psychological Need Satisfaction questionnaire Leisure Time Exercise Questionnaire Psychological Need Satisfaction questionnaire items Definitions of Autonomy Support, Structure, and Involvement given to the Doctoral panel	224 225 226 229 230 231
Appe	endix 2	232
2.A -T t 2.B - T t	The full list of situational PESQ items featured in Chapter 5 accompanied by he original PESQ items featured in Chapter 2 The full list of situational need satisfaction items featured in Chapter 5 accompanied by the original need satisfaction items featured in Chapter 2	233 235
Appe	endix 3	236
3.A - H 3.B - H 3.C - H	Exercise Information Booklet 1 Exercise Information Booklet 2 Exercise Information Booklet 3	237 242 248
Appe	ndix 4	249
4.A - 4.B - 4.C -	BREQ-2 items featured in Chapter 6 Expectation questionnaire as featured in Chapter 6 Exercise by Invitation referral criteria	250 251 252
Appendix 5		253
5.A - 5.B - 5.C - 5.D -	General information forms supplied to participants taking part in the study documented in Chapter 6 Group 1 Information Sheet Group 2 Information Sheet Group 3 Information Sheet	254 256 257 258
Appe	ndix 6	259
6.A - 6.B - 6.C -	Consent to be contacted by the researcher Patient consent form Interview Guide as featured in Chapter 6	260 261 262
Appe	ndix 7	264
Regres	Regression Tables for Chapter 4 analyses	

i

# LIST OF TABLES

2.1 Initial item pool	Page
2.2. Means and standard deviations for weight and height in males and females	39
2.3. Ethnic origin, first language, and level of education of the sample	39
2.4. Fit indices for autonomy support	46
2.5. Fit indices for structure	47
2.6. Fit indices for the 3-factor PESO model	47
2.8. Item means and SDs, factor loadings with their standard errors, and Cronbach's alphas for the scales	49
2.9. Fit indices for relatedness	51
2.10. Fit indices for perceived competence	52 52
2.11. Fit indices for LCE	52 53
2.12. Fit indices for the 5-factor psychological needs model 2.13. Item means and SDs, factor loadings with their standard errors, and Cronbach's alphas for the scales	55 54
2.14. Mean subscale scores, SDs, factor intercorrelations and Cronbach's alpha reliability coefficients for BREQ-2 subscales	57
3.1. Item composites for the latent variables	70
<ul><li>3.2. Standardised parameter estimates and standard errors for measurement model</li><li>3.3. Standardised parameter estimates, standard errors and disturbance terms for structural model</li></ul>	73 75
4.1 Ethnic origin first language and level of education of the sample	85
4.2. Number of participants from each centre	85
4.3. PESQ items	87
4.4. Psychological need satisfaction items	87
<ul> <li>4.5. Summary of regression analysis for environmental supportiveness variables</li> <li>4.6. Summary of regression analysis for mid-scheme psychological need satisfaction</li> <li>variables predicting post-scheme BREQ-2 subscales</li> </ul>	90 92
4.7. Descriptive statistics for week 4 and week 22 variables	93
4.8. Means and standard deviations for mild, moderate, strenuous exercise and overall exercise level as measured pre and post scheme	94
5.1. Initial item pool	106
5.2. Height, weight, exercise history and current exercise class attendance of sample	109
5.3. Ethnicity, language, and education of sample	110
5.5 Fit indices for autonomy support	113
5.6. Fit indices for structure	114
5.7. Fit indices for involvement	114
5.8. Fit indices for the 3-factor perceived environmental supportiveness model	115
5.9. Item means and SDs, factor loadings with their standard errors, and Cronbach's alphas for the perceived environmental supportiveness scales	117
5.10. Fit indices for perceived autonomy	118
5.11. Fit indices for perceived competence	118
5.12. Fit indices for relatedness	119

ii A

# Page

5.13. Fit indices for the 3-factor psychological needs model	119
5.14. Item means and SDs, factor loadings with their standard errors, and Cronbach's alphas for the perceived environmental supportiveness scales	120
5.15. Fit indices for interest-enjoyment	122
5.16. Factor loadings with their standard errors and Cronbach's alpha for interest-enjoyment	122
5.17. Item composites for the latent variables	123
5.18. Standardised parameter estimates and standard errors for measurement model	124
5.19. Standardised parameter estimates, standard errors and disturbance terms for structural model	125
6.1 Ethnic origin, first language, and level of education of the sample	153
<ul><li>6.2. Means, standard deviations, and ANOVA results for the BREQ-2 subscales at week 4</li></ul>	158
6.3. Means, standard deviations, and ANOVA results for the BREQ-2 subscales at week 22	159
6.4. Means and standard deviations for RAI at week 4 and week 22	160
6.5. Means and standard deviations for the number of sessions completed by the 10 <sup>th</sup> week of the exercise scheme	161
6.6. Means and standard deviations for leisure-time exercise, pre and post-scheme	162

# LIST OF FIGURES

	Page
<ul><li>1.1. The self-determination continuum</li><li>1.2. Relationship between environmental support and psychological needs</li><li>1.3. Vallerand's hierarchical model of intrinsic and extrinsic motivation</li></ul>	11 13 17
<ul><li>2.1. PESQ factor loadings, item error variances and factor intercorrelations</li><li>2.2. Need satisfaction factor loadings, item error variances and factor intercorrelations</li></ul>	50 55
<ul><li>3.1. Model to be tested</li><li>3.2. Structural model standardised parameter estimates</li></ul>	71 74
<ul><li>5.1. Model to be tested</li><li>5.2. PESQ factor loadings, item error variances and factor intercorrelations</li><li>5.3. Need satisfaction factor loadings, item error variances and factor intercorrelations</li><li>5.4. Structural model standardised parameter estimates</li></ul>	108 116 121 126
<ul> <li>6.1. Graphical representation of study protocol</li> <li>6.2. Reasons for referral</li> <li>6.3. Mean scores for each group on autonomy support, structure, and involvement at week 4</li> </ul>	151 154 155
<ul><li>6.4. Mean scores for each group on autonomy, competence, and relatedness at week 4.</li><li>6.5. Mean scores for each group on autonomy, competence, and</li></ul>	156
relatedness at week 22 6.6. Graph showing group mean scores for autonomy at 4-weeks and 22-weeks 6.7. Graph showing group mean scores for competence at 4-weeks and 22-weeks 6.8. Graph showing group mean scores for relatedness at 4-weeks and 22-weeks 6.9. Mean scores for each group on amotivation at week 4 and 22 6.10. Mean scores for each group on RAI at weeks 4 and 22 6.11. Mean leisure-time exercise levels for each group pre-scheme and	157 157 158 159 160 161
<ul> <li>post-scheme</li> <li>6.12. Mean levels of mild exercise pre and post scheme for each group</li> <li>6.13. Mean levels of moderate exercise pre and post scheme for each group</li> <li>6.14. Mean levels of strenuous exercise pre and post scheme for each group</li> <li>6.15. Group 1 Hierarchical content analysis: 1<sup>st</sup> order</li> <li>6.16. Group 2 Hierarchical content analysis: 1<sup>st</sup> order</li> <li>6.17. Group 3 Hierarchical content analysis: 1<sup>st</sup> order</li> <li>6.18. 2<sup>nd</sup> &amp; 3<sup>rd</sup> Order themes for each group</li> </ul>	163 164 164 174 176 178 180
6.19. Sub-components of the 'instruction' theme presented group by group	181

### ACKNOWLEDGEMENTS

In the style of an Oscar award acceptance speech; "there are many people that I would like to thank" for their support throughout the last three and a half years!

First of all, I want to thank Dave Markland for his endless supply of time and effort, he was always there to put me back on track whenever doubts entered my mind about the worth of my PhD, and was enthusiastic to the end. He truly leads by example in the practice of 'autonomy supportive' supervision!

I would also like to thank my office mates, Elaine and Vicky for putting up with me when I was feeling stressed out, and my friends Bec, Simon, Anna and Sally and my boyfriend Carl for sharing 'time-out' with me. Thanks go out to all the staff within the SSHES department who have provided a friendly and relaxed environment in which to work.

Last but not least, I would like to thank my Mum and Dad for all their encouragement and support, and for their continued unshakeable belief in me. I couldn't have got through it without you! To Mum and Dad: This one's for you!

### SUMMARY

The aim of the thesis was first of all to examine the relationships between the constructs of self-determination theory and motivational processes and outcomes within the GP exercise referral population; and secondly, to determine whether the practice of motivational interviewing can be understood within the unifying theoretical framework of Deci and Ryan's (1985) self-determination theory. Four studies were conducted in order to obtain these global aims.

The first study involved the adaptation and development of an instrument to measure perceptions of environmental support and psychological need satisfaction. This study produced a factorially valid measurement tool, and structural equation modelling analyses supported the hypothesised model with environmental supports having a moderately strong effect upon need satisfaction, which in turn had a strong effect upon relative autonomous regulation.

The second study examined the relationships between perceived environmental support, perceived psychological need satisfaction, and exercise adherence longitudinally. Results suggested that the degree of self-determination experienced by the participants mid-way through the exercise referral scheme was an important predictor of exercise maintenance three-months after the scheme had finished. The study also showed how autonomy and relatedness play an important role in the internalisation of exercise behaviour; specifically, when individuals experience feelings of autonomy, competence, and relatedness in the exercise environment can lead to higher levels of intrinsic and identified regulation and lower levels of amotivation, introjected, and external regulations are observed three-months post-scheme.

The third study was a cross-sectional design, and assessed the individual's 'situational' experiences of environmental support (autonomy support, structure, and involvement) and the corresponding perceptions of autonomy, competence and relatedness within an exercise class. Results revealed that even in a situational context, the conceptual model developed in the first study (i.e. the contextual study) was upheld.

The final study compared a motivational interviewing-based intervention with an attention control group (educational information sessions) and a control group in order to tease apart the effect of motivational interviewing upon the dependent variables, and the effect of attention on the dependent variables. Results revealed that the individuals receiving

the motivational interviewing based intervention possessed significantly greater levels of autonomy support than the control group, and lower levels of post-scheme amotivation.

#### CHAPTER ONE

### **General Introduction**

#### **Exercise Uptake and Adherence**

One of the largest lifestyle surveys conducted in the UK showed that 80% of men and 70% of women were not meeting the minimum exercise requirements to benefit health (Allied Dunbar National Fitness Survey, 1992). However, getting people to adopt and adhere to physical exercise is an extraordinarily difficult task. People often begin an exercise regimen, but typically discontinue it after only a few months (Dishman, 1988). Their initial reasons for becoming more active are generally extrinsic reasons such as weight loss or improved fitness (Ingledew, Markland, and Medley, 1998). It has been suggested however, that long-term participation in exercise depends upon the development of more intrinsic reasons such as enjoyment and interest (Dishman 1988; McAuley, Wraith and Duncan, 1991; Mullan, Markland, and Ingledew, 1997; Wankel, 1993).

It is acknowledged that an increase in physical activity in the population would have a major impact in reducing the economic and social costs of ill health. Figures cited in a recent Government report proposed that a 10% increase in adult activity would benefit England by at least £500m a year and would save about 6,000 lives (The Strategy Unit, 2001). In spite of this knowledge however, recent surveys are still showing that a large proportion of the adult population is minimally physically active or sedentary with only 32% of adults in England take 30 minutes of moderate exercise three times a week, compared with 57% of Australians and of 70% of Finns (The Strategy Unit, 2001).

The greatest relative gains from increasing physical activity are anticipated to be when completely sedentary individuals become just a little more active (UK Department of Health, 1996). Thus exercise promotion could make a significant contribution to the goal of sustainable health for all (World Health Organization/Federation of Sports Medicine, 1995; UK Department of Health, 1996). Coronary Heart Disease is the most common cause of premature death in the UK causing over 120,000 deaths per year (British Heart Foundation, 2003). Since it is widely accepted that 30 minutes of moderate physical activity five times a week can help reduce the risk of cardiovascular diseases, some cancers, strokes, and obesity (The Strategy Unit, 2001); it is important that the difficulties which people have adopting and adhering to exercise are addressed (Woods, Mutrie, and Scott, 2002). Traditional methods used by health workers to try to encourage people to become more active range from individual advice-giving with a leaflet to campaigns and displays within the health centre and community-based activities outside the health centre (Hunt and Hillsdon, 1996). However, health professionals are often frustrated by their inability to help clients achieve a regular exercise pattern in the long-term in spite of their attempts to provide them with information and advice.

Advice-giving certainly has its place in promoting behaviour change, but there is evidence which shows that simple advice can be more effective in the fields of smoking and excessive drinking than eating or exercise (Ashenden, Silagy, and Weller, 1997). It has been argued that only a small proportion of recipients respond to advice and that advice can actually render clients passive in the consultation or lead to the threat of disagreement about behaviour change (Rollnick, Mason, and Butler, 1999). There is therefore a need for a strategy which encourages the uptake of exercise, but one that is more effective than advicegiving alone.

#### **Motivational Interviewing**

Motivational Interviewing (MI) is a directive but client-centred therapeutic method for behaviour change developed by Miller and Rollnick (2002; Miller, 1983). It attempts to bring about behaviour change through the exploration and resolution of ambivalent feelings that an individual has with regard to particular behavioural changes.

#### How MI was developed

Motivational interviewing was originally developed within the context of the treatment of alcohol problems by Miller (1983). The technique incorporated Carl Roger's view that the ideal conditions for behaviour change are ones that involve accurate empathy, non-possessive warmth, and genuineness (Rogers, 1959). Many therapists believed that people with behavioural problems such as an addiction had inherently 'strong defences' and that it was their defective personality that made them 'unmotivated to change' (Miller and Rollnick, 2002). In contrast to this, Miller and Rollnick viewed motivation not as something wholly determined by personality, but as something that could fluctuate from situation to situation. Many environmental factors can influence a client's motivation to change, and one that is particularly salient is the therapist's *interactional style* (Miller and Sovereign, 1989).

Research has shown that therapists working in the same setting and offering the same treatment approaches show dramatic differences in the dropout and success rates of their clients (Luborsky, McLellan, Woody, O'Brien and Auerbach, 1985).

Motivational interviewing therefore places the emphasis upon the importance of the therapist enhancing the conditions for change instead of imposing change onto the client. Miller and Rollnick (2002) declared the four principles of MI as being:

1) To express empathy - this is demonstrated via reflective listening whereby the content of the client's responses are presented back to them. This shows that the therapist has listened and understood what the client has said. Underlying this empathic style is genuine 'acceptance' of the client; this acceptance is conveyed to them by avoiding the use of language that is critical, judgemental, or accusatory. This makes the client feel safe and unthreatened, which then paves the way for change.

2) To develop discrepancy - this is where the therapist leads the client to explore the disparity between how they currently behave and how they would like to behave in future. This process often results in the client presenting the arguments for and against change themselves and this is thought to facilitate behaviour change because they are presenting the arguments instead of the therapist imposing them.

3) Roll with resistance - when the therapist is faced with "resistance" (e.g. the client may deny that they have a problem), it is important not to directly confront it and risk eliciting an argumentative style of interaction with the client. If the dialogue becomes argumentative, then the focus is taken away from the problem behaviour and shifted onto more of an interpersonal issue. Therefore, instead of quashing the client's resistant views, the therapist explores them, making suggestions that the client is free to take or leave.

4) To support self-efficacy - this is a crucial ingredient of successful behaviour change; many individuals fail to make a change because they feel that they are incapable of doing what is required to effect the change. In MI self-efficacy is supported by helping the client recognise their strengths and past successes of any form, encouraging them by referring to the success of others, and by giving them command of a full menu of options for change.

#### Is Motivational Interviewing Effective?

As already mentioned, MI was originally developed within the context of the treatment of alcohol problems and as such a large proportion of research conducted has been of this nature, and has demonstrated much support with regard to its efficacy. For example, Brown

and Miller (1993) found that patients on an alcohol treatment programme who received MI sessions were judged by therapists to be more engaged in treatment and showed a substantially larger decrease in alcohol use three months after discharge. More recently however, motivational interviewing has been applied to a wider range of health behaviours (Miller and Rollnick, 2002) and research evidence gathered over the last decade has given considerable support to the efficacy of the approach in a variety of settings.

For example, motivational interviewing has been shown to be effective in improving adherence to outpatient treatments among psychiatric patients (Swanson, Pantalon, and Cohen, 1999) and among diabetic patients (Smith, Heckemeyer, Kratt, and Mason, 1997). More recently, MI has been used in a probation setting (Harper and Hardy 2000). In the latter study MI was used as a technique to aid probation officers in their assessment and supervision of offenders who misuse alcohol and drugs. They found more statistically significant improvements in attitudinal scales towards drugs, alcohol and offending amongst offenders whose officers were trained in MI compared to those officers who were not trained in this technique.

There have been several reviews of MI research (Burke, Arkowitz and Dunn, 2002; Dunn, DeRoo and Rivara, 2001; Noonan and Moyers, 1997) and each one has provided support for MI. A systematic review conducted by Dunn et al. (2001), initially identified 107 MI studies from literature searches, but only 29 met the inclusion criteria for the analysis. Those that were included encompassed a wide variety of contexts ranging from studies in the field of substance abuse (n=15); smoking cessation (n=2); HIV risk reduction (n=4); to diet/exercise studies (n=5). Twenty-six of the studies enabled the researchers to calculate effect sizes (treatment group .v. control group); and 17 of these had at least one outcome with a significant effect size in favour of MI. For the substance abuse studies the range of effect sizes was .30 to .95; for smoking cessation .23; HIV risk reduction studies yielded effect sizes from .46 to .64; and for diet/exercise studies the range was from zero to .217. From the studies that were included in this last category, two were not exercise related (one examined water disinfection practices; and the other examined eating and binging behaviour) the remaining 3 studies however produced some encouraging effect sizes for exercise behaviour. Scales (1998) looked at diet and exercise behaviour change amongst patients with cardiovascular disease and found an effect size of .42 for increases in physical activity three months post-intervention. Smith et al. (1997) used a four month follow-up with diabetic patients, which yielded an effect size for exercise of 0.94.

The only study from this category to focus exclusively on exercise behaviour was a study by Harland *et al.* (1999) which produced effect sizes from zero to .40; (depending upon

the outcome, as there were several). The largest effect was for increased physical activity scores three months post-intervention. However this effect size dropped to zero 12 months after the intervention. A criticism of the Harland et al. study is the lack of clarity regarding the precise contents of the 'MI' intervention. In their paper they simply stated that the researcher had "been trained in motivational interviewing" (p.829); this was not elaborated upon and consequently makes it difficult to assess their competence with using MI. This is not a criticism exclusive to Harland et al., it is a problem with many studies that claim to use "MI" (Dunn et al., 2001). This deficiency makes it exceedingly difficult to know how comparable apparently 'similar' studies are in terms of their MI interventions and precludes precise replication. It should also be pointed out that the evaluations of 'MI' that have been performed to date are based on adaptations of MI (known as 'AMIs') and not based on 'pure' MI. As yet, there are no studies evaluating the efficacy of 'pure' MI as defined by Miller and Rollnick (1991; 2002), only evaluations of AMIs (Burke et al., 2002). Adaptations of MI mainly consist of problem feedback delivered in a MI style and were borne from the demand for a less time-consuming method and one that required less training time for practitioners who were dealing with a variety of problems in settings that were very different from the original MI situation (i.e. specialist addiction counselling). Miller and Rollnick (2002; pp.274) proposed a descriptive framework in order to help clarify how precisely MI differs from brief advice and behaviour change counselling (the latter method is more closely aligned to the content of an AMI).

Although it is important to be aware of the differences between pure MI and AMIs, for the purposes of simplicity, the term MI will nonetheless be used throughout the majority of the thesis.

Overall the results of the MI reviews seem to be encouraging, and MI is now starting to become accepted as being an effective behaviour change method for areas other than substance abuse. However, whilst various aspects of the principles and practice of motivational interviewing have been linked to a variety of social psychological and social cognitive models, this has been largely on a piecemeal and descriptive basis. Motivational interviewing has been criticised for being essentially atheoretical (Draycott and Dabbs, 1998). Indeed, Miller (1994, 1996, 1999) has repeatedly acknowledged that little attention has been paid to developing a theoretical underpinning to motivational interviewing and that as yet there is no satisfactory explanation as to how and why it can be effective. More recently, Foote *et al.* (1999) and Ginsburg, Mann, Rotgers, and Weekes (2002) have proposed that motivational interviewing can be conceptualised and informed by self-determination theory (SDT: Deci and Ryan, 1985; 1991). One of the central questions

addressed in this thesis is whether SDT offers the possibility of providing a comprehensive theoretical framework for understanding motivational interviewing's efficacy. Furthermore, it is proposed that a consideration of motivational interviewing from a self-determination theory perspective will help in reaching a deeper understanding of the processes involved, which could inform future developments in research into its methods and applications.

#### **Self-determination Theory**

Clearly, exercise adoption and adherence require considerable motivation from the individual and many different theories of motivation have been proposed over the years. Deci and Ryan, (1985) developed one such theory known as self-determination theory (SDT). Selfdetermination theory is a theory of motivation based on the idea that human beings have an innate organisational tendency toward growth, integration of the self, and the resolution of psychological inconsistency (Ryan, 1995; Ryan and Deci, 2000b). At the heart of SDT lays Organismic Integration Theory (OIT), which proposes that humans are motivated to act in ways that will allow them to accept and integrate values and behaviours into their lives. Individuals strive to regulate acts that are not initially intrinsically interesting to them (e.g. social conventions) and this process is deemed important for day-to-day life and social functioning (Deci and Ryan, 1985). This transition occurs by the individual transforming regulation by external contingencies into regulation by internal processes (Ryan, 1993). Internalisation of external contingencies permits the person to operate more effectively because they are no longer in conflict with the previously extrinsic acts; they have accepted them as their own and as a result are more committed to them. Deci and Ryan (1985) claim that organismic integration is facilitated by the satisfaction of three innate psychological needs: autonomy, competence and relatedness. To feel autonomous is to feel as though one is freely initiating a behaviour; to feel competent involves knowing what to do in order to achieve an outcome and feeling capable of performing these relevant actions; and to feel related is to feel as though one has a connection with others and is part of a social world.

Self-determination theory contrasts with social cognitive theories (Ajzen, 1985; Bandura, 1977; Becker, 1974; Rotter, 1966) that deny the existence of such needs and adopt a more mechanistic view of human motivation. The innate and universal needs posited by SDT can also be contrasted with social learning approaches and acquired needs theories which would argue that the 'needs' are not innate but simply a product of reinforcement or socialisation (Skinner, 1995). In spite of social cognitive theories acknowledging the role of perceived competence, they do not address the role of autonomy or indeed relatedness. Autonomy and self-initiation of actions is a crucial part of accepting and integrating values as one's own yet many of the social cognitive theories portray human motivation without any mention of the need for autonomy. Self-determination theory looks more at the development of the self and motivation to act, and at what 'nutriments' are necessary for normal development.

Increases in perceived autonomy have been linked with more intrinsic types of motivation and adherence. Williams, Grow, and Freedman (1996) conducted a study exploring weight loss and maintenance. They found that the degree of patients' autonomous reasons for participating in a six-month low calorie diet program (e.g. it is important to me personally to succeed in losing weight), predicted attendance at weekly meetings of the programme, weight loss during the period, and maintenance of weight loss at 23-month follow-up.

The psychological need for competence involves the individual understanding what is required to achieve their desired outcomes, as well as the belief that they can do what is necessary to achieve them. Again, there is literature in support of greater levels of perceived competence leading to more intrinsic types of motivation and adherence to behaviours (Deci, Ryan, and Williams, 1996; Vallerand and Reid, 1984).

The need for relatedness is more of a social component, which involves the feeling that others authentically relate to oneself, and feeling a satisfying and coherent involvement with the social world in general. In the context of education, relatedness has been linked to greater adjustment and achievement (Grolnick and Ryan, 1989). The need for relatedness has been acknowledged for some time for example in the attachment literature (e.g. Bowlby, 1988), which describes how secure attachments facilitate active exploration and interest in one's environment.

In a recent study, Sheldon, Elliot, Kim, and Kasser (2001) compared 10 candidate needs (autonomy, competence, relatedness, physical thriving, security, self-esteem, selfactualisation, pleasure-stimulation, money-luxury, and popularity-influence) in an attempt to determine which are truly most fundamental for humans. The needs were derived from a number of psychological theories such as Bandura's self-efficacy theory (1997); achievement motivation theory (Atkinson, 1964); Maslow's hierarchy of needs (1954); Epstein's cognitive-experiential self-theory (1990); and also drew from the concepts of the 'American dream' where happiness supposedly results from popularity / influence and money / luxury (Carnegie, 1936; Derber, 1979). Participants were asked to describe the most 'satisfying events' in their lives and then rate the salience of these events. Autonomy, competence and relatedness were consistently among the top four needs and this held true across different cultures (e.g. the American individualistic culture and the South Korean collectivist culture). In one of their studies Sheldon *et al.*, (2001) also asked participants to describe their most unsatisfying events and autonomy, competence and relatedness still emerged as important factors with regard to what was 'missing' from their unsatisfying event. This provides strong support for the needs of SDT, and also suggests that it is a universally applicable theory.

### **Behavioural Regulation**

Self-determination theory (Deci and Ryan, 1985) contains three sub-theories known as Cognitive Evaluation Theory (CET), Organismic Integration Theory' (OIT), and Causality Orientations Theory (COT). OIT focuses on explaining the development of intrinsic motivation, and views motivation as being on a continuum whereas CET seems at first sight to present a fairly dichotomous model of motivation that pits extrinsic motivation against intrinsic motivation. This dichotomous distinction is perfectly acceptable for understanding the effects of events on behaviours that are initially intrinsically interesting, and how certain events can undermine intrinsic motivation. However it is inadequate for understanding behaviour that is not intrinsically interesting at the outset. The continuum that OIT proposes acknowledges the fact that there are clearly degrees of intrinsic or extrinsic motivation that fall between the two extremes, which is perhaps a more realistic view of human motivation.

For example, within the exercise context people rarely maintain regular exercise purely for intrinsic reasons such as fun and enjoyment (Ryan, Frederick, Lepes, Rubio, and Sheldon, 1997). Equally, exercisers are unlikely to adopt a consistent pattern of exercise behaviour if they are regulated only by external forces (e.g. somebody nagging them to exercise). The continuum mentioned above is referred to as the 'Behavioural Regulation Continuum', and it represents the extent to which our behaviour is self-determined (i.e. freely initiated by the self). The continuum ranges from behaviour that is completely non-selfdetermined (external regulation - e.g. someone being told to exercise), to behaviour that is wholly self-determined (intrinsic regulation - e.g. wanting to exercise because one enjoys exercising itself). Between these extremes fall introjected regulation, identified regulation and integrated regulation, which represent intermediate degrees of self-determination. Introjected regulation is when external pressures are internalised but the individual does not yet identify with or accept the behaviour (e.g. the individual puts pressure on themselves to exercise, and may do it because they want to avoid feelings of guilt associated with not exercising). Identified regulation is when the individual identifies with the importance of achieving a particular outcome that results from the behaviour. They no longer act out of guilt and selfpressure, but are working to achieve a goal that they have identified as being important to them (e.g. wanting to exercise in order to lose weight or in order to look better). Integrated regulation is when an individual's behaviour is experienced as part of the person's sense of self and is consistent with their values and desires (e.g. wanting to exercise because it is an important and valued part of their life). The main distinction between integrated and intrinsic regulation is that intrinsically regulated behaviour is performed for no other reason than for the enjoyment of engaging in the activity. In contrast, integrated behaviour is done freely, but also because it is instrumental in achieving an outcome that the person finds meaningful and important. There is one further type of behavioural regulation that represents an individual having absolutely no desire at all for a particular behaviour and feeling as though they would be unable to perform the behaviour even if they wanted to and this is called amotivation (see Figure 1.1.).



Figure 1.1. The Self-determination Continuum

For many years, the motivation literature has focused on intrinsic motivation, the purest and most self-determined form of motivation. However one could question the realism of expecting people to have pure intrinsic motivation for exercise (as defined by enjoyment). This is because the by-products of exercise (e.g. sweating, shortness of breath) are not usually in themselves 'enjoyable' and although many people enjoy exercising a great deal of exercise behaviour is not intrinsically motivated (Ryan, *et al.*, 1997). Developing 'optimal motivation' for exercise therefore seems more realistic and attainable, encouraging people to exercise for reasons that they can value and can identify with (i.e. identified and integrated regulation). Behaviourally, optimal motivation would be manifested when the probability of engaging in a particular behaviour is increased. Developing these more self-determined forms of behavioural regulation is important as they aid the satisfaction of autonomy, competence and

relatedness, and adequate satisfaction of these psychological needs are deemed necessary for effective, healthy functioning (Ryan, 1995; Ryan, Sheldon, Kasser and Deci, 1996).

### How does satisfaction of needs occur?

Deci and Ryan (1985) state that social contexts that provide opportunities to satisfy the psychological needs will promote integration, and those that block the satisfaction of needs will impair self-regulation. Self-determination theory proposes three dimensions of a motivationally supportive environment that correspond to the three psychological needs for competence, self-determination and relatedness: structure, autonomy support, and involvement (Deci and Ryan, 1991). From the SDT perspective, the need for competence involves the need to feel that one can reliably produce desired outcomes and/or avoid negative outcomes. This implies a requirement to understand both the relationships between behaviour and its consequences and what it takes to achieve certain outcomes (outcome expectations or strategy beliefs: Skinner, 1995) and a need to feel capable of successfully engaging in the behaviour (efficacy expectations or capacity beliefs: Skinner, 1995). Therefore the structural dimension of a supportive environment will address both of these needs: individuals would be helped to develop clear and realistic expectations about what behaviour change could do for them, they would be helped to formulate realistically achievable goals, they would be encouraged to believe that they are capable of engaging in the appropriate behaviours, and positive informational feedback regarding progress would be provided.

According to SDT, however, simply feeling competent to engage in a behaviour is not enough to promote optimal motivation (Deci and Ryan, 2000c; Markland, 1999; Ryan, 1995). One can feel competent about performing a behaviour whilst still not feeling inclined to do so. An increase in perceived competence will only lead to optimal motivation to act when it takes place within a context of some degree of self-determination (Deci and Ryan, 1985). Thus a motivationally supportive environment will provide supports for autonomy as well as supports for competence. Autonomy support is concerned with helping individuals to recognize that they can exercise choice regarding their behaviour. In autonomy supporting contexts options are provided, pressure to engage in the behaviour is minimized, and individuals are encouraged to initiate actions themselves and for their own reasons.

The need for relatedness involves the desire to feel close to others and emotionally secure in one's relationships. The involvement dimension of supportive environments

therefore, is concerned with the extent to which individuals perceive that significant others relevant to a behaviour understand their position and the difficulties they are facing and are genuinely interested in them and their well-being (see Figure 1.2 below).



**PSYCHOLOGICAL NEEDS** 

Figure 1.2. Relationship Between Environmental Support and Psychological Needs

According to the theory, enhancement of these needs will aid one's development of more self-determined behavioural regulation and thereby adherence to a particular behaviour. Grolnick and Ryan, (1987) performed an experiment looking at autonomy support in the context of education. A group of fifth-grade students had to read text material in one of three conditions each one varying in the extent to which it was autonomy-supportive. Results indicated that conditions containing more autonomy support led to more interest in the material and better conceptual understanding than the more controlling conditions. Similarly, infants whose mothers were more controlling evidenced less mastery motivation and

persistence in independent problem solving than did the infants of mothers who were supportive and encouraging of their initiations and autonomous play (Grolnick, Bridges, and Frodi, 1984). Support also comes from studies examining older groups of individuals, for example late elementary school students. In a study by Deci, Schwartz, Sheinman, and Ryan (1981), teachers who were oriented toward supporting autonomy produced students who displayed higher levels of intrinsic motivation, perceived cognitive competence and selfesteem when compared with teachers who were oriented toward controlling their students. Studies have been conducted with adult students attending medical school (Williams and Deci, 1996; Williams, Saizow, Ross, and Williams, 1995; Williams, Wiener, Markakis, Reeve, and Deci, 1994) and findings have revealed that when the learning climate is autonomy supportive, students become more self-regulating in their learning over the period of the course and in turn more competent and successful in internalising the values espoused to them in that setting. Similarly, Georgiadis and Biddle, (2001) found that individuals who were in an autonomy-supportive exercise group achieved significantly higher weekly frequencies of walking sessions than individuals in a control or education group, which had less autonomy support.

Numerous laboratory experiments confirm that intrinsic motivation can be influenced not only by specific contextual events but also by the interpersonal style with which these events are administered. Ryan, Mims, and Koestner (1983) found that when rewards are delivered in an autonomy supportive style, they are less likely to undermine intrinsic motivation. Similarly despite positive feedback generally strengthening perceived competence and intrinsic motivation, this effect depends upon whether the feedback is administered in an autonomy supportive way. For example, a non-autonomy supportive delivery of feedback such as "Good, you did just as you should" would undermine intrinsic motivation (Ryan, 1982), whereas an autonomy supportive delivery such as "Good, you worked that out very well", would be more likely to enhance intrinsic motivation.

Research has also been carried out with respect to structure. Deci (1971) conducted a laboratory experiment with college students and a puzzle-solving activity, and found that those students who were told that they were doing well at the task evidenced greater subsequent engagement with the activity than did students who received no feedback. Similarly, Deci and Cascio, (1972) found that negative feedback decreased intrinsic motivation.

Research has shown that when the informational aspect of feedback is salient and the controlling aspect is relatively non-salient (Fisher, 1978), positive feedback enhances

14

peoples' perceptions of competence which in turn positively impacts their intrinsic motivation (Vallerand and Reid, 1984).

There is also research supportive of the importance of involvement in internalisation and academic achievement. Grolnick and Ryan (1989) and Grolnick and Slowiaczek (1994) found that both mother and father involvement (i.e. being concerned and attending to the child's school work) predicted children's internalisation of behaviours relevant to doing well in school.

All three supportive constructs (autonomy support, structure, and involvement) were specifically examined in relation to regulation development in a study by Deci, Eghrari, Patrick, and Leone (1994). They used a sample of 192 psychology undergraduates to test the ability of autonomy support (minimising pressure and conveying choice), structure (presenting a meaningful rationale), and involvement (acknowledging the individual's conflicting feelings), to predict the internalisation of an external regulation. They tested this by manipulating the three supportive aspects. The study also looked at how introjected and integrated internalisation could be distinguished. They proposed that in an environment containing the above components (and therefore more supportive of self-determination), regulations will be integrated in contrast to an environment where these components are less salient (therefore non-supportive of self-determination), where regulations will be introjected. Behaviourally, integration would be represented by consistency between participants' behaviour and their feelings about the activity, and introjection would be represented by a lack of consistency. The task was to watch light spots on a monitor and to press a space bar when they saw a light appear, and this task had a reputation for being a boring activity (thus not intrinsically interesting). One group was given no facilitating factors, whereas others were given one, two or three facilitating factors. The autonomy support factor involved the experimenter changing the wording of the task instructions from being controlling to being autonomy supportive (e.g. from "you must attend" to "it involves attending"). The structure factor was to give participants a meaningful rationale for performing the task (e.g. air traffic controllers use the task to enhance their signal detection abilities). Finally the involvement factor involved the experimenter acknowledging participants' possible disinterest in the task (e.g. "I know that doing this is not much fun"). Results showed that increasing the number of facilitating factors increased participants' persistence with the behaviour (participants spent longer on the task in a free-choice period), thus lending support for the idea that environments which are supportive of self-determination lead to integrated regulation (as represented by engagement time).

Their results also supported the idea that internalisation of an activity (as measured by the length of time spent on an activity) can occur through integration or introjection and that individuals exposed to a greater number of facilitating factors spent longer engaged with the activity. Participants' internal motivation was assessed by a 25-item questionnaire that asked them about their perceptions of choice (e.g. "I believe I had some choice about doing this activity") perceptions of usefulness (e.g. "I believe that doing this activity could be of some value to me"), and perceptions of interest/enjoyment (e.g. "I enjoyed doing this activity very much"). The greater the number of facilitating factors (thus a greater self-determination context), the higher they scored on choice, usefulness and interest/enjoyment. There are therefore grounds to support the theory that autonomy support, structure and involvement can yield positive outcomes such as interest and persistence with a particular behaviour and can minimise the possibility of nurturing an introjected regulation.

#### Vallerand's Hierarchical Model of Intrinsic Motivation

Vallerand (1997, 2001) proposed a model of intrinsic motivation which encompassed the tenets of self-determination theory. The model proposes a mediational role for psychological need satisfaction; specifically, social factors influence one's psychological need satisfaction, which in turn affects the internalisation of behaviour, which in turn produces affective, cognitive and behavioural consequences. This pattern of relationships has also been noted by Deci and Ryan, (1985; 1991; Ryan and Deci, 2000b). The model contends that the above sequence operates at three levels, namely the global (or personality), contextual (or life domain), and situational (or state) levels (Vallerand, 1997). Motivation at one level can influence motivation at another level. For example there can be top-down effects where global motivation can influence contextual motivation and in turn influence situational motivation, or alternatively there are recursive effects where motivation at the situational level can influence contextual motivation which in turn can affect global motivation. If an individual therefore has low motivation in a number of exercise situations, then it would follow that the aggregation of such poor motivational experiences could influence their motivation toward exercise in general (i.e. the context). The proposed mediational role for psychological need satisfaction could therefore be tested at the situational, contextual, and global levels. The present thesis examines the model at the situational and contextual levels.

According to self-determination theory (Deci and Ryan, 1985) and indeed Vallerand's hierarchical model of intrinsic motivation (1997), the environment to a large extent determines how well our psychological needs are met and thus how motivated we feel towards a situation or context. (Refer to Figure 1.3 below for a graphical representation of Vallerand's model).



Figure 1.3 Vallerand's hierarchical model of intrinsic (IM) and extrinsic (EM) motivation. AM: Amotivation (from Vallerand, 1997).

#### The Relationship between Motivational Interviewing and Self-determination Theory

According to SDT, an intervention resulting in adherence to a particular behaviour would need to encourage people to move along the behavioural regulation continuum, and develop behaviours that are more self-determined. Again, using SDT as a framework for an intervention, adequate provision of environmental supports such as autonomy support, structure and involvement would need to be in place. From the literature, one would predict that such environmental conditions would be successful in terms of boosting the individual's levels of autonomy, competence and relatedness. In the practice of MI, many comparisons can be drawn with SDT as Foote *et al.* (1999) and Ginsburg *et al.* (2002) have pointed out. One of the central issues addressed in the present thesis is to see if SDT is indeed capable of

providing an adequate theoretical framework for understanding MI, since at present MI lacks a theoretical basis.

The four principles of MI outlined by Miller and Rollnick, (2002) - to express empathy, develop discrepancy, roll with resistance, support self-efficacy - tie in well with the psychological needs of SDT, as they have the potential for enhancing psychological need satisfaction. Autonomy support is inherent in each principle as they all encourage the client to feel free to make choices and to volunteer ideas for behaviour change. The therapist endeavours to enhance the client's perceived competence by supporting their self-efficacy and by eliciting change-talk, these are positive statements elicited from the client regarding behaviour change. Reflective listening and empathy often allow the client to produce such statements, as they do not feel pressured into making any commitments to change and feel as though the therapist is on their side. Lastly, relatedness is supported by the genuine interest and warmth reflected by the therapist in conjunction with the use of empathy and reflective listening. In this respect enhancing the client's perceived level of need satisfaction could explain the success of the MI approach. These relationships could be tested in any behaviour change context; however the present thesis takes exercise its exemplar context.

#### Alternative mechanisms for MI

For many years the idea of behavioural change being an 'all or nothing' phenomenon has been challenged (Godin, Desharnais, Valois and Bradet 1995), and it is now generally accepted as being a process in which the individual passes through a series of stages. The Transtheoretical Model of Behaviour Change (TTM: Prochaska and Diclemente 1984) has been a popular model in describing behaviour change in this way. The TTM is composed of two major components: the stages of change (SOC); and the processes of change (i.e. the processes that people go through at each of the stages). Despite its popularity within the health promotion field and its intuitive appeal, the SOC model (and the other components of the TTM) have relatively little empirical support for their efficacy and their ability to provide adequate explanations with regard to how people change (Sutton, 1996; Whitelaw, Baldwin, Bunton, and Flynn, 2000). Whitelaw *et al.* (2000) reviewed the literature with regard to the SOC model and reported that there were few studies actually examining the outcomes of applying this model. They further stressed the need to adopt a more critical assessment of the model whereby refutations of it are 'actively sought, openly discussed and genuinely assimilated' (pp.715). Sutton (1996) also criticised the SOC model for failing to provide a model of *how* people change; instead he proposes that it should be thought of as a model of *ideal* change (pp.204).

Although the intricacies of the components of TTM will not be explored in this thesis, the SOC component will be discussed, since this was considered to be the most pertinent aspect of the model in terms of the focus of the present thesis.

Briefly, the stages of change proposed by Prochaska and Diclemente (1984) are as follows: pre-contemplation, contemplation, preparation, action and maintenance. *Pre-contemplation* is the stage in which the client does not feel the urge or see the need to change their behaviour. *Contemplation* is the stage in which the client begins to see that the disadvantages of continuing their current behaviour outweigh the advantages, and so considers change. *Preparation* is where the client begins to make plans to change, and the *action* stage is where the plans are carried out. Finally, *maintenance* is reached once the client has maintained the behaviour change for six months (Prochaska and Diclemente, 1984).

Research has been performed to examine the relationships between stage of change and self-determination; individuals in different stages of change (for exercise behaviour) have been assessed in terms of their level of self-determination (Mullan and Markland, 1997) and findings have indicated that self-determination increases from the earlier to later stages of change. This is thought to be because in the initial stages of change for exercise behaviour the focus is on making the decision to start exercising and taking steps to becoming more active. In SDT terms, the initial stages of change are the start of the internalisation process; the individual must internalise the regulation of an initially uninteresting behaviour. As they move through the stages however, individuals will become increasingly more self-determined in the regulation of their exercise behaviour (Ingledew *et al.*, 1998; Mullan and Markland, 1997).

One way of viewing MI could be as a way of guiding the individual through these stages. Miller, (1983) proposed a model of how the individual passes through the stages of change and how the techniques employed in MI aid their journey from the early stages to the later stages. His explanation in this early paper (he has since moved away from this position: Miller, 1999) combined the TTM with another psychological theory known as Cognitive Dissonance Theory (CDT - Draycott and Dabbs, 1998; Festinger, 1957). Miller proposed that the client begins with the problem behaviour and following objective assessment (or elicitation of their concerns) awareness of its negative consequences is raised. The knowledge-behaviour conflict that is created by such elicitation produces cognitive dissonance that may be resolved in several ways. First the individual can convince themselves that they are not capable of performing the target behaviour and thus perceive

themselves as being relatively powerless to take any action. Second, the client can resolve the cognitive dissonance by denying that they have a problem at all, or by trivialising the problem and making it seem unimportant. However, despite the conflict being resolved in such cases, the behaviour change is still not achieved and the client has still not progressed on to the next stage of change. The therapist's role is to try to reduce the possibility of a resolution being reached via these two methods and to encourage the client to change their behaviour rather than their cognitions. The therapist aims to help the client to develop a higher level of self-esteem and self-efficacy as a function of their supportive affirmations, which hopefully in turn helps the client to possess more internal attributions and personal responsibility. According to Miller (1994) this process arises from within the individual when they recognise the incompatibility of a problem behaviour with those things that are more central and more valued. This cannot be imposed upon the client but rather emerges when the counsellor helps the client to become consciously aware of this inconsistency within a safe and supportive atmosphere (Markland, Ryan, Tobin, and Rollnick, submitted.) This would ultimately allow them to bring their behaviour in line with their cognitions as opposed to bringing their cognitions in line with their current unsuitable behaviour and thus propel them from the contemplation stage into the preparation stage. Once the stage of preparation has been reached, provided the client has agreed on a suitable plan for change, they then proceed to the action stage. If a suitable plan is not settled upon, then they may return to an earlier stage (relapse). It should be noted however, that at any point in the model the client might relapse to an earlier stage.

Cognitive dissonance theory can be viewed as support for SDT and the innate need for integration, as when our cognitions and actions conflict, humans strive to harmonise them, in order to dispel the negative feelings of discord. It is clear that humans prefer integrity to conflict. However, one could question how sufficient CDT is in explaining the whole MI process as MI is not simply about raising awareness of the need to change, but also about how to plan, execute, and maintain the plan for change. Furthermore, CDT does not take into account the notion of psychological needs, so in this respect is only capable of explaining the direction of behaviour, but not the energisation of it, which is necessary in order for the explanation to be an adequate one.

Draycott and Dabbs, (1998) presented a theoretical grounding of motivational interviewing based on the concept of cognitive dissonance. Like Miller, (1994) they argued that the efficacy of motivational interviewing lies in the development of a dissonant state where the client realizes that their behaviours are in conflict with their attitudes and values. Draycott and Dabbs (1998) went on to show how the principles and practices of motivational

interviewing could be seen as ways to maximise dissonance and then channel the dissonance reduction response toward behaviour change rather than allowing the individual to engage in the maladaptive responses to reduce dissonance. However, although awareness of the discrepancy may help initiate behaviour change as it were, to almost jump-start the client into taking steps toward behaviour change, it does not by itself have the power to maintain the change. MI is a multi-faceted behaviour change technique that encompasses not only the spark element produced by discrepancy development, but other ingredients such as empathy, neutrality, warmth and empowerment that enable the spark to change into more of a sustained behaviour change. One could argue that creating cognitive dissonance can help the client to become aware of inconsistencies between their current behaviours and their core values and sense of self, thus providing the momentum to move along the self-determination continuum toward greater integration. On the other hand, a recognition of such a discrepancy could lead the individual into the partially internalised and self-controlling regulatory state represented by introjection, whereby they are pressurising themselves to change. In this respect, the broader therapeutic aim, that of helping the individual to move towards integration and internal harmony (Miller, 1994), would be forestalled.

According to SDT, all three ambient supports are necessary to promote optimal internalisation of behavioural regulation and integration into the self (Deci and Ryan, 1995; Markland and Tobin, *submitted*). The provision of structure and involvement in the absence of autonomy support is likely to promote introjected regulation and its accompanying feelings of pressure to act. There is empirical support for this proposition, for example Deci *et al.* (1994) who examined the effects of manipulating the three ambient supports (refer to page 15 of this chapter). Similarly, Weiss and Grolnick (1991) examined the effects of adolescents' perceptions of parental involvement and support for autonomy on their symptomatology. It was found that involvement and autonomy support interacted such that high levels of involvement accompanied by low levels of autonomy support led to a higher level of symptoms. Thus feeling at once related to significant others whilst at the same time feeling that they do not promote choice and autonomy can be harmful to one's well being (Markland *et al., submitted.)* MI aims to channel the initial spark of motivation so that change is more likely to be maintained and valued by the client, by providing a supportive environment.

## Stages of Change Model, Self-Determination Theory, and MI: A Theoretical Framework

This link between readiness to change and self-determination can also be extended to the process of MI as the aim of MI is to help an individual increase their readiness to change and to feel self-determined in doing so. In the pre-contemplation stage, the MI therapist fosters self-determined behaviour by presenting information about the behaviour in a nonjudgmental non-coercive fashion; thus minimising pressure and emphasising free choice. During the contemplation stage, the therapist encourages self-determination by eliciting the pros and cons of the current behaviour and target behaviour from the clients themselves. In this way, because these utterances have come from the client, they are more likely to value and be committed to them. The pros and cons are elicited and received in a non-threatening environment thus minimising the risk of promoting introjection. Similarly, in the preparation and action stages the therapist encourages the client to suggest ways of going about the change and elicits arguments for change from the client (known as 'change-talk'). Such strategies support their self-efficacy and build their confidence to the point where they feel ready to begin their plan of action. Encouragement is again a key feature of the maintenance stage, as well as eliciting relapse prevention strategies from the client so that the client feels autonomous and not dependent upon the therapist if a relapse was ever to occur.

One aim of MI could be stated as trying to increase the "intrinsicity" of the individual's motivation toward a certain behaviour by working with the client's particular stage of readiness. One could additionally suggest that (in line with SDT), MI achieves this objective by providing environments which serve to fulfil the three psychological needs (as presented in Figure 2.). During an MI session the professional attempts to provide the individual with clear information and feedback about their behaviour with the intention of enhancing their feelings of competence. Autonomy is supported in MI by creating an environment in which choice is maximised, pressure to act in a specific way is minimised, and initiation of action is encouraged. Finally, relatedness is fostered by the professional being genuinely interested in the client and what they have to say, and by presenting examples of behaviour from people who are similar to that particular client, reporting their progress; making them feel connected and related to others.

An important distinction should be made here about the precise meanings of intrinsic and extrinsic motivation, as the proponents of SDT and MI seem to use these terms quite differently. Miller and Rollnick (2002) defined motivational interviewing in terms of the enhancement of intrinsic motivation to change. They go on to contrast intrinsic motivation,

22

where the motivation arises from within the person, with motivation by extrinsic means where the motivation to change is imposed by others. Miller (1994) also associated internally derived motivation with intrinsic motivation and Foote et al. (1999) described autonomous motivation as arising from an internal source in contrast to controlled motivation arising from external sources. In SDT though, the terms 'intrinsic' and 'extrinsic' do not equate with 'internal' and 'external' to the person. Intrinsic motivation represents the organismic tendency to explore one's environment, to seek novelty and challenge, to develop new skills, and to learn new things (Ryan and Deci, 2000a). Operationally, intrinsic motivation is defined as the tendency to engage in a behaviour in the absence of external rewards or controls (Deci and Ryan, 1985). Instead, the rewards for intrinsically motivated behaviours are the satisfying experiences of autonomy and competence that are inherent in engaging in the behaviour itself. By this view, behaviours that emanate from within the person are not necessarily intrinsically motivated. When the behaviour is undertaken in order to achieve some separable outcome, it is regarded as extrinsically motivated, even if the intention to act arises from within the person. Thus in SDT a distinction is drawn between internally controlling regulation of behaviour, where the individual pressurises themselves to act, and internally informational regulation, where the individual experiences a sense of choice and freedom from self-imposed pressure and self-coercion (Deci and Ryan, 1985, 1995).

Furthermore, rather than simply contrasting intrinsic and extrinsic motivation, SDT proposes a more differentiated view of extrinsic motivation as represented by the continuum of behavioural regulation. This is important because, in the behaviour change contexts typically encountered in counselling, it may often be unrealistic to expect clients to become truly intrinsically motivated to engage in a new behaviour. Behaviours such as adopting and maintaining a diabetic treatment regimen, for example, are unlikely to ever be experienced as intrinsically satisfying or enjoyable (Markland *et al.,submitted*). Cessation behaviours, such as giving up alcohol, drugs or smoking, which have been the principle focus of motivational interviewing, are even less likely to be intrinsically motivated. Indeed, Ryan (1995) has argued that "the lion's share of social development concerns the assimilation of culturally transmitted behavioural regulations and valuations that are neither spontaneous nor inherently interesting" (p. 405).

#### What will be learned from this?

If the framework for MI proposed in this thesis is accurate, adopting a SDT perspective offers the opportunity to explore pertinent psychological and motivational processes that might mediate the effects of motivational interviewing on successful treatment outcomes. Thus, one could determine whether motivational interviewing impacts upon perceptions of support for autonomy, competence and relatedness, actual satisfaction of these needs, and subsequently on behaviour change and maintenance. Moreover, we could then move on to refine motivational interviewing by exploring the extent to which its various strategies are more or less effective in modifying these motivational processes across different populations and presenting problems. Indeed such work is already in hand. Foote *et al.* (1999) have shown that individuals randomly assigned to a group motivational interviewing treatment for chemical dependency, informed by SDT, perceived the environment to be significantly more autonomy-supportive than those assigned to a 'treatment as usual' group. Furthermore, perceptions of autonomy support were significantly related to frequency of attendance during the initial phase of treatment. The population examined in the present thesis is composed of people referred by their GP onto an exercise scheme. This is expanded upon in the next section.

#### **GP** Exercise Referral Schemes

The realisation by health professionals that Primary Health Care Teams can play a significant role in facilitating health behaviour change led to the emergence of GP exercise referral schemes during the 1990s. These schemes were a response to the need for proactive, community-based interventions designed to encourage greater exercise participation and in turn measurable improvements in public health. GP exercise referral schemes typically involve the GP referring patients who display risks for developing coronary heart disease (e.g. smokers, drinkers, the overweight, or those who have high blood pressure), as well as for controlling conditions such as diabetes, arthritis and osteoporosis. They are usually referred to a leisure facility whose staff prescribe a 10-week exercise programme for them. Normally, patients pay a nominal fee for participating on the scheme, but once the scheme is complete if they wish to continue attending the centre they pay the full entrance fee. The aim of the schemes is to encourage continued regular physical activity. Unfortunately however, these schemes do not generally produce long-term adherence and once the 10-week scheme is over, clients return to their pre-scheme sedentary lifestyle (Riddoch, Puig-Ribera, and Cooper, 1998). In contrast to the quantitative studies reviewed, Riddoch et al. found wider ranging and more significant effects from the qualitative studies with regard to experience on a GP exercise referral scheme. Case studies suggested that the biggest impact of such schemes was in the social and psychological domains. Further positive qualitative outcomes

emerged from a study by Hardcastle and Taylor (2001) which reported social factors as being important in influencing the physical activity of older females.

One of the possible reasons for the apparent long-term ineffectiveness of these schemes is that clients are not *psychologically* prepared for the behaviour change. Moving from a sedentary lifestyle to an active one is a considerable leap, and one must ensure that clients know and understand what is involved in the change and give them the opportunity to express their apprehensions or concerns also. GPs and nursing staff have very little time to allow the client to express such feelings, and a large proportion of medical staff report a lack of counselling skills and exercise knowledge (Walsh, Swangard, Davis, and McPhee, 1999).

In order to facilitate uptake, adherence and transfer to long-term exercise participation from these schemes there is a pressing need to identify appropriate motivational interventions (Health Education Authority, 1998). Riddoch *et al.* (1998) recommends training referral staff in relevant theory-led techniques such as counselling and motivational interviewing, in order to maximise patient motivation. This recommendation is further supported by the National Quality Assurance Framework guidelines (Department of Health, 2001) which propose training staff in motivational communication skills. By investigating the supposed determinants of optimal motivation using self-determination theory within the exercise context, and by exploring how they relate to motivational interviewing, this pressing need will hopefully be addressed and fulfilled.

#### **Goal of Present Research**

The aims of the proposed research are to first of all examine the constructs of selfdetermination in relation to motivational processes and outcomes within the GP exercise referral context and secondly, as little attention has been paid to developing a theoretical understanding of why motivational interviewing is effective, the present research aims to determine whether the practice of motivational interviewing can be understood within the unifying theoretical framework of Deci and Ryan's (1985) self-determination theory. These global aims are broken down into several stages below.

Four studies were designed and conducted by the present author, and details of this research will form the body of this thesis:

#### Stage One (Chapter Two)

The second chapter details the first stage of the research process which involves instrument adaptation and development to enable the measurement of environmental supports and the psychological need for relatedness. At present there are no tools to measure perceptions of environmental support (autonomy support, structure, involvement), or perceptions of the psychological need relatedness in the exercise context. The second chapter therefore focuses on the development and validation of measures of these 4 constructs.

#### Stage Two (Chapter Three)

Following on from the validation work detailed in Chapter 2, this chapter tests the structural models of the relationships between environmental supports and psychological need satisfaction and between environmental supports and behavioural regulation in the exercise referral context.

### Stage Three (Chapter Four)

A longitudinal study examining the relationships between perceived environmental supports, perceived psychological need satisfaction and exercise adherence, are examined in this chapter. The study assesses GP referral clients in terms of their perceptions mid-way through their 10-week scheme, and three months following the end of the scheme. Levels of leisure time exercise were also assessed at the commencement of the scheme and three months after the scheme, and data regarding adherence to the scheme itself were gathered throughout the period. These measurements will allow an investigation of whether the level of perceived environmental support predicts the level of perceived psychological need satisfaction and in turn scheme adherence and longer-term maintenance of exercise.

#### Stage Four (Chapter Five)

This chapter describes a cross-sectional study that assesses the individual's 'situational' experiences of environmental support (autonomy support, structure, and involvement) and the corresponding perceptions of autonomy, competence and relatedness within an exercise class. The instruments developed in the contextual study (Stage One) were adapted for use in the situational (as opposed to trait) context. This study would allow for further analysis of the structural relationships of the constructs examined in Stage One.
## Stage Five (Chapter Six)

Once these relationships (described in Stage Three) have been established, an intervention based on the principles of motivational interviewing can be used. This chapter details a study that examines whether the provision of motivational interviewing on referral enhances the perceived supportiveness of the environment so that it more effectively meets the three psychological needs, thereby facilitating adherence and maintenance of activity levels. A group receiving motivational interviewing sessions will be compared to an attention only group (educational information sessions) and a control group (no sessions), in order to tease apart the effect of motivational interviewing upon the dependent variables, and the effect of attention on the dependent variables.

The present chapter has provided the background to motivational interviewing and selfdetermination theory and has endeavoured to explain how the former may be explained by the latter. The GP exercise referral scheme is the chosen context within which the present thesis is based, and such schemes and their associated problems have also been described. Finally the structure of the thesis has been set out; a series of four studies form the thesis and together attempt to investigate the central questions posed.

## CHAPTER TWO

# Development and Validation of Tools to Assess Perceived Environmental Supportiveness and Satisfaction of the Psychological Need for Relatedness, and an Assessment of the Factorial Validity of the BREQ-2

## Introduction

As described in Chapter One, previous research has substantiated the idea that the extent to which one feels autonomous, competent and related can be influenced by how supportive of these three psychological needs one perceives the environment to be (Deci and Ryan, 1996; Deci et al., 1981; Grolnick and Ryan, 1987). Furthermore, research has shown that a social environment that supports perceptions of autonomy, competence and relatedness can facilitate the internalisation of behavioural regulation so that activities are engaged in with greater self-determination (Deci et al., 1994). However, the contexts in which the relationships between environmental supports and psychological need satisfaction have been studied are primarily educational and healthcare related and the instruments used in such studies are quite varied. Consequently, it was necessary to develop appropriate instruments to assess perceptions of environmental support and relatedness in the exercise referral context and to assess the factorial validity of existing measures of perceived autonomy, competence and exercise behavioural regulation in the referral scheme context before proceeding to test the theorised relationships among the constructs. The broad aims of Study One, then, were first to develop and examine the factorial validity of appropriate measurement instruments and second to test models of the structural relationships between environmental supports and psychological need satisfaction and between environmental supports and behavioural regulation in the exercise referral context. This chapter describes the measurement development whilst Chapter Three describes the structural model testing.

#### Measuring Environmental Support

Autonomy support, structure, and involvement are the three necessary environmental requirements for the experience of autonomy, competence and relatedness (Deci and Ryan, 1985). Support for autonomy is characterised by a social context that gives an individual a sense of freedom and choice and where pressure and control are minimised. Support for competence would be characterised by a social context that provides a clear structure and

positive feedback/encouragement; the environment must support not only the informational aspect of competence (i.e. being made aware of the behaviour outcome relationship), but it also needs to provide support for self-efficacy in order for one to develop confidence in their ability to perform (Biddle, 1999). Lastly, support for relatedness would involve the presence of warm relationships with others (as opposed to hostile or indifferent), and situations where people devote time and interest to the individual (Deci and Ryan, 1991).

## Existing Measures of Perceptions of Environmental Support

In the realms of education, environmental support is a well-researched area, with clear links being established between supportive teaching styles and greater academic performance (Deci, Ryan and Williams, 1996). In 1987, Wellborn and Connell developed an educational assessment package known as the Rochester Assessment Package for Schools (RAPS – Institute for Research and Reform in Education) which featured tools to assess children's perceptions of autonomy support, structure, and involvement. This portion of the package consisted of a self-report measure for the pupil that asked questions about the support they received from their teachers and their parents. The teacher subdomain encompassed items pertaining to both the general context and the school context. The reliability information for parental (alpha = 0.86) and teacher (alpha=0.82) subdomains were made available by the authors but the reliability scores for the individual subscales autonomy support, structure, and involvement were not specified.

On examination of the items, some of them appear to be more appropriate than others. For example, the involvement subscale matches the intended flavour of the involvement concept quite well with items emphasising the provision of time, care, and understanding. The structure subscale however, is not as satisfactory in terms of reflecting the features of its corresponding psychological need - competence (see above). The subscale possesses the informational aspect of knowing what to expect from schoolwork but seems to lack any items that would assess support for self-efficacy. Feeling confident about performing a behaviour is a crucial part of the development of competence (or self efficacy – Bandura, 1977) and providing positive feedback is one way of aiding this development. Lastly, the items for autonomy support appear to be a mixture of all three supports; for example, "My parents don't allow me to make any of my own decisions" is clearly an autonomy support item, but the item "My parents don't explain why schoolwork is important" with its emphasis on explanation makes it more of a structure item than one of autonomy support. Furthermore,

the item "My parents trust me" possesses much more of an involvement flavour. These measures of autonomy support, structure and involvement do not adequately represent the conceptual definitions stated by Deci and Ryan (1985), and as such could not be used or modified for an adult exercise context such as that featured in the present study.

Williams *et al.* (1996) developed the Health-Care Climate Questionnaire (HCCQ), which assesses an individual's perception of the care they are given during a medical visit. There are 15 items in the long-form version and all items are concerned with the degree of autonomy support in the medical context. Although they have classified all items as being 'autonomy supportive', some of the items do have the flavour of structure or involvement. For example, "I am able to be open with my physician at our meetings" (involvement) and "My physician has made sure I really understand about my condition and what I need to do" (structure). The hybrid nature of such questionnaires also demonstrates how closely related the environmental supports are. Some researchers may have chosen to put all environmental supports under the umbrella of 'autonomy support' because of their intercorrelated (although distinct) nature (Ryan, Deci, and Grolnick, 1995).

The HCCQ has been contextualised for other settings (others include learning climate, work climate, and sport climate) and Cronbach's alpha is reported as being in excess of .90 for each of these. A shorter version (six items) of the HCCQ has been created for several different contexts too, ranging from smoking behaviour, drinking behaviour, eating behaviour to exercise behaviour. The same basic items are used for each one except that they have been contextualised for the appropriate setting. On closer examination of the items however, the short-form version appears to be made up of three involvement items, two autonomy support items, and 1 structure item, which does not seem to provide a balanced coverage of the three different environmental supports. In spite of the longer version providing a greater range of items, there seems to be some psychological need items mixed in with the environmental support items (especially relatedness items).

There is an important distinction to be made between support and need satisfaction, but this is not evident in the HCCQ. For example, involvement and relatedness; relatedness is feeling connected to others, and a feeling that people care about you and understand you. In contrast, involvement items need to represent the provision of elements necessary for experiencing such feelings of relatedness which would include sparing time for an individual, expressing genuine interest and warmth towards them, and taking time to listen to them. Some of the supposed environmental support items featured in the HCCQ (e.g. "I feel that my physician accepts me"; "I feel a lot of trust in my physician"; "I feel understood by my physician") are clearly more akin to the experience of relatedness rather than the environmental features that engender this feeling, and this complicates the measure somewhat. Additionally, some of the items in the HCCQ imply a fairly close relationship – (e.g. "My physician handles people's emotions very well"). One could argue that the doctorpatient relationship lends itself more to the expression of emotional support than an exercise instructor – client relationship because of the nature of the subject matter discussed in their meetings (i.e. personal medical problems). Furthermore, the privacy of a doctor's consultation room would provide a relatively safe environment for being emotional in contrast to working with an exercise instructor, where the majority of contact would be in a room full of exercisers. This subtle distinction thus makes some of the items appear to be inappropriate. It was therefore necessary to develop a measure for environmental supportiveness for the exercise referral scheme context that more accurately reflected the situation and environment.

#### **Psychological Needs Satisfaction**

The three psychological needs - autonomy, competence, and relatedness – are purported to aid integration of values and practices into our sense of self and thus lead to persistence with certain behaviours (Deci and Ryan, 1985). To feel autonomous involves feeling free to choose, and feeling as though actions are initiated by the self rather than enforced by others. To feel competent involves knowing what actions lead to what outcomes as well as feeling capable of carrying out the necessary actions. Lastly, relatedness involves feeling connected to others and feeling a part of a social context.

Tools to assess perceptions of psychological need satisfaction have been developed for all but one of the needs (relatedness) in exercise contexts. This is because much of the research has focused upon autonomy and competence. The Intrinsic Motivation Inventory (McAuley, Wraith, and Duncan, 1991) contains a subscale able to assess perceived competence within the exercise setting; and the Behavioural Regulation in Exercise Questionnaire (Mullan *et al.*, 1997) can assess perceived autonomy (self-determination) within the exercise context. However, relatedness has been cited as an important ingredient for an individual's development and positive wellbeing (Bowlby, 1988; Reis, Sheldon, Gable, Roscoe and Ryan, 2000).

The existing scale for competence in the exercise domain does not completely reflect all aspects of the competence concept; further items were therefore developed and validated in the present study. Thus a second and third aim of this first study was to develop a tool to assess relatedness in the exercise context, and to refine an existing measure of competence.

#### Existing Measures of Psychological Need Satisfaction

To further justify a) the development of a relatedness for exercise subscale; and b) the selection of the particular competence and autonomy tools used in the present study, a summary of the existing need satisfaction measures is presented below.

The Activity Feeling States Scales (AFS: Reeves and Sickenius, 1993) was intended to be a brief measure of the satisfaction of the three psychological needs underlying intrinsic motivation. Reeves and Sickenius, (1993) wanted to construct a measure 'capable of assessing the extent to which environmental events nurture versus frustrate each need over a relatively short period of time' (pp.507). They went on to say that they conceptualised the experience of a psychological need as a relatively 'ephemeral' one (pp. 507). The items included in the questionnaire are broadly items that assess psychological needs, but there are also environmental support items mixed in with them, although they all come under the category of psychological need. The measure therefore appears to be somewhat confused as the important distinction between psychological needs and environmental supports for these needs is blurred. An example of this can be illustrated with the autonomy items used in the AFS where one item is clearly assessing the satisfaction of a 'need' (e.g.: "Activity X makes me feel free"); and an item which assesses the perception of environmental support for that need (autonomy support: "Activity X makes me feel offered choice what to do").

Reeves and Sickenius state that the AFS has three relatedness items, three competence items, and four self-determination items (already discussed above) plus a tension subscale to indicate internal conflict which is believed to correlate negatively with intrinsic motivation (Reeves and Sickenus, 1993). The competence items (e.g. Activity X makes me feel.... "capable"; "competent"; "achieving"); were comparable to items featured in the Intrinsic Motivation Inventory (McAuley *et al.*, 1991). The three relatedness items (Activity X makes me feel .... "involved with friends"; "part of a team"; "brotherly / sisterly") do not seem to be applicable to the present sample as the clients exercise alone most of the time. It is hard to see how a measure with predominantly needs-based items can adequately assess the extent to

which environmental events impact each need if perceived environmental support items are not well represented.

The AFS scales were developed using confirmatory factor analyses (LISREL 7.0) but the authors' assessment of fit can be criticised in terms of rigour as they judge the model fit principally upon the goodness of fit index (GFI) and whether it exceeds 0.90. Cronbach's alpha for the subscales was reported for each subscale (self-determination, (.53-.69); Competence (.88-.93); Relatedness (.63-.83); and Tension (.82-.94).  $\chi^2$  was also reported ( $\chi^2$  = 128.1, df = 59, p<.001) but was not discussed in detail. A number of authors have recommended examining and reporting a range of fit indices in order to arrive at a more comprehensive evaluation of fit as opposed to focussing on one criterion (Hu and Bentler, 1995; Jaccard and Wan, 1996; Jöreskog, 1993); this is discussed further in the analytical strategy section.

In the context of education a measure of relatedness has also been developed for children. This measure forms part of the Rochester Assessment Package for Schools (RAPS -Institute for Research and Reform in Education, 1989). The relatedness scale has 5 subscales (emotional security with self, satisfaction with self, parent emotional security, teacher emotional security, and peer emotional security). The authors explain how the scales are meant to: "each reflect the extent to which positive emotions are present, and negative emotions are absent when thinking about the self, or in the presence of a relationship partner (parent, teacher, peer)" (p.13 of the RAPS manual). They go on to talk about how the "satisfaction with self" items are intended to reflect "the extent to which students wish that they were different or someone else" (p.14 of the RAPS manual). The first two of these subscales (emotional security with self; and satisfaction with self) do not appear to reflect the concept of relatedness at all. For example it is not clear how these reflect the feeling of being connected to others (which is an important part of relatedness). The items appear to assess how an individual feels about themself (e.g. "When I think about myself, I feel bad") and is thus measuring a construct more akin to self-esteem than to relatedness. The subscales regarding parental, teacher, and peer security all use the same basic items (but obviously directed at different people) and consist of assessing the extent to which the individual feels 'ignored'; 'mad'; 'good'; or 'unhappy' in the presence of these significant others. As the scale was developed for children the adjectives used in the items are perhaps too simplistic for obtaining a detailed picture of adult relatedness. Just because one feels good and does not feel unhappy or mad in the presence of someone does not necessarily mean that the

individual feels *related* to them (and vice versa). These items therefore were not incorporated into our relatedness instrument.

Richer and Vallerand, (1996) developed a measure of relatedness for the work place. On initial reading it appeared to contain items that could be adapted for the present context. The scale is made up of two subscales 'Acceptance' (alpha= .89) and 'Intimacy' (alpha= .91). The acceptance items were reasonably appropriate for the present purpose but the intimacy items such as feeling "bonded" or "close-knit" would be better suited to contexts in which individuals experienced closer relationships and had more frequent contact with people than the clients in the present population. In the GP exercise referral context there is often a more distal relationship between the individual and their instructor than that suggested by these scales. These items were therefore not considered to be wholly appropriate for the current purpose.

Some studies have employed measures designed to assess attachment style or loneliness in order to assess the relatedness construct (Reis *et al.*, 2000). These measures, however, would not adequately assess relatedness for the present purpose as they are too general and also assume a level of interpersonal contact that is far greater than that found in the exercise referral context. One could argue that measures of social support may be useful in the assessment of relatedness, and although social support may indeed facilitate the satisfaction of the need for relatedness (through provision of the ambient supports), social support is not synonymous with relatedness (Ryan and Solky, 1996). Consequently, the social support literature is not reviewed in the present thesis.

The Locus of Causality for Exercise scale (LCE – Markland and Hardy, 1997) was included in the present study as a measure of autonomy (self-determination). The items assess the extent to which the individual exercises out of choice and desire as opposed to feeling that they have to exercise (see Appendix 1E). The LCE scale has good reliability (alpha=.83) and the fit indices yielded from a confirmatory factor analysis indicated a good fit ( $\chi^2 = 1.640$ ; df=2; P=0.440; RMSEA=0.000; P=.575; CFI=1.000: Markland and Hardy, 1997). The LCE has been used as a measure of self-determination (Markland, 1999), but the constructs of self-determination and perceived locus of causality (PLOC) are not entirely synonymous. PLOC is concerned with the source of the initiation of behaviour, whereas self-determination is the perception of choice. However, since an internal PLOC is evident when an individual feels that he or she is engaging in a behaviour freely and with no sense of

coercion, the LCE can be viewed as an indicator of SDT (Markland, 1999). Furthermore, the LCE has also been shown to be a strong predictor of intrinsic motivation (Markland and Hardy, 1997).

Competence was assessed in the present study using three modified perceived competence items from the Intrinsic Motivation Inventory (IMI: McAuley *et al.*, 1991). The IMI competence subscale has good reliability (alpha = .83: McAuley *et al.*, 1991). Two further competence items were generated for this study; one reflecting the individual's knowledge of how to do the exercises ('I know what I have to do in order to perform the exercises') and one item reflecting the individual's confidence in performing the exercises ("I feel confident that I can do my exercises"). These items were added in order to reflect all aspects of competence since competence is not only about understanding the connections between behaviours and outcomes, but also the extent to which a person feels capable of producing a desired outcome (Patrick, Skinner, and Connell, 1993, p.782).

# **Behavioural Regulation**

According to SDT, there are varying forms of motivation representing qualitatively different ways in which a behaviour can be regulated. The theory proposes that these forms of regulation lie along a continuum ranging from completely non-self-determined to completely self-determined regulation (see Chapter One for a full description of the behavioural regulation continuum).

The Behavioural Regulation in Exercise Questionnaire (BREQ) was developed in order to assess external, identified, introjected, and intrinsic regulations in the context of exercise behaviour. There is growing evidence for the validity of the BREQ as a measure of the continuum of behavioral regulation in exercise contexts (Wilson, Rodgers, and Fraser, 2002; Wilson, Rodgers, Gesell, and Blanchard, *in press*). The first version of the BREQ however, did not contain a measure of amotivation. Amotivation is a state of lacking any intention to engage in a behavior and is a completely non-self-determined form of regulation and it has been argued that including a valid measure of amotivation would be theoretically useful in the assessment of behavioural regulations for exercise in order to investigate its antecedents and consequences (Markland and Tobin, *in press*<sup>1</sup>). However, in the initial

<sup>&</sup>lt;sup>1</sup> This part of the chapter has been accepted for publication: Markland, D. and Tobin, V. A Modification to the Behavioural Regulation in Exercise Questionnaire to include an Assessment of Amotivation. Accepted to the Journal of Sport & Exercise Psychology, July 2003.

development of the measure, Mullan *et al.* (1997, study one) found that items designed to tap amotivation exhibited very high levels of skewness and a restricted range of scores and so these items were eliminated from subsequent analyses. A likely explanation for this was that the majority of the participants in the initial validation study were attendees at a leisure center who were regularly exercising. One would not expect such individuals to be amotivated for exercise. The current study aimed to test the factorial validity of a revised BREQ (BREQ-2), which included amotivation items in a sample that was likely to present a wider range of responses to such items (i.e. the GP exercise referral population).

The BREQ-2 therefore included four amotivation items from Mullan *et al.*'s (1997) initial item pool (e.g. I don't see the point in exercising). Responses were scored on a five-point scale ranging from zero (not true for me) to four (very true for me).

The remainder of this chapter describes first the development of scales to measure environmental supportiveness. This is followed an assessment of the factorial validity of the three measures of psychological need satisfaction, including the development of a relatedness scale and the modified perceived competence scale. Finally the factorial validity of the BREQ-2 is assessed.

#### **Item generation**

A pool of 27 items for the Perceived Environmental Supportiveness Questionnaire (PESQ) was generated from hypothesised aspects of the environment that were considered to be supportive of autonomy, competence and relatedness in the GP exercise referral context. Ten relatedness items were also generated for the development and validation of the psychological need satisfaction subscale as well as the two further items proposed to extend the competence subscale. A panel of six doctoral level judges familiar with the research area assessed the content validity and comprehensibility of the items. This procedure involved presenting a description of the questionnaire to be developed along with definitions of autonomy support, structure, involvement, competence and relatedness. Autonomy was also defined (even though items for this construct were not being developed) in order for the panel to view the autonomy support items in the context of their corresponding psychological need (see Appendix 1F for details). The panel were then asked to read through the proposed items and comment on their readability and the extent to which they matched the definitions of the constructs of interest. On receiving the comment sheets back from the panel members,

suggested refinements were considered and the necessary modifications were made to the item set. Following this social validation procedure, the initial item pool comprised 26 items for the PESQ (autonomy support 10, structure 9, involvement 7), 10 items for relatedness and five items for perceived competence (see Table 2.1).

Table 2.1. Initial item pool.

# PESQ: The staff at the exercise facility....

# **Autonomy Support**

- 1. Encourage me to make my own choices
- 2. Don't allow me to make any decisions
- 3. Take into account my individual needs
- 4. Make me feel free to make decisions
- 5. Ignore my individual needs
- 6. Make me feel pressured to perform in specified ways
- 7. Imposed an exercise programme on me
- 8. Provide a range of activities
- 9. Provide me with choices and options
- 10. Encourage me to take my own initiative

# Structure

- 1. Give me good advice
- 2. Make it clear to me what I need to do to get results
- 3. Provide clear feedback about my progress
- 4. Make it clear what to expect from engaging in the activities
- 5. Make sure I understand the best ways to exercise
- 6. Give me exercises that are suited to my level
- 7. Make me feel positive about being able to perform
- 8. Help me to feel confident about exercise
- 9. Help me to achieve my exercise goals

# Involvement

- 1. Make time for me even though they are busy
- 2. Make me feel like I matter to them
- 3. Are concerned about my wellbeing
- 4. Aren't too bothered about my wellbeing
- 5. Look after me well
- 6. Don't concern themselves with what I need to get from exercising
- 7. Care about me

## Relatedness

- 1. I feel isolated when I exercise
- 2. In exercise situations I feel supported
- 3. I feel out of place when I exercise
- 4. I don't feel like I "fit-in" when I exercise
- 5. In exercise situations I feel accepted
- 6. I feel like a fish out of water when I exercise
- 7. I feel lonely when I exercise
- 8. In exercise situations I feel like I belong there
- 9. In exercise situations I feel that people are interested in me
- 10. In exercise situations I feel different from everybody else

#### **Perceived competence**

- 1. I think I am pretty good at the exercises I do
- 2. I am pretty skilled at the exercises I have been set
- 3. I feel confident that I can do my exercises
- 4. I think I do pretty well in my exercise compared to other people
- 5. I know what I have to do in order to perform the exercises

#### Methods

#### **Participants**

Respondents were individuals who had taken part in the local GP exercise referral scheme (*Exercise by Invitation*) during the past 6-36 months. The names and addresses were released from a number of leisure centres once the relevant councils had granted permission. Five hundred and eighty questionnaires were sent out along with an explanatory letter and pre-paid reply envelope, this number was reported as being close to the total number of referrals made within the three years of the scheme's operation. Thirty-five percent (n=201) of the questionnaires were returned in total; 68% of the sample was female (mean age= 54.24 yrs; SD= 13.28), and 30% was male (mean age= 56.33 yrs; SD= 12.90); 2% of the sample did not disclose their sex / age. An independent samples t-test did not reveal any statistically significant differences between males and females by age (t=1.026 (195); p>0.05). The mean exercise level for the sample was 33.66 METs per week, SD=24.73 (see page 38 and Appendix 1.D). In terms of occupation, 41% were retired, 15% were housewives, 9% care workers, 9% clerical, 7% manual, 6% unemployed / sick. The remainder of the sample (13%) comprised of a number of sectors ranging from retail to clergy. Mean body weight of the

sample was 79.41kg (SD=16.85kg); and mean height was 1.67m (SD=0.09m) (mean weight and height for males and females separately are tabulated in Table 2.2). The ethnic origin, first language, and level of education are also presented below in Table 2.3. No information was available with regard to those GP exercise referral scheme participants who did not return their questionnaire.

2	Sex	Mean	Standard Deviation
Height (Metres)	Male	1.73	0.08
	Female	1.64	0.07
Weight (Kg)	Male	86.66	16.25
	Female	76.25	16.18

Table 2.2. Means and standard deviations for weight and height in males and females

Table 2.3. Ethnic origin, first language, and level of education of the sample

Ethnic Origin	White	99%
	Black	1%
First Language	English	80%
	Welsh	19%
	Other	1%
Level of	Secondary	51%
Education	College	34%
	University	8%
	Postgraduate	7%
the second se		

### Instruments

Questionnaire booklets were produced which included an introductory front-page providing participants with background information and a rationale for its development. An informed consent form was printed on the inside page (see appendix 1A and 1B); both the introduction and consent pages were reproduced in the Welsh language and inserted at the back of the booklet. A box requiring demographic information (age, sex, height, weight, ethnic origin, first language, level of education, occupation) was also included.

The main questionnaire section comprised the environmental supportiveness and psychological need satisfaction scales (detailed below) and the BREQ-2 (also detailed later). For the environmental supportiveness items, the following stem was used: "The staff at the leisure facility...", and participants were required to read through each of the statements regarding their specific exercise environment and then respond by circling the appropriate number. All items were scored on a 5-point Likert-type scale ranging from *not true for me* (0), through *sometimes true for me* (2), to *very true for me* (4).

## Leisure Time Exercise Questionnaire

This measure (Godin and Shephard, 1985) assessed patterns of self-reported exercise. The LTEQ contains three questions assessing the frequency of strenuous (heart beating rapidly), moderate (not exhausting but moderately hard), or mild (minimal effort) exercise engaged in for a minimum of 15 minutes during a typical week (seven days). Each category is accompanied by typical examples of exercises that would be classed as strenuous, moderate, or mild (see appendix). These frequencies are then transformed into METS (a unit representing the metabolic equivalent of physical activity in multiples of resting oxygen consumption). Weightings are applied to the frequencies by multiplying the number of sessions by nine for strenuous exercise; by five for moderate exercise; and by three for mild exercise. Once the weightings have been applied the values are summed creating a total exercise score for each person. This measure has been shown to correlate well with physiological indices of fitness such as body fat percentage and VO<sub>2</sub> Max (Jacobs, Ainsworth, Hartman, and Leon, 1993). The exemplar activities provided on the original questionnaire were modified to match activities practiced in the UK (e.g. activities such as

'snow mobiling' and 'alpine skiing' were omitted as they are not accessible on a regular basis to the general UK population).

#### Procedure

Following ethics approval from the local health trust, names and addresses of 580 exreferees were obtained from seven leisure centres covering an area of one hundred square miles. Questionnaires were sent out along with a consent form, information sheet, and a prepaid envelope. Once the flow of completed questionnaires had slowed down, the data were entered. Reminders were not sent to referral patients who did not return the questionnaire; the lack of response was interpreted by the researcher as their decision not to take part in the study.

#### Analyses

The analytical strategy chosen for the measurement development part of this study was an exploratory approach using structural equation modelling with LISREL, 8.30 (Jöreskog and Sörbom, 1999) to generate progressively more refined models using both substantive and statistical reasoning. A strict view of the structural equation modelling (SEM) approach is one which only supports its use for confirming a pre-specified model. For measurement assessment, this confirmatory procedure is known as confirmatory factor analysis (CFA). There are two types of factor analysis CFA and EFA (exploratory factor analysis), and both types seek to reduce a larger number of variables to a smaller number of factors in order to provide an operational definition for an underlying process by using observed variables to test a theory about underlying processes. The difference between EFA and CFA is that EFA is used mostly for generating hypotheses about underlying processes whereas CFA tests hypotheses that have been already been generated by the researcher, or the research evidence (Jöreskog, 1993).

Although SEM uses the CFA approach, a more 'exploratory' application of CFA has been justified by proponents of structural equation modelling (e.g. Jöreskog, 1993). Jöreskog states that in practice the most common use of SEM is for model generation where the researcher has specified a tentative initial model which is tested, refined, and re-tested using the same data. The goal may be to find a model that not only fits the data well statistically, but also from a more substantive and meaningful standpoint. The strictly confirmatory use of SEM is relatively rare because few researchers are content with just rejecting a given model without suggesting an alternative one (and they seldom specify the alternative models a priori). As long as it is clearly stated that the analyses are exploratory from the outset and they are not 'passed off' as being a priori, then this application of SEM is permissible (Jöreskog, 1993). Further justification of this exploratory use comes from Bollen (1989) who states that researchers often modify poorly fitting models in CFA in an exploratory way with the goal of improving the fit. He goes on to say that the distinction between EFA and CFA is often more blurred than originally stated; the labels EFA and CFA refer to ideal types, with most applications falling between these extremes.

There are two parts to SEM: the relationship between the observable indicators and the theoretical constructs (i.e. the measurement model) and the theoretical relationships between the constructs (i.e. the structural equation part of the model). The testing of the structural model may be meaningless unless it is first established that the measurement model is robust. Jöreskog (1993) has therefore recommended that each construct of the measurement model should first of all be tested separately and then later put together for testing. This chapter will only deal with the measurement models, the structural relationships among the variables are discussed in the next chapter.

### Model testing strategy

Measurement model testing involves examining the overall or global fit of a hypothesised model to the data and detailed assessment of individual parameters in the model. The global fit indices used in this study were the  $\chi^2$  likelihood ratio test statistic, Root Mean Square Error of Approximation (RMSEA) and its 90% confidence interval (CI), Comparative fit index (CFI), and the Standardised Root Mean Square Residual (SRMR).

 $\chi^2$  provides a test of whether residual differences between the fitted covariancepopulation matrix and the sample matrix converge (Marsh, Balla and McDonald, 1988). The  $\chi^2$  statistic tests the null hypothesis that the observed and model-implied covariance matrices are not significantly different, thus a good fit is indicated by a non-significant  $\chi^2$  (Hu and Bentler, 1995). However, it has been recognised that the  $\chi^2$  value is a direct function of sample size and that the larger the sample the more likely it is that  $\chi^2$  will be significant (Bentler and Bonnet, 1980). A situation therefore arises where good models may be rejected with large sample sizes, and poor models accepted with smaller samples. For these reasons, it has been suggested that  $\chi^2$  should be used as an *index* of fit rather than a test statistic, where large values relative to the degrees of freedom indicate a poor fit and small values a good fit (Biddle, Markland, Gilbourne, Chatzisarantis, and Sparkes, 2000).

More importantly as the sample size in the present study was not large but the size of the model was (i.e. there were many parameters to be estimated), is the observation that the  $\chi^2$  test statistic is sensitive to trivial differences between the sample and fitted covariance matrices (Hu and Bentler, 1995 pp.78). Assuming that the model is correct, any trivial differences are likely to be due to sampling fluctuations.

Furthermore, maximum likelihood estimation was used to test the models in the present study, as alternative methods require much larger sample sizes. Maximum likelihood assumes that the data are multivariate normal, a condition that is rarely met in practice and which was not met with the current data. When the assumption of multivariate normality is violated,  $\chi^2$  tends to be inflated and the standard errors of parameter estimates underestimated, although the parameter estimates themselves are usually not unduly affected (West, Finch, and Curran, 1995). Consequently, the Satorra-Bentler scaled  $\chi^2$  (Satorra and Bentler, 1994) was used in the present study. This has been shown to more closely approximate the  $\chi^2$  distribution than the uncorrected statistic when assumptions are violated and to have more trustworthy standard errors (Bentler, 1995; Byrne, 1994; Hu and Bentler, 1995).

The stringency of the  $\chi^2$  statistic as a measure of *exact* fit has led to the development of a statistic assessing *closeness of fit* called the RMSEA (Browne and Cudeck, 1993); thus replacing a point hypothesis with a less implausible interval hypothesis. RMSEA assesses the lack of fit of the model to the population covariance matrix and is expressed in terms of discrepancy per degree of freedom (Browne and Cudeck, 1993). According to Browne and Cudeck, a value of about 0.08 or less for RMSEA would indicate a reasonable fit whereas anything greater than 1.0 would represent a poor fit. The related confidence interval allows assessment of the precision of the estimate and the point estimate for the RMSEA can be usefully augmented by its 90% confidence interval and by a significance test for RMSEA < 0.05. A large probability indicates that the RMSEA value is not significantly greater than 0.05.

CFI is an incremental fit index that compares the existing model fit with a null model which assumes the observed variables in the model are uncorrelated (the independence model). It compares the covariance matrix predicted by the model to the observed covariance matrix, and compares the null model (covariance matrix of 0's) with the observed covariance

matrix, to gauge the proportion of lack of fit which is accounted for by going from the null model to the researcher's specified model. CFI can vary between 0 and 1.0, with values close to 1.0 indicating a good fit.

SRMR represents the average discrepancy between the observed and model implied covariances, the smaller the discrepancy, the better the fit. Hu and Bentler, (1999) suggested a cut-off for this index of around 0.08.

Hu and Bentler (1999) explored how various combinations of fit indices with certain cut-off points can lead to a reduction in type I and type II errors. They concluded that in general, a cutoff value close to 0.95 for CFI; 0.08 for SRMR; and 0.06 for RMSEA seemed to result in lower error rates. For small samples (N $\leq$ 250), they recommend the combination of CFI (cutoff  $\geq 0.96$ ) and SRMR (cutoff  $\leq 0.06$ ) rather than combinational rules based on SRMR and RMSEA which tended to reject more simple and complex true population models under the nonrobustness condition. However, they also warn researchers about using any of the combinational rules when using small samples as most of them have a slight tendency to over-reject true population models (Hu and Bentler, 1999), and as such they recommend the use of the Satorra-Bentler scaling corrected test statistic in conjunction with the combinational rules. Given that the models tested in the measurement development phase of this study were not large (i.e. had relatively few parameters to be estimated), the principle criterion adopted for global fit assessment was a non-significant Satorra-Bentler scaled  $\chi^2$ . In addition, one of the combinational rules (for small samples) suggested by Hu and Bentler (1999) was implemented. CFI and SRMR were inspected using the following cut-off points; CFI ≥0.96 and SRMR ≤0.06. RMSEA and its associated 90% confidence interval and the probability that RMSEA > .05 were also included as it is an informative index.

For both the environmental supportiveness and the psychological needs scales a sequential model testing approach was adopted (Jöreskog, 1993). In the first phase separate single factor latent variable models were tested for each construct. The aim in this phase was to eliminate items that were poor indicators of their factor by examination of the global fit indices and the standardised residuals and modification indices in order to ensure that each set of items had a unidimensional factor structure.

A standardized residual is a residual (observed minus a fitted covariance or variance), divided by its estimated standard error; standardized residuals are calculated for every pair of observed variables. Standardized residuals are independent of the units of measurement of the variables and provide a statistical metric for judging the size of a residual. A large positive residual indicates that the model underestimates the covariance between the two variables and a large negative residual indicates that the model overestimates the covariance between the variables. Large positive residuals can be decreased by adding paths which could account for the covariance between the two variables better. Large negative residuals can be decreased by eliminating paths that are associated with the particular covariance. Modification indices indicate how much chi-square is expected to decrease if a previously constrained parameter is set free and the model is re-estimated. Thus, the modification index is approximately equal to the difference in chi-square between two models in which one parameter is fixed or constrained in one model and free in the other, all other parameters being estimated in both models. The largest modification index shows the parameter that improves the fit most when set free.

For the single factor models each complete initial item set was tested first. Global fit was assessed and items were successively eliminated that showed low factor loadings, a pattern of large residuals among the error variances, or modification indices that indicated potential improvement in fit if the error terms were allowed to covary. Together these would indicate that the covariances among the items could be better explained by more than one latent variable. Assuming that there were sufficient remaining items within each set and that the fit of the final models was good, elimination of such problematic items would produce a set of items with a unidimensional factor structure.

In the second phase the single factor item sets were combined into two three factor models for the environmental supportiveness and the psychological needs scales respectively, with the latent variables allowed to correlate. Global fit was assessed and standardised residuals and modification indices examined in order to identify factorially ambiguous items. Such items were eliminated and the models respecified and tested again until the fit of the models was acceptable and there were no remaining indications that they needed further refinement. Once the final item sets had been identified, Cronbach's alpha (1951) was calculated for each of the subscales as a measure of internal consistency. Given that the factorial validity of the BREQ has already been extensively tested (e.g. Mullan *et al.*, 1997; Wilson, Rodgers and Fraser, 2002), the sequential approach was not adopted for testing the BREQ-2. Instead a five factor oblique model was tested immediately.

45

## **Results**

### **Perceived Environmental Supportiveness**

#### Phase 1 analyses: single subscales

#### Autonomy Support

The sample size following listwise deletion of case with missing values was 183. The normalised Mardia's coefficient was 10.14 (p < .001) indicating that the data departed significantly from multivariate normality. The initial ten-item model showed a very poor fit to the data. Items 2, 6, and 7 were removed on the basis of low factor loadings (< .40) and the model re-estimated. Model 2 showed an improvement in fit but there were large residuals among items 3, 5, and 8. With the removal of these items the fit was very good (model 3). Fit indices are tabulated in Table 2.4. The remaining four items were:

1. Encourage me to make my own choices

4. Make me feel free to make decisions

9. Provide me with choices and options

10. Encourage me to take my own initiative

Table 2.4. Fit indices for autonomy support

Model	S-B χ <sup>2</sup>	df	P-value S-S χ 2	RMSEA	90% CI RMSEA	P-value RMSEA	CFI	SRMR
Model 1	177.59	35	.000	.15	.1317	.000	.84	.11
Model 2	81.36	14	.000	.16	.1319	.000	.88	.10
Model 3	1.17	2	.558	.00	.0013	.685	1.00	.02

#### Structure

The sample size following listwise deletion of case with missing values was 185. The normalised Mardia's coefficient was 11.21 (p < .001) indicating that the data departed significantly from multivariate normality. The fit for the initial set of nine items was poor. Items 5, 6, and 9 were eliminated due to large residuals and modification indices among the error terms. The fit was improved (model 2), but item 8 now showed large residuals and

modification indices with some of the other error terms. Elimination of this item led to a very good fit (model 3). Fit indices are tabulated in Table 2.5. The remaining five items were:

- 1. Give me good advice
- 2. Make it clear to me what I need to do to get results
- 3. Provide clear feedback about my progress
- 4. Make it clear what to expect from engaging in the activities
- 7. Make me feel positive about being able to perform the activities

Table 2.5. Fit indices for structure

Model	S-B χ <sup>2</sup>	df	P-value S-S $\chi^2$	RMSEA	90% CI RMSEA	P-value RMSEA	CFI	SRMR
Model 1	100.20	27	.000	.12	.0115	.000	.95	.04
Model 2	21.80	9	.009	.09	.0414	.084	.99	.02
Model 3	2.61	5	.759	.00	.0007	.889	1.00	.01

# Involvement

The sample size following listwise deletion of case with missing values was 186. The normalised Mardia's coefficient was 10.79 (p < .001) indicating that the data departed significantly from multivariate normality. The fit for the initial set of seven items was good and there were no large residuals or modification indices. Consequently the full set of items was retained at this stage. Fit indices are tabulated in Table 2.6.

Table 2.6. Fit indices for involvement

Model	S-B χ 2	df	P-value S-S χ 2	RMSEA	90% CI RMSEA	P-value RMSEA	CFI	SRMR
Model 1	22.22	14	.07	.06	.000099	.365	.99	.02

# Phase 2: complete model analysis

The remaining 16 items were then combined and a three-factor oblique model was tested. The sample size following listwise deletion of cases with missing values was 180. Although  $\chi^2$  was significant, the fit of the initial model was relatively good. Nevertheless, there were large modification indices for the autonomy support item 1 on both the other latent variables, indicating that this was an ambiguous item. The fit improved following its elimination (model 2), however, there remained large modification indices for the involvement items 4 and 6 on both the non-intended factors. Respecification (model 3) with these items removed improved the fit but there was now a pattern of large residuals for involvement item 1. Elimination of this item led to a good fit (model 4). Fit indices are tabulated in Table 2.7.

Model	S-B χ 2	df	P-value S-S χ 2	RMSEA	90% CI RMSEA	P-value RMSEA	CFI	SRMR
Model 1	164.83	101	.000	.06	.0408	.17	.99	.06
Model 2	137.67	87	.000	.06	.0407	.25	.99	.05
Model 3	84.92	62	.028	.05	.0207	.61	.99	.04
Model 4	67.56	51	.060	.04	.0007	.66	.99	.04

Table 2.7. Fit indices for the 3-factor PESQ model

Table 2.8 shows the standardised factor loadings and standard errors for the items and Cronbach's alpha reliability coefficients for the scales. Factor loadings, item error variances and factor intercorrelations are shown in Figure 2.1. The factor loadings were all strong (minimum .60) and significantly greater than zero. Subscale reliabilities were all good. The interfactor correlations were high, particular that between structure and involvement (.96), which approached unity. This suggests a potential lack of discriminant validity between these two scales. In order to examine this, two further models were specified and tested. First, a single factor model with all the items loading on one latent variable was specified and second, a model in which the correlation between structure and involvement was constrained to unity, effectively specifying that all the structure and involvement items loaded on a common factor (i.e. a two factor model). The fit of the single factor model was poor in comparison to the three factor model and departed significantly from the data. (Satorra-Bentler  $\chi^2 = 125.51$ , df = 54, p < .000). The two factor model was a nested version of the three factor model and so it was possible to directly compare the two using the  $\chi^2$  difference test. However, the difference between Satorra-Bentler  $\chi^2$ s for nested models is not  $\chi^2$ distributed. Consequently the unscaled, minimum fit function  $\chi^2$ s were used to compare the models. The  $\chi^2$  difference was 26.73 (p < .000), indicating that the two factor model had a significantly worse fit than the three factor model.

	Mean	SD	Factor Loading	Standard Error
Autonomy Support: (Alpha = .77)				
4. Make me feel free to make decisions	2.98	1.16	.60	.109
9. Provide me with choices and options	2.68	1.38	.80	.088
10 Encourage me to take my own initiative	2.70	1.41	.79	.092
Structure (Alpha = .93)				
1. Give me good advice	2.99	1.31	.89	.079
2. Make it clear to me what I need to do to get results	2.80	1.37	.90	.072
3. Provide clear feedback about my progress	2.15	1.55	.81	.062
4. Make it clear to me what to expect from engaging in the activities	2.63	1.37	.77	.090
7. Make me feel positive about being able to perform the activities	2.77	1.43	.91	.069
<b>Involvement:</b> (Alpha = .95)				
2. Make me feel as if I matter to them	2.78	1.41	.86	.081
3. Are concerned about my well-being	2.81	1.40	.92	.072
5. Look after me well	2.72	1.38	.90	.074
7. Care about me	2.65	1.43	.95	.061

Table 2.8. Item means and SDs, factor loadings with their standard errors, and Cronbach's alphas for the scales.



Figure 2.1 shows PESQ Factor loadings, item error variances and factor intercorrelations

**<u>Kev</u>**: AS = Autonomy support; STR = Structure; INV = Involvement

## **Psychological Need Satisfaction**

#### Phase 1 – Single Subscales

The following section details development of the relatedness subscale and the refinement of the competence subscale. The same analytical strategy used for the Perceived Environmental Support Questionnaire (PESQ) was employed, with the analysis of the single subscales (for item refinement purposes), followed by an analysis of the complete model in which all items are featured. For consistency a single factor model of the LCE was also tested.

#### Relatedness

The sample size following listwise deletion of cases with missing values was 188. The normalised Mardia's coefficient was 9.579 (p < .001) indicating that the data departed significantly from multivariate normality. The initial ten-item model showed a very poor fit to the data. Items 3, 6, 7 and 8 were removed on the basis of a pattern of large residuals and the model re-estimated. Model 2 also showed a poor fit. There were large residuals among items 1, 4 and 10. With the removal of these items only three items remained. Three item models have zero degrees of freedom and are therefore untestable when the factor loadings and error variances are entirely free to be estimated. In order to test the model, therefore, the model was specified as tau equivalent with the factor loadings constrained to be equal, releasing two degrees of freedom. The fit was very good (model 3). Fit indices are tabulated in Table 2.9. The remaining three items were:

- 2. In exercise situations I feel supported
- 5. In exercise situations I feel accepted
- 9. In exercise situations I feel that people are interested in me

Model	S-B χ 2	df	P-value S-S χ 2	RMSEA	90% CI RMSEA	P-value RMSEA	CFI	SRMR
Model 1	170.27	35	.000	.14	.1217	.000	.94	.07
Model 2	44.60	9	.000	.15	.1119	.000	.94	.06
Model 3	.55	2	.758	.00	.0009	.839	1.00	.02

Table 2.9. Fit indices for relatedness

# Competence

The sample size following listwise deletion of cases with missing values was 184. The normalised Mardia's coefficient was 5.395 (p < .001) indicating that the data departed significantly from multivariate normality. The initial five-item model showed a reasonable fit to the data but item 3 was removed on the basis of a pattern of large residuals with items one and five and the model re-estimated. This led to a very good fit. Fit indices are tabulated in Table 2.10. The remaining four items were:

- 1. I think I am pretty good at the exercises I do
- 2. I am pretty skilled at the exercises I have been set
- 4. I think I do pretty well in my exercise compared to other people
- 5. I know what I have to do in order to perform the exercises

Model	S-B χ 2	df	P-value S-S χ 2	RMSEA	90% CI RMSEA	P-value RMSEA	CFI	SRMR
Model 1	14.18	5	.015	.10	.0416	.08	.96	.04
Model 2	.38	2	.827	.00	.0009	.89	1.00	.01

Table 2.10. Fit indices for perceived competence

# Locus of Causality for Exercise Scale (LCE)

The sample size following listwise deletion of cases with missing values was 194. The normalised Mardia's coefficient was 2.916 (p < .01) indicating that the data departed significantly from multivariate normality. The model was specified as tau equivalent, as there were only three items, and had a good fit to the data. Fit indices are tabulated in Table 2.11. The three items were:

- 1. Having to exercise is a bind but it has to be done
- 2. I exercise because I like to rather than because I feel I have to
- 3. Exercise is not something I would choose to do, rather it is something that I feel I ought to do

Table 2.11. Fit indices for relatedness LCE

Model	S-B χ 2	df	P-value S-S χ 2	RMSEA	90% CI RMSEA	P-value RMSEA	CFI	SRMR
Model 1	.20	2	.906	.00	.0006	.94	1.00	.01

## Phase 2: Complete Measurement Model Testing

The three psychological need satisfaction subscales were then combined into a three factor oblique model and tested. The sample size following listwise deletion of cases with missing values was 179. Although  $\chi^2$  was significant, the fit of the initial model was relatively good. Nevertheless, there were large modification indices for the competence item 3 on both the other latent variables, indicating that this was an ambiguous item. The fit was good following its elimination (model 2).  $\chi^2$  was still just significant at the 5% level but the other indices met all the adopted criteria described earlier. Fit indices are tabulated in Table 2.12.

Table 2.12. Fit indices for the 3-factor psychological needs model

Model	S-B χ 2	df	P-value S-S χ 2	RMSEA	90% CI RMSEA	P-value RMSEA	CFI	SRMR
Model 1	61.74	32	.001	.07	.0510	.088	.97	.06
Model 2	36.93	24	.044	.06	.0109	.375	.98	.05

Table 2.13 shows the standardised factor loadings and standard errors for the items and Cronbach's alpha reliability coefficients for the scales. Factor loadings, item error variances and factor intercorrelations are shown in Figure 2.2. The factor loadings were all moderate to strong (minimum .44) and significantly greater than zero. Reliabilities were good for relatedness and perceived competence but a little low for the LCE.

Table 2.13. Item means and SDs, factor loadings with their standard errors, and Cronbach's alphas for the scales.

	Mean	SD	Factor Loading	Standard Error
Autonomy (LCE): Alpha=0.65			8	
1. Having to exercise is a bind but it has to be done	2.40	1.45	.49	.102
2. I exercise because I like to rather than because I feel I have to	2.70	1.34	.88	.300
3. Exercise is not something I would choose to do, rather it is something that I feel I ought to do	2.03	1.63	.44	.186
Competence: Alpha=0.80				
1. I think I am pretty good at the exercise I do	2.32	1.20	.86	.084
2. I am pretty skilled at the exercises I have been set	2.04	1.34	.82	.085
5. I know what I have to do in order to perform the exercises	3.06	1.08	.69	.080
Relatedness: Alpha=0.81				
2. In exercise situations I feel supported	2.33	1.54	.65	.085
5. In exercise situations I feel accepted	2.55	1.45	.67	.218
9. In exercise situations I feel that people are interested in me	2.00	1.48	.84	.240





<u>**Kev</u></u>: AUT= Autonomy (LCE); COMP = Competence; REL = Relatedness.</u>** 

55

## Behavioural Regulation in Exercise Questionnaire - 2

The BREQ-2 assessed intrinsic, identified, introjected, external regulation and amotivation. This version of the BREQ originally included four identified regulation items from Mullan *et al.*'s (1997) initial item pool, however due to an error, one item was omitted from the original BREQ identified subscale (I get restless if I don't exercise regularly). A list of the items for the BREQ-2 can be found in Appendix 4A.

#### Analysis and results

The factorial validity of the BREQ-2 was assessed using confirmatory factor analysis (CFA) with LISREL 8.51. The covariance matrix was analysed. The specified model allowed the items to load on their intended factors, inter-factor correlations and error variances were also free to be estimated, and error covariances were constrained to zero. Listwise deletion of cases with missing data produced an effective sample size of 194. Preliminary analysis revealed that the data departed significantly from multivariate normality. Consequently, model fit was assessed using the Satorra-Bentler (1994) scaling correction to the maximum likelihood  $\chi^2$ . In addition, the root mean square error of approximation (RMSEA) and its 90% confidence interval, the comparative fit index (CFI), the non-normed fit index (NNFI) and the standarized root mean square residual (SRMR) were examined.

The results showed that the hypothesized five-factor model did not depart significantly from the data (Satorra-Bentler  $\chi^2 = 136.49 (125)$ , p = .23). The other fit indices also indicated an excellent fit (RMSEA = .02, 90% CI = .00 - .04; CFI = .95; NNFI = .94; SRMR = .05). Standardised factor loadings were all significant and moderate to strong (Mdn = .76; range .53 - .90; ps < .001). Table 2.14 shows the means (calculated as the mean of the item scores for each subscale) and standard deviations of the subscales, factor intercorrelations and Cronbach's alpha reliability coefficients. Internal consistency of all the factors was acceptable.

	M	<u>SD</u>	1	2	3	4	5
Intrinsic	2.80	1.02	0.86				
Identified	3.24	0.87	0.80	0.73			
Introjected	1.74	1.25	0.08	0.25	0.80		
External	0.59	0.90	-0.59	-0.48	0.08	0.79	
Amotivation	0.30	0.68	-0.62	-0.79	-0.20	0.65	0.83

Table 2.14. Mean subscale scores, <u>SDs</u>, factor intercorrelations and Cronbach's alpha reliability coefficients (on the diagonal) for BREQ-2 subscales.

# Discussion

#### PESQ

The analyses showed all the subscales of the PESQ (autonomy support (AS), structure (S), and involvement (I)) to be factorially valid subscales. Items were eliminated at the single subscale and complete model stages of analysis if they proved to be poor indicators of their factor by examination of the global indices and the standardised residuals and modification indices. Separate analyses for each of the constructs, prior to complete measurement model testing is a rigorous approach, and in this case led to scales with good measurement properties such as convergent and discriminant validity (Jöreskog, 1993).

Six items were eliminated from the autonomy support subscale on the basis of the statistical indices. A possible explanation of why four of these items were poor indicators of the factor could be because they were worded too extremely (e.g. The staff at the exercise facility: "don't allow decisions"; "ignore my individual needs"; "make me feel pressured to perform in specified ways"; "imposed an exercise programme on me"). Participant responses

reflected the extremity of these questions, as participants tended to strongly disagree with these items. Anecdotal reports from participants suggested that this was because they did not want to 'criticise' any staff members who had helped them or to 'get them into trouble' as it were (irrespective of how helpful they actually were). The item pertaining to the provision of a 'range of activities' was also eliminated (The staff at the exercise facility: "provide a range of activities"), this item may not have been applicable in this context as the exercise programmes which are created for the clients are by their very nature quite constrained and they do not always provide a vast array of activities. Nor do they lend themselves to be changed by the client as the client typically does not have the knowledge to do this. Finally, the item: "The staff at the exercise facility take into account my individual needs" may have been too vague for the clients to answer appropriately since an individual has many different needs not just those related to their exercise and health and this may therefore have caused some confusion.

Four items were eliminated from the structure subscale (The staff at the exercise facility: "make sure I understand the best ways to exercise"; "give me activities to perform that are suited to my level"; "help me to feel confident about exercising"; and "help me to achieve my exercise goals"). The first two of these items may not be appropriate for people who are new to exercise as they would not initially know what the "best ways to exercise" actually are or if the suggested exercises are indeed "suited" to their level or not. Furthermore, the last two items may not have suited the GP referral environment since they were not frequently in contact with the staff, and frequent contact would presumably be necessary in order to help someone feel 'confident' about exercising or to help someone achieve their 'exercise goals'.

Finally, no items were eliminated from the involvement subscale at this initial stage of analysis, indicating that the seven items were good indicators of their factor. Following the initial elimination of items at the single subscale level, the remaining 16 items were then put into a complete measurement model. A three-factor oblique model was tested (autonomy support, structure, and involvement) and examination of the modification indices led to the elimination of one autonomy support item (The staff at the exercise facility: "encourage me to make my own choices"); and three involvement items (The staff at the exercise facility: "make time for me even though they are busy"; "aren't too bothered about my wellbeing"; and "don't concern themselves with what I need to get from exercising"). The eliminated autonomy support item showed signs of shared method variance with the other two remaining autonomy support items and this was possibly due to one of the other items having common use of the word 'encourage' and another item having common use of the word 'choices'.

Two of the involvement items that were eliminated could have been too extremely worded (as was discussed above with some of the autonomy support items at the single subscale stage). The other eliminated involvement item may not have been applicable to the GP referral scheme context since little contact was made between client and instructor once the initial consultation had been carried out.

Large correlations were observed between the factors, especially between structure and involvement. Large interfactor correlations can usually be explained by one of the following three things:

- 1) Measurement error
- 2) Specification error
- 3) Presence of a single factor

The items were subsequently checked for possible measurement error (such as similarly worded items) and the specifications were examined for flaws. There was no evidence that would support the idea of either measurement or specification error being responsible for the intercorrelations in this instance. However, the existence of a single factor underlying all three constructs still needed to be explored. A single factor model was thus tested in order to check whether or not the three subscales were measuring same construct; if the single factor model produced a good fit, then there would be little reason to say that there were three distinct factors. In accordance with our hypotheses, we would predict the 3-factor model to be superior to the single factor model. This prediction was confirmed as the single factor model failed to yield an acceptable fit in contrast to the acceptable fit produced by the 3-factor model.

Since the single factor model was unable to explain the large intercorrelations that were observed between each of the latent variables, the next step was to test a 2-factor model. As the highest correlations observed were between structure and involvement (0.96), a 2factor model with autonomy support as one factor, and structure and involvement as the other needed to be tested. If the 2-factor model also yielded an acceptable fit, then there would be grounds to collapse the structure and involvement items into one factor. The results of the  $\chi^2$ difference test (using minimum fit function  $\chi^2$ s) revealed the 3-factor model to be a significantly superior fit compared to the 2-factor model.

The fact that the results showed autonomy support, structure, and involvement to be closely related to one another whilst at the same time not belonging to a single factor is not as surprising as it may sound. It is quite natural for a group of constructs generally 'supportive' in nature to be highly related, but nonetheless distinct from one another. Previous researchers have also encountered problems obtaining completely separate factors. For example, Ryan et al. (1995) commented on the results of their classroom climate studies and how one cannot empirically separate perceived teachers' warmth and caring from their autonomy support. Separable factors of autonomy support and involvement did not emerge from their analyses. Their explanation of this was that one feels authentically related to another person only to the extent that one perceives the presence of autonomy support from that person (Ryan, 1991). In other words, involvement needs to be in the presence of autonomy support to achieve optimal effects. Similarly interactions reported in the research on competence and autonomy indicate that the existence of both constructs is necessary for positive effects (Deci and Ryan, 2000). Reis et al. (2000) reported finding significant and high correlations between competence and relatedness, and between autonomy and competence whilst still finding reasonable discriminant validity (pp. 425). If we assume that the environmental counterparts of autonomy and competence (i.e. autonomy support and structure) behave in a similar way, then this could be viewed as further support for the legitimacy of the inter-related nature of the constructs. One could therefore question the utility of keeping the constructs separately at all given that they are so inter-related. In answer to this, it is important to keep the constructs separate on a conceptual basis in order to establish whether or not they are able to differentially predict various outcomes (e.g. autonomy, competence, and relatedness). This potential differential predictive power of the environmental support constructs will be something that is further explored in Chapter Four.

## **Psychological Need Satisfaction Subscales**

The following section discusses the results of the development of the relatedness subscale and the refinement of the competence subscale. The same analytical strategy used for the Perceived Environmental Support Questionnaire (PESQ) was employed, with the analysis of the single subscales (for item refinement purposes), followed by an analysis of the complete model in which all items are featured. For consistency a single factor model of the LCE was also tested. The LCE retained all three of its original items, no eliminations were required. The three perceived competence items featured in competence subscale of the IMI (McAuley *et al.*, 1991) were extended to include other aspects of competence that were not adequately represented in the IMI. The three original items were mainly direct assessments of how skilled the individual perceives themselves to be, and how skilled they perceive themselves to be in comparison with other people. Two items were added; "I feel confident that I can do my exercises"; and "I know what I have to do in order to perform the exercises". The first item represents the feeling of confidence with regard to the exercise; this is not the same as feeling skilled since an individual may not consider themselves to be skilled, but still have a certain degree in confidence in being able to perform a task. The latter supplementary item was added in order to represent the knowledge aspect of competence, where an individual knows what they have to do in order to achieve a certain outcome (Skinner, 1995). However, the confidence item was subsequently eliminated from the subscale as modification indices suggested that it shared variance with two of the other items. The fit for the remaining four items was reasonable and consequently no further adjustments were made.

Relatedness is the least researched of the psychological needs in terms of assessment, and in terms of SDT. When it has been examined in the past, it has been examined in other contexts such as education (Wellborn and Connell, 1987) and out-patient care (Williams et al., 1996), but has been neglected in the realms of exercise. Furthermore, it has usually been examined in conjunction with just autonomy. To date, the only published study to examine relatedness in conjunction with competence or indeed in conjunction with both competence and autonomy involves the daily assessment of psychological need satisfaction (Reis et al., 2000). They assessed trait levels of need satisfaction as well as daily fluctuations of need satisfaction by using open-ended questions; for example to assess daily relatedness participants were asked to think about the three social interactions that had taken the most time during that day and rate the extent to which during the interaction they had felt "close and connected" with the people they were with. The scale was from (1) not at all to (7) extremely. They went on to compare these assessments with daily assessments of well being. Results demonstrated that need fulfilment fluctuated from day to day and covaried with emotional well being. Trait need satisfaction was also found to be related to well being, but no comparisons were performed between trait need satisfaction and daily need satisfaction. This would be useful as it could indicate whether need satisfaction experienced on a daily basis adds to trait need satisfaction. This idea is not dissimilar to Vallerand's (1997) conceptualisation of bottom-up effects influencing global intrinsic motivation which states that situational motivation can influence contextual motivation, which in turn can influence

61

global motivation (Kowal and Fortier, 2000). Specifically, a series of negative experiences at the gym could have a negative impact upon an individual's contextual motivation for exercise in general, which – if accompanied by low motivation for other contexts – could lead to an individual developing poor global motivation (see Chapter Five for further discussion).

The relatedness subscale was analysed as a single subscale separately from the PESQ subscales. From the initial set of ten items, seven were eliminated (e.g. "I feel lonely when I exercise"; "I feel isolated when I exercise"; "I feel out of place when I exercise"; "I feel like a fish out of water when I exercise"; "In exercise situations I feel different from everybody else"; "I don't feel like I "fit-in" when I exercise"; and "In exercise situations I feel like I belong there". The decision to eliminate these items was made by taking into account statistical indices as well as considering the items from a substantive viewpoint.

Substantively, the first six items appeared to represent the antithesis of relatedness in contrast to the remaining three items ("In exercise situations I feel supported"; "In exercise situations I feel accepted"; "In exercise situations I feel that people are interested in me") which more closely resembled the essence of relatedness and this last set was therefore chosen. However, the last item in the above list of eliminated items "In exercise situations I feel like I belong there", was more akin to the three items that were retained and so the same justification for elimination could not be applied. Judging by anecdotal reports from the participants whilst completing the questionnaires this item was perceived as being confusing and may not have fully captured the feeling of 'relatedness' as experienced by this particular population since participating in exercise was often a new experience and not one that they felt completely at ease with.

Following the initial elimination of items at the single subscale level, the remaining ten psychological need satisfaction items were then put into a complete measurement model (autonomy, competence, and relatedness). One further competence item was eliminated at this stage ("I think I do pretty well in my exercise compared to other people"), statistically this was due to shared error variance with the other latent variables. Substantively, elimination also made sense as many of the scheme participants felt that they were there to improve their health and not to 'compete' with other people, which could be one possible interpretation of this item.
# Behavioural Regulation in Exercise Questionnaire – 2

Finally, the results of this study showed that the addition to the original BREO of amotivation items produced a model that had an excellent fit to the data, indicating that the new version has good factorial validity. The study also assessed the addition of a measure of amotivation with a sample that was likely to express a greater range of amotivation scores than that used in the preliminary development of the instrument. However, the mean for the amotivation subscale indicates low levels of amotivation and the distribution of scores on the amotivation items was heavily skewed, though not to the same extent as in Mullan and Markland's (1997) study, and the distribution did not exhibit the restricted range evidenced in their sample of regular exercisers. The fact that the respondents in this study had been through an exercise referral scheme could be a possible explanation of why the distribution is skewed. The respondents had voluntarily participated in the scheme, and this in itself suggests that the respondents would have possessed some degree of motivation for exercise. Indeed, according to the self-reported activity scale, the present sample was moderately physically active. This was contrary to the initial expectation that such a sample would exhibit a broad range of amotivation scores. Further work is therefore required to determine the distributional properties of the amotivation subscale scores in samples that are more likely to include amotivated individuals. If similar distributional problems continue to be observed in such samples, then clearly further item development will be necessary.

It should be noted that the mean for external regulation was also well below the scale's midpoint, suggesting that some internalisation of the initial referral to exercise by external agencies had occurred. Nevertheless, the results of the CFA reported here suggest that the BREQ-2 has strong factorial validity and could prove useful for researchers wishing to assess amotivation along with the other forms of behavioural regulation for exercise.

As predicted by SDT (Ryan and Connell, 1989), the correlations among the BREQ-2 subscales generally conformed to a simplex-like pattern with stronger positive correlations between factors adjacent on the self-determination continuum and stronger negative correlations between more distal factors. However, this was not the case for the correlations between amotivation and intrinsic and identified regulation. There was a stronger negative relationship between amotivation and identification than between amotivation and intrinsic regulation. This is perhaps not surprising because the identification items concern the personal importance or value placed on exercising whereas the amotivation items reflect a lack of such importance or value. A possible concern here is that the identification and amotivation subscales could be assessing a single construct. However, the 90% confidence interval around the correlation between identification and amotivation did not encompass unity. Furthermore, a comparison was made between the five factor model and a more constrained nested model with the correlation between identification and amotivation fixed to unity (thereby simulating a four factor model with identification and amotivation items as indicators of a single latent variable). The results of a  $\chi^2$  difference test showed that the 'four factor' model fitted significantly worse than the five factor model ( $\chi^2$  difference = 56.23, df = 1). The evidence therefore suggests that the identification and amotivation subscales are assessing different constructs.

Wilson *et al.*; (2002) tested a true simplex model of the BREQ as well as a correlated factor model by specifying causal paths among the constructs. This approach was not adopted because such a model implies causal connections among the behavioral regulations with amotivation causing external regulation which in turn causes introjection and so on. This was not considered by the researcher to be theoretically justified. Rather, the theory carries the less stringent assumption that the constructs are intercorrelated in an ordered pattern as described above.

## Limitations of the Study

One limitation of the study is the retrospective manner in which the data were collected. Participants were answering questions based on a scheme that they had experienced 6-36 months earlier, which could have led to inaccurate recall of how they actually felt. For example they may remember it as being considerably more negative / positive than it actually was.

Secondly, the eventual total effective sample size for all analyses performed fell below 200 which for this particular type of analysis was quite small. A sample of 250-300 participants would allow for greater confidence in the reliability of the results (Tabachnick and Fidell, 2001).

The participants involved in the study were individuals who had already been on the local GP exercise referral scheme and this meant that there were a finite number of available subjects. This was further hampered first of all by the fact that the scheme had only been running for

three years, and secondly not all of the participants approached wished to take part in the study. Ideally, the study would be better suited to a larger scale GP exercise referral scheme that would be capable of providing larger numbers of participants. However, it is anticipated that results from the longitudinal study detailed in Chapter Four will provide further support for the present study.

## **Conclusion**

Despite its limitations, this study produced a factorially valid tool for assessing perceptions of environmental supportiveness and relatedness for the GP exercise referral scheme context. It has also provided evidence for the factorial validity of the BREQ-2. These tools will be tested longitudinally in the Chapter Four which will provide further support for their validity and robustness.

## **CHAPTER THREE**

# An Examination of the Structural Relationships between Environmental Supports, Psychological Need Satisfaction, and Behavioural Regulation.

#### Introduction

The following chapter deals with the second aim of Study One: to test models of the structural relationships between environmental supports and psychological need satisfaction and between environmental supports and behavioural regulation in the exercise referral context. The first aim of the study, which was to develop and examine the factorial validity of appropriate measurement instruments, was detailed in the preceding chapter.

Vallerand's hierarchical model of intrinsic motivation (1997) builds on and extends the theoretical tenets of self-determination theory (SDT) and has been supported by the findings of many researchers over the past ten years (see Vallerand, 1997 for a review). The model proposes that social factors influence one's psychological need satisfaction, which then affects the internalisation of behaviour, which then produces affective, cognitive and behavioural consequences (see Figure 1.3, page 17). This pattern of relationships has also been noted by Deci and Ryan, (1985; 1991; Ryan and Deci, 2000b). The model contends that the above sequence operates at three levels, namely the global (or personality), contextual (or life domain), and situational (or state) levels (Vallerand, 1997). The present study examines this motivational sequence at the contextual level of motivation, but does not look at the affective, cognitive and behavioural consequences.

The 'social factors' part of Vallerand's model encompasses the three ambient supports for self-determination (i.e. autonomy support, structure, and involvement) which according to SDT are deemed necessary for promoting optimal internalisation of behavioural regulation and integration into the self (Deci and Ryan, 1995). All three supports must be present; the provision of structure and involvement in the absence of autonomy support is likely to promote introjected regulation and its accompanying feelings of pressure to act (Fisher, 1978; Ryan, 1982; Ryan and Deci, 2000a). Each one of these supports is proposed to enhance its corresponding psychological need i.e. autonomy, competence, and relatedness (Deci and Ryan, 1985). Just as all three ambient supports have to be present, all three of the psychological needs must also be satisfied in order for internalisation to be facilitated. For example, an increase in perceived competence will only lead to optimal motivation to act when it takes place within a context of some degree of self-determination (Deci and Ryan, 1985; Markland, 1999; Ryan and Deci, 2000a, pp. 64). Deci and Ryan (2000a) even go as far to say that the absence of just one of these needs may indeed hamper an individual's psychological development (pp. 229). The structural model thus features all three ambient supports as well as all three psychological needs.

Alongside the measurement of each of the five behavioural regulations featured in the BREQ-2, a single score that gives an index of the degree to which respondents feel selfdetermined can also be derived from these subscales (i.e. the relative autonomy index (RAI). The use of a single score of self-determination can be useful, especially in situations where the researcher needs to select participants who are high or low in self-determination, so that they can be assigned to a specific experimental condition (Vallerand, 1997). This index is obtained by applying a weighting to each subscale and then summing these weighted scores. The weightings are derived from the observation that subscale scores form a simplex pattern, with subscales adjacent on the continuum showing stronger positive correlations than nonadjacent subscales. The more autonomous subscales have positive weights attached to them, and the non-self-determined subscales have negative weights attached. Thus a weight of +3 is assigned to the intrinsic motivation subscale as this construct represents the highest level of self-determination. Accordingly, a weight of +2 is assigned to the identified regulation subscale; +1 is allocated to the introjected regulation subscale; -2 is assigned to the external regulation subscale; and -3 is assigned to amotivation since it is representative of the lowest level of self-determination.

Despite these weightings possessing some intuitive and theoretical appeal, they are arbitrary as opposed to being empirically based, thus the model presented below contains a second order construct which subsumes the five dimensions of the BREQ-2. Many previous studies have used the RAI to formulate a composite score of behavioural regulation (Black and Deci, 2000; Vallerand, 1997; Williams and Deci, 1996), but none have formulated a composite behavioural regulation variable using empirical weightings as opposed to the arbitrary weightings stipulated by the RAI.

Previous models in the area of self-determination theory have used autonomy support as a measure of environmental support with the three components (autonomy support, structure, and involvement) being mixed together rather than examined separately. The advantage of being able to view the individual contribution of each of the supports is that it gives one the potential to assess whether there are differences in their relative importance in relation to other variables (e.g. need satisfaction). Wilson and Rodgers (*in press*) examined the relationships between autonomy support from friends, exercise regulations, and behavioural intentions to continue exercising for the next four months. They used a combined autonomy support variable that encompassed items reflecting each of the three supports as opposed to forming a composite variable constructed from autonomy support, structure, and involvement. Need satisfaction was not included in their model; instead, behavioural regulations were hypothesised to mediate the effects of autonomy support on behavioural intention. Wilson *et al.* (*in press*) found that their data supported the mediational role of behavioural regulation with greater perceptions of autonomy support leading to more autonomous behavioural regulation which in turn resulted in greater exercise intentions. The present model is also a mediational model, but has need satisfaction as its mediating variable rather than behavioural regulation, (the latter being the outcome variable within the present model); in short, need satisfaction is hypothesised to mediate the effects of environmental support on behavioural regulation.

Previous models that have examined need satisfaction have tended to keep each of the needs (i.e. autonomy, competence, and relatedness) separate rather than forming a composite variable (contrary to the present model which uses a composite). Ntoumanis (2001) examined motivation in the physical education setting and hypothesised a model wherein autonomy, competence, and relatedness mediated the effect of motivational climate on behavioural regulation. In his study each of the needs were examined separately and he hypothesised relatedness to be more strongly related to self-determined forms of behavioural regulation; autonomy to be positively predict intrinsic motivation and to negatively predict external regulation and amotivation. Lastly, positive relations were predicted between competence and more self-determined forms of behavioural regulation, and negative relations with less self-determined forms. These hypothesised relationships were supported by the data from this physical education study, which in turn provides support for the mediational role of psychological need satisfaction upon motivational consequences.

This study was extended by Standage, Duda, and Ntoumanis (2003) in a study which hypothesised a model wherein the effect of motivational climate upon behavioural regulation (and subsequently intention) was mediated by psychological need satisfaction. Again this was in the context of physical education, but their results nonetheless supported the mediational role of need satisfaction. Standage *et al.* (2003) aimed to add a situational assessment of the environmental constructs into their model, instead of focussing purely upon contextual measures. A study that utilises situational assessment of the SDT contructs will also be detailed in Chapter Five of the present thesis.

A study carried out by Deci *et al.* (2001) used a composite variable for need satisfaction in the context of an Eastern Bloc organisational work study. They hypothesised a model where composite need satisfaction mediated the effects of autonomy support on task engagement, anxiety and general self-esteem. Their model was supported by the data, and again provided evidence to support need satisfaction as a mediator of environmental support on motivational outcomes.

# Model testing strategy

The model tested in this chapter was based on Vallerand's (1997) hierarchical model of intrinsic and extrinsic motivation (refer to page 17 of this thesis). Perceived environmental supportiveness was held to influence psychological need satisfaction, which in turn influenced behavioural regulation (Figure 3.1). Environmental supportiveness was operationalised using the three PESQ scales developed in Chapter Two and was conceptualised as a second order construct (labelled *environmental support*) subsuming the three dimensions of autonomy support, structure and involvement. Need satisfaction was operationalised using the autonomy, competence and relatedness scales reported in the previous chapter and was again conceptualised as an overall second order construct subsuming the three specific needs (labelled *need satisfaction*). Finally, autonomous versus controlled behavioural regulation was conceptualised as a second order construct (labelled *relative autonomous regulation*) subsuming the five dimensions of the BREQ-2.

Model fit was assessed using the same indices as in the previous chapter: the Satorra-Bentler scaled  $\chi^2$  test statistic, the Root Mean Square Error of Approximation (RMSEA) and its 90% confidence interval (CI), the comparative fit index (CFI), and the Standardised Root Mean Square Residual (SRMR). However, because the model reported here is much more complex than the measurement models described in Chapter Two, a non-significant Satorra-Bentler scaled  $\chi^2$  was not expected.

Given the relatively small sample size, it was not feasible to test the structural models as latent variable models with all of the indicator items included, so item composites, or parcels were computed instead. Marsh, Antill and Cunningham (1989) highlight the advantages of analysing item parcel scores in place of using all the items such as, increasing reliability and generality and reducing the idiosyncratic characteristics of individual items. With the present model, items were parcelled such that each latent variable had two observed indicators. The number of items combined depended on the number of original items available. For three item scales two items were combined as one indicator and the remaining item stood as the second indicator. For four item scales, each composite indicator comprised the mean of two items. For structure, which comprised five items, the first composite indicator comprised three items and the second two items. Table 3.1 shows the item composites for each latent variable. For consistency, the items are given the same numbers as in the previous chapter (see Chapter Two, Tables 2.7 and 2.13).

Latent variables	Composite indicator 1	Composite indicator 2
Environmental supportivenes	SS	
Autonomy support	Items 4 + 9	Item 10
Structure	Items $1 + 3 + 4$	Items 2 + 7
Involvement	Items 2 + 5	Item 3
Psychological needs		
Autonomy (LCE)	Items 2 + 3	Item 1
Competence	Items 1 + 5	Item 2
Relatedness	Items 2 + 5	Item 9
BREQ-2		
Intrinsic regulation	Items 1 + 3	Items $2 + 4$
Identified regulation	Items 2 + 3	Item 1
Introjected regulation	Items 1 + 3	Item 2
External regulation	Items 1 + 4	Items 2 + 3
Amotivation	Items 1 + 4	Items $2 + 3$

Table 3.1. Item composites for the latent variables.



Figure 3.1. Model to be tested

## **Results**

The initial model failed to converge to an admissible solution. Examination of the preliminary LISREL output for diagnostic purposes showed that the second introjection item had a negative error variance, representing an improper estimate (Hoyle, 1995). Furthermore, the unstandardised parameter estimate for this item's relationship with its latent variable was extremely high (67.26) whilst the relationship between the higher order dimension of relative autonomy and introjection was virtually zero (.002). In addition the multiple  $R^2$  for introjection was zero (.000), suggesting that the model did not explain any variance in introjected regulation. Therefore it seemed likely that the source of the inadmissibility of the solution lay in the introjection scale. Consequently the model was respecified with introjection eliminated. This resulted in an admissible solution. The overall fit of the model only approached the adopted fit criteria (Satorra-Bentler scaled  $\chi^2 = 361.50$ , df = 158, p <.000; RMSEA = .08, 90% CI = .07 - .09, p < .000; CFI = .93; SRMR = .09). Nevertheless, the solution lead to meaningful and interpretable parameter estimates. Figure 3.2 shows the standardised parameter estimates for the structural relationships and Table 3.2 shows the standardised estimates with their standard errors and error variances for the measurement model. Table 3.3 shows the standardised parameter estimates and disturbance terms for the structural model. All parameter estimates were significant at p < .001. Environmental support had a moderately strong effect on psychological needs (.63), which in turn had a strong effect on relative autonomous regulation (.92). Structure and involvement had stronger relationships with environmental support (.97 and .99 respectively) than autonomy support (.78). The three dimensions of psychological need satisfaction contributed roughly equally to their higher order need construct. Relative autonomy showed an ordered, simplex-like pattern of relationships with the four forms of behavioural regulation, as one would expect from the correlations reported in Chapter Two (Table 2.14), with positive relationships with intrinsic and identified regulation and negative relationships with external regulation and amotivation. The model accounted for 39.5% of the variance in psychological needs and 85.5% of the variance in relative autonomy.

Table 3.2. Standardised parameter estimates and standard errors for measurement model. Note: standard errors for one composite for each latent variable not computed as these were specified as reference variables to set the metric.

	Estimate	Standard Error	Error Variance
Autonomy Sunnort			
As composite 1	05		20
AS composite 2	.85	12	.28
AS composite 2	.80	.15	.30
Structure	02		10
ST composite 1	.93	05	.13
S1 composite 2	.94	.05	.12
Involvement	00		16
IN V composite 1	.92	05	.10
INV composite 2	.94	.05	.13
Autonomy			
AUT composite 1	.85		.28
AUT composite 2	.54	.12	.71
Perceived competence			
PC composite 1	.86		.26
PC composite 2	.79	.11	.37
Relatedness			
REL composite 1	.86		.26
REL composite 2	.76	.08	.43
Intrinsic regulation			
INT composite 1	.82		.33
INT composite 2	.89	.08	.20
Identified regulation			
ID composite 1	.74		.45
ID composite 2	.64	.17	.60
External regulation			
EX composite 1	.85		.27
EX composite 2	.76	.12	.42
Amotivation			
AM composite 1	.89		.21
AM composite 2	.64	.19	.59



Figure 3.2. Structural model standardised parameter estimates (all estimates significant at p < .001).

74

Table 3.3. Standardised parameter estimates, standard errors and disturbance terms ( $\delta$ ) for structural model.

Note: standard errors for one first order latent variable for each second order latent variable not computed as these were fixed to 1.0 to identify the model.

	Estimate	Standard Error	δ
Environmental Support			
Autonomy support	78		30
Structure	.78	17	.55
Translation	.97	.17	.00
Involvement	.99	.20	.02
Need Satisfaction			
Autonomy	.81		.34
Perceived competence	.79	.10	.37
Relatedness	.86	.12	.27
<b>Relative Autonomous Regulation</b>			
Intrinsic	.99		.01
Identified	.75	.10	.44
External	61	.10	.63
Amotivation	50	.08	.76
Needs on Environmental Support	.63	.13	
<b>Relative Autonomy on Needs</b>	.92	.09	

# Alternative models

Testing competing models directly against one another to determine which one gives the better fit to the data has been recommended as a modelling strategy (Jöreskog, 1993; Musil, Jones, and Warner, 1998). Jöreskog (1993) also highlights the importance of evaluating alternative models not only in terms of whether they fit the data well from a statistical viewpoint, but also in terms of considering whether or not every parameter of the model can be given a substantively meaningful interpretation. Suggested modifications to the initial model are detailed below alongside substantive reasons for their adoption.

Firstly, there was a large modification index (13.00) suggesting that the model fit would improve if environmental support were allowed to have a direct effect on relative autonomy. Research exists to support the idea that environmental supports can have a direct effect upon self-determination (Deci *et al.*, 1981; Wilson and Rodgers, *in press*). Wilson *et al.*, in a study that examined autonomy support, behavioural regulations and exercise

intentions found perceived autonomy support from a friend underpinned the tendency to endorse more autonomous exercise regulations.

Secondly, there was a large modification index (55.81) for a direct effect of environmental support on relatedness. This makes both intuitive and theoretical sense as involvement is the corresponding support for relatedness, and as such would cause the environmental support construct to be correlated with relatedness (Connell and Wellborn, 1991). Finally, there was a large modification index (50.02) indicating that allowing the disturbance terms for identified regulation and amotivation to covary would improve model fit. This is perhaps not surprising because the identification items concern the personal importance or value placed on exercising whereas the amotivation items reflect a lack of such importance or value (Markland and Tobin, *in press*).

Each of these modifications was made sequentially. In each case the fit only improved marginally and the solutions contained improper estimates (standardised parameter estimates > 1.0), indicating model mis-specifications. Consequently the target model was accepted as the most plausible representation of the data.

#### **Discussion**

The aim of this chapter was to test the structural relationships between the environmental supports and psychological need satisfaction, and between psychological need satisfaction and behavioural regulation. This aim was achieved and an acceptable model emerged, with environmental supports having a moderately strong effect upon need satisfaction, which in turn had a strong effect upon relative autonomous regulation. The model provided support for psychological need satisfaction mediating the effects of environmental supports, need satisfaction. Previous research examining environmental supports, need satisfaction, and behavioural regulation can be seen as partial support for the present model as only parts of the present model have previously been tested and some have not used composite variables. It is thus difficult to directly compare previous models with the particular model tested here.

In spite of this, the current model can still be viewed as support for past research. Regardless of Vallerand (1997) examining each of the psychological needs individually, he still stipulated that the presence of all three needs was necessary for the development of selfdetermined regulation, and as the present model subsumes all three psychological needs then some support is provided. Futhermore, just as Ntoumanis (2001); and Standage *et al.* (2003) found support for psychological need satisfaction mediating the effect of environmental factors upon motivational outcome, the present model concurs with this mediational role of psychological need satisfaction. The current study is also consistent with the results of the one study which did test a model with psychological needs as a composite variable (Deci *et al.*, 2001). Lastly, additional support for the existence of a mediating role for psychological needs within the present data was provided by the testing of a model possessing a direct path from environmental support to behavioural regulation which failed to converge. In sum, the mediating role of psychological need satisfaction on behavioural regulation was supported by the present results.

## **Environmental Support**

On examination of the individual contributions of the three environmental supports, structure and involvement were found to be the most salient dimensions of environmental support. Autonomy support was a weaker dimension. This is perhaps not surprising with this population since the very nature of the GP exercise referral scheme is such that clients are told what exercises to do, and how to do them and it is this aspect that might attract patients to enrol on the scheme in the first place as they often have a fairly limited amount of exercise experience (Biddle and Mutrie, 2001; p. 237).

## **Psychological Need Satisfaction**

The three dimensions of psychological need satisfaction contributed roughly equally to their higher order need construct, with relatedness making a slightly stronger contribution than competence and autonomy. This contrasts with much of the SDT literature which often champions competence or autonomy in terms of the relative importance of the three psychological needs (Koestner and Losier, 2002; Ryan and Deci, 2000a, pp.64; Ryan and Deci, 2000b). Although the originators of SDT place less emphasis upon relatedness in terms of intrinsic motivation, some researchers believe that relatedness serves a more critical role than autonomy and competence (Andersen, Chen, and Carter, 2000, pp.272), and this is perhaps the case with the present study. It was mentioned earlier that this particular population may differ from those previously studied in exercise contexts (e.g. fit, healthy individuals or student populations) in terms of both environmental supports and in terms of the relative importance of autonomy, competence, and relatedness. The relatively stronger relationship of relatedness among the needs makes intuitive sense when the characteristics of

the GP exercise referral population are considered. Individuals with medical/physical conditions are commonly very protective with regard to their medical condition and do not want to aggravate it by exercising (Biddle and Mutrie, 2001; p.39; 141). In addition to this, GP exercise referral clients often feel self-conscious as a function of their condition, age, or lack of exercise experience (Biddle and Mutrie, 2001; p.237). Thus it is easy to see how feeling supported and accepted (i.e. relatedness) in a new venture such as an exercise regimen could be viewed as being more important to such individuals than being able to excel at the exercises (i.e. competence) or to feel free to exert choice (i.e. autonomy) with regards to their exercises.

Indeed Vallerand (2000) suggested that there may be individual differences in psychological needs depending on what the individual is most 'in need' of. He goes on to suggest that individual differences in needs may serve various functions including that of determining which type of perceptions (i.e. autonomy, competence, or relatedness) will influence motivation. The implications of this would be that if one can identify the relative impact of the three needs upon an individual's motivation, then activities and services can be tailored to more adequately promote the fulfilment of those needs. It has also been suggested that relatedness may play a more important role in contexts that are inherently social in context such as fitness classes in contrast to more solitary and individual pursuits (Cadorette, Blanchard, and Vallerand, 1996). This suggestion sits well with the present context where many of the individuals exercise not only to improve their health, but for the social environment it can provide (Biddle and Mutrie, 2001; pp.35).

#### **Behavioural Regulation**

Consistent with previous research, relative autonomy showed an ordered, simplex-like pattern of relationships with the four forms of behavioural regulation, with positive relationships with intrinsic and identified regulation and negative relationships with external regulation and amotivation (Mullen, Markland, and Ingledew, 1997; Wilson, Rodgers, and Fraser, 2002). However, contrary to the various behavioural regulations presented on the self-determination continuum (Deci and Ryan, 2000a), the introjection scale of the BREQ-2 had to be removed from the present model after problems associated with it led to inadmissable solutions. The elimination of this subscale is not a consistent finding in the SDT literature, and may in this case be due to the idiosyncrasies of the population used in this study. However, a possible alternative explanation is proposed below.

A consistent finding in previous research is that introjected regulation is associated with anxiety, conflict and tension (Koestner and Losier, 2002). These feelings are attributed to the experience of pressure to do an activity in order to feel good about oneself, whilst at the same time preferring not to do it. Introjected regulation like external regulation has an external locus of causality, but in contrast to external regulation where one engages in a behaviour because of external pressures, introjection has been internalised to a certain degree. This is where the conflict occurs as with externally regulated behaviours, the individual has less 'ownership' of the behaviour and so has not invested any part of themselves in performing it hence there is less ego-involvement (Koestner and Losier, 2002). An individual who is has an introjected regulation with regard to a particular behaviour on the other hand, has taken a small step towards ownership and is thus more prone to sustaining damage to their self-esteem as a function of the greater involvement of their ego. If the behaviour is externally regulated and the individual fails to perform a behaviour, then the consequences for them would consist of letting down other people or failing to receive a reward; whereas if the behaviour is introjected, the individual would experience feelings of guilt, shame, and failure, which would ultimately have a negative impact upon their level of self-esteem (Deci, 1987; Koestner and Losier, 2002; Ryan, 1982).

Thus, one explanation for the model's inability to account for variance in introjected regulation could be related to the fact that introjection reflects the *partial* internalization of a behaviour's value whilst remaining an ambivalent and unstable form of motivation (Deci and Ryan, 2000a; Koestner, Losier, Vallerand, and Carducci, 1996). All of the other behavioural regulations on the continuum are more or less self-determined, but introjected regulation is exactly half way along the continuum and in this way could be said to possess an equal balance self-determined and non-self-determined regulation. An individual who possesses an introjected regulation for a particular behaviour could be said to be in a *transitional* phase of internalisation wherein confused and conflicted emotions temporarily 'hi-jack' self-determination whilst the transition occurs. As a result, autonomy, competence, and relatedness may not always be capable of predicting introjected regulation. This explanation however does not have any empirical support and as such must be considered as speculative.

## Formative .v. Reflective Latent Variables

The present model was specified as a reflective indicator model, however, there are grounds to question this choice of specification based on recent thinking of precisely how indicators are related to latent variables. The choice of formative versus reflective specification depends on the causal priority between the indicator and the latent variable (Bollen, 1989; p. 65-67). If constructs are viewed as underlying factors that *give rise* to something that is observed, then the indicators should be specified as reflective. If constructs are conceived as explanatory combinations of indicators that are determined by a combination of variables then their indicators should be formative (Fornell and Bookstein, 1982; p.292). Working on these definitions, the model tested in the present study should be a formative indicator model, as an increase in environmental support does not lead to increases in autonomy support, structure, and involvement and neither does an increase in need satisfaction lead to an increase in perceived autonomy, competence and relatedness. Rather it is the other way round.

An everyday example of a formative indicator model is that of socio-economic status (SES), which might comprise education, income, occupation, and residence (Hauser, 1973). An increase in any one of these indicators would result in an increase in SES irrespective of the other three indicators remaining unchanged. In contrast, if an individual's SES increases, this would not necessarily be accompanied by an increase in all four indicators.

However modelling a formative indicator model is a complex task and is not without its problems. Unlike reflective indicators, formative indicators do not have error terms and as a consequence the formative model is *underidentified* (Diamantopoulos and Winklhofer, 2001). In order for the model to be estimated it must be placed within a larger model that incorporates consequences (i.e. effects) of the latent variable in question (Bollen, 1989). Attempts to test the present model in this way failed to reach an admissable solution, and as such a reflective indicator model was retained. This is not an unusual occurrence; identification problems in specifying formative indicator models have been acknowledged in the literature and attempts to work around the problem have frequently been unsuccessful (MacCallum and Browne, 1993).

## **Limitations**

Although the model tested in the present study generally supported the central tenets of self-determination theory, there are several limitations. Firstly, the relations observed were

retrospective in nature thus offering only a 'snap-shot' view of the causal relations among the SDT constructs. As Deci and Ryan (2000a) propose a temporal relation between need satisfaction, behavioural regulation, and motivational consequences; a longitudinal study needs to be conducted in order to provide a greater insight into these causal relationships. The next chapter (Chapter Four) describes a longitudinal examination of these relationships.

Secondly, despite each of the environmental supports and psychological needs being present in the model, embodying them in this higher order fashion precludes any investigation with regard to the direct contributions of autonomy support, structure and involvement upon the three needs (autonomy, competence, and relatedness) or being able to examine the direct relationships between each of the three psychological needs and behavioural regulation. Nor can the relationships between each of the different behavioural regulations and each of the needs be investigated either.

#### **Conclusions**

The relationships contained within the present model are consistent with past models (Deci *et* al., 2001; Ntoumanis, 2001; Vallerand, 1997) and with the basic tenets of self-determination theory which state that all three environmental supports are required to facilitate the satisfaction of the three psychological needs which in turn aid the internalisation of behavioural regulations (Deci and Ryan, 1985; Vallerand, 1997).

The structural model examined in this chapter is re-visited in Chapter Five, where the sample consisted of individuals attending various community-based exercise classes. It is anticipated that the structural relationships will be corroborated further with these data.

## **CHAPTER FOUR**

Testing the Relationships between Perceived Environmental Supports and Perceived Levels of Psychological Need Satisfaction, Exercise Adherence, and Maintenance.

#### Introduction

Deci and Ryan, (1985) propose that the way an individual perceives their environment can influence the extent to which their psychological needs are satisfied. Thus an environment that is perceived to be supportive of autonomy, competence, and relatedness would facilitate the satisfaction of these needs in contrast to an environment deemed as being unsupportive, which would undermine the attainment of adequate psychological need satisfaction. As these environmental supports serve as nutriments to one's integration and development of intrinsic motivation, it is predicted that supportive environments will increase the likelihood of an individual persisting with certain behaviours.

This chapter describes a study that examines the relationships between an individual's level of perceived environmental support; the extent to which their psychological needs are satisfied; adherence to a GP exercise referral scheme; and maintenance of exercise three months after the scheme has finished. The present study extends the cross-sectional study that was detailed in Chapters Two and Three. Chapter Two examined the factorial validity of appropriate measurement instruments, whilst Chapter Three examined the structural relationships between environmental supports, psychological needs, and behavioural regulation. Chapter Two produced a factorially valid tool for assessing perceptions of environmental supportiveness and relatedness for the GP exercise referral scheme context; and an acceptable structural model emerged from Chapter Three, with environmental supports having a moderately strong effect upon need satisfaction, which in turn had a strong effect upon relative autonomous regulation. However the conclusions that can be drawn from cross-sectional studies are fairly limited as data are taken from a single time point. Consequently, the present study aimed to provide a more rigorous test of the relationships through a longitudinal examination.

Participants on a GP exercise referral scheme received ten gym sessions at their local leisure centre during which they would be prescribed an exercise programme aiming to ameliorate their health condition. Participants completed a baseline assessment of leisuretime exercise levels prior to their commencement of the scheme, and three months following the scheme in order to assess any changes in leisure-time exercise. Environmental supports, psychological needs, and behavioural regulation were assessed at the approximate mid-point of the scheme (four weeks) and were re-assessed three months after the scheme (except environmental supports). Each participant's scheme adherence was monitored by staff at the leisure facilities involved, and this was assessed at week ten of the scheme which was the ostensible scheme end point (based on a minimal attendance of one session per week).

## Hypotheses

Firstly, it was predicted that those individuals demonstrating higher levels of perceived environmental support would also display higher levels of psychological need satisfaction, greater scheme adherence, and higher levels of exercise three months after the scheme had finished (relative to their baseline exercise levels), and higher post-scheme self-determination (as measured by the relative autonomy index - RAI).

Secondly, relative autonomy midway through the scheme was hypothesised to predict scheme adherence and post-scheme exercise.

Thirdly, a higher level of need satisfaction midway through the scheme was hypothesised to predict greater scheme adherence, post-scheme exercise, and more selfdetermined behavioural regulations.

Lastly, several analyses were performed with regard to temporal changes between week 4 (this point was chosen because by week 4 participants would have had enough experience of the scheme to answer complete the questionnaire) and week 22 (three months post-scheme). The stability of need satisfaction has been an issue explored by several researchers (Reis *et al.*, 2000; Sheldon, Ryan, and Reis, 1996) and fluctuations in need satisfaction have been linked to variations in well-being (Sheldon *et al.*, 1996). Since increases in well-being can influence an individual's motivation towards particular behaviours, changes in need satisfaction and thereby well-being can have a positive or negative impact upon motivation (Vallerand, 1997). For these reasons the three needs were examined over time; it was hypothesised that need satisfaction would decrease from midscheme measurement to post-scheme measurement (week 4 and 22 respectively). Since need satisfaction influences self-determination (Deci and Ryan, 1985), it was further hypothesised that self-determination would also significantly decrease over time. Specifically, a significant decrease in self-determination (RAI) was predicted between week 4 and 22 measurement. Finally, changes in leisure-time exercise levels were examined in order to ascertain whether or not participation in the scheme had changed participants' habitual leisure-time exercise behaviour.

#### Methods

#### **Participants**

Once the study had received ethical approval from the local research ethics committee, recruitment commenced at the leisure centres, and was 'rolling' in nature. GP exercise referral clients were recruited for the study by the leisure centre staff after being referred by their doctors. From the 235 individuals who initially agreed to take part in the study, 117 completed the 6-month period of study involvement. The age range for participants was between 14-83 yrs, and included both males and females. Seventy-six percent of this final sample was female (mean age= 54.52 yrs; SD= 15.00), and 24% was male (mean age= 60.32) yrs; SD= 10.62). An independent samples t-test did not reveal any statistically significant differences between males and females by age (t=1.901 (115); p<0.05). The mean baseline exercise level for the sample was 10.40 METs per week, SD=10.07. In terms of occupation, 49% were retired, 17% were housewives, 10% clerical, 6% care workers, 4% unemployed/sick. The remainder of the sample (14%) comprised of a number of occupational sectors. Mean body weight of the sample was 79.86kg (SD=16.73kg); and mean height was 1.65m (SD=0.09m). The sample was at the upper end of the overweight category of the body mass index (M = 29.45 kg/m<sup>2</sup>, SD = 6.89) as would be expected in this population. The ethnic origin, first language, and level of education are also presented below in Table 4.1.

Ethnic Origin	White	99%
	Black	1%
First Language	English	77%
	Welsh	19%
	Other	4%
Level of Education	Secondary	57%
	College	27%
	University	10%
	Postgraduate	6%

Table 4.1. Ethnic origin, first language, and level of education of the sample

Participants were recruited from eight local leisure centres who were involved with the GP exercise referral scheme; a breakdown of the number of participants recruited from each centre can be found in Table 4.2 below:

Table 4.2. Number of participants from each centre.

Centre	No. of recruits	% of total sample
1	12	10.3
2	17	14.5
3	14	12.0
4	32	27.4
5	1	0.9
6	22	18.8
7	17	14.5
8	2	1.7
TOTAL	117	100

## Instruments

Questionnaire booklets were produced which included an introductory front-page providing participants with background information and a rationale for the study. An informed consent form was printed on the inside page; both the introduction and consent pages were reproduced in the Welsh language and inserted at the back of the booklet. A box requiring demographic information (age, sex, height, weight, ethnic origin, first language, level of education, occupation) was also included. The main questionnaire section comprised the PESQ and the psychological need satisfaction items.

#### PESQ (see Table 4.3 below)

For the PESQ items, the following stem was used: "The staff at the leisure facility...", and participants were required to read through each of the 9 statements (from the final item set developed in Study One) regarding their specific exercise environment and then respond by circling the appropriate number. All items were scored on a 5-point Likert-type scale ranging from *not true for me* (0), through *sometimes true for me* (2), to *very true for me* (4).

#### Psychological Need Satisfaction Items (see Table 4.4 below)

This section of the questionnaire consisted of 28 statements (developed in Study One, -Chapter Two) that applied to exercise in general; there was no standard stem for these items. Items from the Locus of Causality for Exercise scale (LCE – Markland and Hardy, 1997) were used to assess autonomy (see above). Items from the competence subscale of the Intrinsic Motivation Inventory (McAuley *et al.*, 1991) were used alongside two additional items to assess competence. Additionally, the items developed in Study One were used to assess relatedness. Consistent with the PESQ responses, need satisfaction item responses were made using the same 5-point Likert-type scale (see above).

## BREQ-2

The BREQ-2 items were also included in the questionnaire in order to assess behavioural regulation with regard to exercise (refer to Appendix 4.A for list of items). The BREQ-2 assesses intrinsic motivation, identified regulation, introjected regulation, and external regulation as well as amotivation. A single index of self-determination (RAI) was also

calculated from the BREQ-2 subscales in order to provide an indication of an individual's relative autonomy with regard to exercise (see Chapter Three for a more detailed description of the RAI and the BREQ-2).

Table 4.3. PESQ items.

# The staff at the exercise facility....

# **Autonomy Support:**

- 1. Make me feel free to make decisions
- 2. Provide me with choices and options
- 3. Encourage me to take my own initiative

# Structure:

- 4. Give me good advice
- 5. Make it clear to me what I need to do to get results
- 6. Provide clear feedback about my progress
- 7. Make it clear to me what to expect from engaging in the activities
- 8. Make me feel positive about being able to perform the activities

# **Involvement:**

- 9. Make me feel as if I matter to them
- 10. Are concerned about my well-being
- 11. Look after me well
- 12. Care about me

Table 4.4. Psychological Need Satisfaction Items

# Autonomy:

- 1. Having to exercise is a bind but it has to be done
- 2. I exercise because I like to rather than because I feel I have to
- 3. Exercise is not something I would choose to do rather it is something that I feel I ought to do

# **Perceived competence**

- 4. I think I am pretty good at the exercises I do
- 5. I am pretty skilled at the exercises I have been set
- 6. I know what I have to do in order to perform the exercises

# **Relatedness:**

- 7. In exercise situations I feel supported
- 8. In exercise situations I feel accepted
- 9. In exercise situations I feel that people are interested in me

# Leisure Time Exercise Questionnaire (see pg 40 for more detail)

This measure (Godin and Shephard, 1985) assessed patterns of self-reported exercise. The LTEQ contains three questions assessing the frequency of strenuous (heart beating rapidly), moderate (not exhausting but moderately hard), or mild (minimal effort) exercise engaged in for a minimum of 15 minutes during a typical week (seven days).

# Assessment of Scheme Adherence

The researcher obtained scheme adherence data by consulting with the exercise referral scheme gym staff at each of the centres (either by telephone or in person) in the tenth week of each participant's time on the scheme. The tenth week was chosen to assess scheme adherence in view of the fact that each participant received ten sessions on the scheme. Based on a minimal attendance rate of one session per week, by week ten all sessions should have been completed (although there were exceptions whereby participants finished their course earlier or later).

## Procedure

New clients entering the 'Exercise by Invitation' scheme were asked during their initial exercise consultation (by the leisure centre staff at the eight participating leisure centres in the area) if they would consider participating in a research project examining exercise behaviour. Following written consent, the staff member completed a baseline exercise measure with them (Leisure Time Exercise Questionnaire) and asked them to return in 3-weeks time to complete a further questionnaire (PESQ and the psychological need satisfaction items). At 10-weeks (ostensible end point of scheme), the researcher obtained information regarding the number of sessions attended by the participant so far. Then three months later the participant was mailed a further questionnaire containing just the psychological need satisfaction items

along with a leisure time exercise questionnaire and a pre-paid envelope for returning the forms.

## Analytical Strategy

The intended analytical strategy for this study was to employ the structural equation modeling technique (SEM) in order to examine the hypothesised relationships. However, due to the small sample size, attempts at testing the models produced inadmissible solutions (Marsh *et al.*, 1989). Thus a combination of regression analyses, ANOVAs, and MANOVAs were used in place of SEM. Multiple regression analyses were performed in order to examine the predictive power of environmental supports on scheme adherence, post-scheme exercise, psychological need, and RAI; whilst repeated measures ANOVAs and MANOVAs were used to explore changes in psychological need, RAI and leisure-time exercise over time.

## **Results**

## Regression and Correlational Analyses: (see Appendix 7 for tables not shown below)

*Hypothesised influence of perceived environmental support (autonomy support, structure, and involvement):* 

1) It was predicted that higher levels of perceived environmental support would lead to greater scheme adherence. Collectively, the three environmental supports failed to account for a significant amount of variance in adherence (p>0.05; see Appendix 7, Table 1).

2) Higher levels of perceived environmental support were hypothesised to predict higher levels of exercise three months after the scheme had finished (relative to their baseline exercise levels). None of the three environmental supports were found to significantly predict leisure-time exercise 3-months post scheme (p>0.05; see Appendix 7, Table 2).

3) It was predicted that levels of perceived environmental support in week 4 would predict psychological need satisfaction at week 22. None of the three environmental supports were found to significantly predict autonomy or competence (p>0.05; see Appendix 7, Tables 3 & 4). However, collectively the three environmental supports accounted for a significant

amount of the variance (13%), in relatedness at week 22 (see Table 4.5). Examination of the beta coefficients however indicated that individually, autonomy support, structure and involvement did not account for a significant proportion of the variance in psychological need satisfaction at week 22.

Table 4.5. Summary of regression analysis for environmental supportiveness variables predicting post-scheme relatedness. Note: p<0.05. All variables entered simultaneously. AS = Autonomy Support; ST = Structure; INV = Involvement.

Predictor	R	R <sup>2</sup>	F	р	Beta	t
AS					183	-1.800
ST					.250	1.552
INV	.365	.133	5.788	.001	.188	1.226*

4) Higher levels of perceived environmental support at week 4 were hypothesised to predict higher levels of post-scheme RAI. None of the three environmental supports were found to significantly predict post-scheme RAI (see Appendix 7, Table 5).

# Hypothesised influence of RAI

5) Higher RAI at scheme midpoint was hypothesised to lead to higher scheme adherence and leisure-time exercise three months post-scheme. Bivariate one-tailed correlations were performed between RAI and scheme adherence. Analyses failed to reveal a significant correlation between RAI and scheme adherence (p>0.05) but revealed a small but significant positive correlation between RAI and leisure-time exercise three months post-scheme (r = .188;  $r^2 = .035$ ; p = <0.05).

## Hypothesised influences of psychological need satisfaction:

6) Higher psychological needs in week 4 were predicted to lead to higher scheme adherence (week 10) and greater leisure-time exercise in week 22. None of the three psychological

needs were found to significantly predict scheme adherence or leisure-time exercise three months post-scheme (see Appendix 7, Tables 6 & 7).

7) Psychological needs (measured in week 4) were hypothesised to positively predict intrinsic and identified regulation; and to negatively predict introjected regulation, external regulation, and amotivation (measured in week 22).

The three psychological needs were entered simultaneously for each of the BREQ-2 subscale variables and results showed that collectively, the three needs significantly predicted all of the BREQ-2 subscales except introjection (see Table 4.6).

Examination of the standardised Beta coefficients revealed that only the effect sizes for autonomy and relatedness were significant in terms of their effect upon intrinsic regulation at the post-scheme measurement point (p<0.05). The effect size for relatedness was also found to be significant in terms of its effect upon identified regulation (p<0.05); and autonomy displayed a significant negative effect in terms of external regulation and amotivation (p<0.05). Lastly, the effect for relatedness upon amotivation was also revealed as significant and negative (p<0.05).

# Temporal Changes:

# 1) Temporal changes in psychological needs (autonomy, competence, and relatedness) and relative autonomy (RAI).

A repeated measures MANOVA (with repeated measures on time) was performed on the psychological needs at week 4 and week 22. The test revealed a significant main effect for time, where values tended to decrease across time (F(3,114) = 6.545, p<0.05, eta squared = 0.147, observed power = 0.968) see Table 4.7 below. Follow-up univariate tests indicated that the changes across time were accounted for by the significant decrement observed in relatedness from week 4 to week 22 (F(1,116) = 15.497, p<0.05, eta squared = 0.118, observed power = 0.974)).

A repeated measures ANOVA was used to analyse changes in RAI from week 4 to week 22. The analysis failed to reveal a significant main effect for time F(1,116) = 0.891, p = 0.347, eta squared = 0.008, observed power = 0.155; see Table 4.7).

Table 4.6. Summary of regression analysis for mid-scheme psychological need satisfaction variables predicting post-scheme BREQ-2 subscales. All three psychological need satisfaction variables were entered simultaneously.

DV	Intrinsic ]	Regulation2	Identified	entified Introjected		External Regulation2		Amotivation2			
			Regulatio	n 2	Regulation2						
R		598	.33	.333		.189		.355		.362	
R <sup>2</sup>		357	.11	11	.0	.036 .126		.131			
F	20.951	( <i>p</i> =0.00)	4.695 ( <sub>1</sub>	<i>p</i> =0.04)	1.393 (	1.393 ( <i>p</i> =0.25) 5.429 ( <i>p</i> =0.02		p=0.02)	5.665 ( <i>p</i> =0.01)		
	В	t	В	t	В	t	В	t	В	t	
Autonomy1	.486	6.133*	.142	1.521	169	-1.738	369	-3.992*	280	-3.042*	
Competence1	.017	.185	.030	.282	.044	.397	.071	.676	0.147	1.410	
Relatedness1	.229	2.549*	.247	2.336*	.121	1.101	.114	1.091	231	-2.211*	

Notes: Intrinsic Regulation2; Identified Regulation 2; Introjected Regulation2; External Regulation2; Amotivation2 = BREQ subscales as measured three months post-scheme. Autonomy1; Competence1; Relatedness1 = psychological need satisfaction variables as measured mid-scheme. \*P<0.05

197 - 198 1980 - 1980 - 198 1980 - 1980 - 198 1980 - 1980 - 198 1980 - 1980	Wee	k 4	Week 22	r
Variable	able Mean		Mean	SD
Relative Autonomy Index	15.39	5.33	14.95	5.64
Needs -Autonomy	2.42	1.06	2.52	1.13
-Competence	2.46	0.78	2.43	0.75
-Relatedness	3.03	0.89	2.70	0.99

Table 4.7. Descriptive statistics for week 4 and week 22 variables.

## 2) Temporal changes in leisure-time exercise

A repeated measures ANOVA was used to analyse changes in leisure-time exercise levels pre to post scheme. The analysis revealed a significant main effect for time (F (1, 116) = 123.061, p<0.05, eta squared = 0.515, observed power = 1.000). The means demonstrated an upward trend in exercise level from pre to post scheme (see Table 4.8 below).

## 3) Temporal changes in mild, moderate, and strenuous exercise (see Table 4.8)

Exercise levels were also examined in terms of mild, moderate, and strenuous types of exercise. A repeated measures MANOVA was therefore carried out. A significant main effect for time was revealed (F (3, 114) = 41.294, p<0.05, eta squared = 0.521, observed power = 1.000). Univariate analyses revealed significant changes in all three sub-types of exercise. Strenuous exercise: (F (1, 116) = 25.130, p<0.05, eta squared = .178, observed power = .999); moderate exercise: (F (1, 116) = 55.712, p<0.05, eta squared = .324, observed power = 1.000); mild exercise: (F (1, 116) = 20.415, p<0.05, eta squared = .150, observed power = .994).

	V	Veek 4	W	eek 22
	Mean	SD	Mean	SD
No. of weekly sessions of mild exercise	2.38	2.79	4.05	3.56
No. of weekly sessions of moderate exercise	0.62	1.32	2.13	2.20
No. of weekly sessions of strenuous exercise	0.02	0.13	0.44	0.90
Overall exercise value (METS)	10.40	10.07	26.79	16.39

Table 4.8. Means and standard deviations for mild, moderate, strenuous exercise and overall exercise level as measured pre and post scheme.

#### Discussion

The aim of the present study was to test the relationships between perceived environmental supports and perceived levels of psychological need satisfaction, exercise adherence, and maintenance. In contrast to the cross-sectional study detailed in Chapters Two and Three, this study was longitudinal in nature and as such had the potential of adding valuable information to the findings of the preceding chapters.

Perceived environmental supports mid-way through the scheme were hypothesised to predict psychological need satisfaction. Specifically, perceiving the centre staff to provide choices and options and encouraging the participant to take their own initiative regarding their exercises (autonomy support); to provide good advice, feedback, and positive encouragement to participants (structure); and to be concerned about participants' wellbeing, and being willing to devote time to participants (involvement) were all predicted to influence how autonomous, competent, and related individuals felt towards exercise.

However, none of the environmental supports were found to significantly influence psychological need satisfaction in the present study. Nor did they emerge as a significant predictor of scheme adherence, post-scheme exercise, or post-scheme RAI. The lack of support for these hypotheses could be due to the fact that many of the scheme participants did not have much contact with the staff members at the centres. Typically they had an initial consultation and induction, and then were left alone to do their sessions as and when they wished. Indeed, of the participants who were given the questionnaires by the researcher, many commented on the difficulties they had in responding to the questions regarding environmental supportiveness as a consequence of having limited contact with the centre staff. Perhaps if the questionnaire items had included items pertaining to support received from fellow exercisers, friends, or family with respect to their exercise venture, then the items would have been more relevant. In a study examining the relationships between autonomy support and behavioural regulation within the exercise environment, Wilson and Rodgers (*in press*) used autonomy support items which focused on friends rather than staff members at the exercise facility and found perceived autonomy support from friends to be associated with more autonomous exercise regulations. Their findings lend credence to the idea that broadening the source from which autonomy support can be obtained may provide a better picture of the role of autonomy support.

The degree to which an individual feels self-determined towards exercise was assessed using the participants' RAI scores. Self-determination theory states that the more one feels self-determined the greater the interest and persistence they are likely to exhibit towards a particular behaviour (Deci and Ryan, 1985). RAI was therefore hypothesised to significantly predict scheme adherence and post-scheme leisure-time exercise; specifically, the greater the RAI score the greater the scheme adherence and post-scheme exercise level should be. These hypotheses were partially supported by the findings of the present study as RAI was correlated with post-scheme exercise level, but not scheme adherence. It is possible that the lack of a significant RAI – adherence relationship was due to inaccuracies of the referral scheme staff in their recording of participant adherence data (refer to the limitations section below). However, the finding that RAI was correlated with post-scheme exercise, provides some support for the important role that self-determination plays in producing positive exercise behaviour outcomes.

Higher levels of autonomy, competence, and relatedness (as measured at week 4 of the scheme) were hypothesised to predict greater scheme adherence (at week 10) and post-scheme exercise (at week 22). However the data failed to support these predictions. Although inaccuracies in recording scheme adherence data could explain the non-significant contribution of the psychological needs to scheme adherence, the non-significant contribution to post-scheme exercise cannot be accounted for by this factor.

Feeling more autonomous, competent, and related in the exercise context was also predicted to produce more self-determined forms of behavioural regulation (i.e. intrinsic and identified regulation). Conversely, the less self-determined forms of behavioural regulation were hypothesised to be negatively predicted by autonomy, competence and relatedness. The findings provided some support for these predictions. Firstly, both autonomy and relatedness were found to be significant positive predictors of intrinsic regulation; and relatedness was also revealed as a significant positive predictor of identified regulation. So when the participants felt as though they were exerting choice and when they felt as though others were concerned about their wellbeing and interested in their exercise venture, they were more likely to exercise because they enjoyed it and because they found it a pleasurable experience. When participants felt as though others were concerned about their wellbeing and interested in their exercise venture, they were more likely to value the behaviour and accept it as being important to them.

Secondly, autonomy was found to negatively predict external regulation, and both autonomy and relatedness were found to negatively predict amotivation. So when the participants felt as though they were exerting choice within the exercising context, they were less likely to exercise because of pressures from outside influences, and less likely to feel amotivated towards exercise. Similarly, when participants felt as though others were concerned about their wellbeing and interested in their exercise venture, they were also less likely to feel amotivated towards exercise. Interestingly, competence did not appear to make an independent contribution to the variance of any of the BREQ-2 subscales, in contrast to autonomy and relatedness. This supports the findings of Markland and Hardy (1997) who found that self-determination mediated the effects of perceived competence on intrinsic motivation in an exercise setting rather than a model which tested the direct effects of competence on intrinsic motivation (which revealed a series of weak paths for competence, in contrast to the strong paths revealed in the mediational model). It also supports the theoretical tenets of self-determination theory (Deci and Ryan, 1985, p.63) which state that increases in perceived competence can only enhance intrinsic motivation when accompanied by an internal perceived locus of causality. Markland (1999) found support for both independent effects of competence on intrinsic motivation (represented by interest and enjoyment); and a moderating effect of self-determination upon the effects of competence on intrinsic motivation. Both the results of the present study and that of Markland (1999) and Markland and Hardy (1997) are in contrast to those of Vallerand's (1997) hierarchical model of intrinsic and extrinsic motivation that suggests that autonomy and competence have only independent effects on intrinsic motivation. It is impossible to state the precise explanation for the lack of impact which competence appeared to have upon intrinsic motivation; however one could

96

argue that in this particular context, feeling competent with regards to the exercises prescribed to participants was not the most important factor in feeling motivated towards exercise. It may be the case that the social aspects of the scheme (i.e. relatedness) were more instrumental in terms of scheme enjoyment and thereby intrinsic motivation.

Interestingly, none of the psychological needs were found to significantly predict introjected regulation, and this is perhaps not surprising since introjection reflects the partial internalization of a behaviour's value whilst remaining an ambivalent and unstable form of motivation (Deci and Ryan, 2000c; Koestner et al., 1996). Introjection involves an inner conflict between the self-imposed demands to engage in the behaviour and the failure to value it (Ryan and Connell, 1989; Ryan, Rigby, and King, 1993). All of the other behavioural regulations on the continuum are more or less self-determined, but introjected regulation is exactly half way along the continuum and in this way could be said to possess an equal balance self-determined and non-self-determined regulation. An individual with an introjected regulation could therefore be said to be in a transitional phase and as such, autonomy, competence, and relatedness neither positively nor negatively predict it (this was also discussed earlier on page 79). In Chapter Three, the lack of significant relationships observed with the introjection subscale led to its elimination from the analyses. The reoccurrence of non-significant relationships with the introjection subscale in the present study, lends further support to the notion that introjection should be further explored within this population as significant relationships between introjection and various motivational constructs have previously been reported (Mullan et al., 1997; Wilson, Rodgers, and Fraser, 2002).

Repeated measures analyses were performed with regard to psychological need satisfaction, RAI, and leisure-time exercise. Analyses revealed that relatedness significantly decreased over time, whilst no significant changes in autonomy or competence were observed. It is impossible to determine precisely why this decrement was observed in just relatedness but one may propose a tentative explanation with regard to the different nature of the needs. One could argue that autonomy and competence perhaps require less support from people in contrast to relatedness. To be given choice and a feeling of freedom can be gleaned from other aspects of the exercise environment such as a range of machines/equipment in a gym, or from how much choice one has with regard to local walks or activities. Support for competence could be provided by the output on the exercise machines which provide systematic feedback on one's performance, or simply from how one's body feels (e.g. a reduction in heart rate or feeling less breathless). Support for relatedness, however, is a

distinctly more interpersonal issue, which necessarily requires input from other people. For example, feeling as though you belong, or are accepted in an environment cannot be vastly altered by machines and equipment, but rather by having friendly people around you. Consequently, viewing the needs in these terms it is understandable for relatedness to be higher whilst individuals are participating on the exercise scheme (where they would have contact with the staff and other exercisers), and lower three months after the end of the scheme (when they may have quit exercising at the gym altogether, or may not receive the same amount of attention as they formerly did whilst on the scheme). This fits in with the findings of Reis et al. (2000) who found the satisfaction for the relatedness need was due to social interactions with others and feeling appreciated and understood. Human contact is therefore a pre-requisite for such experiences, in contrast to autonomy and competence which are perhaps not quite as reliant upon other people. The notion that human support is only crucially important for the satisfaction of the need for relatedness may call into question a fundamental premise of SDT, that need satisfaction requires environmental support. However, Deci and Ryan (2002) state that needs can be satisfied either by the extent to which the environmental nutriments are immediately present, or to the extent that the individual has 'sufficient inner resources to find or construct the necessary nourishment' (p. 229). It is therefore conceivable that some of the GP referral participants were able to construct these ambient supports from the non-human forms of support within their environment (e.g. felt improvements within their fitness etc.).

No significant changes over time were found with RAI, suggesting that RAI was relatively robust with this particular population, in spite of the decrement in relatedness. The finding that a decrement in relatedness over time was not accompanied by an overall decrement in self-determination (RAI) over time, supports the view of Koestner and Losier, (2002) who consider autonomy and competence to be the more essential ingredients of self-determination. The originators of SDT place less emphasis upon relatedness in terms of intrinsic motivation, defining the role of relatedness as providing the 'groundwork' for facilitating internalisation (Ryan and Deci, 2000). Some researchers however, believe that relatedness serves a more critical role than both autonomy and competence (Andersen *et al.*, 2000, pp.272), and this is perhaps the case with the present study. It was mentioned earlier that this particular population may differ from those previously studied in exercise contexts (e.g. fit, healthy individuals or student populations) in terms of both environmental supports and in terms of the relative importance of autonomy, competence, and relatedness (see Chapter Three, page 77 for a more detailed discussion of the role of relatedness).
Lastly, significant increases in leisure-time exercise levels from pre to post scheme were observed in the present study, and given the sedentary population involved it is tempting to attribute such increases to participation in the exercise scheme. However, one cannot rule out the possibility that these individuals may have increased their leisure-time exercise levels irrespective of their involvement on the exercise referral scheme (although it is unlikely in view of their initial low levels of activity). The only way in which this could be examined would be to include a 'non-referral' group in the study and to assess their exercise levels over the 22-week period and to compare the referral group with the non-referral group. Nevertheless it is encouraging to see improvements over time in leisure time exercise behaviour among the participants of the present study.

#### Limitations

There are several limitations with regard to the present study. Firstly, eight leisure centres took part in the study, and although each centre was thoroughly briefed in person by the researcher, there was a degree of variability with which the centre staff followed the study protocol. The centres were also contacted by telephone each week, and visited by the researcher every fortnight in order to monitor the progress of recruitment and questionnaire administration. Nonetheless, some centre staff were more motivated to co-operate than others and this was reflected in the efficiency and timeliness with which the relevant data were collected from the participants. The less efficient members of staff often administered the questionnaires later than requested and did not keep an up-to-date record of scheme adherence, which ultimately meant that the staff members had to ask the participants how many sessions they had attended and rely upon their honesty and accurate recall. This could have influenced the accuracy of the data collected, but was not within the researcher's control as logistically she could not be present at every centre all of the time in order to oversee the running of the study. A related issue is the time course of the study. Data were collected for the study over a two-year period, and as such staff changes occurred. Staff changed jobs, took holidays, and had days off for sickness which meant there was often irregularity of staff involvement in the study.

Secondly, when the participants were mailed a post-scheme questionnaire pack, there was often a long delay in response. Thus despite participants receiving the questionnaire three-months post-scheme (week 22), there was often a large degree of variability in terms of response times amongst the participants. It is impossible therefore to determine how accurate

99

the post-scheme responses are in terms of assessing psychological needs at 'three-months post-scheme'. Some respondents returned their questionnaires four, five, or even six months post-scheme, and if needs fluctuate over time this would have influenced the results. The researcher operated a system wherein a polite reminder was sent out if no response had been received within one-month. A second and third reminder was sent out at one-month intervals if a response had still not been received. After the third reminder, it was assumed that the participant no longer wanted to take part in the study and no further reminders were sent. This system aimed to minimise the tardiness of responses, but could not possibly eliminate the response time variability completely.

Perhaps a more sensible strategy would have been to assess participants' baseline psychological need satisfaction and behavioural regulations toward exercise rather than threemonths post-scheme, as changes between baseline and mid-scheme may have been more salient. Relationships between changes in psychological need etc. and subsequent scheme adherence and post-scheme exercise maintenance, may have then produced more telling results.

Thirdly, the self-report nature of the leisure-time exercise questionnaire sent out to the participants post-scheme was frequently misunderstood and sometimes resulted in unbelievably large amounts of reported exercise. The researcher followed up the participants who had reported the most unlikely responses, by telephoning them to clarify their weekly amounts and frequency of mild, moderate, and strenuous exercise. However, there is no way of knowing how accurate even the 'less extreme' responses were, thus confidence in the validity of this measure is fairly limited.

Finally, from the 235 individuals initially recruited for the study, the final sample accounted for 50% of this initial sample. Drop-outs from the study were often drop-outs from the exercise scheme itself, and this provides support for the commonly cited drop-out rate of 50% found in adherence research in supervised settings (Dishman, 1982, 1990). What is alarming however is the fact that the initial 235 individuals were only a proportion of the total number of exercise referrals scheme clients, thus the rate of drop-out for the scheme itself is likely to be even greater than 50%. This highlights the need for schemes such as this to find ways of retaining participants for at least the course of the scheme.

## **Conclusion**

Despite the limitations of the present study, the results suggest that this particular GP exercise referral scheme may have helped to increase the leisure time exercise habits of the individuals who took part. The degree of self-determination experienced by the participants mid-way through the scheme was revealed as a significant predictor of exercise maintenance three-months after the scheme had finished. Thus it is important for scheme staff to help individuals develop a higher degree of self-determination in order for persistence with exercise to emerge (further implications are discussed on page 198 of the present thesis). The study also showed how autonomy and relatedness play a role in the internalisation of exercise behaviour; specifically, increasing feelings of autonomy, competence, and relatedness in the exercise environment can lead to higher levels of intrinsic and identified regulation and lower levels of amotivation, introjected external regulations three-months post-scheme.

#### **CHAPTER FIVE**

# A Situational Examination of the Relationships between Environmental Supports, Psychological Needs, and Motivational Consequences in the Context of Exercise.

#### Introduction

This study re-visits the structural relationships examined in Chapters Two and Three (Study One) between environmental supports, psychological needs, and motivational consequences in the context of a GP exercise referral scheme. Chapter Three produced an acceptable structural model of relationships between these variables with psychological needs mediating the effects of environmental supports on behavioural regulation. However, there are two main ways in which the present study differs to Study One. Firstly, the present sample consisted of individuals attending community-based exercise classes and secondly the motivational outcome assessed in the present study was interest/enjoyment as opposed to behavioural regulation. Chapter Four described a longitudinal study which aimed to provide support for the temporal relationships between environmental support, psychological need satisfaction, and motivational outcomes which could not be truly tested in the cross-sectional study (Study One). However due to a smaller than anticipated final sample, structural equation modelling (SEM) could not be used and regression analyses had to be used in place, which could only analyse the model one section at a time. Data for the present study were collected from an exercise class population as it provided the researcher with the opportunity to collect a large amount of data in a relatively short period of time (in contrast to the GP referral scheme population) which then enabled the researcher to use SEM. The inclusion of the variable interest and enjoyment as a motivational outcome (cf. behavioural regulation) was considered to be appropriate in this situation as one could argue that feelings of interest and enjoyment are likely to be felt more immediately experienced than perceptions of behavioural regulation which may take longer to develop. This is suggested by Deci and Ryan (2000a) who proposed a temporal relation between need satisfaction, behavioural regulation, and motivational consequences. Data pertaining to a single time point (as with the present study) would not provide this temporal view, so interest/enjoyment was chosen as an outcome variable that would possibly be felt more immediately. Additionally, several studies have used interest and enjoyment as a measure of intrinsic motivation (McAuley et al., 1991; Markland, 1999; Markland and Hardy, 1997).

Indeed, one of the main proponents of SDT stated a case for intrinsic motivation being operationally defined in terms of interest and enjoyment (Deci, 1987).

The present study (Study Three) therefore aimed to examine whether applying the questionnaire items to individuals in a situational context would produce similar relationships to those found in the contextual study (Study One) and thus provide further support for the conceptual model.

#### Contextual .v. Situational Psychological Needs and Environmental Support

Chapters Two and Three discuss previous research that has examined models which supported the mediating role of psychological need satisfaction (Deci *et al.*,2001; Ntoumanis 2001; Standage *et al.*, 2003; Vallerand, 1997). It was further acknowledged that these studies were only able to provide partial support for the complete hypothesised model detailed in Chapter Three, since each of those studies encompassed only certain aspects of the present model. Even less research has been conducted examining the SDT constructs at a situational level. Standage *et al.* (2003) aimed to add a situational assessment of the environmental constructs into their model, instead of focussing purely upon contextual measures. Their data supported the mediation model hypothesised in spite of making such situational adjustments to their assessments. In the same way, it is anticipated that the data from the present study will also support the model that emerged from Chapter Three regardless of its situational application.

Despite there being a considerable body of research examining contextual and global psychological need satisfaction (Deci and Ryan, 2000; Ryan, 1995; Sheldon, Elliot, Kim, and Kasser, 2001; Vallerand, 1997) there has been little work carried out examining the situational perceptions of psychological need satisfaction. Reis *et al.* (2000) investigated how need satisfaction can fluctuate from day to day by giving participants a daily log to complete each evening for 14 days. The log required participants to think of three activities which they had spent most time doing during the day (excluding sleep). They then had to rate the activities (from (1) *not at all* to (7) *completely*) in terms of autonomy, competence and relatedness. For autonomy the scales tapped *external* ("something about your external situation forced you to do it"), *introjected* ("you made yourself do it, in order to avoid anxiety or guilt"), *identified* ("interesting or not, you felt that it expressed your true values") and *intrinsic* ("you did it purely for the interest and enjoyment in doing it") reasons. For

in doing that activity (from (1) not at all effective to (7) extremely effective). Lastly, for relatedness, participants were asked to think about the three social interactions that had taken the most time during that day and rate the extent to which during the interaction they had felt "close and connected" with the people they were with. The scale was from (1) not at all to (7) extremely. Well-being was also assessed by asking the participants to respond to a list of positive and negative adjectives (e.g. joyful, happy, depressed, anxious) and to rate the extent to which they had experienced each emotion during that day (from (1) not at all to (7) extremely). Results demonstrated that need fulfilment fluctuated from day to day and indeed covaried with emotional well-being. This study therefore showed how the fulfilment of competence, autonomy and relatedness matters not only in trait processes but also in state processes. Reis et. al., 's outcome variable was daily well-being and their findings provided clear support for the relevance of the three basic needs to emotional well-being. Reis et. al. went on to suggest that when people generally feel good (e.g. usually on weekends rather than weekdays), they tend to engage in more activities and do so for more autonomous reasons. They concluded their article by highlighting the need for "further research in order to build an understanding of how specific everyday activities and one's reasons for engaging in them contribute to the dynamic model of motivation, social activity, and emotional wellbeing" (Reis et al., 2000; pp.433). The present study aims to examine not only the state-like levels of psychological need, but also the state-like perceptions of environmental support.

In past research, clear distinctions have not been made amongst the environmental supports and the psychological needs. For example, the Activity Feeling States Scales (AFS - Reeves and Sickenius, 1994) were developed as a brief measure of the three psychological needs underlying intrinsic motivation. Reeves and Sickenius wanted to construct a measure capable of assessing the extent to which environmental events nurture versus frustrate each need over a relatively short period of time. However, the important distinction between psychological needs and environmental supports for these needs is not apparent in this assessment tool. Psychological needs and supports are mixed in with each other, making the instrument unclear (see Chapter Two for further discussion of the AFS). The present study aimed to keep this distinction clear.

The exploration of the situational experience of environmental support and psychological needs also fits in with Vallerand's hierarchical model of intrinsic motivation (Vallerand, 1997). In his model, Vallerand proposes that motivation exists at three different levels of generality. The lowest level is the situational (state) level, the next level is the contextual (life domain) level, and lastly there is the global (personality) level; motivation at one level can influence motivation at another level. For example there can be top-down effects where global motivation can influence contextual motivation and in turn influence situational motivation, or alternatively there are recursive effects where motivation at the situational level can influence contextual motivation which in turn can affect global motivation. If an individual therefore has low motivation in a number of exercise situations, then it would follow that the aggregation of such poor motivational experiences could influence their motivation toward exercise in general (i.e. the context). According to self-determination theory (Deci and Ryan, 1985) and indeed Vallerand's hierarchical model of intrinsic motivation (1997), the environment to a large extent determines how well our psychological needs are met and thus how motivated we feel towards a situation or context.

In the present study the aim was to assess individuals' experiences of environmental support (autonomy support, structure, and involvement); the corresponding immediate perceptions of autonomy, competence and relatedness; and levels of enjoyment/interest within an exercise class situation. The items for both the environmental supportiveness questionnaire and the psychological needs were adapted to suit the situational context. The hypothesised model drew on the model produced in Chapter Three, where psychological need satisfaction mediated the effects of environmental supports on motivational outcomes (in this case interest and enjoyment).

The first part of the chapter examines the factorial validity of the three measures of environmental supportiveness; psychological need satisfaction; and interest and enjoyment. The second part of the chapter tests a structural model of the hypothesised relationships discussed earlier in the introduction and depicted in Figure 5.1. below.

#### **Item generation**

A pool of 18 items for the Perceived Environmental Supportiveness Questionnaire (PESQ), and 16 psychological need satisfaction items were modified from Study One (see below). In addition, items from the interest/enjoyment subscale from the Intrinsic Motivation Inventory (McAuley *et al.*, 1991) were included but did not need modifying since they were already phrased for a situational context.

Table 5.1. Initial item pool.

The item stem for the autonomy support, structure, and involvement items was:

"During the class..."

# **Autonomy Support**

- 1. The instructor encouraged me to make choices
- 2. I felt that the instructor didn't allow me to make any decisions
- 3. The instructor made me feel free to make decisions
- 4. The instructor provided me with choices and options
- 5. The instructor encouraged me to take my own initiative

# Structure

- 1. I felt the instructor gave me good advice
- 2. The instructor gave me clear and understandable instructions
- 3. The instructor provided clear feedback
- 4. The instructor made it clear to me what to expect
- 5. The instructor made me feel positive about being able to do the moves
- 6. The instructor helped me to feel confident about exercising

# Involvement

- 1. The instructor tried to involve me even though there were many people in the group
- 2. The instructor made me feel as though I mattered to them
- 3. I felt that the instructor was concerned about my wellbeing
- 4. I felt that the instructor wasn't too bothered about how I got on
- 5. I felt that the instructor looked after me
- 6. I felt that the instructor considered my personal needs
- 7. I felt that the instructor cared about me

Note: There was no common stem for the autonomy, competence, relatedness, and

interest/enjoyment items.

# Autonomy

- 1. Having to go to the class was a bind but it had to be done
- 2. I went to the class because I wanted to rather than because I felt I had to go

3. Going to the class is not something that I chose to do rather it was something I felt I ought to do

# **Perceived Competence**

- 1. I think I was pretty good at the class I have just done
- 2. I am pretty skilled at doing the class I have just done
- 3. I felt confident that I could do the class
- 4. Compared to other people in the class I think I did pretty well
- 5. I knew what I had to do in order to perform the exercises in the class

# Relatedness

- 1. I felt like I belonged in the class
- 2. I felt out of place when I was in the class
- 3. I didn't feel like I 'fitted-in' when I was in the class
- 4. I felt isolated whilst in the class
- 5. In the class I felt accepted
- 6. In the class I felt different from everyone else
- 7. In the class I felt supported
- 8. I felt like a 'fish out of water' whilst I was in the class

# Interest-enjoyment

- 1. I enjoyed doing the class very much
- 2. While I was doing the class, I was thinking about how much I was enjoying it
- 3. I thought this was a boring class
- 4. I thought the class was quite enjoyable
- 5. The class did not hold my attention at all
- 6. The class was fun to do
- 7. I would describe the class as very interesting



Figure 5.1. Model to be tested

# **Methods**

## **Participants**

Respondents were 243 individuals who had just taken part in an exercise class. The exercise classes ranged from circuit training, aerobics, step aerobics, kick aerobics to body toning classes (see Table 5.4). Eighty-five percent of the sample was female (mean age= 30.43 yrs; SD= 11.56), and 15% was male (mean age= 34.22yrs; SD= 10.15). An independent t-test did not reveal any statistical differences between males and females in terms of age (t=1.868 (241) 0.063, p>0.05). In terms of occupation, 31% were office-based, 21% were students, 8% teachers, 7% nursing/care workers. The remainder of the sample (33%) comprised a number of sectors ranging from retail to creative arts.

	Sex (n)	Mean	Standard
			Deviation
Height (Metres) <sup>*</sup>	Male (37)	1.77	0.09
	Female (203)	1.64	0.07
Weight (Kilograms) <sup>*</sup>	Male (37)	78.33	10.02
	Female (193)	61.94	8.86
Exercise Class	Male (37)	6.16	7.97
History (years/months) <sup>*</sup>	Female (192)	3.83	5.20
Current Exercise	Male (37)	2.38	1.09
Class Attendance (per week)	Female (206)	3.78	11.69

Table 5.2. - Height, Weight, Exercise History and Current Exercise Class Attendance of sample.

\*Some participants failed to provide this information.

		%
First language	English	77
(n=243)	Welsh	22
	Other	1
Ethnic Origin	White	93
(n=243)	Black	5
	Asian	1
	Other	1
Education	Secondary	26
(n=243)	Further education	25
	University	31
	Postgraduate	18

Table 5.3. – Ethnicity, Language, and Education of sample

## Instruments

Questionnaire booklets were produced which included a box requiring demographic information (age, sex, height, weight, ethnic origin, first language, level of education, occupation) was also included. Participants were also required to record how many classes they attend on average each week and the length of time that they have been attending classes (see Tables 5.2 & 5.3).

The main questionnaire section comprised the environmental supportiveness and psychological need satisfaction scales (detailed above) and the interest/enjoyment items taken from the Intrinsic Motivation Inventory (McAuley *et al.*, 1991) which are also detailed above.

The items were adapted from those used in Study One (plus some which did not emerge in the final item set; these are printed in bold type - Table 5.1 above) to make them

suitable for a 'situational' application. For example, the structure item "The staff at the exercise facility help me to feel confident about exercising"; was changed to "During the class the instructor helped me to feel confident about exercising".

Competence items were taken from an already situation-adapted version of the competence subscale of the IMI (Intrinsic Motivation Inventory - McAuley *et al.*, 1991). The two additional competence items created in the first study were also adapted for situational use (as were the relatedness items). These items were added in order to reflect all aspects of competence since competence is not only about understanding the connections between behaviours and outcomes, but also the extent to which a person feels capable of producing a desired outcome (Patrick *et al.*, 1993, p.782).

For the environmental supportiveness items, the following stem was used: "During the class...", and participants were required to read through each of the statements regarding their specific exercise class and then respond by circling the appropriate number. All items were scored on a 5-point Likert-type scale ranging from *not true for me* (0), through *sometimes true for me* (2), to *very true for me* (4). The psychological need items and interest/enjoyment items were self-contained items which did not have a common stem, and were scored using the same Likert-type scale.

## Procedure

In total, the researcher collected data from five different leisure centres and health clubs in the Chester and North Wales area.

Class Type	Number of	Percentage of		Age	(	Gender (N)		
	participants	total sample	Mean	SD	Male	Female		
Aerobics	74	31%	35.35	14.38	1	73		
Circuit Training	60	25%	30.93	9.69	27	33		
Kick Aerobics	52	21%	26.77	7.67	1	51		

Table 5.4. Breakdown of participants by class attended

Step	18	7%	33.06	12.37	1	17
Aerobics						
Boxercise	16	7%	26.00	5.96	7	9
Step & Tone	18	7%	27.00	9.04	0	18
Tone & Trim	5	2%	34.60	7.60	0	5

Once permission from each centre manager was obtained, the researcher met with the class instructors prior to the start of each class in order to introduce herself and explain what the questionnaire was for and to appeal for their co-operation. All instructors that were approached agreed to help and at the start of their class they introduced the researcher to the participants. The instructor then briefly explained what the researcher was interested in, and asked them to complete a short questionnaire once the class had finished. At the end of the class the instructor reminded the participants about the questionnaire, and the researcher handed the questionnaires out and supplied them with pens. The researcher made it clear to the participants that they should respond instinctively to the questions and to answer them with regard to the class that they had just taken part in. Participants gave informed consent and completed the questionnaire.

## Analyses

The analytical strategy chosen for this study was the same approach as that used in Study One (please refer to Chapters Two and Three for a detailed description). The measurement model was tested first, followed by the structural model.

# **Results**

# **Perceived Environmental Supportiveness**

## Single subscale analyses

#### Autonomy Support

The sample size following listwise deletion of cases with missing values was 241. The normalised Mardia's coefficient was 8.21 (p < .001) indicating that the data departed significantly from multivariate normality. The initial five-item model showed a good fit to the data. However, item 2 had a low factor loading (.27). The model was re-estimated with this item removed. Model 2 had a good fit to the data and was accepted. Fit indices are tabulated in Table 5.5. The remaining four items were:

1. The instructor encouraged me to make choices

3. The instructor made me feel free to make decisions

4. The instructor provided me with choices and options

5. The instructor encouraged me to take my own initiative

Model	S-B χ 2	df	P-value S-S χ 2	RMSEA	90% CI RMSEA	P-value RMSEA	CFI	SRMR
Model 1	8.77	5	.118	.06	.0012	.366	.99	.03
Model 2	3.69	2	.158	.06	.0015	.327	.99	.02

Table 5.5. Fit indices for autonomy support

#### Structure

The sample size following listwise deletion of case 5 with missing values was 240. The normalised Mardia's coefficient was 10.59 (p < .001) indicating that the data departed significantly from multivariate normality. The fit for the initial set of six items was good and there were no large residuals or modification indices, so the model was accepted as it stood. Fit indices are tabulated in Table 5.6. The remaining items were:

1. I felt the instructor gave me good advice

2. The instructor gave me clear and understandable instructions

3. The instructor provided clear feedback

- 4. The instructor made it clear to me what to expect
- 5. The instructor made me feel positive about being able to do the moves
- 6. The instructor helped me to feel confident about exercising

Table 5.6. Fit indices for structure

Model	S-B χ	df	P-value S-S $\chi^2$	RMSEA	90% CI RMSEA	P-value RMSEA	CFI	SRMR
Model 1	10.24	9	.332	.02	.0008	.721	.99	.03

# Involvement

The sample size following listwise deletion of case 5 with missing values was 240. The normalised Mardia's coefficient was 11.23 (p < .001) indicating that the data departed significantly from multivariate normality. The fit for the initial set of seven items was acceptable but item four had a low loading (.25) and so this item was eliminated and the model retested. The fit was good but item 2 showed a pattern of large residuals and modification indices for the covariances among the error terms. With this item eliminated the fit was excellent and the final model accepted. Fit indices are tabulated in Table 5.7. The remaining five items were:

- 1. The instructor tried to involve me even though there were many people in the group
- 3. I felt that the instructor was concerned about my wellbeing
- 5. I felt that the instructor looked after me
- 6. I felt that the instructor considered my personal needs
- 7. I felt that the instructor cared about me

Model S-B x 2 df P-value RMSEA 90% CI CFI P-value SRMR S-S 2 2 RMSEA RMSEA Model 1 20.72 14 .109 .05 .00 - .08 .542 .98 .04 Model 2 13.83 9 .129 .05 .00 - .09 480 .98 .04 1.00 Model 3 5.61 5 .346 .02 .00 - .05 .644 .03

Table 5.7. Fit indices for involvement

# Complete measurement model analysis: perceived environmental supportiveness

The remaining 15 items were then combined and a three-factor oblique model was tested.

The sample size following listwise deletion of case 5 with missing values was 237. Mardia's

normalised coefficient was 15.00. Although  $\chi^2$  was significant, the fit of the initial model was relatively good. However, there were large modification indices for the autonomy support item 5 on both the other latent variables, indicating that this was an ambiguous item. The fit improved following its elimination (model 2), however, there remained large modification indices for the structure item 5 on autonomy support. Respecification (model 3) with this item removed improved the fit but there was now a pattern of large residuals for structure item 3 with three other items. Elimination of this item led to a good fit (model 4). Fit indices are tabulated in Table 5.8.

Model	S-B χ 2	df	P-value S-S χ 2	RMSEA	90% CI RMSEA	P-value RMSEA	CFI	SRMR
Model 1	123.57	87	.006	.04	.0206	.770	.98	.05
Model 2	103.88	74	.013	.04	.0206	.773	.98	.05
Model 3	92.63	62	.007	.05	.0206	.624	.97	.05
Model 4	63.73	51	.109	.03	.0006	.88	.98	.04

Table 5.8. Fit indices for the 3-factor perceived environmental supportiveness model

Table 5.8 shows the standardised factor loadings and standard errors for the items and Cronbach's alpha reliability coefficients for the scales. Factor loadings, item error variances and factor intercorrelations are shown in Figure 5.2. The factor loadings were all moderate to strong (minimum .46) and significantly greater than zero. Subscale reliabilities were all good. The interfactor correlations were high, particular that between structure and involvement (.92), which approached unity. This suggests a potential lack of discriminant validity between these two scales. In order to examine this, two further models were specified and tested. First, a single factor model with all the items loading on one latent variable was specified and second, a model in which the correlation between structure and involvement was constrained to unity, effectively specifying that all the structure and involvement items loaded on a common factor (i.e. a two factor model). The fit of the single factor model was poor in comparison to the three factor model and departed significantly from the data. (Satorra-Bentler  $\chi^2 = 131.41$ , df = 54, p < .000). The two factor model was a nested version of the three factor model and so it was possible to directly compare the two using the  $\chi^2$  difference test. However, the difference between two Satorra-Bentler  $\chi^2$ s for a nested model is not  $\chi^2$ distributed. Consequently the unscaled, minimum fit function  $\chi^2$ s were used to compare the models. The  $\chi^2$  difference was 9.92, indicating that the two factor model had a significantly worse fit than the three factor model.



Figure 5.2 shows PESQ Factor loadings, item error variances and factor intercorrelations

<u>**Key</u>**: AS = Autonomy support; STR = Structure; INV = Involvement</u>

17	Mean	SD	Factor Loading	Standard Error
Autonomy Support: (Alpha = .79)				
1. Instructor encouraged me to make choices	2.88	1.26	.63	.08
3. Instructor made me feel free to make decisions	2.66	1.24	.71	.07
4. Instructor provided me with choices and options	2.83	1.10	.92	.06
Structure (Alpha = .79)				12
1. Instructor gave me good advice	3.19	.95	.71	.06
2. Instructor gave me clear and understandable instructions	3.27	.96	.65	.07
4. Instructor made clear what to expect	2.88	1.10	.66	.06
6. Instructor helped me feel confident	3.33	.82	.75	.05
<b>Involvement:</b> (Alpha = .78)				
1. Instructor tried to involve me	3.10	1.02	.51	.06
3. Instructor concerned about my well- being	2.93	1.08	.46	.07
5. Instructor looked after me	2.98	1.00	.69	.06
6. Instructor considered personal needs	2.71	1.10	.76	.01
7. Instructor cared about me	2.88	.98	.81	.05

Table 5.9. Item means and SDs, factor loadings with their standard errors, and Cronbach's alphas for the perceived environmental supportiveness scales.

# **Psychological Need Satisfaction**

Single subscale analyses

Perceived autonomy (modified LCE)

The sample size following listwise deletion of case 5 with missing values was 242. The normalised Mardia's coefficient was 5.52 (p < .01) indicating that the data departed significantly from multivariate normality. The model was specified as tau equivalent, as there were only three items, and had a reasonable fit to the data. Fit indices are tabulated in Table

5.10. The three items were:

1. Having to go to the class was a bind but it had to be done

2. I went to the class because I wanted to rather than because I felt I had to go

3. Going to the class is not something that I chose to do rather it was something I felt I ought to do

Table 5.10. Fit indices for perceived autonomy.

Model	S-B χ 2	df	P-value S-S χ 2	RMSEA	90% CI RMSEA	P-value RMSEA	CFI	SRMR
Model 1	5.36	2	.069	.08	.0017	.083	.93	.07

# Competence

The sample size was 243 with no missing values. The normalised Mardia's coefficient was 8.97 (p < .001) indicating that the data departed significantly from multivariate normality. The initial five-item model showed a poor fit to the data. Item 4 was removed due to a pattern of large residuals and the model re-estimated. The fit was still not good. Item 2 was then eliminated due to large residuals. The resulting model specified as tau equivalent showed a good fit. Fit indices are tabulated in Table 5.11. The remaining three items were:

1. I think I was pretty good at the class I have just done

3. I felt confident that I could do the class

5. I knew what I had to do in order to perform the exercises in the class

Table 5.11. Fit indices for perceived competence

Model	S-B χ <sup>2</sup>	df	P-value	RMSEA	90% CI RMSEA	P-value RMSEA	CFI	SRMR
Model 1	15.69	5	.008	.09	.0415	.070	.98	.04
Model 2	6.35	2	.042	.10	.0218	.134	.98	.04
Model 2	1.35	2	.509	.00	.0011	.680	1.00	.03

# Relatedness

The sample size following listwise deletion of case 5 with missing values was 238. The normalised Mardia's coefficient was 17.88 (p < .001) indicating that the data departed significantly from multivariate normality. The initial eight-item model showed a very poor fit to the data. Items 3, 6, and 8, were removed on the basis of a pattern of large residuals and the

model re-estimated. Model 2 showed a good fit. However, items 2 and 4 had low factor loadings (.27 and .24 respectively). These items were eliminated and the resultant model, specified as tau equivalent, had a good fit. Fit indices are tabulated in Table 5.12. The remaining three items were:

1. I felt like I belonged in the class

5. In the class I felt accepted

7. In the class I felt supported

Table 5.12. Fit indices for relatedness

Model	S-B $\chi^2$	df	P-value	RMSEA	90% CI RMSEA	P-value RMSEA	CFI	SRMR
Model 1	89.18	20	.000	.12	.1015	.000	.81	.11
Model 2	.87	2	.647	.00	.0010	.780	1.00	.02
Model 3	1.04	2	.595	.00	.0011	.744	1.00	.04

## Complete measurement model analysis: Psychological needs

The three psychological need satisfaction subscales were then combined into a three factor oblique model and tested. The sample size following listwise deletion of case 5 with missing values was 242. Although  $\chi^2$  was marginally significant, the fit of the model was relatively good. Modification indices did not suggest that any of the items were ambiguous. Fit indices are tabulated in Table 5.13.

Table 5.13. Fit indices for the 3-factor psychological needs model

Model	S-B $\chi^2$	df	P-value	RMSEA	90% CI RMSEA	P-value RMSEA	CFI	SRMR
Model 2	37.60	24	.038	.05	.0108	.500	.95	.06

Table 5.14 shows the standardised factor loadings and standard errors for the items and Cronbach's alpha reliability coefficients for the scales. Factor loadings, item error variances and factor intercorrelations are shown in Figure 5.3. The factor loadings were all moderate to strong (minimum .41) and significantly greater than zero. Subscale reliabilities for autonomy and competence were relatively low. The correlation between competence and relatedness

approached unity, suggesting a potential lack of discriminant validity between these two scales. In order to examine this, two further models were specified and tested. First, a single factor model with all the items loading on one latent variable was specified and second, a model in which the correlation between structure and involvement was constrained to unity. However, this model failed to converge to an admissible solution. Consequently, the model was specified as a two factor model with the competence and relatedness items loading on a single factor. The fit of the single factor model was poor in comparison to the three factor model and departed significantly from the data. (Satorra-Bentler  $\chi^2 = 67.10$ , df = 27, *p* < .000). The two factor model was not a nested version of the three factor model and so it was not possible to directly compare the two using the  $\chi^2$  difference test. The model showed a marginally better fit according to the  $\chi^2$  test (Satorra-Bentler  $\chi^2 = 37.93$ , df = 26, *p* = .061). However, the other fit indices were identical (rmsea = .05; CFI = .95; srmr = .06). Given the conceptual distinction between competence and relatedness, and the fact that modification indices had not shown evidence of ambiguous items, the three factor model was retained.

Table 5.14. Item means and SDs, factor loadings with their standard errors, and Cronbach's alphas for the perceived environmental supportiveness scales.

Note: Standard	errors for	one indicator	of each	factor n	ot computed	as these	were	used a	as
reference varial	bles to set	the metric.							

	Mean	SD	Factor Loading	Standard Error
Autonomy: (Alpha = .56)				
1. Having to go to the class was a bind	3.42	1.08	.56	
2. I wanted to rather than felt I had to	3.31	1.14	.49	.16
3. Not something that I chose to do	2.65	1.64	.58	.16
<b>Competence:</b> (Alpha = .69)				
1. I think I was pretty good at the class	2.83	.94	.65	
3. I felt confident	3.52	.73	.67	.14
5. I knew what I had to do	3.42	.79	.41	.13
<b>Relatedness:</b> (Alpha = .72)				
1. I felt like I belonged in the class	3.39	.84	.73	
5. In the class I felt accepted	3.43	.78	.70	.11
7. In the class I felt supported	3.22	.83	.63	.11



# Figure 5.3 shows Need Satisfaction Factor loadings, item error variances and factor intercorrelations

<u>**Key</u>**: AUT= Autonomy (LCE); COMP = Competence; REL = Relatedness.</u>

## Interest-Enjoyment

The measurement properties of the interest-enjoyment scale were also examined by specifying a single factor model. The sample size following listwise deletion of case 5 with missing values was 237. The normalised Mardia's coefficient was 15.94 (p < .001) indicating that the data departed significantly from multivariate normality. The initial seven-item model showed a poor fit to the data. Items 3 and 5, which were both negatively keyed, had low factor loadings (.24 and .15 respectively) and were removed from the model. Model fit was improved but still had a significant Satorra-Bentler  $\chi^2$ . There was a large modification index for the covariance between the error terms for items 1 and 4. Given that item 4 had the lowest factor loading in the model (.57) it was removed. This led to a very good fit. Fit indices are tabulated in Table 5.15. The remaining four items were:

1. I enjoyed doing the class very much

- 2. While I was doing the class, I was thinking about how much I was enjoying it
- 6. The class was fun to do

7. I would describe the class as very interesting

Model	S-B χ <sup>2</sup>	df	P-value	RMSEA	90% CI RMSEA	P-value RMSEA	CFI	SRMR
Model 1	27.69	14	.016	.06	.0310	.225	.94	.07
Model 2	11.38	5	.044	.07	.0113	.204	.98	.04
Model 3	3.25	2	.197	.05	.0015	.374	.99	.02

Table 5.15. Fit indices for interest-enjoyment

Table 5.16. Factor loadings with their standard errors and Cronbach's alpha for interestenjoyment.

	Mean	SD	Factor Loading	Standard Error
<b>Interest-enjoyment:</b> (Alpha = .82)				
1. I enjoyed doing the class very much	3.79	.50	.64	.06
2. While I was doing the class, I was thinking about how much I was enjoying it	3.13	1.01	.79	.06
6. The class was fun to do	3.58	.65	.84	.06
7. I would describe the class as very interesting	3.38	.84	.73	.06

## **Structural Model**

## Model testing strategy

Given the relatively small sample size, it was not feasible to test the structural models as latent variable models with all of the indicator items included, so item composites, or parcels were computed instead. Marsh *et al.* (1989) highlight the advantages to analysing item parcel scores in place of items such as, increasing reliability and generality and reducing the idiosyncratic characteristics of individual items. With the present model, items were parcelled such that each latent variable had two observed indicators. The number of items combined depended on the number of original items available. For three item scales two items were combined as one indicator and the remaining item stood as the second indicator. For four item scales, each composite indicator comprised the mean of two items. For involvement, which comprised five items, the first composite indicator comprised three items and the second two items. Table 5.17 shows the item composites for each latent variable. Since the structural model reported here is much more complex than the measurement models described in the preceding section, a non-significant Satorra-Bentler scaled  $\chi^2$  was not expected.

Latent variables	Composite indicator 1	Composite indicator 2			
Environmental supportiveness					
Autonomy support	Items $1 + 3$	Item 4			
Structure	Items 1 + 4	Items $2 + 6$			
Involvement	Items $1 + 3 + 6$	Items 5 + 7			
<b>Psychological needs</b>					
Autonomy (modified LCE)	Items 1 + 2	Item 3			
Competence	Items 1 + 5	Item 3			
Relatedness	Items 1 + 7	Item 5			
Interest-enjoyment	Items 1 + 7	Items $2 + 6$			

Table 5.17. Item composites for the latent variables.

## **Results**

The fit of the model was good (Satorra-Bentler scaled  $\chi^2 = 88.00$ , df = 70, p = .072; RMSEA = .04, 90% CI = .00 - .05, p = .924; CFI = .99; SRMR = .04). Figure 5.4 shows the standardised parameter estimates for the structural relationships and Table 5.18 shows the standardised estimates with their standard errors and error variances for the measurement model. Table 5.19 shows the standardised parameter estimates and disturbance terms for the structural model. All parameter estimates were significant at p < .001. Motivational support had a strong effect on psychological needs (.91), which in turn had a moderately strong effect on interest-enjoyment (.69). Structure and involvement had stronger relationships with motivational support (.94 and .93 respectively) than autonomy support (.75). The autonomy dimension of psychological need satisfaction contributed considerably less to the higher order need construct (.35) compared to competence (.90) and relatedness (.96). The model accounted for 83.6% of the variance in psychological needs and 47.9% of the variance in interest-enjoyment.

Table 5.18. Standardised parameter estimates and standard errors for measurement model. Note: standard errors for one composite for each latent variable not computed as these were specified as reference variables to set the metric.

	Estimate	Standard Error	Error Variance
Autonomy Support			
AS composite 1	.73		.46
AS composite 2	.93	.11	.13
Structure			
ST composite 1	.81		.34
ST composite 2	.83	.06	.32
Involvement			
INV composite 1	.80		.37
INV composite 2	.86	.09	.26
Autonomy			
AUT composite 1	.88		.23
AUT composite 2	.47	.18	.78
Perceived competence			
PC composite 1	.58		.66
PC composite 2	.70	.17	.52

Relatedness			
REL composite 1	.89		.20
REL composite 2	.67	.08	.55
Interest-enjoyment			
INT composite 1	.87		.24
INT composite 2	.85	.11	.27

Table 5.19. Standardised parameter estimates, standard errors and disturbance terms ( $\delta$ ) for structural model.

Note: standard errors for one first order latent variable for each second order latent variable and for interest-enjoyment on needs not computed as these were fixed to 1.0 to identify the model.

	Estimate	Standard Error	δ
Environmental Support			
Autonomy support	75		44
Structure	94	.13	12
Involvement	.93	.11	.13
			CLUC
Need Satisfaction			
Autonomy	.35		.88
Perceived competence	.90	.20	.19
Relatedness	.96	.24	.07
Needs on Environmental Support	.91	.08	.16
Interest-enjoyment on Needs	.69		.52



Figure 5.4. Structural model standardised parameter estimates (all estimates significant at p < .001).

-

## Alternative models

Finally an alternative model was specified in which environmental supports had a direct effect on needs in order to test the hypothesis that the effects of supports on interest-enjoyment were not mediated by psychological need satisfaction. The alternative model did not depart significantly from the data (Satorra-Bentler scaled  $\chi^2 = 87.70$ , df = 69, p = .064). However, a  $\chi^2$  difference test revealed that despite being less constrained, the alternative model did not fit significantly better than the original model (minimum fit function  $\chi^2$  difference = .43, p > .05). In addition the parameter estimate for the effect of environmental supports on interest-enjoyment (.10) was not significantly greater than zero.

#### **Discussion**

#### The Measurement Models

#### PESQ

The measurement model analyses showed all the subscales of the PESQ (autonomy support (AS), structure (S), and involvement (I)) to be factorially valid subscales. Items were eliminated at the single subscale and complete model stages of analysis if they proved to be poor indicators of their factor by examination of the global indices and the standardised residuals and modification indices. Separate analyses for each of the constructs, prior to complete measurement model testing is a rigorous approach, and leads to scales with good measurement properties such as convergent and discriminant validity (Jöreskog, 1993).

At the single subscale level, one autonomy support item was eliminated. The item ("I felt that the instructor didn't allow me to make any decisions") was eliminated first of all on a statistical basis, but substantively, a possible explanation of why it was a poor indicator of the factor could be because it was worded too extremely. This was also found in the contextual study (Chapter Two). Furthermore, when individuals attend an exercise class they expect to be instructed by the instructor thus this item may not be an appropriate item. Another item was eliminated at the complete model stage, ("The instructor encouraged me to take my own initiative"). Aside from its statistical problems, this item seems a little inappropriate as in the context of an exercise class as one could

argue that in contrast to a gym environment (such as that in Study One), there is less scope for taking initiative. Indeed, this is corroborated by the fact that this item was not eliminated in the contextual study.

In terms of structure, no eliminations were made at the first stage of analysis. However, two items were eliminated at the complete model analysis. These items were most probably poor indicators of the factor because of their relatively individualistic nature. This is reflected by the fact that the contextual study (in which there was a one to one instructor-exerciser relationship), items such as "The instructor provided clear feedback" and "The instructor made me feel positive about being able to do the moves" were retained. It could be that these items are more likely to be applicable to an exercise situation that allows a proximal relationship in contrast to a distal one such as a busy group exercise class.

Lastly, the involvement subscale lost two items at the single subscale stage ("The instructor made me feel as though I mattered to them"; and "I felt that the instructor wasn't bothered about how I got on"), which were poor indicators of the factor for possibly different reasons. The first item suffers the same problem as those eliminated from the structure subscale in that it may not be feasible to expect an instructor to inculcate such a feeling amongst their class attendees. The second item was worded very extremely, and anecdotal reports from study participants suggest that they do not like to be critical of their instructors for fear of reprisals. This item was also eliminated from the contextual study.

Again, consistent with the contextual study, large correlations were observed between the factors, especially between structure and involvement.

The items were subsequently checked for possible measurement error (such as similarly worded items) and the specifications were examined for flaws. There was no evidence that would support the idea of either measurement or specification error being responsible for the intercorrelations in this instance. However, the existence of a single factor underlying all three constructs still needed to be explored.

A single factor model was thus tested in order to check whether or not the three subscales were measuring the same construct; if the single factor model produced a good fit, then there would be little reason to say that there were three distinct factors. In accordance with our hypotheses, we would predict the 3-factor model to be superior to the single factor model. This prediction was confirmed as the single factor model failed to yield an acceptable fit in contrast to the acceptable fit produced by the 3-factor model. Since the single factor model was unable to explain the large intercorrelations that were observed between each of the latent variables, the next step was to perform a 2factor model. As the highest correlations observed were between structure and involvement (0.92), a 2-factor model with autonomy support as one factor, and structure and involvement as the other needed to be tested. If the 2-factor model also yielded an acceptable fit, then there would be grounds to collapse the structure and involvement items into one factor. The results of the  $\chi^2$  difference test (using minimum fit function  $\chi^2$ s) revealed the 3-factor model to be a significantly superior fit compared to the 2-factor model. The closeness, yet distinctness of these environmental support constructs has been commented upon in the literature (e.g. Ryan, 1989; 1991; Ryan *et al.*, 1995 refer to Chapter Two also) and since the 2-factor model in the present study failed to produce a good fit, this distinction was considered a worthwhile distinction to retain.

## Psychological Need Satisfaction Subscales

The following section discusses the results of the factorial analyses of the psychological need satisfaction subscales. The same analytical strategy used for the Perceived Environmental Support Questionnaire (PESQ) was employed, with the analysis of the single subscales (for item refinement purposes), followed by an analysis of the complete model in which all items are featured. For consistency, single factor models of both the LCE and interest/enjoyment subscales were also tested. The LCE retained all three of its original items, no eliminations were required. Necessary modifications to the interest/enjoyment subscale are detailed below.

At the single subscale level, two items were eliminated ("I am pretty skilled at doing the class I have just done"; and "Compared to other people in the class I think I did pretty well"). The first item was retained in the contextual study, and this may be due to the nature of the exercises featured on a gym programme which individuals may perceive more readily as a 'skill'. In contrast, participating in an exercise class may be less likely to be perceived as 'skilful' as the participants follow the instructions of the class leader and are dependent upon the instructor being present in the class. The second item, consistent with the contextual study, was eliminated; one possible explanation for this item not being appropriate for a class environment could be that during the class, the focus of attention is on the instructor and their instructions, so although there are many other individuals close-by to serve as comparisons, self-evaluations of performance relative to other people may not be important. In the context of a GP exercise referral scheme study, many of the scheme participants commented on how they never thought about comparing their level of skill to others in the gym, predominantly because they were focussing on improving themselves for their health.

Lastly, five items were eliminated from the relatedness subscale; ("I felt out of place when I was in the class"; "I didn't feel like I 'fitted-in' when I was in the class"; "I felt isolated whilst in the class"; "In the class I felt different from everyone else"; I felt like a 'fish out of water' whilst I was in the class". There are several possible explanations for these items being eliminated; firstly, they were all negatively worded and as such may have caused respondents to respond in a peculiar way (i.e. not wanting to be critical). Secondly, being in a group environment may have rendered these items unsuitable especially since (based on self-reported class attendance) many of the class participants attended the classes regularly and may therefore have felt comfortable as opposed to feeling awkward within their exercise environment. Lastly, social desirability may have caused participants to respond in a particular way which rendered the items incompatible with the rest of the item set; if they were taking part in a group activity, then they may not want to contradict that action by agreeing with such negative items.

In contrast to the contextual study, the intercorrelation between competence and relatedness in the present study approached unity suggesting a lack of discriminant validity. In order to explore the possibility that the items were measuring the same construct, a single factor model-was tested and the fit of this model was poor in comparison to the 3-factor model. A second single factor model with the correlation between competence and relatedness constrained to unity was specified in order to test whether relatedness and competence were measuring the same thing. This model failed to converge. A two-factor model was therefore tested instead with the competence and relatedness items loading on a single factor. This model could not be directly compared with the three factor model as it was not nested; but judging by the fit of this model, it appeared to be marginally better than the 3-factor model. However, taking into consideration the fact that all of the other indices were identical, along with the conceptual distinction between the two constructs, and the lack of evidence pointing to ambiguous items; the three factor model was retained.

The reasons why competence and relatedness were so closely related in the present study cannot be stated with certainty, although one may tentatively suggest that within a group exercise context, feeling competent helps one to feel related to other group members. This has been reported in the realms of sport research, (e.g., Evans, 1985; Weiss and Duncan, 1992), where there is evidence to suggest that competence can increase peer acceptance and social interactions in the physical domain. In a recent study,

Standage *et al.* (2003) observed a path between competence and relatedness in their model of motivation in physical education context; they suggest that children who are physically competent are more likely to be accepted by their peers. It may be that this environment shares particular properties with that of school group exercise activities and as such may demonstrate similar relationships. The fact that the contextual study did not display this close relationship between competence and relatedness could be attributed to the lack of group exercise activities or simply because competence was not their main preoccupation (in contrast to relatedness perhaps).

#### Interest-Enjoyment

Finally, the measurement properties of the interest-enjoyment subscale were examined by specifying a single factor model. Three items were eliminated due to large modification indices. Substantively, possible explanations for their elimination could be that two of these items were negatively phrased ("I thought this class was a boring class"; and "The class did not hold my attention at all") and responses may have been influenced by such negativity (see discussion above) especially since participants may have held the belief that their instructors would be able to view their responses. Anecdotal evidence for this came in the form of participants passing comments to their instructor's employment may be detrimentally affected by any unfavourable responses given. The third item to be eliminated ("I thought the class was quite enjoyable") displayed signs of shared error variance most probably due to the similar wording of that item with one of the other items (i.e. "I enjoyed doing the class very much").

#### The Structural Model

The aim of the present study was to re-visit the structural model set out on Chapter Three, where psychological need satisfaction mediated the effect of environmental support on motivational outcomes. This aim was achieved and an acceptable model emerged, with environmental supports having a moderately strong effect upon psychological need satisfaction, which in turn had a moderately strong effect upon relative interest-enjoyment. The model provided support for psychological need satisfaction mediating the effects of environmental supportiveness on interest/enjoyment. The existence of a mediating role for psychological needs within the present data was demonstrated by the poor performance of a model specifying a direct path from environmental support to interest/enjoyment. The fit for this model was not significantly better than that of the mediation model. This is consistent with the findings of the contextual study which also found the fit of the mediating model to be superior to the direct effects model. The fact that the two studies discovered the same pattern of findings despite them having different outcome variables (behavioural regulation and interest/enjoyment) also bolsters the assertion that the effects of environmental supports upon motivational outcomes are mediated by psychological need satisfaction.

Previous research examining environmental supports, need satisfaction, and various motivational outcomes can be seen as partial support for the present model since only parts of the present model have previously been tested; and some have not employed the use of composite variables. It is thus difficult to directly compare previous models with the particular model tested here. In spite of this, the current model can still be viewed as support for past research. Vallerand (1997) examined each of the psychological needs individually but he nonetheless stipulated that the presence of all three needs was necessary for the development of self-determined regulation, and since the present model subsumes all three psychological needs then some support is provided.

Futhermore, just as Ntoumanis (2001) and Standage *et al.* (2003) found support for psychological need satisfaction mediating the effect of environmental factors upon motivational outcomes, the present model concurs with this mediational role of psychological need satisfaction. The current study is also consistent with the results of the one study which also tested a model with psychological needs as a composite variable (Deci *et al.*, 2001). The benefits of using composites have been reported by Liang, Lawrence, Bennett, Amp, and Whitelaw (1990). They state that using composites often simplifies the measurement specifications and provides a more parsimonious formation whilst not detracting from an explicit evaluation of the underlying measurement specification. Confidence in using composites however, often requires a careful analysis of one or more measurement models as a pre-requisite.

## Environmental Support

On examination of the individual contributions of the three environmental supports, structure and involvement were found to be the most salient dimensions of environmental support. Autonomy support was a weaker dimension. This is perhaps not surprising with this population since the very nature of an exercise class involves an instructor giving out instructions at the front of the class. It may be this aspect that attracts individuals to exercise classes as they can 'switch off' and simply follow the leader. The

relative strength of these relationships are consistent with those reported in Study One (Chapter Three), which adds support for the model.

## Psychological Need Satisfaction

In contrast to the contextual study where the three dimensions of psychological need satisfaction contributed roughly equally to their higher order need construct; the present study found autonomy to contribute considerably less than competence and relatedness. Relatedness came out as the strongest contributor to psychological need satisfaction which is consistent with the contextual study. Again this contrasts with much of the SDT literature which often champions competence or autonomy in terms of the relative importance of the three psychological needs (Koestner and Losier, 2002; Ryan and Deci, 2000a, pp.64; Ryan and Deci, 2000b). Although the originators of SDT place less emphasis upon relatedness in terms of intrinsic motivation, some researchers believe that relatedness serves a more critical role than autonomy and competence (Andersen et al., 2000, pp.272), and this is perhaps the case with the present study (see Chapter Three for further discussion). The relatively stronger relationship of relatedness among the needs makes intuitive sense when the characteristics of a group environment are considered. It has also been suggested that relatedness may play a more important role in contexts that are inherently social in context such as fitness classes in contrast to more solitary and individual pursuits (Cadorette, Blanchard, and Vallerand, 1996).

#### **Limitations**

Although the model tested in the present study generally supported the central tenets of self-determination theory, there are several limitations. Firstly, as with the cross-sectional contextual study, the relations observed here were also cross-sectional in nature thus offering only a 'snap-shot' view of the causal relations among the SDT constructs.

Secondly, despite each of the environmental supports and psychological needs being present in the model; embodying them in this higher order fashion precludes any investigation with regard to the direct contributions of autonomy support, structure and involvement upon the three needs (autonomy, competence, and relatedness); or being able to examine the direct relationships between each of the three psychological needs and interest/enjoyment.

Thirdly, Cronbach's alpha coefficient for the autonomy subscale (LCE) was especially low (.57) in the present study and this is in contrast to the reliability

coefficients for competence and relatedness (.69 and 72 respectively). It also contrasts with the alpha values found in the contextual study (autonomy = .65; competence = .80; relatedness = .81). One possible explanation is that the autonomy items required respondents to think about their feelings *prior to* coming to the class in contrast to all the other items which as respondents to think about their feelings *during* the class. This may have made it difficult for respondents to accurately answer as they had a mixture of time points to reflect upon. In contrast, this was not a problem in the contextual study since all the psychological need satisfaction items were asking participants to think about their *current* feelings towards exercise in general, and not to flip from one time zone to the next.

Some researchers have criticised the use of Cronbach's alpha as a measure of reliability as it operates under the assumption that all pairs of items are tau equivalent (Miller, 1995). The final 3-factor model tested in the present study is not a tau equivalent model and therefore violates one of the assumptions of Cronbach's alpha. When this assumption is violated alpha tends to underestimate test reliability, thus one could have a homogeneous set of items yet have a low alpha coefficient (Miller, 1995). Miller goes on to state that Cronbach's alpha is a 'lowerbound approximation to test reliability even for a perfectly homogeneous test' (p.266), and concludes that it has little or no value as an index of test homogeneity or unidimensionality. So although Cronbach's alpha is a commonly reported reliability coefficient, a balanced interpretation of its value must be considered.

Lastly, one may argue that the population sampled from in the present study was not comparable to that of the contextual study. The present study's population consisted of healthy, fit, relatively young individuals who were exercising in a group setting in contrast to the population used for the contextual studies which consisted of older people suffering from various medical conditions and who were exercising alone. This could in fact be viewed as a strength of the study since regardless of these differences, the hypothesised structural relations were still supported by this study which is testimony to the conceptual model in that it can be sustained by different populations and at different levels (i.e. situational and contextual).
### **Conclusions**

In spite of the limitations and the paucity of empirical research to directly support the present model in its entirety, the relationships contained within it are consistent with past models (Deci *et* al., 2001; Ntoumanis, 2001; Vallerand, 1997) and with the basic tenets of self-determination theory which state that all three environmental supports are required to facilitate the satisfaction of the three psychological needs which in turn aid intrinsic motivation (as measured by interest and enjoyment) (Deci and Ryan, 1985; Vallerand, 1997). The different population and motivational outcome featured in the present study provides particularly good support for the conceptual model put forward in the present thesis, since despite such differences the hypothesised structural relations found in the contextual study were upheld in this situational study.

An extension of this research would be to collect data over a number of 'situations' (instead of just a single occasion) and then assess the individual's contextual motivation in order to test the recursive effects of Vallerand's hierarchical model of intrinsic motivation (Vallerand, 1997). Another possible extension to the study could be to collect situational data as well as data pertaining to the continued attendance of the classes over a period of time, so that any longer term effects could be examined.

The research performed so far in the present thesis has enabled a structural model of relations to be constructed, tested, and verified. The next chapter therefore (Chapter Six) will explore the question of whether SDT could be a suitable framework for motivational interviewing. Chapter Six examines this via an intervention study which compared a control group; an attention-control group; and a motivational interviewing group.

#### CHAPTER SIX

# The Effects of Environmental Support on Psychological and Behavioural Outcomes within the GP Exercise Referral Scheme Context

### Introduction

This next chapter brings us closer to the central question of the thesis (i.e. whether Self-Determination Theory (SDT) can provide a meaningful framework for Motivational Interviewing). It details a study that investigates the extent to which the provision of motivational interviewing (MI) on referral to the GP exercise referral scheme, enhances the perceived supportiveness of the environment so that it more effectively meets the three psychological needs, thereby facilitating adherence and maintenance of exercise levels.

In this study, a group of individuals receiving motivational interviewing sessions was compared to an attention only group (educational information sessions) and a control group (no extra sessions) in order to tease apart the effect of motivational interviewing upon the dependent variables, and the effect of attention on the dependent variables.

It was predicted that individuals in the motivational interviewing group would demonstrate higher levels of perceived environmental support and psychological need satisfaction and thereby greater scheme adherence and post-scheme exercise participation. If this prediction were correct, the practical implications would be to incorporate elements of motivational interviewing in the present referral process and to train gym staff in the spirit of motivational interviewing and in the behaviour change counselling technique. If on the other hand no differences were observed between the attention-control group and the motivational interviewing group, then the implication would be to ensure that participants receive regular appointments with a gym staff member, and are given adequate exercise information. Finally, if no differences were seen among any groups, then no implications can be drawn except that neither extra information, attention or counselling have been able to improve scheme adherence / post-scheme exercise participation in this instance.

Although a major aim of the study was to examine the processes by which MI works, another aim was to address the general criticism of studies examining MI (or MI-based interventions) regarding the lack of clarity when describing the precise training and competence of the interventionist involved in the research. Many studies which appear to feature pure MI are in fact adaptations of MI (see page 7 of the present thesis). In a recent review paper (Dunn *et al.*, 2001) only 10 out of the 29 MI studies examined reported the number of hours of training completed by the interventionist. Among those that did report training, the length of training ranged from 2 to 31 hours. The training received by the current interventionist has spanned over four years of postgraduate study, and has ranged from participation in bona fide MI workshops, to supervised experience with genuine clients, to gaining a qualification as an MI trainer with the Motivational Interviewing Network of Trainers (MINT).

The MI-based intervention used in this study is similar to the briefer derivative of MI known as 'Behaviour Change Counselling' (BCC) as time only permits 30 minutes per session with the client. The creators of BCC claim that it can even be used in consultations as short as eight minutes (Rollnick, 2001); therefore this has implications for medical staff who have time-limited consultations. BCC and other adaptations of MI lend themselves more readily to the scarce training resources and time that leisure centre staff and GP practice staff have available to them, and in this way is a more realistic training goal.

As the spirit of MI encourages a very individualistic approach it is difficult to document the exact contents of each session with the client, however the lack of clarity regarding the precise contents of the 'MI' intervention featured in past studies has been criticised in reviews and evaluations of MI (Dunn *et al.*, 2001). This deficiency makes it exceedingly difficult to know how comparable apparently 'similar' studies are in terms of their MI interventions and precludes precise replication. I have therefore provided an outline of what each session included, and this was used with every MI participant. The following strategies were also used in conjunction with the four principles of MI (see Chapter One for details) as part of the sessions.

### **MI** Strategies

#### Ask open questions (Miller and Rollnick, 2002 p.65)

Asking open questions (e.g. "What do you not like about exercise?") is more likely to produce a longer and elaborate response from the client than a closed question (e.g. "You don't like exercise do you?"). A closed question does not give the client the same freedom of response, and usually prompts a simple "Yes" or "No". Furthermore, open questions are

much less threatening as there is no 'expected' answer inherent in the question and they are thus free to choose.

### Reflective Listening (Miller and Rollnick, 2002 p.67)

Often we do not know what we are feeling until we actually try to verbalise it, even then we still may not be able to explore those feelings until we hear them repeated back to us in words similar to our own (Resnicow *et al.*, 2002). When a practitioner reflects back to us what we have said, this is known as reflective listening. In MI, reflective listening is crucial to the progression of a session, not only does it echo back to the individual what they have said, it also helps build rapport and trust (Miller and Rollnick, 2002 p.67). It signals to the client that you have been listening and have understood what they have said. However, reflective listening is not merely an exact repetition of what the client has spoken; the counsellor rewords it slightly so that the client knows that the counsellor has taken in and understood what they have said.

### Summarising (Miller and Rollnick, 2002 p.74)

An extension of a reflection is when the counsellor summarises a period of talk. In addition to reflecting small portions of speech, sometimes it is helpful to draw certain points together and present them back to the client. This can be a useful way for the counsellor to check their understanding of the client so far and also to direct the session in a particular direction. Again, this should also further enhance the rapport and therapeutic relationship, which will in turn help to minimise resistant responses.

#### Affirming (Miller and Rollnick, 2002 p.73)

This is where the counsellor makes a statement about the client that may demonstrate to them another perspective on what they have just said. For example if the client says that they are useless because they are 'weak-willed', then the counsellor may think back through the content of the session and point out to them an instance which clearly demonstrated that they can be strong-willed and determined.

### Elicit Change Talk (Miller and Rollnick, 2002 p.76)

Self-motivational statements (otherwise known as 'change talk'); are overt declarations by the client that demonstrate recognition of the need for change; concern for their current position; intention to change; or the belief that change is possible. The counsellor aims to elicit these statements from the client in order to strengthen their motivation to change. This is in contrast to simply telling the client that they are capable of making the change and presenting them with the reasons why they should. This often has the effect of producing counter-arguments from the client instead of the desired pro-change arguments. The client is also more likely to be committed to the behaviour change if they have presented the reasons and optimism themselves.

Eliciting change talk (or self-motivational statements as it was formerly called) is a strategy which is important in helping to move the client out of ambivalence; and there are four broad types of change talk: problem recognition; concern; intention to change; and optimism for change (Miller and Rollnick, 1991). Encouraging the client to recognise that they have a problem and to allow them to express their concerns with regard to the problem behaviour are important first steps in the change process. It is also important for the individual to express intention and optimism towards the behaviour change, since without these elements their change attempts are likely to be short-lived as they do not truly want to change and neither do they believe that it is possible. There are six micro-skills involved in eliciting these kinds of change talk from the client and these are outlined below (Miller and Rollnick, 1991):

1) Ask evocative questions – this is a direct approach where the therapist asks the individual how they feel (e.g. what are you thinking about your problem at the moment?)

2) The decisional balance – this enables the client to express what they feel are the negative things about continuing with their problem behaviour as well as discussing the positive aspects. This allows the client to feel more relaxed as they have the freedom to discuss what they *like* about the problem behaviour.

3) Elaboration – asking the client to clarify or extend their response helps to reinforce the theme and to elicit further change talk (e.g. in what way?; such as?).

4) Using extremes – this helps them to explore their feelings towards the worst consequences that would result from not changing their behaviour and can thus elicit change talk effectively (e.g. what are your worst fears about what might happen if you don't make a change?).

5) Looking back – this is useful because it allows the client to think back to a time before the problem behaviour and to compare that time with their present situation (e.g. Do you remember a time when things were going well for you? What has changed?).

6) Looking forward – this helps the client to visualise what the future would be like if their behaviour was changed (e.g. what would be the best results you could imagine if you make a change?).

### Readiness to change (Rollnick et al., 1999; p.61)

According to MI, there are two major facets to being 'ready' to change: 1) the realisation of importance to change; and 2) feeling confident about making the change. For example a client may be fully aware of the reasons and the need for change but may not feel confident about making the change due to a lack of knowledge or support. Furthermore, despite knowing the reasons, they must also feel that these reasons are important to them (as opposed to being reasons that people keep telling them are important). The client must value the reasons him/herself in order for the change process to progress.

In MI a way to assess readiness to change is to first of all ask the client how important it is for them at this moment to change the behaviour. Scaled questions are a useful method to use, by asking clients to give themselves a number from 0 (not at all important to them) to 10 (extremely important to them) with regard to making the change. Once the number has been established the same procedure is followed with the confidence aspect; they are asked to assign themselves a number between 0 (not at all confident about changing) to 10 (extremely confident about changing). The counsellor then returns to the importance response and if it were for example 3 out of 10; they would ask the client why they chose 3 and not zero. This should produce the self-motivational statements discussed above and you can at the same time assess how much knowledge they have about the particular behaviour. Following this, deficits in their knowledge are not automatically filled by the counsellor; instead the counsellor asks *them* what they think it would take for them to move up to a 4 or a 5 in terms of importance. The client then usually directs the counsellor to the information that is most needed by them, most important for them, and most valued by them rather than the counsellor providing 'blanket' information that may or may not be particularly appropriate. The same process takes place with the confidence response. If they gave themselves 4 out of 10 for example, they would be asked "why 4 and not zero", which would elicit self-motivational statements regarding their capacity to change. The kind of help that they feel they need in order to feel more confident about changing will also be described by the client when the counsellor asks them what they would need in order to augment their score to a 5 or 6.

#### Pros and Cons

This is a useful strategy to use for gaining an understanding of the client's ambivalence, and it can also make the client feel less threatened. The counsellor asks the client to tell them about what they like about being as they are (e.g. what they like about being sedentary) and once these points are established, the counsellor summarises them and proceeds to ask them what they don't like about being as they are. This is an alternative to the traditional scenario where the professional tells them what is bad about their current behaviour, ignoring the 'good' things that the client has to say about their 'problem' behaviour. The latter example distances the client and increases the likelihood of resistance whereas the pros and cons approach relaxes the client as they can openly talk about what it is they like about their behaviour. They are often surprised that anyone is interested in what they like about the 'bad' behaviour and this relief clears the way for enhanced cooperation and communication. When the points are summarised and presented back to the client, they are often surprised about how little they actually like about being as they are and the extent to which they dislike some aspects of the behaviour. The client therefore is allowed to discover themselves what they feel as opposed to being told what and how to feel about the behaviour in question. This is important in terms of the client feeling in control and positive rather than being made to feel bad about themself and under pressure to conform. With the guidance of the counsellor the client creates a picture representing the discrepancy between their current behaviour and their ideal behaviour, this incongruent state therefore provides the impetus for change.

### Dealing with resistance

When a client has ambivalence with respect to a behaviour change, resistance is always something a counsellor has to be aware of and deal with. It is claimed that attempting to directly persuade a client to change will be ineffective because it entails taking one side of the

conflict which the client is already experiencing. The result is that the client may adopt the opposite stance, arguing against the need for change, thereby resulting in increased resistance and a reduction in the likelihood of change (Miller, Benefield and Tonigan, 1993; Miller and Rollnick, 2002; Rollnick and Miller, 1995). Instead, motivational interviewing allows the client to overtly express their ambivalence in order to guide them to a satisfactory resolution of their conflicting motivations with the aim of triggering appropriate behavioural changes (Rollnick and Miller, 1995). With MI, ambivalence and resistance are accepted as normal and respected by the counsellor and, rather than imposing goals or strategies, the counsellor encourages the client to consider alternative perspectives on the problem. Clients may actively dispute the need for change but the counsellor's role is not to try to subdue the client and render them a passive recipient of the counsellor's point of view through the force of argument (Markland et al., submitted). Miller and Rollnick (2002) describe the process of not engaging in conflict or trying to overpower a client's arguments against change as 'rolling with resistance', the fourth general principle of motivational interviewing. The aim is to transfer the responsibility for arguing for change to the client by eliciting self-motivational statements (see above).

The strategies just described have many parallels with SDT. For example the use of open questions and reflections can help the client to process and integrate his or her emotions through enhancing their feelings of autonomy, competence, and relatedness (Sheldon, Joiner, Pettit, and Williams, *in press*). Furthermore, reflections and summaries can help enhance the client's feelings of relatedness, and making positive affirmations during the session with the client can help them feel a greater sense of competence. The general lack of coercive or authoritative interactions from the counsellor to the client can also be viewed as being supportive of their autonomy. For example asking the client about the pros and cons of the behaviour is often a very liberating experience for the client, since they no longer feel compelled to restrict their talk to the 'bad' things about their behaviour, but they are also at liberty to say what they like about it. Furthermore, when the counsellor is not assuming a certain level of readiness, which again may help enhance feelings of autonomy.

#### Methods

### **Study Design**

The study design is a randomised pre to post test control group design. Participants were randomly allocated to one of three groups: control, attention-control, and a motivational interviewing group. Fifteen sets of the numbers 1-3 (1 being the control group; 2 being the attention control group; and 3 being the motivational interviewing group) were scrambled by computer in order to obtain a random sequence. As participants were recruited into the study they were assigned the next number (1-3) in the sequence. It was necessary to include an attention control group because it permitted a distinction to be drawn between MI being efficacious due to the extra attention participants receive, or whether MI is efficacious because of its idiosyncratic properties. Comparison treatment conditions have been included in other MI studies, with comparisons being made between the control condition, a brief advice condition, and an MI-based condition (Butler et al., 1999; Colby et al., 1998). It was also deemed necessary to assess participants belonging to each group in terms of their expectations with regard to taking part on the scheme. Systematic differences between groups would preclude any solid conclusions to be drawn from the study if the condition that was most efficacious was also composed of participants who initially had higher expectations than the other groups. Studies have shown that participants' expectations of benefit from training regimens can have a powerful impact on therapeutic outcomes (Shaw and Blanchard, 1983). Persson and Nordlund (1983) performed a study examining four treatments for phobias and found participants' expectations to be positively associated with outcome. It is therefore important to control for variations in participant expectations in order to minimise their potentially confounding influence.

# Participants

Participants were aged between 19-74 years of age and included males and females. All participants recruited were eligible for referral onto the local GP exercise referral scheme ("Exercise by Invitation" - EBI). Participants were recruited on a continuous basis as and

when referrals were made by the medical staff of 3 key medical practices in North Wales<sup>2</sup>. Participants were recruited into one of three groups (Control, Attention-Control, and Motivational Interviewing group) and for pragmatic reasons – i.e. time and resources available – the initial aim was to recruit 15 participants to each group, yielding a total of 45 participants for the study. Individuals assigned to the attention-control group and the motivational interviewing group met with the researcher in weeks 0, 2, & 8 for 30-minute intervention sessions. Individuals belonging to all three groups met the researcher in week 4 of the scheme purely for questionnaire completion. The control group received no intervention treatment but met with the researcher in weeks 0 and 4 for questionnaire completion. Participants were always seen on an individual basis.

Thirty-four participants initially agreed to participate in the study, four of whom ceased their participation in the study at various stages of its time course. Three out of the four 'discontinuers' were from the control and attention control groups, and one was from the motivational interviewing group. Those participants from the control and attention control groups who ceased participation cited 'a lack of time' as their principle reason for discontinuation. The one discontinuer from the motivational interviewing group ceased her involvement due to becoming pregnant.

#### Instruments

The package of instruments included in the study is detailed below: (copies of which can be found in the appendices).

<sup>&</sup>lt;sup>2</sup> Approximately one year before the commencement of this study, several medical practices in North Wales were visited by the researcher and discussions were held with the staff regarding the workability of the proposed studies and their co-operation was enthusiastically offered. Once preliminary studies had been completed and ethics approval had been granted (by the North West Wales Health Trust Research Ethics Committee) for the present study, the researcher returned to these practices to make a presentation to the doctors and nurses about her research and to update them on its progress. The present study protocol was then described and their potential contribution to the study was outlined. The researcher felt it courteous and essential that they were actively involved in deciding how they would contribute, and discussion of various strategies took place. The main objective of the discussions was that of minimising extra work for their staff. Only 3 practices were targeted in this study in order to keep it manageable.

1. "Leisure-Time Exercise Questionnaire" - (Appendix 1.D).

This measure (Godin and Shephard, 1985) assessed patterns of self-reported exercise. The LTEQ contains three questions assessing the frequency of strenuous (heart beating rapidly), moderate (not exhausting but moderately hard), or mild (minimal effort) exercise engaged in for a minimum of 15 minutes during a typical week (7-days). Each category is accompanied by typical examples of exercises that would be classed as strenuous, moderate, or mild (see Appendix 1.D). These frequencies are then transformed into METS (a unit representing the metabolic equivalent of physical activity in multiples of resting oxygen consumption). Weightings are applied to the frequencies by multiplying the number of sessions by nine for strenuous exercise; by five for moderate exercise; and by three for mild exercise. Once the weightings have been applied the figures are summed creating a total exercise score for each person. This measure has been shown to correlate well with physiological indices of fitness such as body fat percentage and VO<sub>2</sub> Max (Jacobs, Ainsworth, Hartman, and Leon, 1993). The exemplar activities provided on the original questionnaire were modified to match activities practiced in the UK (e.g. activities such as 'snow mobiling' and 'alpine skiing' were omitted as they are not accessible on a weekly basis to the general UK population).

# 2. "The Exerciser's Inventory"- (Appendix 1.C).

This questionnaire booklet consisted of a tool to assess an individual's perceptions of environmental support (Perceived Environmental Supportiveness Questionnaire - PESQ) and a tool to assess an individual's level of psychological need satisfaction within the exercise context (Perceived Psychological Need Satisfaction Questionnaire). These questionnaires were developed and validated in a previous study by the present researcher (see Chapter Two).

3. "The Behavioural Regulation In Exercise Questionnaire - 2" (BREQ 2 – Mullan *et al.*, 1997) was used to measure amotivation, and external, introjected, identified and intrinsic forms of regulation of exercise behaviour based on Deci and Ryan's (1985, 1990) continuum conception of extrinsic and intrinsic motivation (see Appendix 4.A for items, and Chapter Two, p. 35).

4. In order to assess whether or not participants from each treatment condition possessed equal expectations with regard to their involvement on the exercise referral scheme, a short questionnaire (Appendix 4.B) was included. This assessment was important as differences in expectations might have influenced progress on the scheme. The questions were based on the ideas of Borkovec and Nau (1972) on the measurement of expectancies of therapeutic benefit and on similar scales used by Moses, Steptoe, Matthews and Edwards (1989) in a study of the effects of exercise training on mental well-being.

#### **Treatment Conditions**

## 1. Motivational Interviewing Group

Session 1(wk 0) – Duration: 30 minutes - The aims of the first session were to build rapport with the client enabling them to talk openly about their feelings towards exercise. The participant's ambivalence towards taking up exercise was then discussed, their importance, confidence, and readiness with regard to beginning exercise was assessed through scaled questions (see the preceding section on 'Readiness to change').

Session 2 (wk 2) - Duration: 30 minutes - The participant was asked to talk about the past two-weeks and how they felt about the scheme so far (this was achieved through the use of open questions and reflective listening). The researcher encouraged the participant in their efforts and supported their self-efficacy with regard to exercise by making positive affirmations about their efforts so far. Participant concerns were addressed and options for resolving any problems were discussed collaboratively. Strategies for preventing relapse into sedentary behaviour were also discussed.

Session 3 (wk 8) - Duration: 30 minutes - The participant was asked to talk about the past six-weeks and how they felt about the scheme and their exercise (this was achieved through the use of open questions and reflective listening). The researcher re-assessed their importance, confidence and readiness with regard to continuing with exercise in order to address any deficits in their motivation (the scaled questions were again used for this purpose). The researcher encouraged the participant in their efforts and supported their self-efficacy with regard to exercise by making positive affirmations about their efforts so far. Participant concerns were addressed and options for resolving any problems were discussed collaboratively. Strategies for preventing relapse into sedentary behaviour were discussed which included learning to recognise the difference between a 'slip' (i.e. missing a single

session) and a relapse (i.e. continually missing sessions), and planning the week ahead in terms of exercise sessions.

### 2. Attention Control Group

The sessions with participants in the attention-control group consisted of delivering exercise information to them. These sessions were strictly informational, if participants raised any problems with regard to their exercise programme, the researcher politely advised them to consult with the gym instructor.

Session 1 (wk 0) – Duration: 30 minutes - This involved the researcher going through a booklet with the participant about the benefits of exercise with regard to health. This booklet was then given to them at the end of the session (Appendix 3.A).

Session 2 (wk 2) – Duration: 30 minutes - This involved the researcher going through a booklet with the participant about the importance of warming-up, cooling-down, and stretching. The participant was given descriptive information as well as being shown how to do the stretches. The booklet was then given to them at the end of the session (Appendix 3.B).

Session 3 (wk 8) – Duration: 30 minutes - This again involved the researcher going through a booklet with the participant; the booklet illustrated and described various different toning exercises. The researcher also demonstrated the exercises described in the booklet. The participant was asked to try them and was given the booklet to take away at the end of the session (Appendix 3.C).

#### 3. Control Group

Participants in the control group met with the researcher during week 0 and 4 when the questionnaires were administered. In week 10 control participants were contacted to ascertain their scheme adherence. No other meetings took place.

### Procedure

### Step 1 – At the GP surgery (Pre-scheme)

Whilst in the GP surgery, the doctor /nurse asked individuals who met the referral criteria for the Exercise by Invitation Scheme (Appendix 4.C) if they would like to be involved in some research regarding exercise participation. The doctor / nurse obtained written consent from the patient to pass their contact details on to the researcher (Appendix 6.A). Consenting clients were then told that the researcher would contact them soon to explain the study and to ask them for their co-operation. The contact details of recruited clients were then faxed to the researcher by the medical staff so that an initial appointment could be arranged with the researcher.

### **Step 2 – Telephone contact (Pre-scheme):**

The researcher telephoned each client to introduce herself and to thank them for considering taking part in the study. They were given a broad outline of the nature of the project and were told that should they decide to take part they would be randomly allocated to one of three groups. One group would complete the exercise scheme as normal and all they would be required to do would be to complete a questionnaire on three occasions. Another group would be required to meet with the researcher three times during the scheme for 30 minutes each time and they would be provided with exercise information. Finally, the last group would be required to meet with the researcher three times during the scheme for 30 minutes each time and they would discuss their exercise experiences on the scheme and their feelings about exercise.

#### **Step 3 – Meeting 1 (Wk 0):**

Irrespective of group, participants attended an initial meeting with the researcher. At this meeting they completed an informed consent form (Appendix 6.B) and their current exercise levels were assessed using the "Leisure Time Exercise Questionnaire" (Godin and Shephard, 1985). Individuals belonging to the control group arranged to meet with the researcher in four weeks time to complete another questionnaire. No more time was spent with this group in meeting 1.

Individuals belonging to the attention control (AC) group then received information about the benefits of exercise and were given a booklet to take away (Appendix 3.A).

The MI group received their first MI-based session.

A second appointment with participants from the AC and MI group was arranged for two weeks time.

### Step 4 - Meeting 2 (Wk 2):

There was no meeting for control group participants.

Individuals belonging to the attention control (AC) group received information about warming-up before exercise, cooling-down after exercise and stretching effectively and were given a booklet to take away (Appendix 3.B). The MI condition had their second MI-based session.

Appointments with participants from the AC and MI group were arranged for two weeks later when they would complete questionnaires.

# Step 5 – Meeting 3 - Questionnaire administration (Wk 4):

All participants were given the PESQ to complete (Appendix 1.C) in order to assess their perceptions of environmental support, psychological need satisfaction and to ascertain the number of exercise sessions that they had attended to date. It was assumed that by the fourth week, participants would have completed at least two sessions (based on typical referral client patterns reported by the instructors) which would enable them to answer the questions. At the end of the session, participants from the AC and MI groups made a further appointment to see the researcher which would take place four weeks later. Control participants were informed that the researcher would telephone them in six weeks time to find out the number of exercise sessions that they had attended so far.

# Step 6 – Meeting 4 (Wk 8):

Individuals belonging to the attention control (AC) group received information about various different toning exercises and were given the booklet to take away (Appendix 3.C). Motivational interviewing participants received their third MI-based session. They were then informed that the researcher would telephone them in two weeks time to find out the number of exercise sessions attended so far.

### Step 7 – Adherence information (Wk 10):

All participants are given a record card when they start the Exercise by Invitation scheme, which they must bring to the leisure centre each time they visit. On each visit the session number is ticked off by the receptionist so that both the centre and the client can keep track. In order to determine each participant's scheme adherence they were telephoned and asked how many sessions had been recorded on their card. The researcher then thanked them for their participation and asked them if they would complete another questionnaire that would be mailed to them in three months time (Appendix 1.C & 1.D).

### Step 8 – Post-Scheme Questionnaire (Wk 22):

All participants were posted the same questionnaire that they were administered in week 4 (see instrument section above) but were only required to complete the second section (PPNSQ) in order to assess their perceived level of psychological need satisfaction. The first section (Perceived Environmental Supportiveness Questionnaire) was not used at this point because participants may have been engaging in independent exercise outside of the centre, hence the PESQ would not be relevant. The same Leisure Time Exercise Questionnaire that was given to them in week 0 was also sent to them to ascertain their weekly exercise levels. A pre-paid envelope was supplied for the return of the questionnaires to the researcher.

### Step 9 – Post-scheme Interview (Wk 23):

Four randomly selected participants from each group were contacted and invited to an indepth interview with the researcher (see the interview guide in Appendix 6.C). The researcher opened the interviews by asking them to talk about their experiences on the EBI scheme. All interviews were tape recorded (with the participant's consent), transcribed and analysed. Consenting participants were given the option of having the interview at their home, or at the University. Transport was provided for those wishing to be interviewed at the University. Figure 6.1 below summarises the study protocol.



\*During week 23 four participants from each group were randomly selected for an in-depth interview with the researcher.

Figure. 6.1 - Graphical Representation of Study Protocol

#### Analyses

#### Quantitative

A one-way MANOVA was performed in order to examine group differences in participant expectation, and three separate one-way ANOVAs were performed in order to examine group differences in perceived environmental supportiveness. This was followed by three separate one-way ANOVAs in order to examine group differences on the three needs (autonomy; competence; relatedness); and a repeated measures MANOVA in order to examine changes in need satisfaction across time. Additionally, a set of one-way ANOVAs was carried out in order to examine group differences on scheme adherence and maintenance of exercise 12 weeks after the end of the 10-week scheme, in addition to a repeated measures ANOVA to examine changes in exercise behaviour across time. Finally, analyses were performed on the BREQ-2 subscales with regard to group differences (for this a set of one-way ANOVAs was used), and differences across time for which a repeated measures MANOVA was used.

The final sample size for this study was small (N=30); each group contained between nine and eleven participants. As a consequence, the power of the study was low, thus increasing the risk of making Type II errors. One way to compensate for the small sample size would be to raise the alpha level for the analysis of the dependent variables to 0.1 (as recommended by Franks and Huck, 1986). However, since a large number of statistical tests were performed on the same set of data, the risk of committing Type II errors was offset by the risk of committing Type I errors as a function of the number of analyses performed. It was therefore considered appropriate to leave the alpha level at 0.05.

### Qualitative

Four randomly selected participants from each group took part in an in-depth interview (see the interview guide in Appendix 6.C), the contents of which were subjected to a hierarchical content analysis where key themes and categories of their experiences throughout the scheme were identified. Quantitative and qualitative methods were employed in order to permit triangulation.

# Debriefing

At the end of the 23-week study period, all three groups were contacted individually in order to explain more fully the mechanisms of the study. The control group and attention-control group were offered an exercise psychology consultation with the researcher, since they did not receive any motivational interviewing during the study. The motivational interviewing group was not offered any further consultations.

# Results

Thirty individuals formed the final sample for this study, 60% of the sample was female (mean age= 46.39 yrs; SD= 17.65), and 40% was male (mean age= 51.17 yrs; SD= 10.58). An independent samples t-test did not reveal any statistically significant differences between males and females by age (t=0.840 (28); p<0.05). The mean baseline exercise level for the sample was 9.60 METs per week, SD=11.26. In terms of occupation, 23% were retired, 17% manual, 13% were housewives, 13% clerical, 10% care workers, 7% unemployed/sick, 7% retail. The remainder of the sample (10%) comprised of a number of occupational sectors. Mean body weight of the sample was 78.98kg (SD=18.03kg); and mean height was 1.65m (SD=0.12m). The sample was at the upper end of the overweight category of the body mass index (M = 28.68 kg/m<sup>2</sup>, SD = 5.20) as would be expected in this population. The ethnic origin, first language, and level of education are presented below in Table 6.1.

Table 6.1. Ethnic origin, first language,	and leve	el of education	of the sample
---	----------	-----------------	---------------

Ethnic Origin	White	97%
F	Black	3%
First Language	English	74%
-	Welsh	23%
-	Other	3%
Level of Education	Secondary	40%
-	College	37%
-	University	13%
-	Postgraduate	10%



Figure 6.2. Reasons for referral

Ten participants formed the control group (seven female, three male: mean age = 51.10, SD = 18.61), nine participants formed the attention control group (four female, five male: mean age = 44.56, SD = 14.12); and 11 participants formed the motivational interviewing group (seven female, four male: mean age = 48.82, SD = 13.31). A one-way ANOVA revealed that the three groups were not significantly different with respect to age (F(2, 27) = 0.432, p=0.653). No significant differences in baseline exercise level (PA1) were observed between the groups (F(2, 27) = 1.092, p=0.350).

A one-way MANOVA was performed on the measures of expectation in order to establish whether the three groups significantly differed in terms of the participants' expectations that the scheme would 1) help improve their fitness level; 2) help improve their health; and 3) help them to continue with regular exercise. Results showed that the groups did not significantly differ on the three expectation questions (F(6, 52), = 1.128, p=0.360).

#### Group differences in autonomy support, structure, and involvement:

It was hypothesised that there would be group differences in environmental support at week 4 (autonomy support, structure, and involvement). Three separate ANOVAs were performed in order to examine this. ANOVA results revealed that the groups significantly differed from each other on autonomy support (F(2, 27) = 4.073, p < 0.05; eta squared = 0.232; observed power = 0.674). A Tukey's test revealed the difference to be between the control group and the motivational interviewing group (p=0.27), with greater autonomy support shown by the

latter group (see Figure 6.3 below). No other group differences were found (structure: (F (2, 27) = 0.982, p = 0.387; eta squared = 0.068; observed power = 0.203; involvement: F (2, 27) = 1.255, p = 0.301; eta squared = 0.085; observed power = 0.249).



Figure 6.3. Mean scores for each group on autonomy support (AS), Structure (ST), and Involvement (INV) at week 4.

## Group differences in autonomy, competence, and relatedness:

It was also hypothesised that there would be group differences in psychological need satisfaction (autonomy, competence, and relatedness). Separate ANOVAs were performed in order to examine group differences on each of the psychological needs at week 4 and week 22. Analyses failed to reveal any group differences on psychological need satisfaction at week 4 or at week 22.

Examination of the mean values for each group indicated a pattern which generally follows the one predicted; with the control group displaying the lowest values, and the MI group displaying the highest. The only variable that did not follow this pattern was relatedness. At both week 4 and week 22 the AC group had a lower relatedness score than the control group (see figures 6.4 and 6.5 below).



Autonomy: F(2, 27) = 0.117, p = 0.890; eta squared = 0.009; observed power = 0.066. Competence: F(2, 27) = 0.602, p = 0.555; eta squared = 0.043; observed power = 0.140). Relatedness F(2, 27) = 0.428, p = 0.656; eta squared = 0.031; observed power = 0.112).

Figure 6.4. Mean scores for each group on autonomy (LCE), competence, and relatedness at week 4.



Autonomy: F(2, 27) = 0.270, p = 0.974; eta squared = 0.002; observed power = 0.054. Competence: F(2, 27) = 1.702, p = 0.201; eta squared = 0.112; observed power = 0.326). Relatedness F(2, 27) = 1.810, p = 0.183; eta squared = 0.118; observed power = 0.344).

Figure 6.5. Mean scores for each group on autonomy (LCE), competence (COMP), and relatedness (REL) at week 22.

A repeated measures MANOVA was also performed in order to look at differences in autonomy, competence, and relatedness across time. The analysis failed to reveal a main effect for treatment group (F(6, 50) = 1.063; p = 0.397; eta squared = 0.113; observed power = 0.379) – (see figures 6.6, 6.7, & 6.8). However, a main effect for time was revealed F(3, 25) = 3.103, p = 0.045; eta squared = 0.271; observed power = 0.652, with need satisfaction decreasing over time. Follow up univariate ANOVA results revealed a significant decrease in relatedness for all groups over time (F(1, 27) = 5.222; p = 0.03; eta squared = 0.162; observed power = 0.596). No significant group by time interactions were revealed (F(6, 50) = 0.278; p = 0.945; eta squared = 0.032; observed power = 0.118)



Figure 6.6. Graph showing group mean scores for autonomy (LCE) at 4-weeks and 22-weeks.



Figure 6.7. Graph showing group mean scores for competence at 4-weeks and 22-weeks.



Figure 6.8. Graph showing group mean scores for relatedness at 4-weeks and 22-weeks.

# Group differences in the BREQ-2 subscales

BREQ-2 subscales were also examined; it was hypothesised that the motivational interviewing group would display higher scores on more self-determined forms of regulation (intrinsic and identified regulation). The 5 separate one-way ANOVAs (see Table 6.2) did not reveal any significant group differences at week 4 measurement, but group differences were revealed for amotivation at week 22 (F(2, 27) = 4.409, p < 0.05). A Tukey's test revealed that the difference lay between the control group and the motivational interviewing group (p = 0.029); with the control group displaying a higher level of week 22 amotivation than the motivational interviewing group (see Table 6.3 and Figure 6.9).

	Int	rinsic	Identified		Int	Introjected		ternal	Amotivated		
	M	SD	Μ	SD	Μ	SD	M	SD	M	SD	
Control	2.90	0.93	3.53	0.53	1.93	1.31	0.53	0.69	0.40	0.63	
AC	3.11	0.63	3.30	0.72	1.70	1.40	0.89	0.64	0.31	0.43	
MI	2.75	1.32	3.61	0.68	1.55	1.23	0.32	0.78	0.18	0.60	
DF		(2,27)	(2.	27)	(2.	27)	(2	27)	(2	27)	
DE		(2.27)	1 (0	07)	10	07)		0.53	1		
F value	9	0.307;	0.0	507	0.2	231	1.604		0.394		
P value	2	0.738.	0.5	552	0.7	0.795		0.220		0.678	
Eta Sq.	ž	0.220	0.0	0.043		0.017		0.106		028	
Obs.Powe	r	0.094	0.1	141	0.082		0.309		0.107		

Table 6.2. Means,	standard deviations,	and ANOVA	results for the	BREQ-2 subscales	at
week 4.					

	Intrins	Intrinsic		Identifie d		Introjected		ternal	A	motivated
	Μ	SD	M	SD	Μ	SD	M	SD	M	SD
Control	2.55	1.37	3.03	0.84	1.60	1.17	0.95	1.10	0.68	0.68
AC	2.28	1.30	2.85	1.49	1.96	1.47	1.25	1.24	0.58	0.75
MI	2.84	1.27	3.55	0.62	1.91	1.37	0.55	1.02	0.00	0.00
ANOVA	A result:	s:								
DF	(2	,27)	(2,2	27)	(2	,27)		(2,27)	1	(2.27)
F value	0.	458	1.2	1.278		0.211		1.008	4.409	
P value	0.	637	0.2	95	0.	0.811		0.378	$0.022^{*}$	
Eta Sq.	0.	033	0.0	0.087		0.015		0.070		0.246
Obs.Power	0.	117	0.253		0.0	080		0.207		0.710

Table 6.3. Means, standard deviations, and ANOVA results for the BREQ-2 subscales at week 22.

\* denotes significance at the 0.05 level.



\*Amotivation at week 22 was zero for the MI group.

Figure 6.9. Mean scores for each group on Amotivation at week 4 and 22<sup>\*</sup>.

### Group and Time differences in RAI

A two-way ANOVA with repeated measures on test revealed a main effect for test (F(1, 27) = 4.813, p<0.05; eta squared = 0.151; observed power = 0.562). The analysis failed to reveal a main effect for group (F(2, 27) = 0.953; p = 0.398; eta squared = 0.066; observed power = 0.198) or any group by test interactions (F(2, 27) = 1.285; p = 0.293; eta squared = 0.087; observed power = 0.254). Examination of the mean values however indicate that whilst the mean RAI value for control and AC groups decreased from week 4 to week 22, the MI group

maintained its value over time. This difference however failed to reach significance (see Table 6.4 and Figure 6.10).

	RAI 1		RAI 2		
	M	SD	M	SD	
Control	11.58	5.55	8.19	8.40	
AC	11.53	4.56	6.32	11.51	
MI	12.73	6.20	12.61	6.18	

Table 6.4.	Means	and	standard	deviations	for	RAI	at	week 4	and	week 22	2.



Figure 6.10. Mean scores for each group on RAI at weeks 4 and 22.

# Group differences in scheme adherence:

Scheme adherence was hypothesised to differ between the groups; with the motivational interviewing group (MI) showing greater adherence to the scheme (in the tenth week of participation) when compared with the control and attention control groups. The data were analysed by using a one-way ANOVA, and the test failed to reveal any significant group differences on tenth week adherence (F(2, 27) = 1.427, p=0.258; eta squared = 0.096; observed power = 0.279). However, the group means showed an upward trend in adherence from the control group to the MI group.

	Mean	SD
Control	5.20	3.97
AC	6.67	3.84
MI	7.73	2.41

Table 6.5. Means and standard deviations for the number of sessions completed by the 10<sup>th</sup> week of the exercise scheme.

### Group differences in leisure-time exercise:

It was further hypothesised that the MI group would display greater increases in exercise from baseline measurement and to measurement three months post-scheme. A 2-factor ANOVA (group x test with repeated measures on test) was used to analyse the data. The analysis failed to reveal any significant group by test interactions (F(2, 27) = 0.647; p = 0.532; eta squared =0.46; observed power = 0.147), although a significant main effect was found for test (F(1, 27) = 41.427, p < 0.05; eta squared = 0.605; observed power = 1.000). Examination of the group means (see Figure 6.11 below) appears to demonstrate a slight trend towards a greater increase in exercise for the MI group than the other two groups.



Figure 6.11. Mean leisure-time exercise levels for each group pre-scheme (PA1) and post-scheme (PA2).

Table 6 6. Mean leisure-time exercise level for each group pre-scheme (PA1) and post-scheme (PA2) with their standard deviations.

		Control				Attention-Control				Motivational Interviewing			
	PA1		PA2		PA1		PA2		PA1		PA2		
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
No. of weekly sessions of mild exercise	2.20	2.86	4.90	2.51	2.89	4.94	3.33	4.58	3.00	3.00	3.82	2.40	
No. of weekly sessions of moderate exercise	0.20	0.42	0.80	0.79	0.22	0.67	0.78	0.83	0.45	0.82	1.64	1.43	
No. of weekly sessions of strenuous exercise	0.00	0.00	0.00	0.00	0.00	0.00	0.78	0.97	0.00	0.00	0.82	1.08	
Overall exercise value (METS)	7.60	10.00	18.70	10.41	9.78	14.45	20.89	19.13	11.27	10.19	27.00	9.60	

### Group differences in mild, moderate, and strenuous exercise

Exercise levels were also examined in terms of mild, moderate, and strenuous types of activity. Three separate ANOVAs (group x test with repeated measures on test) were carried out. Significant main effects for test were revealed for all categories of exercise: mild exercise (F(1, 27) = 9.118, p < 0.05; eta squared = 0.252; observed power = 0.829); moderate exercise (F(1, 27) = 11.558, p < 0.05; eta squared = 0.300; observed power = 0.906); strenuous exercise (F(1, 27) = 11.865, p < 0.05; eta squared = 0.305; observed power = 0.913). No group by time interactions were revealed for mild or moderate exercise (mild: F (2, 27) = 2.517, p=0.099; eta squared = 0.157; observed power = 0.461; moderate: F (2, 27) = 0.812, p=0.455; eta squared = 0.057; observed power = 0.174). A group by time interaction approached significance for strenuous exercise (F(2, 27) = 3.007, p=0.066; eta squared = 0.182; observed power = 0.535) with a greater increase in strenuous exercise observed in the motivational interviewing group and the attention control group compared with the control group. Examination of the group means also indicated that the largest increases in mild exercise appear to be for the control group (see Figure 6.12). This is in contrast to increases in moderate and strenuous exercise for which the MI group showed the largest increase from baseline to post-test (see figures 6.13 and 6.14).



Figure 6.12.Mean levels of mild exercise pre and post scheme for each group.



Figure 6.13. Mean levels of moderate exercise pre and post scheme for each group.



Figure 6.14.Mean levels of strenuous exercise pre and post scheme for each group.

### **Discussion of quantitative results**

The purpose of the study was to investigate the extent to which the provision of motivational interviewing (MI) on referral to the GP exercise referral scheme enhances the perceived supportiveness of the environment so that it more effectively meets the three psychological needs, thereby facilitating adherence and maintenance of exercise levels. It was predicted that individuals in the motivational interviewing group would demonstrate higher levels of perceived environmental support; higher levels of psychological need satisfaction; and thereby greater scheme adherence and post-scheme exercise participation.

The hypothesis regarding group differences in autonomy support, structure, and involvement failed to be supported by the present results. It was hypothesised that the MI group would yield higher scores on these perceptions of environmental support as the intervention given to this group aimed to enhance these supports. The only group difference revealed by the analysis was for autonomy support. Specifically, perceptions of autonomy support were higher in the MI group than in the control group. No significant differences were found between the AC group and the MI and control groups. However, scrutiny of the mean values illustrated the predicted direction; with the control group displaying the lowest level of autonomy support (mean = 2.30); followed by the AC group (mean = 2.59); and the MI group (mean = 3.33). However it is probable that due to such a small sample size, these differences did not reach significance by virtue of the low observed power and small effect sizes for autonomy support, structure, and involvement. There is also the possibility that some participants did not include the present researcher in their evaluation of environmental support. The questionnaire items had the following stem: "The staff at the exercise facility" and despite the researcher pointing out to the participants that 'the staff' was to include the researcher as well, one can see how easy it would be for them to still focus on the exercise facility staff because of the way the items were worded.

Contrary to the hypothesised group differences in autonomy, competence, and relatedness, no significant group differences were revealed at week 4 measurement or post-scheme measurement of the three needs. Examination of the group means indicated that although there was little difference between the control group and the AC group, the MI group values were somewhat higher than the other two groups. This difference however was not strong enough to produce a statistically significant group difference.

This could again be due to the small sample size, but could also be due to a lack of real differentiation between the interventions. No manipulation checks were carried out to

ensure that the interventions were sufficiently different from each other, thus it is impossible to establish if the interventions provided were strictly adhering to the control, attention control, and motivational interviewing protocols. Furthermore, it is questionable how closely the 'control' group was in fact a 'no treatment' condition since there was initial contact with participants, and contact at 4 and 10 weeks into the scheme. Despite the researcher making every attempt to keep conversation to a minimum when meeting with the control participants, it is possible that in the course of being polite and respectful, participant perceptions of environmental support could have been unwittingly enhanced. At the end of the study, some participants even mentioned how the questionnaire was useful, as it 'made them think' more about exercise and how they felt about it, so even an apparently innocuous questionnaire could have made the control group less of a 'no treatment' condition. Such reactive effects have frequently been documented in the social sciences with regard to the process of *measuring* and how it can change that which is being *measured* (Campbell, and Stanley, 1966; Cherulnik, 1983).

The attention control group may also have perceived their education sessions as being motivationally supportive simply because the researcher delivered the information to each participant in a way that was polite and respectful. An alternative would be for the researcher to sit with the participant for the duration of the session, but let the participant read through the booklet as opposed to the researcher going through the booklet with the participant.

Another possible explanation of the lack of significant results could be due to the selfselected nature of the individuals taking part. The GPs asked the individuals if they would be interested in taking part in the study, and those who consented were then contacted by the researcher. The fact that particular individuals *chose* to take part may indicate that they were more motivated than the average GP exercise referral client. The small number of patients recruited for the study did not reflect the rate at which GP exercise referrals were being made, which suggests that many of the referees did not wish to take part in the study and this may have lead to the present sample being biased. A further implication of this would be that perhaps the participants involved in the present study did not actually have a high degree of ambivalence with regard to exercise behaviour. As part of the motivational interviewing intervention, readiness to change was verbally assessed using scaled questions regarding how confident participants felt; and how important participants felt it was to start exercising (please refer to the 'readiness to change' section for a detailed description of the questions). These responses were recorded by the researcher, and all participants except one provided an importance rating that exceeded six (out of a possible 10). A similar set of responses was observed with the confidence ratings, with all but one participant reporting confidence ratings in excess of five. This is important since motivational interviewing has been observed to work best when individuals are truly ambivalent; so using the motivational interviewing approach with individuals who may already be prepared to change may have made the intervention appear to be less effective. This was found in a randomised control trial in the context of smoking (Butler *et al.*, 1999). Butler *et al.*, concluded that those less ready to quit smoking may benefit more from motivation-enhancing interventions while those more ready might benefit more from action-orientated advice (p. 615).

The degree of importance and confidence towards exercise reported by the motivational interviewing participants of the present study suggests that they may have benefited more from an 'action-orientated' intervention. This has important implications for clinicians with regard to which type of consultation should be used with patients who are in need of exercise. Those patients deemed 'less ready' would appear to be better suited to a motivational consulting style compared with those who are perhaps more ready, and in need of more action-focused style. Studies in a number of domains have shown that stage-matched interventions can be more effective than standard interventions. Campbell et al., (1994) found that in the context of dietary improvement participants in a stage-matched group demonstrated greater improvements relative to those in the standard group. Similar results have been reported with smoking behaviour (Prochaska, DiClemente, Velicer, and Rossi, 1993); and with encouraging women to attend breast screening examinations (Skinner, Stretcher, and Hospers, 1994). A systematic review of the effectiveness of stage based interventions to promote smoking cessation however, concluded that overall, the evidence suggested that stage based interventions are no more effective than non-stage based interventions or no intervention in changing smoking behaviour (Riemsma et al., 2003). However, the authors point out that this conclusion should be considered with caution as the methodological quality of the trials that were reviewed was mixed, and few reported any validation of the instrument used to assess participants' stage of change.

Taking all of the above points into consideration, it may nonetheless have been useful to assess each participant's stage of readiness, using a standardised questionnaire (e.g. Marcus and Simkin, 1993) so that this avenue could have been explored.

In this study, the MI-based intervention that was used, aimed to develop an individual's self-determination towards exercise through the provision of environmental

support. It was therefore hypothesised that the MI group would show more self-determined forms of regulation than the AC and control groups. Specifically, the MI group was predicted to show higher levels of intrinsic regulation and identified regulation than the AC and control groups. No significant group differences were observed on any of the BREQ-2 subscales at week 4 measurement and only one significant group difference was revealed among the subscales at week 22. The significant difference observed at week 22 was on amotivation; the control group compared to the MI group exhibited higher levels of amotivation. No significant difference was observed between the control group and the AC group, but the difference between the AC group and the MI group - although not found to be statistically significant - approached significance.

The finding that the control group exhibited higher levels of amotivation in comparison to the motivational interviewing group at the three months post-scheme time point makes theoretical sense, as the control group received minimal support. The attention control group and the motivational interviewing groups on the other hand did receive extra support, and this may have prevented these groups from becoming amotivated towards exercise once the scheme had ended. There was no significant difference revealed between the attention control group and the control group, but nor was there a significant difference between the motivational interviewing group and the attention control group. This implies that despite the intervention preventing some degree of amotivation (shown by the lower mean value of amotivation for the attention control group compared to the controls) the intervention was not powerful enough to influence the attention control groups' level of amotivation from the control groups' level at the post-scheme time point. This can be viewed as providing support for the hypothesis that providing a motivational interviewing based intervention for this population can help reduce the likelihood of developing amotivation. It is interesting that this difference was not observed at the first time point (the fourth week of the scheme), which could imply that the effects of the intervention take time to manifest themselves in motivational terms. From an applied perspective, this would have important implications for training referral scheme staff members, because the true value of helping individuals develop a more self-determined form of behavioural regulation may take time to emerge, and their efforts therefore should be thought of in terms of 'investing' in the client as opposed to having an immediate motivational impact upon them.

Group differences in RAI (the Relative Autonomy Index) failed to emerge from the analyses for week 4 or week 22 measurements. Nor were there any group by time interactions revealed, which gives a picture of all groups following the same pattern of week 4 to week 22

168

RAI. However, when the mean values for each group at the two time points were examined. it was clear to see that the motivational interviewing group RAI scores behaved somewhat differently from that of the control and attention control groups. Both the control and attention control groups demonstrated a noticeable drop in RAI from week 4 to week 22 (control group: 3.39; attention control group: 5.21), in contrast to the motivational interviewing group which decreased by only 0.12. This suggests that the motivational interviewing intervention may have made their self-determination more robust, and strong enough to survive the passage of time. However, these differential effects were not large enough to produce a significant result despite being in the desired direction. The observation that the motivational interviewing group appeared to better maintain their level of RAI across time may link in with the significant group difference observed with autonomy support. The motivational interviewing group reported significantly higher levels of autonomy support in the fourth week of the scheme, and also maintained their level of RAI from that point until the 22<sup>nd</sup> week of the scheme. One could argue that the higher levels of autonomy support could have contributed to the development of an apparently more robust RAI for the motivational interviewing group. However despite this link making theoretical and intuitive sense, without conclusive evidence in support of it, caution must be used with this interpretation. The time allowed for this study did not permit a longer-term follow-up of RAI scores; it would be interesting to see whether the RAI scores of the motivational interviewing group could be sustained over a longer period of time than that studied here.

Groups were hypothesised to differ in terms of scheme adherence (as measured by the number of sessions completed by the final week of the exercise scheme). However, analyses failed to reveal any such group differences. This could be due to the small sample size; perhaps a larger sample may have increased the strength of the differences between the groups that was evident upon scrutiny of the group means for adherence. The mean values showed an upward trend in adherence from the control group to the MI group, which reflected the predicted direction.

In addition to the sample size, the fact that there was a limit to the number of sessions available to the participants on the scheme - which therefore precluded the scope for large variations in adherence scores – may also have contributed to the lack of significant group differences in adherence.

The results of the present study revealed significant increases in levels of leisure-time exercise participation for all groups involved in the exercise referral scheme. Since the baseline exercise levels were low (many of the participants led a sedentary lifestyle) this

global increase in exercise level, is as one would expect. Any intervention aimed at increasing exercise levels would be expected to generate some degree of improvement with this population. However, the finding that the motivational interviewing (MI) group failed to show a significantly larger increase in pre and post scheme exercise, could again be due to the small sample size involved in the study. Examination of the mean values for each group at baseline and post-scheme indicated that the level of exercise for the control group was the lowest at both time points, followed by the attention control (AC) group, and with the MI group exhibiting the highest levels of all; so in spite of this trend not being significant, it was nonetheless in the predicted direction.

The overall levels of exercise discussed in the preceding paragraph, were composed of mild, moderate, and strenuous exercise subtypes. These subtypes were examined for group differences. The analyses demonstrated all groups to have increased their levels of mild, moderate and strenuous exercise levels. However, a closer examination of the mean values indicted that the control group did not increase its level of strenuous exercise pre to post test (at both points the mean was zero). This interaction however was not significant, although it was close to reaching significance. This has implications for encouraging individuals to increase their level of strenuous exercise; perhaps a greater amount of support is necessary for promoting a higher intensity of exercise.

In conclusion, despite the limitations of this research, a number of interesting results emerged. Firstly, from a health promotion perspective the data suggests that GP exercise referral schemes can be successful in increasing exercise levels (as demonstrated by prescheme to three months post-scheme assessment). However, the lack of a true control group must also be considered along with this suggestion. Secondly, this study suggests that being exposed to a motivational interviewing based intervention can lead to enhanced perceptions of autonomy support, and lower levels of post-scheme amotivation. This is an important point, as the GP exercise referral schemes aim to inculcate a regular exercise habit within the patients who are referred so that the maximum health benefits can be obtained. Individuals therefore need to stay motivated in order to ensure the longevity of their participation in exercise.

### **Qualitative Analyses**

The first section of the present chapter focused on quantitative data capture and analysis, which was able to reveal certain characteristics and relationships among the data using a
statistical approach. However, employing a qualitative approach allows data that is richer and more detailed to be captured and allows participants to be understood in 'their own terms' as opposed to responding to a restricted set of questionnaire items (Patton, 1980, p.22). In order to try and fully understand the feelings of participants who took part in the GP exercise referral scheme, inductive analyses were used in order to analyse the transcript data that were yielded by the interviews. Inductive analysis enables relationships and theories to emerge from the data, rather than being imposed on them (Glaser and Strauss, 1967; Patton, 1980); and in this way may lead to a more complete picture of how the participants felt. Combining quantitative and qualitative research methodologies may also help substantiate and strengthen conclusions drawn from the quantitative analyses.

Qualitative research is often criticised for lacking scientific rigour (Mays and Pope, 1995) and this has partly been due to the fact that many qualitative researchers have neglected to give adequate descriptions in their research reports of their assumptions and methods, particularly with regard to data analysis. It is therefore important to present a research report that gives a detailed account of these, so that another trained researcher could analyse the same data and follow the same procedure. At the same time, the present researcher acknowledges the fact that this would not necessarily mean that another investigator would form the same conclusions, since a large part of qualitative research is based on how the investigator *interprets* the information.

#### Methods

#### **Participants**

The 12 interviewees were aged between 31-66 years of age (mean age = 52.00 years; SD = 11.74); six interviewees were male, and six were female. In the control group, there were three males and one female (mean age = 51.75 years; SD = 13.38). The attention-control group consisted of three females and one male (mean age = 50.00 years; SD = 13.51), and the motivational interviewing group comprised two males and two females (mean age = 54.25 years; SD = 11.47).

### Procedure

Four randomly selected participants from each group took part in an in-depth interview. The interview was semi-structured, and was based on a pre-designed interview guide (see the interview guide in Appendix 6.C). The guide aimed to steer the interviewees through their experiences on the exercise referral scheme in a chronological order from the point of referral; up to the present day. This 'time-bounded' approach where the beginning and end points of each time frame of the scheme are clearly specified by the interviewer has been cited as a useful tool for facilitating recall (Moss, 1979).

The 12 interviews were transcribed and inductive hierarchical content analysis procedures were used to organise the selected quotes into interpretable and meaningful categories that emerged directly from the participants' own words. Separate hierarchical content analyses were performed on quotes taken from the control group; attention control group; and the motivational interviewing group in an attempt to examine any group differences using a qualitative approach. The main differences between the present approach (hierarchical content analysis) and the grounded theory approach (GT - Glaser and Strauss, 1967) are first of all pertaining to the number of interviews conducted. In the GT approach the number of interviews is determined by the extent to which the generation of themes has been exhausted; whereas the number of interviews conducted in the present study were prespecified and finite. Secondly, far more interpretation of the material is involved in the GT approach; in contrast to the present approach where the researcher attempted to remain as objective as possible. The researcher acknowledges the fact that she performed this qualitative analysis by applying a fairly positivist approach; and this was a consequence of her penchant towards quantitative methodologies. However an attempt was made to include a more qualitative perspective in order to broaden the scope of the highly quantitative nature of the thesis.

In line with the inductive approach, transcripts for the 12 interviews were read several times in order for the researcher to 'immerse' herself in the documents which would then permit the identification of meaningful themes (Abrahamson, 1983; p.286). Transcripts were then grouped according to which intervention condition they received, and a separate hierarchical content analysis was performed on each group of transcripts. Similar quotes were clustered together from the raw data (first order level) according to their common features. When no more clusters could be created, the researcher then proceeded to form a hierarchical structure with the clusters. This was done by examining the clusters and assigning a common theme to each of them (where appropriate), which linked each of the clusters together (second order level). Further links between the second order themes were then made, which created a

third order level. This process continued until one could no longer make any links between the themes.

After a hierarchical content analysis had been performed for each of the three groups, comparisons and contrasts were noted between the themes and structure of the analyses. These similarities and differences between the groups were then considered in the discussion section. Finally, the findings of the qualitative section of the study are considered with regard to the quantitative findings.

#### Results

The first stage of the analysis was to decide which quotes were important, and to assign appropriate labels to them. These decisions were based on the degree of commonality amongst the participants' comments. Quotes that appeared to be exclusive to one particular individual alone were therefore eliminated at this stage, as the aim was to find common perceptions which several individuals shared.

Figures 6.15-6.17 below illustrate the first order levels of the hierarchical content analysis for each group. The names of the two leisure centre staff featured in the quotes have been substituted with the letters 'A' and 'B' in order to maintain their anonymity. Similarly, participants in each group are numbered from P1 to P4 in order to indicate the responses made by different individuals.

Following the clustering of the first order themes, second and third order themes emerged from the data and these are illustrated in Figure 6.18 below. Overall, similar themes emerged from each of the three groups. However, some variations were observed with regard to the 2<sup>nd</sup> and 3<sup>rd</sup> order themes. The 3<sup>rd</sup> order themes (which will subsequently be referred to as the 'major' themes) common to all three groups were: 'instruction'; 'benefits'; and 'enjoyment'. These major themes and their 2<sup>nd</sup> order counterparts (which will be subsequently referred to as the 'sub-components') are described individually later. Group variations in the sub-components of the major theme 'instruction' can be viewed in Figure 6.19. 1. Pace of instruction

We were quickly shown around every apparatus, you weren't allowed to have a go to see if you were doing it right (P1)

He was very thorough and showed everybody how to do everything, but whether you could remember it all was a different story (P2)

There was such a lot there and possibly if you're young with an agile brain then you're going to retain all the information and pick it up again, but I'm not like that anyway! (P3)

She did sort of like show you how to go over things and you need to do this and that, but you still didn't have time to go on each one (P1)

I thought he was very good, in that from his point of view he really wanted to know what it was that he was going to have to deal with so that he could design something for me to do (P3)

# 2. Availability of guidance

You couldn't go to them if you had any problems and that (P1)

She was never around if you had anything wrong (P1)

There was no feedback to say, "How's your programme going?; Is it alright for you?" (P1) Just to talk to them and say "Oh, how did it go today? What do you feel like?"...Things like that, being there to ask (P1)

# 3. Following instruction

I found it quite helpful 'cos you had er, it worked on all bits of your body and specialised areas that you wanted to work on (P1)

When you got there, you were sort of hanging around waiting for different apparatus and then you'd try and do something different...so the chart that she made out for you, you couldn't follow it (P1) Doing it in a structured way er, you didn't get too much with your legs or too much with your arms, it was varied (P4)

If the machine was being used, I waited because I thought it was important to follow through the exercises as they were (P4)

Yes, yes it was great it was nice to have some area of one's life that's disciplined (P3) There's no penalty thing on this you see, if you don't do it, nobody will chase you (P4) I suppose the best part of the scheme for me was the advice, the one to one and the programme, that's the best part of it (P3)

# 4. Equipment

I was like motivated to go but when you got there, you were sort of hanging around waiting for different apparatus (P1)

You were hanging around because I could only go on those 2 items, so I didn't have a variety did I? (P2)

There's also the possibility of using other equipment – I haven't got around to that yet, but erm obviously I could (P3)

I thought the amount in the gym itself, I thought the amount of equipment and the variety was excellent (P4)

# 5. Location

It's a bit of a drag coming to the gym from the other side of town, that's the only disadvantage of the centre being such a distance (P3)

It was the traveling to here as there wasn't anywhere nearer, erm and y'know just the getting here basically (P4)

And it's like I've got to go all the way back to town, and then come back again. If I lived in Bangor, yeah I'd go to the gym quite a lot (P1)

6. Belonging

You could wear anything, you could be whoever you were, everybody was pleasant y'know, nobody sort of frosted you out, people smiled at you and erm, I felt comfortable (P4) I thought y'know, you haven't got the same contact have you? So I'd feel uncomfortable now,

because I'm more overweight yeah? (P2)

Atmosphere, and having a space for people like myself I think (P2)

### 7. Enjoyment

Yeah, and it wasn't such a - I wouldn't miss a week, but it was like a penance y'know? I made it a Friday cos it was the last day of the week and I had to go didn't I? But I felt it as a penance (P2) I enjoy it actually, I enjoy it, but I don't feel guilty about not going there but I enjoyed going there. (P3)

I felt good in myself for making myself to go, I used to hate going in there but when I came out I thought "Wow, I've done it" y'know? (P2)

### 8. Progress / improvements

Yes, it got easier, in the sense that I knew what I was doing and I didn't have to consult my programme all the time...I felt confident in doing it, that I knew what I was doing (P3) I felt it got easier (P4)

The first time, I said my legs were wobbly, but then the second time they weren't as wobbly, and then the third time they weren't wobbly at all - so I thought "God, this must be doing me good" cos I was getting better. (P2)

### 9. Feeling good

You do feel better after it, you got a bit more energy (P1) I felt more wide awake and I didn't have aches and pains because I was taking it gently which I thought was a bonus, I thought y'know if I was to be aching all the time then there was no point in doing it is there (P4) I felt better when I came out of there, but it's the initial going bit (P2)

I felt better doing it, and I think it was very effective (P3)

# Figure 6.15. Group 1 Hierarchical Content Analysis: 1st Order

1. Pace of instruction

When you're in a large group, surrounded like that, access to each piece of equipment is quite hard to, space is tight, so you get an idea, but you don't get to understand exactly how that piece of equipment goes.(P1)

It went very well, but I didn't think it was good enough if you want my honest opinion....there was lot to learn. (P2)

He showed us everything, explained everything, told us what to watch, and how to do it without hurting yourself... He explained it really well, really well (P3)

I didn't feel as if we knew any more than when we went in actually to be honest, y'know cos the following week we went back, and we couldn't remember how to do the shoe bit on the rowing machine (P2)

Erm, I suppose it was a process of getting used to equipment (P1)

I thought it was fun really, because it was trial and error and as I say, we hadn't had an awful lot of - well we'd had none

really, y'know we had a sort of a really basic knowledge of what the machines did and that's it (P2)

## 2. Clarification

That was much better, that's when I started to become a bit more comfortable with what was going on and what I was expected to do. (P1)

He seemed to understand where I was coming from, my needs, my condition, and everything like that. (P1)

He didn't ask us anything! – I mean I suppose in a way, why should he ask? – we've come there via a doctor, and nobody there are medical people, so why should they to be honest. (P2)

She always asks you, you know, "How do you feel about this?" It's not a case of you know, "This is what you'll do" erm, "Because this is what's good for you". She always sort of said well, "Do you agree with that?" you know? (P3)

## 3. Following instruction

I was doing that every time I went there – course I used to go there and it was full and you needed to go on these things and you'd do one, and then have to go on something else, but it was alright, yeah, yeah (P4)

I thought it was quite good, that sheet of paper I remember the first few times afterwards going round I thought right, I should be doing this (P1)

It was very good, I think B - B puts an awful lot of thought into tailoring a regime for a particular person, I think she is very good. (P3)

We don't use it, after the first session we didn't need it cos all that's on it are those three exercises! (P2)

## 4. Feedback and Progression

Now whether we're doing it right, or whether it's good or bad, we don't really know to be honest because nobody's told us about that (P2)

Erm, somebody there a little bit more often to encourage you to go that extra mile, or to tell you "hang-on a minute, you shouldn't be doing that"...just to keep you on the right road (P2)

If there was say a regular review or whatever or an ongoing review maybe for a longer time span then at least you'd think well, I've gotta sort of talk to somebody in a month's time to say yeah this is where I've got to or whatever, or I've not been doing my bit, I've got to get a slap on the wrist or whatever. It would have been nice if there had been that element (P1)

I found later on that after I'd finished the first block of ten that I needed a review as it were, because I obviously gone as far as could on those three sets of figures (P1)

Nobody's ever been back, now we shouldn't still be on 68 should we? I mean we should have increased (P2)

5. Company

I had no one to go with. I know people, but not people who are interested – I'm not a loner or nothing like that, I have friends – but er, nobody to go to the gym with (P4)

Erm, the first few times I suppose was having somebody with me (P1)

Nattering away, so seeing familiar faces helps as well, the enjoyment side of it you know; I don't care if I don't see anybody while I'm actually sort of working, erm but the actual bit of a chat here and there it all makes it more enjoyable (P3)

I was excited in a way that Maureen was coming with me and that there was somebody with me doing it, which makes a difference I think...I know some of them do it on their own, but I like to talk while I'm on it (P2)

I didn't like it, all on my own y'know. I don't like going anywhere on my own y'know. I wouldn't even go to a pub on my own y'know (P4)

6. Enjoyment

I wouldn't say that I 'tolerated' it, but I did it yeah (P4)

I do thoroughly enjoy my time there (P3)

I think the main thing was that it made me feel good, cos I enjoy doing it, and if I can't go for any reason I get cross! (P2)

7. Progress / improvements

I suppose I feel fitter, I've put on a little bit of muscle on my arms it's something that you can see but yes I feel fitter you know (P1)

I didn't last very long I was lucky if I did five or ten minutes, but that's improved to twenty now, so there's a definite improvement y'know definitely (P3)

I've probably been out on my bike more over the past two or three months than I have been in the previous five years (P1)

I can get into a pair of trousers that I couldn't get into before (P2)

I can walk much better, I don't feel as breathless (P2)

8. Feel good

Ah Christ yeah, it just made me feel better, feeling a bit fitter, seeing a load of people I haven't seen for a long time; enjoying the workout, enjoying the chit-chat. Marvellous. (P3) I think the main thing was that it made me feel good (P2)

## Figure 6.16. Group 2 Hierarchical Content Analysis: 1st Order

1. Care

I felt one of the group cos she sheparded the whole group, so nobody was singled out, it was allinclusive (P1)

And then I had my one to one, erm training interview. And I enjoyed that very much I thought B was very accepting (P1)

Yes, we went into his office and he asked me some things and I had to lie on the floor to see what I could do with my back and he was very caring (P2)

I think in a way having somebody sympathetic to talk to like you has helped considerably! (P1) I've done a bit of counseling theory myself so I can see from that point of view being non-judgmental and supportive an empathic listener (P1)

Just speaking things through with you, helps keep things fresh in my mind and made me think a bit about something that I hadn't actually thought I was feeling... Part counselor, part teacher (P3) I felt as though I could at least ask silly questions without looking at me as if I'm a raving lunatic (P4) But you tend to feel that they're [referring to the centre staff] not there so much for you as being just there to work you know? Whereas you tend to feel because you're there, and you're human so to speak (P4)

I think so, yes, maybe just to be there to answer questions if you've got something to ask. That's the only thing I think I would say (P2)

# 2. Availability of supervision

Yeah, but I could just do with somebody there (P4)

I do think that they should give more, there is nobody about at all; if somebody was to be taken ill or faint while they were there, there's nobody there. I do think that there should be somebody walking around (P2)

# 3. Clarification

He's very good, he does try to make sure he knows what's wrong with you, you know so that he's not putting you on machines that are gonna affect this and that (P4)

It was actually being able to speak to A, and the GP as well cos he explained fully what he was trying to do, and A did the same thing, he explained exactly what it was we were going to do, he explained what each exercise was meant to do (P3)

I think that in a way I might not have stuck to it so much if I hadn't known that you were gonna be there at the end of so many lessons say, and say "Well what do you think about this?" (P4)

And she made sure that everybody understood what she'd been saying about every piece of apparatus and so on (P1)

# 4. Following instruction

I felt that was really useful (P1)

The exercises I've been given have been superb, they've given me a bit of 'umph' and I hope they will continue to help me (P3)

It was better that way cos you knew what you were doing, (P4)

He just put me on the treadmill, and explained that – which was simple enough cos it's got the chart there which tells you what to do (P2)

# 5. Feedback and Progression

It might have been nice to have something half-way through, where there was a one to one planned with somebody like A again (P3)

That the um - the motivation of having some feedback from the computers on the apparatus (P1)

I'm hoping that the next time I get referred...that erm I'll have another interview with B, and she'll week my programme and possibly introduce me to some new equipment, and also step up the pressure on the other equipment (P1)

6. Belonging

I suppose I felt A) rather old, and B) rather y'know like an enormous fat blob with all these fit young people bouncing around, so I was a bit erm apprehensive that I would feel like a fish out of water (P1) I did wonder whether they might sort of feel this was really their province, and geriatrics shouldn't sort of be invading their territory, but I didn't get any feeling like that at all (P1)

Yes, it was alright. As I say you tend to think that everybody's looking at you, and I've come to the conclusion that yes, everybody does, but more along the lines of "Who's she?" more than "Oh my God, look at her!". You know? (P4)

I'd rather sit in an armchair and read the paper with a cup of coffee and a packet of biscuits! (P1) I don't feel right being there I would be happier here reading a book than I would be there doing the gym...the whole thing; I feel it's not 'me'...It's just that I feel out of place (P4)

It's a little bit daunting when somebody looks about sixteen comes bouncing in and puts the thing on ten and spends half an hour on there and I'm sort of flaked out after five minutes on number 3! (P1)

### 7. Enjoyment

I feel that I have reduced tension in a very palpable way, if I'm physically tense, then I know that exercise will relieve that (P1)

Yeah, after each session I've felt well and I do feel that my body is more supple and can bend and stretch in ways that I couldn't do before (P1)

The weight is definitely starting to drop off (P3)

The pain in the hips has definitely diminished, almost disappeared. But the stiffness, the mobility is still a problem, but I don't get those little twinges that I used to do, so it seems to be of benefit (P3) Oh, yeah I can get into the bath and I can with a struggle get out, and I can crouch down, so in a sense I can say that they are better (P4)

I think the effect on my back was really good, and I could also see the weight coming off, and people kept telling me it was coming off, it was good for me, and I could feel that my legs were more mobilised when I was there (P2)

8. Progress / improvements

But, I know that by the time I get through the, it's round about one and a half hours, and that when I come out I shall feel really good (P1)

I was feeling good, cos at last I'd done an exercise session with hardly any pain afterwards (P3)

9. Feeling good

I was enjoying it, I was looking forward to going, I'd go on Thursdays, and all day Thursday I was looking forward to it, I didn't seem to get stressed on Thursdays for some reason because I think I knew I was going to the gym and I could burn it off there anyway (P3)

It was nice to get that feeling again that I actually had to push myself just to finish it; there's no real goal there but just for the sake of finishing it (P3)

I enjoyed doing it I liked going (P2)

## Figure 6.17. Group 3 Hierarchical Content Analysis: 1st Order







Figure 6.18. 2<sup>nd</sup> & 3<sup>rd</sup> Order Themes for each group.

Control	Attention Control	Motivational
		Interviewing
Pace of instruction	Pace of instruction	Care
Availability of	Clarification	Availability of
supervision	Following instruction	supervision
Following instruction	Feedback &	Clarification
	progression	Following instruction
		Feedback &
		progression

Figure 6.19. Sub-components of the 'instruction' theme presented group by group.

# **Major theme 1: Instruction**

# Sub-theme 1: "Following instruction"

All three groups expressed their feelings associated with following a structured exercise programme; a representative quote from each of the 3 groups is presented below:

"When you got there, you were sort of hanging around waiting for different apparatus and then you'd try and do something different...So the chart that she made out for you, you couldn't follow it."

P1 (Control group)

"I thought it was quite good, that sheet of paper I remember the first few times afterwards going round I thought right, I should be doing this."

P1 (Attention control)

"It was better that way cos you knew what you were doing."

P4 (Motivational interviewing group)

# Sub-theme 2: "Pace of instruction"

For the control group and the attention control group, a theme pertaining to the 'pace of instruction' emerged:

"We were quickly shown around every apparatus; you weren't allowed to have a go to see if you were doing it right."

P1 (Control group) It went very well, but I didn't think it was good enough if you want my honest opinion....there was lot to learn.

P2 (Attention control)

# Sub-theme 3: "Availability of supervision"

For the control group and the motivational interviewing group, a theme regarding the 'availability of supervision' emerged:

She was never around if you had anything wrong

P1 (Control group)

"I do think that they should give more, there is nobody about at all; if somebody was to be taken ill or faint while they were there, there's nobody there. I do think that there should be somebody walking around."

P2 (Motivational interviewing group)

One could argue that since the attention control group received 3 education sessions about exercise (the benefits, how to exercise safely, and the different types of exercise), that they may not have felt as though they needed as much supervision. This is in contrast to the control group who received no extra information about exercise and with the motivational interviewing group who would only be provided with information if the participant requested it.

# Sub-theme 4: "Feedback and progression"

For the attention control group and the motivational interviewing group a theme emerged which reflects the existence of, or lack of feedback and progression during the scheme:

"It might have been nice to have something half-way through, where there was a one to one planned with somebody like A again."

P3 (Motivational interviewing)

"I found later on that after I'd finished the first block of ten that I needed a review as it were, because I obviously gone as far as could on those three sets of figures."

P1 (Attention control)

Since the attention control group and the motivational interviewing groups generally received more information than the control group, this may account for why the control group did not seem to raise the issue of feedback and progression. Progress and the building up of ones' fitness was a topic covered in the education sessions with the attention control group, and was also something raised in many of the motivational interviewing sessions, so perhaps this heightened their awareness of the importance of feedback and progression in contrast to the control group.

### Sub-theme 5: "Clarification"

A theme pertaining to the quality of explanation received throughout the scheme, emerged for the attention control and the motivational interviewing groups:

"It was actually being able to speak to A and the GP as well cos he explained fully what he was trying to do, and A did the same thing, he explained exactly what it was we were going to do, he explained what each exercise was meant to do."

P3 (Motivational interviewing)

"That was much better, that's when I started to become a bit more comfortable with what was going on and what I was expected to do."

P1 (Attention control)

Again, the extra information available to the attention control and motivational interviewing groups may explain why only these groups commented on the quality of explanation. It could be that the information and explanation provided during their intervention sessions may have aided their understanding of information given to them by the instructors on the scheme.

### Sub-theme 6: "Care"

Finally, a theme emerged exclusively for the motivational interviewing group; the theme reflects the interpersonal aspects of instruction. These quotes did not centre around the particular instructions given; or the feedback provided; but describe the 'style' in which the instruction was delivered to the participants:

"I felt as though I could at least ask silly questions without looking at me as if I'm a raving lunatic."

P4 (Motivational Interviewing)

"Just speaking things through with you, helps keep things fresh in my mind and made me think a bit about something that I hadn't actually thought I was feeling... Part counsellor, part teacher."

P3 (Motivational Interviewing)

This theme failed to emerge from the control and attention control groups, and could be accounted for by the different interventions received by each group. The interpersonal experiences of the control group participants were based solely upon the centre staff; therefore, if the 'caring' element was absent from these interactions, then this could explain the non-emergence of the 'caring' theme. The attention control group despite receiving the same amount of contact with the researcher also failed to exhibit this theme. This could be because the information sessions given to these participants were intended to strictly adhere to the information contained within the booklets and a conscious effort was made by the researcher not to engage in any other conversation so as not to 'pollute' the intervention and risk making it too similar to the motivational interviewing intervention. Thus, this caring element may not have been apparent.

#### **Major theme 2: Benefits**

This theme was composed of quotes describing the physical improvements and progress experienced by the participants, as well as the psychological benefits gained from participating in the exercise scheme. This theme emerged from all three groups: "I can walk much better, I don't feel as breathless."

P2 (Attention control)

"The pain in the hips has definitely diminished, almost disappeared. But the stiffness, the mobility is still a problem, but I don't get those little twinges that I used to do, so it seems to be of benefit."

P3 (Motivational interviewing)

"I think the main thing was that it made me feel good."

P2 (Attention control)

"You do feel better after it; you've got a bit more energy."

P1 (Control)

Major theme 3: Enjoyment

This theme comprised of the presence or absence of enjoyment experiences of the scheme and emerged from all three groups:

"I think the main thing was that it made me feel good, cos I enjoy doing it, and if I can't go for any reason I get cross!"

P2 (Attention control)

"I was enjoying it, I was looking forward to going, I'd go on Thursdays, and all day Thursday I was looking forward to it, I didn't seem to get stressed on Thursdays for some reason because I think I knew I was going to the gym and I could burn it off there anyway."

P3 (Motivational interviewing)

"Yeah, and it wasn't such a – I wouldn't miss a week, but it was like a penance y'know? I made it a Friday cos it was the last day of the week and I had to go didn't I? But I felt it as a penance."

P2 (Control group)

#### Major themes not common to all three groups

### Belonging

This theme emerged from the control group and from the motivational interviewing group, but not from the attention control group. These quotes reflected the degree that participants felt comfortable in their exercise environment:

"You could wear anything, you could be whoever you were, everybody was pleasant y'know, nobody sort of frosted you out, people smiled at you and erm, I felt comfortable."

P4 (Control)

"I don't feel right being there; I would be happier reading a book than I would be there at the gym...the whole thing; I feel it's not 'me'...It's just that I feel out of place."

P4 (Motivational interviewing)

### Company

This theme only emerged from the attention control group, and it reflected a preference for having someone else with them whilst exercising:

"I was excited in a way that Maureen was coming with me and that there was somebody with me doing it, which makes a difference."

P2 (Attention control)

"I didn't like it, all on my own y'know. I don't like going anywhere on my own y'know. I wouldn't even go to a pub on my own y'know."

P4 (Attention control)

### Facilities

This theme was exclusive to the control group, and was composed of two subcomponents 1) equipment and 2) location. Quotes were both positive and negative for the former component, but all were negative for the later component:

Equipment:

"I was like motivated to go but when you got there; you were sort of hanging around waiting for different apparatus."

P1 (Control) "I thought the amount in the gym itself, I thought the amount of equipment and the variety was excellent."

## Location:

"It's a bit of a drag coming to the gym from the other side of town, that's the only disadvantage of the centre being such a distance."

"It was the travelling to here as there wasn't anywhere nearer, and just the getting here basically."

P4 (Control)

P3 (Control)

P4 (Control)

### General discussion

Overall, the volume of quotes provided by interviewees varied according to the treatment group they had been allocated to. The control group provided the least; the attention control provided more than the control group; and the motivational interviewing group provided the most. This could be a function of the nature of the interventions; the motivational interviewing group sessions involved a lot of discussion and perhaps the rapport built between the researcher and participants enabled the participants to feel more relaxed and talkative in their interviews.

Despite there being a set of 2<sup>nd</sup> and 3<sup>rd</sup> order themes common to all three groups, there were themes exclusive to some groups too. The control group was the only group to express opinion about the facilities; and this could perhaps be due to the fact that they had received the least amount of intervention and contact with the researcher. This is in contrast to the attention control group who were provided with information about exercise, and the MI group who discussed their feelings and attitudes towards exercise. In this respect, the control group may have focused more on the location and equipment of the leisure facility, in the absence of having someone to direct their thoughts about the exercise itself and how they were feeling about it.

The motivational interviewing group were the only group to discuss the "style" of the instructor with regard to experiencing caring and understanding interactions with the researcher/staff members. This could be attributed to the MI intervention; as they received

empathic and caring consultations with the researcher and perhaps this also influenced their perceptions of the additional contact they had with the leisure centre staff.

It is clear from the volume of quotes within the theme of 'instruction' that this is a very important aspect of the exercise referral scheme. This has implications for centre staff who work on the exercise referral schemes in that they need to consider the importance of designing a clear exercise programme, and how feedback and progression are necessary components of motivating their clients. Making supervision an integral part of the scheme also seems to be important, having someone close-by in the event of needing information, encouragement or help. This theme appears to be closely aligned with one of the environmental supports (i.e. 'structure'). Structure emphasises the importance of clear instruction, feedback and progression, and positive encouragement (Deci & Ryan, 1985).

Clearly, feeling and seeing the benefits that exercise can bring to an individual is highly motivating for a client, and can be viewed as a form of feedback. This is perhaps especially important for clients from the GP exercise referral population as they have been referred in order to ameliorate a specific health problem. If no beneficial outcomes are experienced by the client, then one would predict a larger risk of relapse into sedentary life than if benefits were experienced. However, unless individuals can stay motivated to exercise long enough to see such benefits, then the potential motivating power of the benefits may never be actualised. It is therefore important initially, to perhaps take the focus away from the specific benefits that are sought by the client and to help the client spread the focus across several more *general* benefits so that they have other aspects of the exercise to focus on whilst they await the specific health outcomes.

In terms of enjoyment, across all groups the presence or absence of enjoyment varied greatly. Some participants genuinely enjoyed the whole experience, whereas others did not. There does not seem to be one single aspect which can determine who will enjoy the exercise scheme and who will dislike it; however being able to feel as though one 'belongs' in the environment that they are exercising in, undoubtedly plays a crucial role in enjoyment. This feeling of 'belonging' has many similarities with the psychological need for 'relatedness'. If an individual feels larger, older, or less fit than the rest of the exercisers in that particular environment, then the scope for enjoyment may be less than when they feel more similar (or related) to those around them. The implications that this has for referral schemes is to perhaps dedicate certain times of the day for the referral clients so that they can experience greater feelings of belonging and comfort.

## **Concluding Remarks**

From the interviews, one could argue that themes akin to the environmental support 'structure' emerged as an important element of the exercise scheme (for example to be given clear instructions, feedback and encouragement). Secondly, themes akin to the psychological need for 'relatedness' also emerged as an important aspect of enjoyment and continuation with the scheme (for example to feel a sense of belonging and to feel at ease within the particular exercise environment). However, autonomy support and its corollary (i.e. autonomy) did not emerge overtly as important aspects of the scheme.

This makes intuitive sense as when participants are referred onto the scheme, they expect to be 'told what to do' since many are inexperienced in terms of exercise. However, this departs from the findings of the quantitative analyses, which found a significant group difference on autonomy support. One could argue that perhaps autonomy support is something that *covertly* makes a difference to these participants, but awareness of its importance may be something that is apparent only when individuals are specifically asked about it (as with the questionnaires). With structure and involvement and their corresponding psychological needs (competence and relatedness) one could argue that it is possible for participants to have a greater awareness of these as they are more tangible aspects and ones which are perhaps more likely to be expected by the participants (e.g. receiving instruction and having time devoted to their care). Similarly, in terms of psychological need, participants may more easily gauge how *capable* they feel with regard to exercise, and how *related* they feel in their exercise environment. Autonomy on the other hand is something which participants may be less aware of, or something which they feel reluctant to express an opinion about because they had been 'referred'. An illustration of this point was when the researcher asked participants whether they had wished for more input into their exercise programme. In response, participants seemed a little confused as one of the reasons why they agreed to go onto the scheme was because they wanted the instructor to design the programme for them as they did not know what would be beneficial / harmful to them. It may be the case that with a different population - perhaps one that is healthy and used to exercising - autonomy could emerge as quite an important aspect of the participant's experience.

#### CHAPTER SEVEN

#### **General Discussion**

#### Summary

Little attention has been paid to developing a theoretical understanding of why motivational interviewing is effective (Draycott & Dabbs, 1998; Miller, 1994, 1996, 1999). One of the aims of the proposed research was to determine whether the practice of motivational interviewing could be understood within the unifying theoretical framework of Deci and Ryan's (1985) self-determination theory. This global aim was addressed in stages:

The first part of the thesis set out to develop valid measurement tools to assess environmental supportiveness and relatedness, and to establish the structural relationships between the constructs. Relationships were examined cross-sectionally and longitudinally. The second part of the thesis aimed to examine the effects of a motivational interviewing based intervention upon motivational and behavioural processes and outcomes and to compare this intervention with an educational intervention and a control group. The intervention study aimed to see if SDT and MI fit together thus discovering whether SDT can provide the much needed theoretical framework for MI.

Chapter Two described a cross-sectional study (Study One) which involved sending out questionnaires to ex-GP exercise referral participants in order to develop and validate tools for assessing perceptions of environmental supportiveness and relatedness for the GP exercise referral scheme context. The questionnaires used selected items from an item pool initially generated by the researcher; items that were deemed most appropriate (by a doctoral panel of individuals familiar with the area of research) were included in the questionnaire. Once the data had been gathered, confirmatory factor analytical procedures were used in order to produce valid instruments. The questionnaire also featured items from the BREQ-2 which included the additional subscale 'amotivation'. This permitted an assessment of the factorial validity of the BREQ-2 to be performed as well.

Chapter Three tested a hypothesised model wherein psychological need satisfaction mediated the effects of environmental supportiveness on behavioural regulation. This model was supported by the data, with environmental supports having a moderately strong effect upon need satisfaction, which in turn had a strong effect upon relative autonomous regulation. The success of this mediational model was in contrast to an alternative model that was also tested featuring a direct path from environmental supports to behavioural regulation, which led to improper estimates and negative error variances. The results of these analyses provide support for similar models which propose a mediating role for psychological need satisfaction (Deci *et al.*, 2001; Ntoumanis, 2001; Standage *et al.*, 2003; Vallerand, 1997).

Chapter Four set out to test the relationships between perceived environmental supports and perceived levels of psychological need satisfaction, exercise adherence, and maintenance. Despite this longitudinal study not having a large enough sample to permit the use of structural equation modelling, some interesting relationships were nonetheless revealed. Firstly, the degree of self-determination experienced by the participants mid-way through the exercise scheme was found to be a predictor of exercise maintenance three-months after the scheme had ended. Secondly, autonomy and relatedness made significant contributions to the internalisation of exercise behaviour. Specifically, feelings of autonomy, competence, and relatedness in the exercise environment predicted higher levels of intrinsic and identified regulation and lower levels of amotivation, introjected and external regulations three-months post-scheme.

Chapter Five described a cross-sectional study using participants from community exercise classes in order to provide further support for the structural relationships revealed in Study One. This study differed in several ways: firstly its participants consisted of fit, healthy individuals (as opposed to GP referral scheme participants). Secondly, this was a situational study in contrast to the contextual study, and assessment tools were modified to accommodate this change. Thirdly, the motivational outcomes were different; in contrast to Study One where the motivational outcome was behavioural regulation, in this study, interest/enjoyment was assessed. In spite of these differences however, the conceptual model where psychological need satisfaction mediated the effects of environmental supportiveness on motivational outcome was supported. The sustainability of the model with such a different set of study characteristics, lends credibility to the mediational model.

Chapters Two, Three, Four, and Five enabled a structural model of relations to be constructed, tested, and verified. Chapter Six therefore explored the question of whether SDT could be a suitable framework for MI. This was tested via an intervention study which compared a control group; an attention-control group; and a motivational interviewing group in terms of perceived environmental supportiveness; psychological need satisfaction; behavioural regulation; GP exercise referral scheme adherence; and post-scheme exercise maintenance. It was hypothesized that the MI based intervention would enhance perceptions of environmental supportiveness and thereby augment psychological need satisfaction to a greater degree than the control condition and the attention-control condition. The MI group would consequently display greater scheme adherence; superior post-scheme exercise maintenance; and more self-determined forms of behavioural regulation with regard to exercise. All results were in the hypothesized direction but as the sample size was small (thus reducing observed power), only some of the hypotheses were statistically significant. Individuals in the MI group did however display significantly higher levels of autonomy support and significantly lower levels of post-scheme amotivation, when compared to the attention-control and control groups.

Chapter Six also encompassed a qualitative study consisting of twelve participants (four from each group) who took part in an in-depth semi-structured interview with the researcher. A hierarchical content analysis revealed themes in common to all groups, in addition to sub-themes that applied exclusively to each group. The themes generally supported the quantitative findings and emphasized the importance of 'instruction' for this population. Specifically, receiving a clear exercise programme; receiving regular feedback on progress; and having someone close-by to encourage individuals in their exercise regimen emerged as critical components of the analysis. These elements share similarities with one of the environmental supports (structure), thus adding support to the quantitative findings. Another important theme to emerge was for participants to be able to see and feel the benefits of their exercise programme because health improvement was the main reason for enrolling on the scheme. This again could be viewed in terms of structure, as perceiving benefits could be interpreted as a form of feedback. Enjoyment also emerged as an important theme; with feeling like 'one belongs' in the particular exercise environment emerging as a salient ingredient of enjoying the exercise scheme. This sense of belonging shares similarities with the need for relatedness.

In sum, aspects associated with competence (because structure is the theoretical support for competence) and for relatedness emerged from the analysis. Autonomy and autonomy support failed to materialize as important aspects of the exercise scheme with this particular sample. This contrasted with the quantitative findings which found group differences in terms of autonomy support. One could argue that perhaps autonomy support / autonomy are aspects that *covertly* make a difference to these participants, but awareness of their importance may be something that is apparent only when individuals are specifically asked about it (as with the questionnaires).

## **Theoretical Implications**

#### Self-determination Theory

Self-determination theory proposes that the presence of certain supports for the three psychological needs will facilitate the satisfaction of autonomy, competence, and relatedness. The results of the four studies performed in the present thesis provide partial support for this premise. Study One (Chapters Two and Three), and Study Three (Chapter Five), tested models wherein environmental supports (autonomy support, structure, and relatedness) led to greater satisfaction of the psychological needs. Self-determination theory further proposes that satisfaction of the three psychological needs will facilitate the internalization of an individual's behavioural regulations towards a particular behaviour. Again, the models tested in Study One and Three featured a path from psychological need satisfaction to behavioural regulation (behavioural regulation was substituted by interest/enjoyment in Study Three) thus providing further support to the relationships proposed by Deci and Ryan (1985; 2000).

The fact that these two studies (One and Three) used different populations and different outcome variables also adds support to the already considerable amount of research demonstrating the applicability of SDT to a variety of contexts and populations such as education (Connell and Wellborn, 1987); healthcare (Williams *et al.*, 1996); and industry (Deci *et al.*, 2001). The mediational models supported in Study One and Three are also consistent with Vallerand's (1997, 2001) hierarchical model of intrinsic motivation, which has psychological need satisfaction mediating the effects of environmental support on motivational outcomes.

The longitudinal study however, (Study Two) described in Chapter Four, failed to support many of the facets of SDT. Environmental supportiveness was not revealed as a significant predictor of psychological need satisfaction, and psychological need satisfaction did not predict any of the behavioural outcomes such as scheme adherence and post-scheme exercise level. Self-determination theory proposes that as a consequence of greater psychological need satisfaction, greater persistence of the behaviour in question will be observed. The specific limitations of Study Two are detailed in Chapter Four, and may well account for the non-significant findings. However, if one accepts the findings of Study Two as an accurate and a true portrayal of this population, then the findings suggest that perceived environmental support from the gym staff have no influence over the level of psychological need satisfaction experienced by the participants. The question then arises: what other aspects of the referral scheme could be examined in order to more fully test the impact of environmental support on psychological need satisfaction? One possible alternative source would be to examine perceived environmental support from friends, family, or significant others. The questions assessing environmental supportiveness in Study Two may have targeted the wrong source - i.e. the staff at the leisure centre. Wilson and Rodgers (*in press*) assessed autonomy support by aiming their questions towards the friends of the participants; and this type of assessment yielded significant relationships.

Consistent with the tenets of SDT however, were the significant relationships observed between psychological need satisfaction and behavioural regulation, and the relationship between relative autonomy and post-scheme exercise levels. Collectively, the needs positively predicted more self-determined forms of behavioural regulation (intrinsic and identified regulation), and negatively predicted the less self-determined forms of behavioural regulation (external regulation and amotivation). Introjected regulation failed to be predicted by the needs, however, which although being inconsistent with previous research (Mullan *et al.*, 1997) makes intuitive sense if one thinks about the mid-point position that introjection holds on the behavioural regulation continuum (see Chapter Three for further discussion).

The degree of self-determination (as measured by RAI) significantly predicted postscheme exercise, with higher self-determination predicting higher levels of exercise three months after the scheme had finished. This is consistent with SDT, as greater selfdetermination is proposed to lead to greater interest and persistence with regard to a particular behaviour (Deci and Ryan, 1985).

Study Four (Chapter Six), compared three groups of referral participants in terms of environmental support, psychological need satisfaction, behavioural regulation, scheme adherence, and post-scheme exercise levels. Autonomy support was the only support to differ among the groups. All three supports were hypothesized to be higher in the MI intervention group as this intervention intended to provide the most environmental support. The MI-based intervention was designed to incorporate autonomy support by minimizing pressure, and emphasizing the participant's personal responsibility and choice. Support for competence (structure) was provided by providing clear information about their options, making behaviour-outcome relationships clear, and providing positive feedback. Lastly, support for relatedness (involvement) was provided by the warm and empathic style adopted by the researcher. Thus the nutriments necessary for facilitating psychological need satisfaction were aimed at being delivered to each participant in the MI-based intervention group. Chapter Six includes a discussion of the specific limitations of the study which may account for some of the non-significant outcomes but the results nonetheless were in the predicted direction which provides some degree of support for the tenets of SDT, albeit slight. Qualitative interviews conducted with the participants revealed a need for support in general. Specifically to be given clear instruction and to help them feel like they belong in their exercise environment. To feel autonomous was not a salient theme to emerge from the hierarchical content analysis, and this may be something which is specific to this GP referral population. This is not to say that autonomy is not desired at all by participants; but it is more likely to be the case that this need is less important relative to competence and relatedness. This was illustrated by the structural relationships in Chapter Three where relatedness had the strongest relationship to the latent variable 'psychological need satisfaction', followed by autonomy and competence. Frequency of contact seemed to be a more important requirement, rather than extended, intense contact with gym staff for this particular population.

#### MI and SDT

The advantages set out at the beginning of this thesis of using SDT as a framework for MI, were that adopting a SDT perspective would offer the opportunity to explore pertinent psychological and motivational processes that might mediate the effects of motivational interviewing on successful treatment outcomes. Thus, one could determine whether motivational interviewing impacts upon perceptions of support for autonomy, competence and relatedness, actual satisfaction of these needs, and subsequently on behaviour change and maintenance.

From the results of the intervention study, one could conclude that on this occasion, motivational interviewing did not appear to impact upon the perceptions of environmental support any more than an intervention which provided information about exercise. It makes sense therefore that neither were there any group differences in terms of the satisfaction of the psychological needs, scheme adherence or exercise maintenance.

The further advantage to demonstrating the suitability of SDT as a framework for MI was to move on to refine motivational interviewing by exploring the extent to which its various strategies are more or less effective in modifying these motivational processes across different populations and presenting problems. Despite the lack of significant findings in the intervention study, one could argue that it has nonetheless helped explore this issue. This particular research programme has shown that the extra attention received by the attention-control and the motivational interviewing groups produced differences in autonomy support

195

and amotivation when compared to the control group. This is consistent with a study by Foote *et al.* (1999) who have shown that individuals randomly assigned to a group motivational interviewing treatment for chemical dependency, informed by SDT, perceived the environment to be significantly more autonomy-supportive than those assigned to a 'treatment as usual' group. In contrast to Foote *et al.* (1999), in Study Four higher levels of perceived autonomy support were not accompanied by higher scheme attendance. Foote *et al.* (1999) found perceptions of autonomy support to be related to frequency of attendance during the initial phase of treatment, however their study did not include an attention-control group. If no comparison treatments are included in such studies, then one cannot be sure that properties of MI (with regard to SDT) are any more unique than those found in an attention-control condition.

One could argue however, that the principal population used in the present thesis (the GP exercise referral population) may not be the most appropriate population with which to practice motivational interviewing based interventions. This could be due to several characteristics of GP referral participants, such as their medical condition placing an external pressure upon them to change behaviour. This external regulation may override any beneficial effects of motivational interviewing (over and above those of providing valuable information) when only a relatively small amount of MI is available to participants. In this intervention study, participants received three, thirty minute MI-based sessions over the course of ten weeks. The MI-based intervention was not as lengthy as traditional MI, and was more closely aligned to the principles of the behaviour change counselling approach (Rollnick et al., 1999). Perhaps the small number and brevity of the sessions was not sufficient to have an impact on the motivational processes and outcomes of these individuals. Had the intervention consisted of three sessions of one hour; or ten sessions of thirty minutes for example, then perhaps more noticeable group differences may have emerged. A study by Harland et al., (1999) featured a brief MI intervention group (three sessions); and a more intensive MI group (six sessions) in an attempt to compare various motivational strategies aimed at the GP referral population. Neither one of these groups showed differences in physical activity at one-year follow-up. This may appear to contradict the above point with regard to the potential benefit of having extra MI sessions; however, although participants had six MI sessions available to them, the median number attended was just three. This provides support for the idea that more sessions of MI may indeed be necessary. Claims have been made about the effectiveness of brief sessions of behaviour change counseling, describing how it can be administered even in a period of time as short as eight minutes

(Rollnick, 2001). However within the GP referral population it may well be the case that a more intensive course of MI is required in order for it to be effective.

Closely related to this issue is the degree of ambivalence that participants from this particular population possessed. Motivational interviewing has been observed to work best when individuals are truly ambivalent (Miller and Rollnick, 2002); so using the motivational interviewing approach with individuals who may already be prepared to change may have made the intervention appear to be less effective. It may be the case that because these referral participants agreed to enrol on the exercise scheme that they were perhaps at a more advanced stage of readiness. Stages of change range from no thoughts of change at all (precontemplation); through some thoughts (contemplation); through making a commitment to change (preparation); through being actively engaged in the behaviour change(action); to sustaining the behaviour for a period of six months (maintenance) (Prochaska and Diclemente, 1992). The participants in this study had enrolled on the scheme and had attended their first appointment unaided. This would suggest that they were already in the action stage as they had made a commitment to start exercising. In the preparation stage a decision to change has been made, thus less ambivalence is likely to be observed. Similarly, individuals in the precontemplation stage are not thinking about change, so one could argue that they have decided not to make a change, thus there is less ambivalence here also. The stage of change that holds the most ambivalence therefore, is likely to be the contemplation stage; where a serious consideration of the pros and cons of making the change takes place (Miller and Rollnick, 2002; pp.208).

One could argue therefore, that matching the intervention to the stage of change of the individual would be the most effective strategy to undertake. The proponents of the stages of change model (Transtheoretical Model of Behaviour Change) have stressed the importance of tailoring interventions to the individuals' specific stage of change (DiClemente, 1993). Rollnick *et al.* (1999; pp.190) make the suggestion that contemplators need motivational help, whereas those who are more ready need skills-based interventions. A study by Marcus, Rossi and Selby (1992) compared a stage-matched intervention and a standard intervention group in the context of exercise behaviour change. They found that more participants in the stage-matched intervention group demonstrated a positive stage of change by the three-month follow-up, in contrast to the standard intervention group which contained more subjects displaying no stage change at all or stage regression.

This issue of different interventions being necessary for different stages of change was also discussed in a randomised control trial in the context of smoking (Butler *et*  *al.*, 1999). Butler *et al.*, concluded that those individuals who were less ready to quit smoking may have benefited more from a motivation-enhancing interventions while those more ready may have benefited more from action-orientated advice (p. 615). Had a staged-matched intervention been used in the present thesis, then perhaps the data would have provided more support for the idea that SDT is a useful framework for MI

Further research is needed therefore, with the GP exercise referral population in order to fully examine the potential relationships between MI and SDT.

### **Applied Implications**

There are several practical implications which can be gleaned from the findings of this research. Firstly, provision of environmental supports are not necessarily restricted to the leisure centre staff, but may encompass other sources such as friends, family and significant others. Practically, the individual's motivation towards the exercise referral scheme may therefore be enhanced through involving family members or friends; gaining their cooperation may be an option that the medical centre staff could pursue.

Secondly, since the degree of self-determination that an individual experiences during participation of the scheme was found to predict post-scheme exercise, enabling the individual to boost their psychological need satisfaction will help to increase the level of self-determination and thereby maintenance of exercise. This relates to the point above, where environmental support from significant others outside of the leisure facility may help enhance these psychological needs and thereby improve self-determination and therefore exercise maintenance.

Thirdly, as the qualitative analyses from Chapter Six indicated that the satisfaction of the need for autonomy may not be the most 'needed' psychological need, then GP referral staff should perhaps focus more on the more pertinent aspects such as clear instruction, and feedback in a manner that is approachable and friendly. Indeed Vallerand (2000) suggested that there may be individual differences in psychological needs depending on what the individual is most 'in need' of. He goes on to suggest that individual differences in needs may serve various functions including that of determining which type of perceptions (i.e. autonomy, competence, or relatedness) will influence motivation. The implications of this would be that if one can identify the relative impact of the three needs upon an individual's motivation, then activities and services can be tailored to more adequately promote the fulfilment of those needs The fact that participants in the most intensive of the three interventions (the MIbased approach) failed to display significantly higher perceptions of the environmental supports, psychological need satisfaction, behavioural regulations, scheme adherence, and post-scheme exercise levels suggests that MI may not be the most appropriate intervention for this particular population, or that the intervention was not intense enough. However, the finding that both the attention-control group and the MI group were significantly different from the control group with regard to these variables suggests that simply being provided (personally) with extra information and education about the individual's condition and how exercise can help, may be sufficient to induce changes in both motivational and behavioural terms. Thus providing referral scheme participants with extra attention and information are both potentially important factors in increasing motivation and thereby improving adherence to the scheme and post-scheme exercise maintenance.

A practical implication related to the earlier discussion regarding stage-matched interventions, would be to deliver an MI-based intervention to individuals who have *not yet* agreed to enrol on the GP exercise referral scheme, and to provide more action-based interventions for those who have *already chosen* to enrol (although it would be wise to judge this on a case by case basis since exceptions will always apply). Medical staff would be best placed to deliver the MI-based intervention, as they have contact with patients who are in need of exercise, but who are not willing to enrol on the referral scheme. Ideally, this intervention would also be used to those patients who do not visit the surgery, but who nonetheless have a need to increase their exercise levels. However, it would first of all be very difficult to identify such individuals; and secondly it would be unethical to impose any intervention could be carried out by the leisure providers, as they would have the exercise knowledge and expertise.

### Limitations

In spite of the measurement tools developed in the present thesis demonstrating good factorial validity, concurrent validity was not assessed. Demonstrating concurrent validity was problematic due to the novelty of the tools developed in the present thesis. In terms of perceptions of environmental support in the exercise context, there did not appear to be a suitable instrument to use for purposes of comparison, and this is partly a function of the instrument's newness. Similarly, assessing the construct of relatedness in the exercise context does not have any comparable measurement tools. Relatedness tools in general have used

instruments assessing attachment style, or loneliness in order to demonstrate concurrent validity (e.g. Richer and Vallerand, 1996); however such instruments are not appropriate for this particular context. Furthermore, adding further questionnaire items to the assessments used in the present set of studies may have led to an increase in attrition and non-participation in the research since the studies already required participants to respond to a large number of items.

Two out of the four studies carried out had sample sizes that were insufficient for the intended analyses. The sample size for Study One was just within the acceptable limits for using SEM; as five participants per parameter measured is a minimum requirement (Biddle *et al.*, 2001). Using this criterion, Study Two (the longitudinal study) possessed only half the number of participants that would be required for SEM; thus the intended analyses could not be conducted and were instead replaced with regression analyses, MANOVAs, and ANOVAs. These analyses were able to examine the proposed model in parts, but not as a whole model which departed from Study One and Three which were both able to employ the use of SEM. Finally, the intervention study had only thirty participants in its sample, (nine, ten, and eleven, participants in each treatment group). The lack of participants was a probable contributory factor in the non-significant findings yielded by the analyses, as the results were in the hypothesized direction but lacked statistical power. A greater number of participants would have increased the statistical power of the study. However, within the limits of a PhD programme, time, resources, and availability of GP exercise referral clients made the issue of inadequate sample sizes extremely difficult to control.

Another limitation of the research is that recruitment for each of the studies was achieved through self-selection, and all data collected were self-reported. Self-selection in research may mean that the sample one examines is biased; hence there may be something different about these participants when compared to individuals who declined to take part in the research programme. Such differences may then cause the data to be less representative than they should be. However, one could not coerce individuals to participate in the research, as that would not only be unethical, but may also lead to data that are influenced by such coercion.

Self-report was the only way in which an individual's perceptions could be assessed. There are no objective measures for obtaining such personal information, thus it seems to be an intractable problem.

Drawing conclusions about the GP participants in the studies is to an extent fairly limited as most of the studies did not have a control group comparison. So one can only

assume that, for example, changes in leisure-time exercise behaviour is attributable to the aspects of the exercise scheme and its environment; but this cannot be stated conclusively since there were no comparison groups. Even in the intervention study, it was questionable how closely the 'control' group was in fact a 'no treatment' condition since there was initial contact with participants, and contact at 4 and 10 weeks into the scheme. Despite the researcher making every attempt to keep conversation to a minimum when meeting with the control participants, it is possible that in the course of being polite and respectful, participant perceptions of environmental support could have been unwittingly enhanced. At the end of the study, some participants even mentioned how the questionnaire was useful, as it 'made them think' more about exercise and how they felt about it, so even an apparently innocuous questionnaire could have made the control group less of a 'no treatment' condition.

One possible solution to this problem would be to recruit participants for several studies concurrently, and to take data for relevant studies as and when it is required. This would perhaps be more labour intensive, but it could also make a more efficient use of the small pool of GP exercise referral participants from which to recruit.

#### **Future Research**

Firstly, future research needs to consider the relative importance of each of the psychological needs across a variety of contexts. Within the GP exercise referral population studied here, satisfaction of the need for relatedness appeared to be the most valued. However, past research in the context of education (Deci, Vallerand, Pelletier, and Ryan, 1991) has shown competence to be most strongly related to self-determined motivation; and in terms of healthcare, research has emphasized the strong relationship between self-determined motivation and autonomy (Williams *et al.*, 1996; Williams, Rodin, Ryan, Grolnick, and Deci, 1998). It is becoming increasingly apparent that the importance of each of the needs may vary as a function of context. Uncovering which of the three needs is most likely to lead to self-determined forms of motivation would help tailor environmental support towards facilitating the most salient of the needs.

Secondly, the relationships between introjected regulation and psychological need satisfaction, relative autonomous regulation, and behavioural outcomes need to be further explored. The present research programme failed to find significant relationships between psychological need satisfaction and introjected regulation, which contrasts with previous research (Mullan *et al.*, 1997). Further justification for future research to include a re-

examination of introjected regulation is evidenced by the results of the confirmatory factor analysis for the BREQ-2 (Chapter Three), where the model failed to explain any significant amount of variance in the introjected regulation subscale.

The possibility of introjected regulation holding a unique position along the selfdetermination continuum, (in so far as it may represent a transitional phase in the development of internalisation) has already been discussed in Chapter Three. In spite of the intuitive appeal of this proposition explaining the non-significant relationships with other motivational variables, more research is required to explore introjection and its relationships. Finally, the motivational interviewing-based intervention used in Study Four (Chapter Six), failed to significantly differ from the attention-control group and control group in terms of many of the motivational and behavioural outcomes that were initially hypothesized to differ. It was suggested that a more 'action-orientated' intervention may be needed for this particular population, since their stage of readiness appeared to be more advanced than anticipated. Future research should therefore explore interventions which may incorporate motivational interviewing at the outset (as an assessment measure), and then to have the flexibility to continue with either further exploration of the client's feelings towards exercise, or to progress to an action-oriented approach. Goal-setting procedures may be the most appropriate focus for this action-based approach, especially as having clear instruction and information emerged from the qualitative interviews as the most important aspects of the exercise scheme. Systematic Motivational Counselling (SMC - Cox, Klinger and Blount, 1991) is an intervention that appears to be more structured and action-oriented than MI, and could therefore be a possible alternative intervention. In common with MI however is that it was developed in the drug and alcohol addiction context; and to date SMC has not been applied to exercise behaviour. It would therefore be worth investigating the application of SMC to the exercise context as it may provide the goal and action oriented aspects that appear to be desired by the population studied here in the present thesis.

To conclude, the findings of this thesis suggest that a motivational interviewing type of approach is perhaps not the most effective approach to be used with individuals who are relatively ready to change, but in need of specific guidance and practical support from others.

#### REFERENCES

Abrahamson, M. (1983). Social research methods. Prentice Hall; Englewood Cliffs, NJ.

Ajzen, I. (1985). From intentions to actions: a theory of planned behavior. In Kuhl, J. and Beckman, J. (eds), *Action-control: From cognition to behavior*. Springer, Heidelberg, pp. 11–39.

Allied Dunbar National Fitness Survey (1992). Main findings. Sports Council and Health Education Authority. London.

Andersen, S. M., Chen, S. and Carter, C. (2000). Fundamental human needs: making social cognition relevant. *Psychological Inquiry*, **11**, 4, 269-318.

Anderson, J. C., and Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin*, **103**, 3, 411-423.

Arkema, P. H. (1981). The borderline personality and transitional relatedness. *American Journal of Psychiatry*, **138**, 2, 172-177.

Ashenden, R., Silagy, C., and Weller, D. (1997). A systematic review of the effectiveness of promoting lifestyle change in general practice. *Family Practice*, **14**, 160-176.

Atkinson, J. W. (1964). Introduction to motivation. New York: Van Nostrand.

Bandura, A. (1997). Self-efficacy: The exercise of control. New York: Freeman.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioural change. *Psychological Review*, **84**, 191-215.

Becker, M. H. (Ed.) (1974). The health belief model and personal health behaviour. *Health Education Monographs*, **2**, 324–508.

Bentler, P. M., (1995). *EQS. Structural Equation Program Manual*. Encino, CA, Multivariate Software Inc.

204

Bentler, P. M. and Bonnet, D. G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin*, **88**, 588-606.

Biddle, S.J., Markland, D., Gilbourne, D., Chatzisarantis, N. and Sparkes, A.C. (2001). Research methods in sport and exercise psychology: quantitative and qualitative issues. *Journal of Sports Sciences*, **19**, 777-809.

Biddle, S. J. H., and Mutrie, N. (2001). *Psychology of physical activity and exercise: a health-related perspective*. Springer-Verlag; London.

Biddle, S.J.H. (1999). Motivation and perceptions of control: Tracing its development and plotting its future in exercise and sport psychology. *Journal of Sport & Exercise Psychology*, **21**, 1-23.

Black, A. E., and Deci, E. L. (2000). The effects of instructors' autonomy support and students' autonomous motivation on learning organic chemistry: A self-determination theory perspective. Science Education, **84**, 740-756.

Bollen, K. A. (1989). Structural model testing with latent variables. Wiley; New York.

Borkovec, T. D. and Nau, S. D. (1972). Credibility of analogue therapy rationales. *Journal of Behavior Therapy and Experimental Psychiatry*, **3**, 257-260.

Bowlby, J. (1988). A secure base: Parent-child attachment and healthy human development. Basic Books; New York.

Bowlby, J. (1969). Attachment and loss, Vol I. New York: Basic Books, Inc.

British Heart Foundation Statistics Database 2003 website. http://www.bhf.org.uk/youngpeople/uploaded/bhf\_heartstats\_2003\_summary.pdf. Accessed 23.07.03. Brown, J. M., and Miller, W. R. (1993). Impact of motivational interviewing on participation in residential alcoholism treatment. *Psychology of Addictive Behaviors*, **7**, 211-218.

Browne, M. W. and Cudeck, R. (1993). Alternative ways of assessing model fit. In K. A. Bollen and J. S. Long (Eds.) *Testing Structural Equation Models*. Newbury Park, CA, Sage.

Burke, B. L., Arkowitz, H., and Dunn, C. (2002). The efficacy of motivational interviewing and its adaptations: What we know so far. In W. R. Miller and S. Rollnick (Eds.) *Motivational interviewing: preparing people for change* (2002). Guildford Press, New York.

Butler, C. C., Rollnick, S., Cohen, D., Russel, I., Bachman, M., and Stott, N. (1999). Motivational consulting versus brief advice for smokers in general practice: a randomised trial. *British Journal of General practice*, **49**, 611-616.

Byrne, B. M. (1994). Testing for the factorial validity, replicability and invariance of a measuring instrument: A paradigmatic application based on the Maslach Burnout Inventory. *Multivariate Behavioural Research*, **29**, 3, 289-311.

Cadorette, I., Blanchard, C. M., and Vallerand, R. J. (1996). *Weight-loss program: The influence of the fitness centre and the monitor style on participants' motivation*. Paper presented at the Annual Conference of the Quebec Society for Research Psychology, Trois-Rivious, Ontario, Canada.

Campbell,M. K., DeVellis,B. M., Strecher,V. J., Ammerman,A. S., DeVellis,R. F. and Sandler,R. S. (1994). Improving dietary behavior: The effectiveness of tailored messages in primary care settings. *American Journal of Public Health*, **84**, 783-787.

Campbell, D. T., and Stanley, J. C. (1966). *Experimental and quasi-experimental designs for research*. Chicago R. McNally.

Carey, M. P., Maisto, S. A., Kalichman, S. C., Forsyth, A. D., Wright, E. M. and Johnson, B. (1997). Enhancing motivation to reduce the risk of HIV infection for economically disadvantaged urban women. *Journal of Consulting and Clinical Psychology*, **65**, 531-541.

Carnegie, D. (1936). *How to win friends and influence people*. New York: Simon and Schuster.

Cherulnik, P. D., (1983). Behavioural research: assessing the validity of research findings in psychology. Harper Row; New York.

Colby, S. M., Monti, P. M., Barnett, N. P., Rohsenow, D. J., Weissman, K., Spirito, A., Woolard, R. H., and Lewander, W. J. (1998). Brief motivational interviewing in a hospital setting for adolescent smoking: a preliminary study. *Journal of Consulting and Clinical Psychology*, **66**, 574-578.

Connell, J. P, and Wellborn, J.G. (1991). Competence, autonomy, and relatedness: A motivational analysis of self-system processes. In Gunnar, M. R. (Ed); Sroufe, L. (Ed). *Self processes and development. The Minnesota symposia on child psychology*, Vol. 23 (pp. 43-77). Hillsdale, NJ, England: Lawrence Erlbaum Associates.

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, **16**, 297-335.

Deci, E. L. (1987). Theories and paradigms, constructs and operations: Intrinsic motivation research is already exciting. *Journal of Social Behavior & Personality*. **2**, 1, 177-185.

Deci, E. L. (1971) Effects of externally mediated rewards on intrinsic motivation. *Journal of Personality and Social Psychology*, **22**, 113–120.

Deci, E. L. and Cascio, W. F. (1972). *Changes in intrinsic motivation as a function of negative feedback and threats*. Paper presented at the Eastern Psychological Association, Boston, MA.

Deci, E. L., Eghrari, H., Patrick, B. C., and Leone, D. R. (1994). Facilitating Internalisation: The Self-Determination Theory Perspective. *Journal of Personality*, **62**, 119-142.

Deci, E. L., and Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, **11**, 227-268.

Deci, E. L., and Ryan, R. M. (1991). A motivational approach to self: Integration in personality. In R. Dienstbier (Ed.), *Nebraska symposium on motivation: Vol. 38. Perspectives on motivation* (pp. 237-288). Lincoln, NE: University of Press.
Deci, E.L. and Ryan, R.M. (1985). Intrinsic motivation and self-determination in human behaviour. New York: Plenum.

Deci, E. L., Ryan, R. M., Gagné, M., Leone, D. R., Usunov, J., and Kornazheva, B. P. (2001). Need satisfaction, motivation, and well-being in the work organizations of a former Eastern Bloc country. *Personality and Social Psychology Bulletin*, **27**, 930-942.

Deci, E. L., Ryan, R. M., and Williams, G. C. (1996). Need satisfaction and the self-regulation of learning. *Learning and Individual Differences*, **8**, 165-183.

Deci, E. L., Schwartz, A. J., Sheinman, L., and Ryan, R. M. (1981). An instrument to assess adults' orientations toward control versus autonomy with children: Reflections on intrinsic motivation and perceived competence. *Journal of Educational Psychology*, **73**, 5, 642-650.

Deci, E. L., Vallerand, R. J., Pelletier, L. G., and Ryan, R. M. (1991). Motivation and education: The self-determination perspective. *Educational Psychologist*. Special Issue: Current issues and new directions in motivational theory and research, **26**, 3 & 4, 325-346.

Department of Health (2001). Exercise Referral Systems: A National Quality Assurance Framework.

http://www.doh.gov.uk/exercisereferrals/exercisereferral.pdf. Accessed 29.09.03.

Department of Health, (1999). Saving lives: Our healthier nation. White Paper. London: Department of Health.

Department of Health, (1996). *Strategy statement on physical activity*. London: Department of Health.

Derber, C. (1979). *The pursuit of attention: Power and individualism in everyday life*. Oxford, UK: Oxford University Press.

Diamantopoulos, A. and Winklhofer, H. M. (2001). Index Construction with formative indicators: an alternative to scale development. *Journal of Marketing Research*, **38**, 2, 269-277.

DiClemente, C. C. (1993). Changing addictive behaviours: A processes perspective. *Current Directions in Psychological Science*, **2**, 101-106.

Dishman, R. K., (1990). Determinants of participation in physical activity. In C. Bouchard, R. J. Shephard, T. Stephens, J. R. Sutton and B. D. McPherson (Eds) *Exercise, fitness and health: a consensus of current knowledge*. Champaign, Ill., Human Kinetics.

Dishman, R. K., (Eds.) (1988). *Exercise adherence: its impact on public health*. Human Kinetics, Champaign, Ill.

Dishman, R. K., (1982). Compliance/adherence in health-related exercise. *Health Psychology*, **1**, 237-267.

Draycott, S. and Dabbs, A. (1998). Cognitive Dissonance 2: A theoretical grounding of motivational interviewing. *British Journal of Consulting and Clinical Psychology*, **37**, 355-364.

Dunn, C., Deroo, L. and Rivara, F. P. (2001). The use of brief interventions adapted from motivational interviewing across behavioural domains: a systematic review. *Addiction*, **96**, 1725-1742.

Epstein, S. (1990). Cognitive-experiential self-theory. In L. A. Pervin (Ed.) *Handbook of personality: Theory and research* (pp. 165-192). New York: Guilford Press.

Evans, J. R. (1985). The process of team selection in children's self-directed and adult directed games. (Unpublished doctoral dissertation, University of Illinois at Urbana–Champaign.)

Festinger, L., (1957). A theory of cognitive dissonance. Stanford, Calif., Stanford University Press

Fisher, C. D. (1978). The effects of personal control, competence, and extrinsic reward systems on intrinsic motivation. *Organizational Behaviour & Human Performance*, **21**, 273-288.

Foote, J., DeLuca, A., Magura, S., Warner, A., Grand, A., Rosenblum, A., and Stahl, S.

(1999). A Group Motivational Treatment for Chemical Dependency. *Journal of Substance Abuse Treatment*, **17**, 3, 181-192.

Fornell, C. and Bookstein, F. L. (1982). A comparative analysis of two structural equation models: LISREL and PLS applied to market data. In C. Fornell (Ed.) *A Second generation of Multivariate Analysis, Vol. 1* (pp. 289-324); Praeger; New York.

Franks, B. D. and Huck, S. W. (1986). Why does everyone use the 0.05 significance level? *Research Quarterly for Exercise & Sport*, **57**, 245-249.

Game Plan: a strategy for delivering Government's sport and physical activity objectives, published by the Strategy Unit. http://www.number-10.gov.uk/su/sport/report/01.htm. Accessed 29.09.03.

Georgiadis, M. M., and Biddle, S. J. H. (2001). Behavioural counselling in obesity: case studies using the stages of change and self-determination theory. *International Society of Sport Psychology: 10<sup>th</sup> World Congress, Conference Proceedings.* 

Ginsburg, J. I. D., Mann, R. E., Rotgers, F., and Weekes, J. R. (2002). Motivational Interviewing with Criminal Justice Populations. In W. R. Miller and S. Rollnick, *Motivational interviewing: Preparing people for change* (2nd ed. pp.). New York: Guilford Press.

Glaser, B. G. and Strauss, A. L. (1967). *The discovery of grounded theory: Strategies for qualitative research*. Aldine: New York.

Godin, G. Desharnais, R, Valois, P, and Bradet, R. (1995). Combining behavioural and motivational dimensions to identify and characterize the stages in the process of adherence to exercise. *Psychology & Health*, **10**, 4, 333-344.

Godin, G. and Shephard, R. J. (1985) A simple method to assess exercise behaviour in community. *Canadian Journal of Applied Sport Sciences*, **10**, 141-146.

Grolnick, W. S., Bridges, L., and Frodi, A. (1984). Maternal control style and the mastery motivation of one-year-olds. *Infant Mental Health Journal*, **5**, 72-82.

Grolnick, W. S., and Ryan, R. M. (1989). Parent styles associated with children's selfregulation and competence in school. *Journal of Educational Psychology*, **81**, 143-154.

Grolnick, W. S. and Ryan, R., M. (1987). Autonomy in children's learning: An experimental and individual difference investigation. *Journal of Personality & Social Psychology*, **52**, 5, 890-898.

Grolnick, W. S and Slowiaczek, M. L., (1994). Parents' involvement in children's schooling: A multidimensional conceptualization and motivational model. *Child Development*, **65**, 1, 237-252.

Hagerty, B. M. K., Lynch-Sauer, J., Patusky, K. L., and Bouwsema, M. (1993). An emerging theory of human relatedness. *Image: Journal of Nursing Scholarship*, **25**, 4, 291-296.

Hardcastle, S. and Taylor, A. H. (2001). Looking for more than weight loss and fitness gain: Psychosocial dimensions among older women in a primary-care exercise-referral program. *Journal of Aging & Physical Activity. Special Issue: Aging and Physical Activity, The Promise of Qualitative Research*, **9**, 3, 313-328.

Harland, J., White, M., Drinkwater, C., Chinn, D., Farr, L., and Howel, D. (1999). The Newcastle exercise project: a randomised controlled trial of methods to promote physical activity in primary care. *British Medical Journal*, **319**, 828-32.

Harper, R. and Hardy, S. (2000) An evaluation of motivational interviewing as a method of intervention with clients in a probation setting. *British Journal of Social Work*, **30**, 393-400.

Hauser, R. M. (1973). Disaggregating a social-psychological model of educational attainment. In A. S. Goldberger and O. D. Duncan (Eds.) *Structural equation models in the social sciences* (pp. 255-84); Seminar Press; New York.

Health Education Authority, (1998). Effectiveness of physical activity promotion in primary care. *Health Promotion Effectiveness Reviews*. London: HEA.

Hoyle, R. H. (1995). The structural equation modeling approach: Basic concepts and fundamental issues Hoyle, Rick H. (Ed). (1995). *Structural equation modeling: Concepts, issues, and applications* (pp. 1-15). Thousand Oaks, CA, US: Sage Publications.

Hoyle, R. H. and Panter, A. T. (1993). Writing about structural equation modelling. In R. H. Hoyle (Ed.) *Structural equation modelling: Concepts, issues and applications*. London, Sage.

Hu, L. and Bentler, P. M. (1999). Cut-off criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, **6**, 1-55.

Hu, L. and Bentler, P. M. (1995). Evaluating model fit. In R. H. Hoyle (Ed.), *Structural Equation Modelling: Concepts, Issues and Applications*. London, Sage.

Hunt, P. and Hillsdon, M. (1996). *Changing eating and exercise behaviour*. Blackwell Science; Oxford.

Ingledew, D.K.I., Markland, D. and Medley, A. (1998). Exercise motives and Stages of Change. *Journal of Health Psychology*, **3**, 477-489.

Institute for Research and Reform in Education (1998). Rochester Assessment Package for Schools (RAPS). University of Rochester.

Jaccard, J. and Wan, C. W. (1996). *LISREL approaches to interaction effects in multiple regression*. Thousand Oaks, CA: Sage.

Jacobs, D. R., Ainsworth, B. E., Hartman, T. J., and Leon, A. S. (1993). A simultaneous evaluation of 10 commonly used physical activity questionnaires. *Medicine & Science in Sports & Exercise*, **25**, 81-91.

Joint Surveys Unit (1999) Health Survey for England, 1998. London, The Stationery Office.

Joreskog, K. G. (1993). Testing structural equation models. In K. A. Bollen and J. S. Long (Eds.), *Testing structural equation models* (pp. 294-316). Newbury Park, CA: Sage.

Jöreskog, K. G., and Sörbom, D. (1999). *LISREL*, 8.30: User's Reference Guide. Chicago, IL., Scientific Software International.

Jöreskog, K. G., and Sörbom, D. (1989). *LISREL 7: User's Reference Guide*. Chicago, IL., Scientific Software International.

Kline, R. B. (1998). *Principles and Practice of Structural Equation Modelling*. Guilford. New York (pp219-220).

Koestner, R., and Losier, G. F. (2002). Distinguishing three ways of being highly motivated: a closer look at introjection, identification, and intrinsic motivation. In E.L. Deci and R. M. Ryan (Eds.) *Handbook of Self-determination Research* (pp. 101-121). The University of Rochester Press; New York.

Koestner, R., Losier, G. F., Vallerand, R. J, and Carducci, D. (1996). Identified and introjected forms of political internalization: Extending self-determination theory. *Journal of Personality & Social Psychology*, **70**, 5, 1025-1036.

Kowal, J. and Fortier, M. S., (2000). Testing relationships from the hierarchical model of intrinsic and extrinsic motivation using flow as a motivational consequence. *Research Quarterly for Exercise and Sport*, **71**, 2, 171-181.

Liang, J. L., Bennett, J. M., and Whitelaw, N. A. (1990). Appropriateness of composites in structural equation models. *Journal of Gerontology*, **45**, 2, 52-59.

Lepper, M. R., Greene, D., and Nisbett, R. E. (1973). Undermining children's intrinsic interest with extrinsic reward: A test of the "overjustification" hypothesis. *Journal of Personality & Social Psychology*, **28**, 1, 129-137.

Luborsky, L., McLellan, A. T., Woody, G. E., O'Brien, C. P., and Auberbach, A. (1985). Therapist success and its determinants. *Archives of General Psychiatry*, **42**, 602-611.

McAuley, E., Wraith, S., and Duncan, T. E. (1991). Self-Efficacy, perceptions of success, and intrinsic motivation for exercise. *Journal of Applied Sport Psychology*. **7**, 346-359.

MacCallum, R. C. and Browne, M. W. (1993). The use of causal indicators in covariance structure models: some practical issues. *Psychological Bulletin*, **114**, 3, 541.

Marcus, B. H., Rossi, J. S. and Selby, V. (1992). The stages and processes of exercise adoption and maintenance in a worksite sample. *Health Psychology*, **11**, 386-395.

Marcus, B. H., and Simkin, L. R., (1993). The stages of exercise behaviour. *The Journal of Sports Medicine & Physical Fitness*, **33**, 1, 83-88.

Markland, D. (1999). Self-determination moderates the effects of perceived competence on intrinsic motivation in an exercise setting. *Journal of Sport & Exercise Psychology*, **21**, 350-360.

Markland, D. and Hardy, L. (1997). On the factorial and construct validity of the Intrinsic Motivation Inventory: Conceptual and operational concerns. *Research Quarterly for Exercise and Sport*, **68**, 20-32.

Markland, D.A., Ryan, R. M., Tobin, V.J. and Rollnick, S. (*submitted*). Motivational interviewing and self-determination theory. *Journal of Social and Clinical Psychology*.

Markland, D. A. and Tobin, V. J. (*in press*). A modification to the Behavioural Regulation in Exercise Questionnaire to include an assessment of amotivation. *Journal of Sport and Exercise Psychology*.

Marsh, H. W., Antill, J. K., and Cunningham, J. D. (1989). Masculinity and femininity: A bipolar construct and independent constructs. *Journal of Personality*, **57**, 3, 625-663.

Marsh, H. W., Balla, J. R., and McDonald, R. P. (1988). Goodness of fit indices in confirmatory factor analysis. The effect of sample size. *Psychological Bulletin*, **103**, 391-410.

Maslow, A. (1954). Motivation and personality. New York: Harper.

Mays, N. and Pope, C. (1995). Qualitative research: Rigour and qualitative research. *British Medical Journal*, **311**, 182-184.

Miller, W. R. (1999). Toward a theory of motivational Interviewing. *Motivational Interviewing Newsletter: Updates, Education and Training*, **6**, 2-4. Miller, W. R. (1996). Motivational interviewing: Research, practice, and puzzles. *Addictive Behaviours*, **21**, 835-842.

Miller, W. R. (1994). Motivational Interviewing: III. On the ethics of Motivational Intervention. *Behavioral and Cognitive Psychotherapy*, **22**, 111-123.

Miller, W. R. (1983). Motivational Interviewing with Problem Drinkers. *Behavioural Psychotherapy*, **11**, 147-172.

Miller, W. R., Benefield, R. G., and Tonigan, S. (1993). Enhancing motivation in problem drinking: A controlled comparison of two therapist styles. *Journal of Consulting and Clinical Psychology*, **61**, 455-461.

Miller, W.R. and Rollnick, S. (1991). Motivational interviewing: Preparing people to change addictive behaviour. New York, Guilford Press.

Miller, W.R. and Rollnick, S. (2002). *Motivational interviewing: Preparing people to change addictive behaviour* (2<sup>nd</sup> Edition). New York, Guilford Press.

Miller, W. R., and Sovereign, R. G. (1989). The Check-up: A model for early intervention in addictive behaviours. In T. Loberg, W. R. Miller, P. E. Nathan, and G. A. Marlatt (Eds.), *Addictive behaviours: Prevention and early intervention* (pp.219-231). Amsterdam: Swets & Zeitlinger.

Miller, M. B. (1995). Coefficient alpha: a basic introduction from the perspectives of classical test theory and structural equation modelling. *Structural Equation Modeling*, **2**, 3, 255-273.

Moses, J., Steptoe, A., Matthews, A., and Edwards, S. (1989). The effects of exercise training on mental well-being in the normal population: A controlled trial. *Journal of Psychosomatic Research*, **33**, 1, 47-61.

Moss, L. (1979). Overview. In L. Moss & H. Goldstein (Eds.), *The recall method in social surveys* (p.159-169). University of London Institute of Education; London.

Mullan, E. and Markland, D. (1997). Variations in self-determination across the stages of change for exercise in adults. *Motivation and Emotion*, **21**, 349-362.

Mullan, E., Markland, D., and Ingledew, D. (1997). A graded conceptualisation of selfdetermination in the regulation of exercise behaviour: Development of a measure using confirmatory factor analytic procedures. *Personality & Individual Differences*, **23**, 5, 745-752.

Musil, C. M., Jones, S. L., and Warner, C. D. (1998). Structural equation modelling and its relationship to multiple regression and factor analysis. *Research in Nursing and Health*, **21**, 271-281.

Noonan, W. C., and Moyers, T. B. (1997). Motivational interviewing: A review. *Journal of Substance Misuse*, **2**, 8-16.

Ntoumanis, N. (2001). A self-determination approach to the understanding of motivation in physical education. *British Journal of Educational Psychology*, **71**, 2, 225-242.

Patton, M. Q. (1980). Qualitative evaluative methods. Sage: Beverly Hills, CA.

Patrick, B. C., Skinner, E. A., and Connell, J. P. (1993). What motivates children's behavior and emotion? Joint effects of perceived control and autonomy in the academic domain. *Journal of Personality & Social Psychology*, **65**, 4, 781-791.

Pedhazur, E. L. and Schmelkin, L. P. (1991). Measurement, design, and analysis: an integrated approach (pp.450). Lawrence Erlbaum Associates; Hillsdale, N.J.

Persson, G. and Nordlund, C. L. (1983). Expectations of improvement and attitudes to treatment processes in relation to outcome with four treatment methods for phobic disorders. *Acta Psychiatrica Scandinavica*, **68**, 6, 484-493.

Prochaska, J. O. and DiClemente, C. C. (1992). Stages of change in the modification of problem behaviours. In M. Hersen, R. M. Eisler, and P.M. Miller, (Eds.) *Progress in behaviour modification*. Sycamore Press; Sycamore, IL.

Prochaska, J. O. and DiClemente, C. C. (1984). *The transtheoretical approach: Crossing traditional boundaries of therapy*. Dow Jones Irwin, Homewood, IL.

Prochaska, J. O., DiClemente, C. C., Velicer, W., and Rossi, J. S. (1993). Standardized, individualized, interactive, and personalized self-help programs for smoking cessation. *Health Psychology*, **12**, 399-405.

Reeve, J. and Sickenius, B. (1994). Development and validation of a brief measure of the three psychological needs underlying intrinsic motivation: The AFS scales. *Educational & Psychological Measurement*, **54**, 2, 506-515.

Reis, H. T., Sheldon, K. M., Gable, S. L., Roscoe, J. and Ryan, R. M. (2000). Daily Well-Being: The Role of Autonomy, Competence, & Relatedness. *Personality & Social Psychology Bulletin*, **26**, 4, 419-435.

Resnicow, K., Dilorio, C., Soet, J. E., Borrelli, B., Hecht, J., and Ernst, D. (2002). Motivational interviewing in health promotion: It sounds like something is changing. *Health Psychology*, **21**, 5, 444-451.

Richer, S. F. and Vallerand, R. J. (1996). Construction et validation de l'Échelle du sentiment d'appartenance sociale (ÉSAS). *European Review of Applied Psychology*, **48**, 2, 129-137.

Riddoch, C. J., Puig-Ribera, A, and Cooper A. (1998). *The effectiveness of physical activity promotion schemes in primary care: a systematic review*. Health Education Authority, London.

Riemsma, R. P., Pattenden, J., Bridle, C., Sowden, A. J., Mather, L., Watt, I. S. and Walker, A. (2003). Systematic review of the effectiveness of stage based interventions to promote smoking cessation. *British Medical Journal*, **326**, 1175-1177.

Rogers, C. R. (1959). A theory of therapy, personality, and interpersonal relationships as developed in the client-centred framework. In S. Koch (Ed.), *Psychology: The study of a science. Vol. 3. Formulations of the person and social context* (pp.184-256). New York: McGraw-Hill.

Rollnick, S. (2001). Behaviour Change Counselling Two-Day Workshop - University of Wales, Cardiff.

Rollnick, S. (1996). Behaviour change in practice: targeting individuals. *International Journal of Obesity*, **20** (suppl. 1), 22-26.

Rollnick, S., Mason, P., and Butler, C. (1999). *Health behaviour change: a guide for practitioners*. Edinburgh: Churchill Livingstone.

Rollnick, S., and Miller, W. R. (1995). What is motivational interviewing? *Behavioral and Cognitive Psychotherapy*, **23**, 325-334.

Rotter, J. B. (1966). Generalised expectencies for internal versus external control of reinforcement, (pp.1-28). *Psychological Monographs*, **80**, 1, 609.

Rouslin, S. (1973). Relatedness in group psychotherapy. *Perspectives in Psychiatric Care*, **11**, 4, 165-171.

Ryan, R. M. (1995). Psychological needs and the facilitation of integrative processes. *Journal* of *Personality*, **63**, 397-427.

Ryan, R. M. (1993). Agency and organization: Intrinsic motivation, autonomy and the self in psychological development. In J. Jacobs (Ed.), *Nebraska symposium on motivation: Developmental perspectives on motivation*, **40**, 1-56. Lincoln, NE: University of Nebraska Press.

Ryan, R. M. (1991). The nature of the self in autonomy and relatedness. In J. Strauss and G.R. Goethals (Eds.), Multidisciplinary perspectives on the self (pp. 208-238). Springer-Verlag; New York.

Ryan, R. M., (1982). Control and information in the interpersonal sphere. An extension of cognitive evaluation theory. *Journal of Personality and Social Psychology*, **43**, 450-461.

Ryan, R. M. and Connell, J. P. (1989). Perceived locus of causality and internalization:
Examining reasons for acting in two domains. *Journal of Personality & Social Psychology*, 57, 5, 749-761.

Ryan, R. M., and Deci, E. L. (2000a). Intrinsic and extrinsic motivations: classic definitions and new directions. *Contemporary Educational Psychology*, **25**, 54-67.

Ryan, R. M., and Deci, E. L. (2000b). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, **55**, 68-78.

Ryan, R. M., and Deci, E. L. (2000c). The darker and brighter sides of human existence: Basic psychological needs as a unifying concept. *Psychological Inquiry*, **11**, 319-338

Ryan, R. M., Deci, E. L., and Grolnick, W. S. (1995). Autonomy, relatedness, and the self: Their relation to development and psychopathology. In D. Cicchetti and D. J. Cohen (Eds.), *Developmental psychopathology: Vol. 1. Theory and methods* (pp. 618-655). New York: Wiley.

Ryan, R., M. and Powelson, C. L. (1991). Autonomy and Relatedness as Fundamental to motivation and education. *Journal of Experimental Education*, **60**, 1, 49-66.

Ryan, R. M., Sheldon, K. M., Kasser, T., and Deci, E. L. (1996). All goals are not created equal: An organismic perspective on the nature of goals and their regulation. In P. M. Gollwitzer and J. A. Bargh (Eds.), *The psychology of action: Linking cognition and motivation to behavior* (pp. 7-26). New York: Guilford.

Ryan, R. M., Frederick, C. M., Lepes, D., Rubio, N. and Sheldon, K. M. (1997). Intrinsic motivation and exercise adherence. *International Journal of Sport Psychology*, 28, 335-354.

Ryan, R.M., Mims, V., and Koestner, R.(1983). Relation of reward contingency and interpersonal context to intrinsic motivation: A review and test using cognitive evaluation theory. *Journal of Personality and Social Psychology*, **45**, 736-750.

Ryan, R. M., Rigby, S. and King, K. (1993). Two types of religious internalization and their relations to religious orientations and mental health. *Journal of Personality & Social Psychology*, **65**, 3, 586-596.

Ryan, R. M. and Solky, J. A. (1996). What is supportive about social support? On the psychological needs for autonomy and relatedness. In Pierce, G. R., Sarason, B. R., and

Sarason, I. G. (Eds). *Handbook of social support and the family* (pp. 249-267). New York, Plenum Press.

Satorra, A., and Bentler, P. M. (1994). Corrections to test statistics and standard errors in covariance structure analysis. In A. von Eye and C. C. Clogg (Eds).,*Latent variables analysis: Applications for developmental research*, pp. 399-419. Thousand Oaks, CA: Sage.

Scales, R. (1998) Motivational interviewing and skills-based counselling in cardiac rehabilitation: the Cardiovascular Health Initiative and Lifestyle Education (CHILE) Study, doctoral dissertation, University of New Mexico, *Dissertation Abstracts International*, **59** – 03A, p.741.

Schwarzer, R. (1992). Self-efficacy in the adoption and maintenance of health behaviors: theoretical approaches and a new model. In R. Schwarzer (Ed) *Self-efficacy: Thought control of action*. London: Hemisphere, 217-43.

Shaw, E. R. and Blanchard, E. B. (1983). The effects of instructional set on the outcome of a stress management program. *Biofeedback & Self Regulation*. **8**, 4, 555-565.

Sheldon, K. M., Elliot, A. J., Kim, Y., and Kasser, T. (2001). What is satisfying about satisfying events? Testing 10 candidate psychological needs. *Journal of Personality & Social Psychology*, **80**, 2, 325-339.

Sheldon, K.M., Joiner, T., Pettit, J., and Williams, G. (*in press*). Reconciling humanistic ideals and scientific clinical practice. *Clinical Psychology: Science and practice*.

Sheldon, K. M., Ryan, R. M. and Reis, H. T. (1996). What makes for a good day? Competence and autonomy in the day and in the person. *Personality & Social Psychology Bulletin*, **22**, 1276-1279.

Skinner, C. S., Strecher, V. J. and Hospers, H. (1994). Physicians' recommendations for mammography: Do tailored messages make a difference? *American Journal of Public Health*, **84**, 43-49.

Skinner, E. A., (1995). *Perceived control, motivation, and coping*. London; Sage publications.

Smith, D. E., Heckemeyer, C. M., Kratt, P. P., and Mason, D. A. (1997). Motivational interviewing to improve adherence to a behavioral weight-control program for older obese women with NIDDM.: A pilot study. *Diabetes Care*, **20**, 52-54.

Standage, M., Duda, J. L., and Ntoumanis, N. (2003). A model of contextual motivation in physical education: Using constructs from self-determination and achievement goal theories to predict physical activity intentions. *Journal of Educational Psychology*, **95**, 1, 97-110.

Swanson, A.J., Pantalon, M.V., and Cohen, K.R. (1999). Motivational interviewing and treatment adherence among psychiatric and dually-diagnosed patients. *Journal of Nervous & Mental Disease*, **187**, 630-635.

Tabachnick, B. G. and Fidell, L. S. (2001). *Using multivariate statistics* (4th ed). Allyn and Bacon, Boston.

Vallerand, R.J. (2001). A hierarchical model of intrinsic and extrinsic motivation in sport and exercise. In G.C. Roberts (Ed.) Advances in motivation in sport and exercise, (pp 263-319). Human Kinetics: Champaign, IL.

Vallerand, R. J. (2000). Deci and Ryan's self-determination theory: A view from the hierarchical model of intrinsic and extrinsic motivation. Psychological Inquiry, **11**, 4, 312-318.

Vallerand, R. J. (1997). Toward a Hierarchical Model of Intrinsic and Extrinsic Motivation. In M. P. Zanna (Ed.), *Advances in Experimental Social Psychology*, **29**, 271-360. New York, SanDiego: Academic Press.

Vallerand, R. J and Reid, G. (1984). On the causal effects of perceived competence on intrinsic motivation: A test of cognitive evaluation theory. *Journal of Sport Psychology*, **6**, 1, 94-102.

Walsh, J. M., Swangard, D. M., Davis, T., and McPhee, S.J. (1999). Exercise counselling by primary care physicians in the era of managed care. *American Journal of Preventative Medicine*, **16**, 4, 307-13.

Wankel, L.M., (1993). The importance of Enjoyment to adherence and psychological benefits from physical activity. *International Journal of Sport Psychology*, **24**, 151-169.

Weiss, R. S. (1974). *Loneliness: The experience of emotional and social isolation.* Cambridge, MA: MIT Press.

Weiss, M. R., and Duncan, S. C. (1992). The relationship between physical competence and peer acceptance in the context of children's sports participation. *Journal of Sport and Exercise Psychology*, **14**, 177-191.

Weiss, L.A., and Grolnick, W.S. (1991), April). *The roles of parental involvement and support for autonomy in adolescent symptomatology*. Paper presented at the biennial meeting of the Society for Research in Child Development, Seattle, WA.

Wellborn, J.G. and Connell, J.P. (1987). A manual for the Rochester Assessment Package for Schools (RAPS) Unpublished manuscript, University of Rochester.

West, S. G., Finch, J. F., and Curran, P. J. (1995). Structural equation models with nonnormal variables: Problems and remedies. In R. H. Hoyle (Ed.), *structural equation modeling: concepts, issues, and applications* (pp. 56-75). Thousand Oaks, CA: Sage.

Williams, G. C., and Deci, E. L. (1996). Internalization of biopsychosocial values by medical students: A test of self-determination theory. *Journal of Personality and Social Psychology*, 70, 767-779.

Williams, G.C., Grow, V.M., Freedman, Z.R., Ryan, R.M, and Deci, E.L. (1996). Motivational Predictors of Weight Loss and Weight-Loss Maintenance. Journal of *Personality and Social Psychology*, **70**, 1, 115-126.

Williams, G. C., Rodin, G. C., Ryan, R. M., Grolnick, W. S., and Deci, E. L. (1998). Autonomous regulation and long-term medication adherence in adult outpatients. *Health Psychology.* **17**, 3, 269-276.

Williams, G. C., Saizow, R., Ross, L., and Williams, S. A. (1995). Motivation for choosing internal medicines and surgery. *Journal of General Internal Medicine* (Abstract), **10**, 4, 116.

Williams, G. C., Wiener, M. W., Markakis, K. M., Reeve, J. and Deci, E. L. (1994). Medical students' motivation for internal medicine. *Journal of General Internal Medicine*, **9**, 327-333.

Wilson, P. M., and Rodgers, W. M. (*in press*). The relationship between perceived autonomy support, exercise regulations and behavioral intentions in women. *Psychology of Sport & Exercise*.

Wilson, P.M., Rodgers, W.M., Gesell, J., & Blanchard, C. (*in press*). The relationship between psychological needs, self-determined motivation, exercise attitudes, and physical fitness. *Journal of Applied Social Psychology*.

Wilson, P. M., Rodgers, W. M., and Fraser, S. N. (2002). Examining the psychometric properties of the behavioural regulation in exercise questionnaire. *Measurement in Physical Education and Exercise Science*, **6**, 1, 1-21.

Woods, C., Mutrie, N., and Scott, M. (2002). Physical activity intervention: a Transtheoretical Model-based intervention designed to help sedentary young adults become active. *Health Education Research*, **17**, 451-460.

World Health Organization/Federation of Sports Medicine (1995). *Exercise for health:* WHO/FIMS committee on physical activity for health. Bulletin of the World Health Organization, **73**, 2, 135-136.

Wothke, W. (1993). Nonpositive definite matrices in structural modelling. In K. A. Bollen and J. S. Long, *Testing structural equation models*. Newbury Park; Sage.

Wynne, L. C. (1984). The epigenesis of relational systems: A model for understanding family development. *Family Processes*, **23**, 3, 297-318.

## **APPENDIX 1**

- 1.A Introductory page of the PESQ / Psychological Need Satisfaction questionnaire booklet.
- **1.B** Consent form included in the PESQ/Psychological Need Satisfaction questionnaire booklet
- 1.C The main section of the PESQ/Psychological Need Satisfaction questionnaire.
- 1.D Leisure Time Exercise Questionnaire.
- 1.E Psychological Need Satisfaction questionnaire items.
- **1.F** Definitions of Autonomy Support, Structure, and Involvement given to the Doctoral panel.

## <u>1.A - Introductory page of the PESQ / Psychological Need</u> Satisfaction questionnaire booklet:



Thank you for considering completion of this questionnaire. The questionnaire has been developed by the School of Sport, Health & Exercise Science at the University of Wales, Bangor. Its purpose is to examine how people feel about exercise and how they feel whilst exercising. Your completion of the questionnaire will help health and fitness professionals to understand how the environment in which you exercise can influence how you feel.

If we can determine what helps us to take part in exercise, then we will be able to increase the number of people who are active in the population. Heart Disease is the UK's biggest killer and without preventative measures such as exercise we are less likely to succeed in reducing death rates.

We realise that some of the questions included can appear to be repetitive. This is not part of an attempt to check if your answers are consistent. You are encouraged to give your best answer to individual questions. Although it can be a bit of a pain for you, repetition of questions make the questionnaire more precise. So please answer ALL questions, without reference to any previous answers, in a way that most accurately describes your opinions at the time. The best answers are those that immediately spring to mind. If you do not spend too much time thinking about any questions you find a bit 'tricky', it will be easiest for you and give us the sort of data we want.

### <u>1.B - Consent form included in the PESQ / Psychological Need</u> Satisfaction questionnaire booklet:

To maintain strict anonymity, this sheet will be detached on receipt of completed questionnaire

INSTRUCTIONS FOR COMPLETION AND RETURN OF QUESTIONNAIRE:

1. Please DO NOT write your name anywhere except on this page.

2. Please complete the CONSENT TO PARTICIPATE form below.

3. Please place your completed questionnaire in the PRE-PAID envelope enclosed and return within one week of receiving it.

#### INFORMED CONSENT BY PARTICIPANT TO PARTICIPATE IN A RESEARCH PROJECT OR EXPERIMENT

The researcher conducting this project subscribes to the ethical conduct of research and to the protection at all times of the interests, comfort, and safety of participants. This form and the information it contains are given to you for your own protection and full understanding of the procedures. Your signature on this form will signify that you have received information, which describes the procedures, possible risks, and benefits of this research project, that you have received an adequate opportunity to consider the information, and that you voluntarily agree to participate in the project.

Having been asked by Vannessa Tobin of the School of Sport, Health and Exercise Sciences at the University of Wales Bangor to participate in a research project study, I have received information regarding the procedures of the experiment.

I understand the procedures to be used in this study and any possible personal risks to me in taking part.

I understand that I may withdraw my participation in this study at any time.

I also understand that I may register any complaint I might have about this study to Dr Roger Eston Head of the School of Sport Health and Exercise Sciences.

I may obtain copies of the results of this study, upon its completion, by contacting: Vannessa Tobin at the School of Sport Health and Exercise Sciences.

I have been informed that the research material will be held confidential by the researcher.

I agree to participate in the study, which involves completion of short questionnaires

NAME (please type or print legibly):	
ADDRESS:	
SIGNATURE:	DATE:

# 1.C – The main section of the PESQ/Psychological Need Satisfaction questionnaire:

### **GENERAL INFORMATION:**

AGE:	SEX:	and a second	_OCCUPA	TION:
HEIGHT: _		WEI	GHT:	
ETHNIC	ORIGIN:	White	Black	Asian Other (please specify)
WHAT IS	S YOUR FII	RST LANGUAGE	? 🗔 En; Otl	glish Welsh ner (please specify)
EDUCAT		Secondary Postgraduate	] College	University (please tick all that apply)

HOW MANY SESSIONS HAVE YOU ATTENDED TO DATE?

### SECTION A: BELIEFS ABOUT YOUR EXERCISE ENVIRONMENT

This section aims to get information about how you perceive your exercising environment and consists of a list of statements about your exercise environment and you are asked to indicate the extent to which you think that each statement applies to you. Please read the statements carefully, and think about them in relation to your current exercise situation. Questions concern the staff at the leisure facility you have had contact with. Answers are on a scale of 0-4: 0 indicating that the statement is not true for you, and 4 indicating that the statement is very true for you.

### To answer, please CIRCLE the appropriate NUMBER beside each item

	Not tr	ue	Sometimes true	Ve tr	ery ue
1. The staff at the exercise facility encourage me to make my own choices	0	1	2	3	4
2. The staff at the exercise facility try to make time for me even though they are busy	0	1	2	3	4
3. The staff at the exercise facility don't allow me to make any decisions	0	1	2	3	4
4. The staff at the exercise facility make me feel as if I matter to them	0	1	2	3	4
5. The staff at the exercise facility give me good advice about exercising	0	1	2	3	4

	Not t	rue	Sometime true	Ve tr	ry ue
<ol><li>The staff at the exercise facility are concerned about my well-being</li></ol>	0	1	2	3	4
7. The staff at the exercise facility aren't too bothered about how I get on	0	1	2	3	4
8. The staff at the exercise facility look after me well	0	1	2	3	4
9. The staff at the exercise facility make it clear and	0	1	2	3	4
understandable to me what I need to do to get results		2			
10. The staff at the exercise facility make me feel free to make decisions	0	1	2	3	4
11. The staff at the exercise facility provide clear feedback about my progress	0	1	2	3	4
12. The staff at the exercise facility make it clear to me	0	1	2	3	4
13. The staff at the exercise facility consider my personal	0	1	2	3	4
needs					
14. The staff at the exercise facility make me feel positive about being able to perform the activities	0	1	2	3	4
15. The staff at the exercise facility provide me with choices and options	0	1	2	3	4
16. I feel that the staff at the exercise facility care	0	1	2	3	4
17. The staff at the exercise facility help me to feel	0	1	2	3	4
18. The staff at the exercise facility encourage me to take my own initiative	0	1	2	3	4

### SECTION B: BELIEFS ABOUT YOURSELF

The following section consists of statements about your feelings towards exercise and you are asked to indicate the extent to which you think that each statement applies to you. Please read the statements carefully, and think about them in relation to your current situation. Answers are on a scale of 0-4: 0 indicating that the statement is not true for you, and 4 indicating that the statement is very true for you.

## To answer, please CIRCLE the appropriate NUMBER beside each item

	Not t	rue	Sometime true	s \ 1	/ery true
1. I exercise because it's fun	0	1	2	3	4
2. I don't see why I should have to exercise	0	1	2	3	4
3. I think I am pretty good at the exercises I do	0	1	2	3	4
4. I enjoy my exercise sessions	Ō	1	2	3	.4
5. I exercise because other people say I should	0	1	2	3	
6. I feel isolated when I exercise	0	1	2	3	4
7. I feel guilty when I don't exercise	Ō	Ť	2	3	4

	Not true		e Sometimes V		/ery	
			true	tı	rue	
8. I take part in exercise because my friends/family/partner say I should	0	1	2	3	4	
9. I find exercise a pleasurable activity	0	1	2	3	4	
10. I feel ashamed when I miss an exercise session	0	1	2	3	4	
<ol> <li>I feel out of place when I exercise</li> </ol>	0	1	2	3	4	
<ol><li>12. It's important to me to exercise regularly</li></ol>	0	1	2	3	4	
<ol><li>I am pretty skilled at the exercises I have been set</li></ol>	0	1	2	3	4	
14. I don't feel like I "fit in" when I exercise	0	1	2	3	4	
15. I don't see the point in exercising	0	1	2	3	4	
16. I exercise because others will not be pleased with me if	0	1	2	3	4	
l don't						
17. I feel confident that I can do my exercises	0	1	2	3	4	
18. I exercise because I like to rather than because I feel	0	1	2	3	4	
I have to						
19. In exercise situations I feel accepted	0	1	2	3	4	
20. I feel like a failure when I haven't exercised in a while	0	1	2	3	4	
21. I get pleasure and satisfaction from participating in	0	1	2	3	4	
exercise						
22. I feel like a fish out of water when I exercise	0	1	2	3	4	
23. I think exercising is a waste of time	0	1	2	3	4	
24. I think it is important to make the effort	0	1	2	3	4	
25. I feel lonely when I exercise	0	1	2	3	4	
26. I feel under pressure from my friends/family to exercise	0	1	2	3	4	
27. In exercise situations I feel like I belong there	0	1	2	3	4	
28. I would feel bad about myself if I was not making the	0	1	2	3	4	
time to exercise						
29. In exercise I feel that people are interested in me	0	1	2	3	4	
30. I think I do pretty well in my exercises compared to	0	1	2	3	4	
other people						
31. I know what I have to do in order to perform the exercises	0	1	2	3	4	
32. In exercise situations I feel different from everyone else	0	1	2	3	4	
33. Exercising is not something I would choose to do,	0	1	2	3	4	
rather it is something that I feel I ought to do						
34. I have to push myself to exercise	0	1	2	3	4	
35. I feel I ought to exercise	0	1	2	3	4	
36. Exercising is a real effort	0	1	2	3	4	
37. I value the benefits of exercise				-	8	
38. Having to exercise is a bind but it has to be done	0	1	2	3	4	
39. I can't see why I should bother exercising	0	1	2	3	4	
40. I feel like I am missing something if I don't exercise	0	1	2	3	4	
regularly	6221	1	927	0.50	2	
41. In exercise situations I feel supported	0	1	2	3	4	
8 A.					-	

.

THANK YOU FOR COMPLETING THESE QUESTIONS

## **<u>1.D - Leisure Time Exercise Questionnaire:</u>**

I would like you to consider a typical week (7-day period) during the past 3-months, and indicate below on average how many sessions (of 15 minutes or more) you participate in the following kinds of exercise during your free time (write in each circle the appropriate numbers).

a) STRENUOUS EXERCISE (heart beats rapidly)

(for example: running, jogging, squash, vigorous swimming, vigorous long distance cycling, high impact aerobics, circuit training classes)

b) MODERATE EXERCISE (not exhausting) (for example: fast walking, hill walking, tennis, easy bicycling, volleyball, badminton, easy swimming, dancing, moderate impact aerobics)

c) MILD EXERCISE (minimal effort) (for example: stretch classes, yoga, archery, fishing from river bank, bowling, golf, easy walking, gentle exercise classes)



## **1.E - Psychological Need Satisfaction questionnaire items:**

### LCE items:

- 1) Having to exercise is a bind but it has to be done
- 2) I exercise because I like to rather than because I feel I have to
- 3) Exercise is not something I would choose to do, rather it is something that I feel I ought to do

### Competence (Total=5)

- 1) I think I am pretty good at the exercise I do
- 2) I am pretty skilled at the exercises I have been set
- 3) I feel confident that I can do my exercises
- 4) I think I do pretty well in my exercise compared to other people
- 5) I know what I have to do in order to perform the exercises

### Relatedness (Total=10)

- 1) I feel isolated when I exercise
- 2) In exercise situations I feel supported
- 3) I feel out of place when I exercise
- 4) I don't feel like I "fit-in" when I exercise
- 5) In exercise situations I feel accepted
- 6) I feel like a fish out of water when I exercise
- 7) I feel lonely when I exercise
- 8) In exercise situations I feel like I belong there
- 9) In exercise situations I feel that people are interested in me
- 10) In exercise situations I feel different from everybody else

## <u>1.F - Definitions of Autonomy Support, Structure, and Involvement</u> given to the Doctoral panel:

Please read the definitions below regarding certain environmental phenomena which are thought to enhance three fundamental psychological needs (i.e. Autonomy, Competence, and Relatedness). First of all however, these three needs will be defined:

- Autonomy: To feel in control of one's own behaviour, and to feel as though one has choice.
- **Competence**: To know what action is required to achieve certain outcomes as well as the belief that one can perform this action.
- **Relatedness**: To feel that others authentically relate to oneself and to feel a satisfying and coherent involvement with the social world in general, feeling connected with others.

According to Deci & Ryan (1985), environments can either enhance or undermine the fulfilment of these needs. Depending upon the extent to which they provide "Autonomy Support", "Structure", and "Involvement". These terms will be described below:

### **Autonomy Support**

Environments in which this is high would make the individual feel that they are provided with choice and the opportunity to make their own decisions. The environment should not make them feel pressured to perform in a specified way and they should feel as though their individual needs are being considered.

### Structure

Expectations and consequences are clearly defined in an environment high in structure; feedback would also be provided and the environment would be conducive to making the individual feel positive about being able to perform the target behaviours.

### Involvement

Environments high in involvement would make the individual feel as though others are dedicating time and interest to them, and also give them a sense of belongingness and acceptance.

## **APPENDIX 2**

- 2.A The full list of situational PESQ items featured in Chapter 3 accompanied by the original PESQ items featured in Chapter 2.
- 2.B The full list of situational need satisfaction items featured in Chapter 5 accompanied by the original need satisfaction items featured in Chapter 2.

## 2.A - The full list of situational PESQ items featured in Chapter 5 accompanied by the original PESQ items featured in Chapter 2:

.

Original PESQ items	State adapted PESQ items			
Autonomy Support (n=5):				
The staff at the exercise facility	During the class I felt that the instructor			
encourage me to make my own choices	encouraged me to make my own choices			
The staff at the exercise facility provide	During the class I felt that the instructor			
me with choices and options	provided me with choices and options			
The staff at the exercise facility	During the class the instructor			
encourage me to take my own initiative	encouraged me to take my own initiative			
The staff at the exercise facility make	During the class the instructor made			
me feel free to make decisions	me feel free to make decisions			
The staff at the exercise facility don't	During the class I felt that the			
allow me to make any decisions	instructor didn't allow me to make any			
	decisions			
Structu	re (n=6):			
The staff at the exercise facility make it	During the class I felt that the instructor			
clear and understandable to me what I	gave me clear and understandable			
need to do to get results	instructions			
The staff at the exercise facility provide	During the class the instructor provided			
clear feedback about my progress	me with clear feedback			
The staff at the exercise facility make it	During the class the instructor made it			
clear to me what to expect from engaging	clear to me what to expect from engaging			
in the activities	in the class			
The staff at the exercise facility give me	During the class I felt that the instructor			
good advice about exercising	gave me good advice about exercising			
The staff at the exercise facility make	During the class the instructor made			
ne feel positive about being able to	the meyes			
The staff at the exercise facility help	During the class the instructor helped			
me to feel confident about exercising	me to feel confident about exercising			
Involvem	ent (n=7):			
The staff at the exercise facility make	During the class I felt that the			
time for me even though they are busy	instructor tried to involve me even			
	though there were many people in the			
	group			
The staff at the exercise facility make me	During the class the instructor made me			
feel as if I matter to them	feel as if I mattered to them			
The staff at the exercise facility are	During the class I felt that the instructor			
concerned about my well-being	was concerned about my well-being			
The staff at the exercise facility look after	During the class I felt that the instructor			
me well	looked after me well			
The staff at the exercise facility	During the class I felt that the			
consider my personal needs	instructor considered my personal			
	needs			
The staff at the exercise facility care	During the class I felt that the instructor			
about me	cared about me			

The staff at the exercise facility aren't too bothered about how I get on	During the class I felt that the instructor wasn't too bothered about how I got on
	how I got on

Bold type indicates items that were not included in the final item set from Study 1

## <u>2.B - The full list of situational need satisfaction items featured in</u> <u>Chapter 5 accompanied by the original need satisfaction items</u> <u>featured in Chapter 2:</u>

Trait Need Satisfaction Items	State adapted Need Satisfaction Items
Locus of Causality	v for Exercise (n=3):
Having to exercise is a bind but it has to	Having to go to the class was a bind but it
be done	had to be done
I exercise because I like to rather than	I went to the class because I wanted to
because I feel I have to	rather than because I felt I had to go
Exercise is not something I would choose	Going to the class is not something that I
to do, rather it is something that I feel I	chose to do, rather it was something I felt
ought to do	I ought to do
Compete	nce (n=5):
I think I am pretty good at the exercise I	I think I was pretty good at the class I
do	have just done
I am pretty skilled at the exercises I have	I am pretty skilled at doing the class I
been set	have just done
I feel confident that I can do my	I felt confident that I could do the class
exercises	
I think I do pretty well in my exercise	Compared to other people in the class I
compared to other people	think I did pretty well
I know what I have to do in order to	I knew what I had to do in order to
perform the exercises	perform the exercises in the class
Relatedn	ess (n=8):
In exercise situations I feel accepted	In the class I felt accepted
In exercise situations I feel supported	In the class I felt supported
In exercise situations I feel like I	I felt like I belonged in the class
belong there	
I feel isolated when I exercise	I felt isolated whilst in the class
I don't feel like I "fit in" when I	I didn't feel like I "fit in" when I was in
exercise	the class
I feel out of place when I exercise	I felt out of place when I was in the
T 0 1111 011	class
I feel like a fish out of water when I	I felt like a fish out of water whilst in
exercise	the class
In exercise situations I feel different	In the class I felt different from
trom everyone else	everyone else
In exercise situations I feel that people	Not adapted for use
are interested in me	

**Bold** type indicates items that were not included in the final item set from Study 1

## **APPENDIX 3**

.

3.A - Exercise Information Booklet 1.

3.B - Exercise Information Booklet 2.

3.C - Exercise Information Booklet 3.

## **3.A - EXERCISE INFORMATION BOOKLET 1:**

# (Note: The size of print on the following booklets has been reduced for the purposes of these appendices.)

## WHAT ARE THE BENEFITS OF EXERCISE?





### THE REWARDS OF EXERCISE:

Regular participation in exercise gives you many benefits to your health:

- It increases your life expectancy
- Reduces the risk of developing Coronary Heart Disease
- Reduces the risk of a stroke
- Reduces the risk of endometrial cancer
- Reduces the risk of breast cancer
- Reduces the risk of colon cancer
- Reduces the risk of colorectal adenomas
- Can prevent and control osteoporosis
- Improve feelings of well being and improve mental health
- Can reduce stress, anxiety and depression



### A HEALTHY HEART

Coronary Heart Disease is a result of coronary arteries reaching a stage where a build up of fatty deposits impedes the flow of blood around the body and to the heart. Participation in regular exercise can reduce the risk factors of Coronary Heart Disease:

> ...By **reducing** - Blood pressure Body weight Bad cholesterol

Likelihood of developing type II diabetes Triglycerides Development of blood clots

...By increasing -

Good cholesterol Glycemic control in diabetes

### HEALTHY JOINTS AND BONES

Activity improves the internal lubrication and nutrition of joints, as well as maintaining flexibility. This reduces the risk of injury, and may help limit the effects of degenerative arthritis. Frequent activity strengthens tendons and ligaments, and maintains their elasticity. This helps with balance and increases the stability of joints, especially of the knees and ankles. Frequent weight bearing activity helps prevent serious loss of calcium from the bones, allowing them to retain their density and thickness for much longer. Exercise may also help to keep the backbone straight, help minimise back pain and reduce the risk of fracture.

Although bone may seem solid, it is very sensitive to its environment, for example the nutrition, minerals, and vitamins which we consume, and also the physical forces that it is subjected to. Muscle moves bones by means of tendons which attach onto bone. Stresses produce electrical effects in the bone, stimulating bone growth, so thicker bones are found in people who frequently use the muscles that are attached to the bone.

The density and thickness of men and women's' bones continues to increase up until they reach their mid-thirties. After this period bone very slowly begins to lose its calcium and becomes thinner. Accelerated bone loss is often seen in women going through the menopause as a result of a reduction in the hormone oestrogen. Consequently, bone loss is more common in women, with men having a bone age of some 15 years younger than women.

This bone thinning is commonly known as osteoporosis, and a consequence of osteoporosis is that bone is more susceptible to fracture. The most common sites for fractures are the wrist, spine and hip. The wrist and spine can be affected from our fifties, but the hipbone is usually affected later on in our seventies and eighties. There is a particular level of bone density which once reached makes fracture more likely. However, this threshold can be pushed back quite considerably by exercise....

We can do a lot to combat the effects of osteoporosis; for example having regular medical checks, ensuring a healthy diet and taking regular exercise.

What types of exercise can I do to prevent or delay bone loss?

The best exercise for the prevention of bone loss is exercise that is weight bearing, for example, brisk walking, jogging, aerobics, step aerobics, line dancing, disco dancing and skipping. Research has shown that moderate strength training is an effective way to increase bone density, even when people reach the age of 80 years it has been demonstrated that exercise may not just slow down the rate of bone loss, but may even reverse the trend.

Although swimming, cycling and aqua aerobics are good exercise, they are not the most effective in terms of bone health. Exercises are also site-specific, so for the vertebrae of the lower back an exercise such as a back raise would be effective; for the legs and hips squats, skipping and jogging would help. A simple exercise such as squeezing a tennis ball is a good exercise for the bones of the wrists.

Whatever exercise one chooses to embark upon, women in their fifties upwards need to build up their exercises slowly and gradually to prevent injury.



### WEIGHT LOSS & WEIGHT MANAGEMENT

Regular exercise greatly assists in the control of body weight, by regulating appetite and improving the metabolism of fat. It also helps to prevent "late onset diabetes" by making insulin more

effective; and it helps the immune system to function better, which may lessen our chances of getting a chest infection, or even some tumours.

Weight loss is often something that makes us feel good about ourselves and boosts our self-esteem. Diets often can help us lose weight in the short-term, but if healthy diet is accompanied by regular exercise weight loss is more likely to be sustained in the long-term. Furthermore, the time you take to exercise is time spent not eating!



### HEALTHY LUNGS

The function of the lungs is to act as a bellows, and to suck in and expel air – about 10 litres (just over two gallons) of air per minute at rest, from which about a quarter of a litre of oxygen is extracted. During strenuous exercise, over 100 litres of air may be breathed in and out, with an uptake of over five litres of

oxygen and the release of roughly similar amounts of carbon dioxide.

As we get older, the size of our breath decreases, and by the age of 70 it has reduced by some 40%. However, we actually have so much lung tissue, that healthy lungs are not a limiting factor to the sort of exercise suggested by your trainer.

A noticeable change in the respiratory system is that the brain's 'respiratory centre' for controlling breathing becomes more sensitive to the carbon dioxide which the muscles and other tissues give off. This means that when you are older you get a bit more breathless for the same effort, so you feel a bit less fit than you really are.

Similarly, the heart and blood vessels show signs of slow deterioration with age. The first gradual change is a reduction in the amount of blood the heart can pump in a minute. Partly, this is due to a gradual drop in the maximum heart rate, by some 50 beats per minute between the ages of 20 and 70. Don't be alarmed by this, the vast majority of us are entirely unaware of this!

The ageing process accounts for approximately half of the decline in one's aerobic fitness, the other half is due to physical inactivity. This is good news as we can control the amount of physical activity we do and thus have a beneficial effect on our fitness.

One's aerobic function is still capable of considerable improvement at virtually any age.

Older subjects have been shown not only to increase their capacity to do aerobic activity but also to be able to continue to use a higher percentage of it. This is especially useful in such activities as swimming, cycling, aerobics and country dancing, to say nothing of easing the burden of walking (especially on hilly streets and against the wind), shopping, gardening and travelling.



### STRESS, ANXIETY, & DEPRESSION

Regular bouts of exercise have been shown to be capable of reducing stress, anxiety and depression.

The precise mechanisms for these effects of exercise is unclear, but there are many possible explanations:

1. Exercise stimulates the flow of certain neurotransmitters in the brain which influence our sense of well being.

2. Performing exercise increases our feelings of 'mastery' and achievement.

3. Exercise acts as a distraction and thus takes our minds off worries and stresses.

4. Alternatively, whilst exercising we can think problems through and this can sometimes enable us to see a different perspective on a problem.

5. Regular exercise makes us expend more energy through the day and thus promotes a better night's sleep. This is especially important during times of anxiety and stress when sleep is often disturbed.

6. Stress raises one's blood pressure, but exercise is capable of lowering blood pressure and thus helps reduce these negative effects of stress



### MAKE NEW FRIENDS

Attending an exercise centre or exercise classes can provide the ideal opportunity for meeting new friends. Exercise then becomes something more than just a physical activity it becomes a social one

too. Exercising with a friend is a great way to keep motivated as the two of you are 'in it together' so to speak. Friendships created in the exercise centre often blossom and continues even outside of exercise. Exercise doesn't have to be a chore it can with the help of others become a pleasure.



### DIFFERENT TYPES OF EXERCISE

If your idea of exercise is being stuck on a treadmill, then think again!!!...There are many options to choose from.

To some extent, the type of exercise is less important than the fact that you actually do some. It is recommended that the ideal amount of exercise is 20 to 30 minutes, five times a week, and that you should exercise to a level that makes you a bit 'breathless'.

### CARDIOVASCULAR



Cardiovascular exercise (CV), leads to healthy lungs, a powerful heart, a good circulatory system, well-conditioned muscles and increased energy levels.

CV activities are steady and rhythmic in nature and are designed to use your body in an increasingly more energetic way so that you have to breathe more deeply. Your heart has to beat a little faster to

deliver oxygen to the working muscles, hence the other name 'aerobic' (= with air). When this is done regularly your heart and lungs become more efficient and your stamina improves. Good examples of CV exercises are: walking, cycling, swimming, aerobics, dancing and rowing.



### RESISTANCE

In order to increase our muscular endurance we need to lift a weight up and down repeatedly. It may feel difficult at the beginning gradually becomes easier and can be sustained for longer. Technique is very important when using weights, and it is always advisable to begin with very light weights until you are confident of your technique. When the weight becomes easy to lift, a heavier weight is needed in order to increase your strength.

Resistance exercise can be performed using fixed machines in the gym, or by using dumbbells, resistance bands or even tins of beans!



### FLEXIBILITY

To increase one's flexibility we need to lengthen the muscles to increase the range of movement at the joints. Careful controlled stretching is a daily must. It can transform your posture, lengthen your spine, give you an ease of movement you may have thought had

gone forever. Tasks such as tying shoelaces, looking over your shoulder, will never be a problem if you stretch daily.

### 3.B - EXERCISE INFORMATION BOOKLET 2:

### WARMING-UP, COOLING-DOWN & STRETCHING





### WARMING UP BEFORE EXERCISE

Before beginning your exercise it is very important that the body is warm, loosened up, lively, and ready for action.

We need to give the heart the chance to send out enough blood to the muscles of the body, so that once you start exercising your muscles can work optimally. Additionally we need to send out signals to the

muscles themselves to get ready for some work so to avoid pulling or tearing them. With regards to your bones and joints the warm-up loosens them by promoting the release of synovial fluid which lubricates the joints. Warm-ups also prepare the mind and give you the chance to get used to the motor control skills involved in the exercise. Warm-ups usually last between 5-15 minutes depending upon how fit you are, the fitter you get the shorter the warm-up can be. Warm-ups can involve easy walking, easy cycling or even marching on the spot, but should always build up gradually. Part of the warm-up will involve 'mobilisation' work such as rolling the shoulders backwards and forwards, circling the ankle joint, and bending down to each side to loosen up the back.



### PRE-EXERCISE STRETCHES

Once the muscles are nice and warm, it is then safe to stretch them. Stretching them before the workout is necessary in order to lengthen the muscles in preparation for the greater range of movement during the workout. The stretches performed before exercise need

only be held for 8-10 seconds, however when we repeat the stretches after the exercise they are held for longer (15-30 seconds) in order to return them to their pre-exercise length. When exercising, our muscles become very short and tight, so if we don't allow them to re-lengthen after exercise then we are more susceptible to injury.

I have featured some of the most important stretches on the next few pages.
## 1. HAMSTRING STRETCH (back of thigh)

Lie on your back, bending one leg keeping that foot on the floor, to prevent you lifting your buttocks during the stretch. Raise your other leg, holding it either side of your knee joint, to gradually pull the leg towards you. You should feel the hamstring muscle stretching at the back of this leg. Concentrate on keeping your buttocks on the floor, and keeping the stretched leg as straight as possible.

- Read notes on stretching prior to doing this stretch.
- Make sure you warm-up prior to stretching.
- Hold for a period of 20 / 30 seconds.

Stop immediately if you feel any pain.

## 2. QUAD STRETCH (front of thigh)

This stretch can be performed either standing, or laying on your side. If standing use a chair or wall for support.

Grab one leg at the ankle, and slowly pull your heel up towards your bottom, whilst slowly applying a stretch on the quadricep muscles (The large muscles a the front of the upper leg).

If you can not reach your ankle, wrap a towel around your ankle, a pull on that, do this version lying down.

Aim to keep your knees together and back straight throughout the stretch.

Push your hips forward to increase the stretch on the quadricep muscles.

## 3. HIP FLEXORS (top of thigh)

Place one leg forward with your knee above your toe, and the other stretched back with that knee touching the floor.

Your hands can be placed on the front leg or floor to aid balance.

Slowly push the pelvis forward until you feel the stretch in the upper thigh / hip flexor muscle of the rear leg.

## 4. ADDUCTOR STRETCH (inner thighs)

Sitting on the floor with the soles of the feet together, place your hands either around your ankles or lower legs.

Keeping your back straight gently open out the knees towards the floor.

The elbows can be pressed against the inner knee to increase the stretch.

Avoid pulling up on your feet during the stretch.









## 5. CALF STRETCH (back of lower leg)

Standing one foot in front of the other, feet comfortably apart, both feet facing forward, front leg bent (knee over ankle joint), back leg straight, back straight.

Press the heel of the back leg into the floor until a stretch is felt in the calf muscle in the back of the lower leg.

If no stretch is felt, slide the heel slowly backwards, keeping the foot on the floor.

For improved stability and a greater stretch, push against a wall.

### 6. GLUTES (BUTTOCKS) STRETCH

Sit up with your left leg out straight, and your right leg crossed over at about the knee joint, placing the foot flat on the floor.

Using your right arm, pull the bent left leg slowly across, until you feel the stretch in the right buttock region.

Simply reverse both leg and arm to do the other side.

### 7. LOWER BACK

Lie on your back, with your legs bent up towards you.

Keeping your upper back firmly on the floor, gently lower your knees to one side, hold for about 20 seconds, then repeat on the other side.

Allow your lower back to rotate naturally to the side, however if any pain is felt avoid this stretch.

- Read notes on stretching prior to doing this stretch.
- Make sure you warm-up prior to stretching.

Stop immediately if you feel any pain.

### 8. UPPER BACK

Whilst on all fours, look down towards the floor, then push your shoulders as high as they can go.

This stretch is often called a cat stretch, due to the motion made.

Aim to hold in the stretched up position for 10 seconds before repeating.









## 9. DELTOIDS SHOULDER STRETCH

Can be achieved either seating or standing.

Take one arm across the front of your body, and use the other arm to perform the stretch.

Push the arm into the chest at a point just to the side of the elbow joint.

Aim to keep the arm straight, and breathe comfortably.

#### 10. CHEST STRETCH

Stand or sit upright and place your hands on the small of your back.

Slowly bring in your elbows, until you feel the stretch on your chest.

Aim to keep the elbows high during the stretch.

Remember to breathe comfortable throughout the stretch

- Read notes on stretching prior to doing this stretch.
- Make sure you warm-up prior to stretching.
- Stop immediately if you feel any pain.
- Hold for 20 / 30 seconds.

#### **11. BICEP STRETCH**

Place your arm straight against a wall, with your palm facing the wall.

With your body close to the wall, slowly turn your body away from it, keeping the arm in contact with the wall.

This is an excellent stretch for the biceps and chest muscles.

#### **12. SIDE BENDS**

Stand with your feet shoulder width apart, keeping a slight bend in your legs.

Slowly bend over to one side, until you feel a stretch along your side.

Your arms can be on your hips, or in the air to increase the stretch.

Avoid leaning forward or back, and keep the movement smooth with no bouncing.

- · Read notes on stretching prior to doing this stretch.
- Make sure you warm-up prior to stretching.
- Stop immediately if you feel any pain.
- Hold for 20 / 30 seconds.









## TRICEP MUSCLE STRETCH

Sit or stand tall, with good posture.

Place one arm behind your head, with your hand facing down your spine. Use the other hand to gradually push down on the elbow joint, whilst slowly increasing the stretch on the tricep muscle. Repeat again on the other side.

## Tips For Stretching



The aims of stretching are to gently lengthen muscles before and after any form of exercise, and to improve tissue elasticity / flexibility. If done correctly, stretching will help prevent injuries and increase exercise performance.

### The following key points should be remembered whilst stretching:

- Begin with gradual mobility exercises of all the joints, i.e. simply rotate the wrists, bend the arm and roll your shoulders. This will allow the body's natural lubrication (synovial fluid) to protect the surface of your bones at these joints.
- Always warm up the body prior to stretching, as this increases blood flow around the body, which in turn makes the muscles more supple.
- After exercise, slowly bring your heart rate down before you begin stretching in order to avoid blood pooling within your muscles, which can lead to cramp and dizzy spells.
- If you're wet and sweaty, take a bath or shower then stretch, as the hot water will help relax the muscles, and prevent you from catching a chill.
- Never bounce whilst you stretch, unless you are doing specific stretches for certain sports, i.e. ballistic stretching for martial arts.
- Hold the stretch until you feel the muscle loosen off, then repeat for a further 15 seconds.
- Whilst stretching you should feel some light pain, if you don't feel anything, then you may be doing the stretch incorrectly, or simply the muscle has eased off.
- Stop immediately if you feel any severe pain.
- Remember to breathe regularly and rhythmically, do not hold your breath.
- Start with your legs, and work up the body, in order not to miss out any stretch.

#### COOLING DOWN AFTER EXERCISE



When we talk about 'cooling-down' after exercise we don't literally mean we want you get cold!!

The aim of a cool-down is to bring the heart-rate down to its normal level, and to gradually allow the blood flow to normalise. If you suddenly stopped exercising, all the blood would suddenly rush away from the working muscles and this could cause dizziness. During exercise we produce a waste product known as lactic acid, a build up of lactic acid in the muscles can be very uncomfortable and the cool-down helps get rid of this substance. Cooling down also allows you to re-orient yourself with your surroundings.

The cool-down works just like the warm-up but in reverse order! So instead of the movements building up gradually, they start to *decrease* in size, speed and effort as the cool-down progresses. Typically the cool-down will last for about 5-10 minutes and can be an exercise such as easy walking, cycling, or marching on the spot. Choose something that you are comfortable doing, and ensure that you are lowering the intensity gradually.

#### **3.C - EXERCISE INFORMATION BOOKLET 3:**

#### EQUIPMENT-FREE EXERCISES



#### **TONING EXERCISES**

Strengthening and toning involves working muscles against resistances. Resistances can be supplied by body weight, and different body positions can be adopted to provide resistance stress for numerous muscle groups. Body position can also make the exercise more or less demanding by reducing the portion of body that one uses, or by reducing gravity or the leverage.

Correct technique, stability, appropriate intensity, safety and effectiveness are essential for keeping healthy and well. The following few pages of this booklet illustrate various toning exercises for lower and upper body, they also show how not to perform the exercises!

Instructions for these exercises with accompanying photographs were taken from:

Pearson, P. (1998). Safe and Effective Exercise (Chapter 8). The Crowood Press, UK.

## **APPENDIX 4**

- 4.A BREQ-2 items featured in Chapters 2, 3, & 6.
- 4.B Expectation questionnaire featured in Chapter 6.
- 4.C Exercise by Invitation referral criteria.

## 4.A - BREQ-2 items featured in Chapters 2, 3 and 6:

#### **Intrinsic Regulation**

- 1. I ex because it's fun
- 2. I enjoy my exercise sessions
- 3. I find exercise a pleasurable activity
- 4. I get pleasure & satisfaction from participating in exercise

#### **Identified Regulation**

- 5. I value the benefits of exercise
- 6. It is important to me to exercise regularly
- 7. I think it is important to make the effort to exercise regularly

#### Introjected Regulation

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

#### **External Regulation**

- 12. I exercise because other people say I should
- 13. I take part in ex because my friends/family/partner say I should
- 14. I exercise because others will not be pleased with me if I don't
- 15. I feel under pressure from my friends & family to exercise

#### Amotivation

- 16. I don't see why I should have to exercise
- 17. I can't see why I should bother exercising
- 18. I don't see the point in exercising
- 19. I think exercising is a waste of time

## 4.B - Expectation questionnaire as featured in Chapter 6 :

#### YOUR EXPECTATIONS ABOUT THE PROGRAMME

The following questions are concerned with your expectations about your involvement in the exercise programme.

1. To what extent do you believe that being involved in the programme will help improve your level of fitness?

Not at all		4	A little		Very mu	
1	2	3	4	5	6	7

2. To what extent do you believe that being involved in the programme will help improve your health?

Not at all			A little		Very	much
1	2	3	4	5	6	7

3. To what extent do you believe that being involved in the programme will help you to continue to exercise regularly?

Not at all		1	A little		Very much
1	2	3	4	5	6 7

## 4.C - Exercise by Invitation referral criteria:

Clients' eligibility would depend on their having one or more of the following:

#### Low Risk Clients

- Raised Blood Pressure mild to moderate and well controlled (max 150/95 mmHg)
- Mild Depression / Anxiety Stress
- Smoking
- Overweight
- Mild Osteoporosis
- Need to Improve Fitness / Muscle Toning
- Mild Arthritis
- Mild Asthma
- Non Insulin dependent diabetes mellitus who are well controlled through diet restrictions

## **APPENDIX 5**

- 5.A General information forms supplied to participants taking part in the study documented in Chapter 6.
- 5.B Group 1 Information Sheet.
- 5.C Group 2 Information Sheet.
- 5.D Group 3 Information Sheet.

# 5.A – General information forms supplied to participants taking part in the study documented in Chapter 6:

#### **GENERAL INFORMATION SHEET**

#### 1. Study title

Exercise Attitudes & Exercise Behaviour

#### 2. Invitation paragraph

You are being invited to take part in a research study. Before you decide it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with friends, relatives and your GP if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

Thank you for reading this.

#### 3. What is the purpose of the study?

The purpose of this study is to examine attitudes towards exercise and subsequent exercise behaviour among people on the 'Exercise by Invitation Scheme'. Involvement will be for the duration of the scheme (10-weeks) followed by a postal questionnaire 3-months after the scheme. A selection of participants will be also be asked to take part in an interview at this point.

#### 4. Why have I been chosen?

You have been chosen because you fulfil the criteria for referral onto the Exercise by Invitation Scheme. There will be 45 people taking part in the study in total.

#### 5. Do I have to take part?

It is up to you to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep and be asked to sign a consent form. If you decide to take part you are still free to withdraw at any time and without giving a reason. This will not affect the standard of care you receive.

#### 6. What will happen to me if I take part?

As we do not know the best way to encourage people to exercise, we need to make comparisons; so people will be put into groups and then compared. You will be randomly placed into one of three treatment groups, two of the conditions involve meeting with the researcher in weeks 0, 2, 4, and 8 of the exercise by invitation scheme (at the leisure centre) and the remaining group will meet with the researcher in weeks 0 and 4. The groups are selected by a computer which has no information about the individual – i.e. they are chosen by chance. Patients in each group then have a different treatment and these are compared.

Three months after the 10-week scheme all groups will be posted a questionnaire and a selection of participants will be asked to be interviewed by the researcher. During this interview they will be asked about their experiences of the scheme. All information will remain confidential and your name shall not appear on the questionnaire or on any study documentation. Please refer to your individual participant information sheet for further details.

#### 7. What is the procedure that is being tested?

A counselling-based approach to exercise adherence and an education approach to exercise adherence will be compared to the normal Exercise by Invitation Scheme which has no extra treatment other than the exercise programme delivered by the gym instructor.

### 8. What are the possible benefits of taking part?

We hope that both (all) the treatments will help you. However, this cannot be guaranteed. The information we get from this study may help us to improve the current Exercise by Invitation Scheme and your motivation to exercise.

#### 9. What happens when the research study stops?

At the end of the research you will be contacted by the researcher in order to explain precisely what they hoped to find by carrying out the research. The group that did not receive any extra treatment will be offered an exercise consultation with the researcher.

#### 10. What if something goes wrong?

Should you feel the need to make a formal complaint about how the researcher has treated you during your involvement in the study, please put your complaint in writing to the head of the School of Sport, Health & Exercise Science Professor Roger Eston. School of Sport, Health & Exercise Science, George Building, Holyhead Road, Bangor, Gwynedd, LL57 2PX.

#### 11. Will my taking part in this study be kept confidential?

All information that is collected about you during the course of the research will be kept strictly confidential. Any information about you will have your name and address removed so that you cannot be recognised from it. Any tape recordings of interviews shall be destroyed after being transcribed, and your name will not appear on the transcription.

#### 12. What will happen to the results of the research study?

The results of this study will form part of the researcher's PhD thesis and may also be published. You may obtain copies of the results of this study, upon its completion by contacting Vannessa Tobin at the School of Sport, Health and Exercise Sciences. If the study is published, you will be informed as to where it is published; you will not be identified in any report/publication.

## 13. Who has reviewed the study?

This study has been reviewed by the North Wales Health Authority Research Ethics Committee (West).

14. Contact for Further Information: Miss Vannessa Tobin.

#### 5.B - Group 1 Information Sheet

This sheet describes what will happen during your involvement in the research, if you have any questions please contact me at any time.

Meeting 1 (prior to scheme commencement)–This is to establish how much exercise you do / don't do.

**Meeting 2** (during the 4<sup>th</sup> week of the scheme) - This questionnaire asks you about how you are feeling about exercise.

**Phone call** (during the  $10^{\text{th}}$  week of the scheme) – This is to establish how many sessions have you have attended so far.

**Postal Questionnaire** (you will receive this 22-weeks after beginning the scheme) – This questionnaire asks you about how you are feeling about exercise.

**Post-Scheme Interview -** Soon after the postal questionnaire is sent to you, you may be asked to participate in an interview with the researcher, during which you will simply be asked to describe your experiences of the Exercise by Invitation Scheme. Five participants from each of the three groups will be randomly selected to be interviewed; you may or may not be one of these. The interview will be tape recorded and then transcribed, following transcription the tapes will be destroyed and your name will not appear anywhere on the transcription.

Please do not worry if you miss exercise sessions or cease exercise altogether at some point in the scheme, your responses are still very <u>important</u> to me!

#### 5.C - Group 2 Information Sheet

This sheet describes what will happen during your involvement in the research, if you have any questions please contact me at any time.

**Meeting 1-** (prior to scheme commencement) – This is to establish how much exercise you do / don't do. You will also be presented with some information about exercise.

Meeting 2 - (during the  $2^{nd}$  week of the scheme) You will be presented with some information about exercise.

Meeting 3 - (during the 4<sup>th</sup> week of the scheme) This questionnaire asks you about how you are feeling about exercise.

Meeting 4 - (during the  $8^{th}$  week of the scheme) You will be presented with some information about exercise.

**Phone call** - (during the  $10^{th}$  week of the scheme) This is to establish how many sessions have you have attended so far.

**Postal Questionnaire** - (you will receive this 22-weeks after beginning the scheme) – This questionnaire asks you about how you are feeling about exercise.

**Post-Scheme Interview -** Soon after the postal questionnaire is sent to you, you may be asked to participate in an interview with the researcher, during which you will simply be asked to describe your experiences of the Exercise by Invitation Scheme. Five participants from each of the three groups will be randomly selected to be interviewed; you may or may not be one of these. The interview will be tape recorded and then transcribed, following transcription the tapes will be destroyed and your name will not appear anywhere on the transcription.

Please do not worry if you miss exercise sessions or cease exercise altogether at some point in the scheme, your responses are still very <u>important</u> to me!

#### 5.D - Group 3 Information Sheet

This sheet describes what will happen during your involvement in the research, if you have any questions please contact me at any time.

**Meeting 1-** (prior to scheme commencement) – This is to establish how much exercise you do / don't do. An exercise consultation will then follow.

Meeting 2 - (during the  $2^{nd}$  week of the scheme) An exercise consultation will take place.

Meeting 3 - (during the 4<sup>th</sup> week of the scheme) This questionnaire asks you about how you are feeling about exercise.

Meeting 4 - (during the  $8^{th}$  week of the scheme) An exercise consultation will take place.

**Phone call** - (during the 10<sup>th</sup> week of the scheme) This is to establish how many sessions have you have attended so far.

**Postal Questionnaire** - (you will receive this 22-weeks after beginning the scheme) – This questionnaire asks you about how you are feeling about exercise.

**Post-Scheme Interview -** Soon after the postal questionnaire is sent to you, you may be asked to participate in an interview with the researcher, during which you will simply be asked to describe your experiences of the Exercise by Invitation Scheme. Five participants from each of the three groups will be randomly selected to be interviewed; you may or may not be one of these. The interview will be tape recorded and then transcribed, following transcription the tapes will be destroyed and your name will not appear anywhere on the transcription.

Please do not worry if you miss exercise sessions or cease exercise altogether at some point in the scheme, your responses are still very <u>important</u> to me!

## **APPENDIX 6**

- 6.A Consent to be contacted by the researcher.
- 6.B Patient consent form.
- 6.C Interview Guide as featured in Chapter 6.

## 6.A - Consent to be contacted by the researcher:

I give my permission for my GP / Nurse (.....) to pass on my contact details to the researcher (Vannessa Tobin, University of Wales, Bangor).

I understand that my contact details shall only be passed on to the researcher named above, and my details shall be kept strictly confidential and secure. No other confidential information shall be passed on to the researcher (e.g. medical records etc).

I understand that the researcher will contact me to explain the nature of her research and to ask for my participation in the study.

I understand that I have the right to refuse participation, and I may withdraw from the study at any time if I choose to. This will in no way affect my future medical care and treatment.

TO BE COMPLETED BY THE PATIENT:	
NAME (Please print legibly):	
ADDRESS:	
TELEPHONE NUMBER:	
SIGNATURE:	
DATE:	
TO BE COMPLETED BY THE GP / NURSE:	
NAME (Please print legibly):	
SIGNATURE:	
DATE:	

Patient Identification Number for this trial:

## **CONSENT FORM**

#### Title of Project: Exercise Attitudes & Exercise Behaviour

Name of Researcher: Vannessa Tobin

#### Please initial box

- 1. I confirm that I have read and understand the information sheet dated 24/12/01 (version 1) for the above study and have had the opportunity to ask questions.
- 2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, without my medical care or legal rights being affected.
- 3. I agree to take part in the above study.

Name of Patient

Date

Signature

Researcher

Date

Signature

	т
	ь
	E
	н



## 6.C - Interview Guide as featured in Chapter 6:

## Interview Aims:

## Control Group

To find out about clients' experience of the EBI scheme in general.

## Attention Control Group

To find out how people who were given more exercise information felt about their experience of the EBI scheme. Did they differ from the control and MI group?...How?

## MI group

To find out how people who were given a very individualistic treatment felt about their experience of the EBI scheme. Did they differ from the control and attention control group?...How?

### Introduction

Thank you very much for coming here today; the purpose of this interview is to find out how you felt, and what you thought about your experiences of the EBI scheme. The interview should last no more than 45 minutes depending on how much we talk!

If you don't mind I would like to tape-record what we say so that I don't miss any of it. If at any time during the conversation you would like to turn the tape recorder off, all you have to do is press the stop button in front of you and the recording will end.

After the interview I will listen to the recording and once I have got enough information from it, the tape will be destroyed. When I write up my findings, you will remain completely anonymous.

It would be helpful to me if you try to recollect as much detail as possible about your experiences. Hopefully my findings will inform us about ways of getting people to enjoy the scheme and for the scheme to help people to make exercise part of their life. Don't worry if you didn't complete the scheme or if you are not active at the moment, I am just interested in your personal experience of the scheme. Try to relax, once we start, you will soon forget that we are being recorded!

Please ask me about anything that you are not sure about.

#### Question points (time-bounded to facilitate recall):

How did they feel upon referral? - What did they think?
"So, you're in the surgery...."
How did they feel at first gym meeting? - What did they think?
"So, you're in the 1:1.."
How did they feel at subsequent gym sessions? - What did they think?
"So, you've gone for your first session alone..."

How did they feel upon completion / drop-out? - What did they think?

How do they feel now about exercise? - What do they think? - Typical day?

#### Prompts (standard phrases to be used when the participant does not say enough):

So, how did that make you feel? Can you explain that to me a little more? And what did you think about that? In what way? Please explain? I'm not sure I understand what you meant by that, could you elaborate please?

At the beginning of the interview the participants will be informed that the purpose of the interview is to get a better understanding of how the scheme works, if it works, and why it does / does not work.

Two interviewees will be selected at random from each of the 3 treatment groups that have taken part in study 3. Participants will be invited to be interviewed at the University (transport will be provided) or if they prefer in their own homes.

It is of paramount importance that the full time span of the referral process is covered during the interview; thus in order to prevent missing any of this information, the questions will be time-bounded (see example questions above).

By re-creating particular time points in their mind, recall of the experiences can be facilitated, for example if we wanted them to re-create the situation in the GP surgery, we may say something like:

"So, you're sitting in the surgery waiting to see Dr .... And you go in, sit down...take me through what happened next and how you got to talking about the EBI scheme".

When discussing how exercise does/doesn't fit in their daily lives, one way of eliciting this type of information is to ask them to describe a 'typical day' in their lives and how exercise may / may not fit into it. This approach will hopefully provide us with important clues about their current lifestyle. It would also be a back-up measure for the reported current exercise levels given on the questionnaire (LTEQ).

# **APPENDIX 7**

**Regression tables for Chapter 4 analyses** 

## 7. Regression tables for Chapter 4 analyses:

# Summary of regression analysis for environmental supportiveness variables predicting scheme adherence and post-scheme exercise.

Table 1. Summary of regression analysis for environmental supportiveness variables predicting scheme adherence. Note: p<0.05. All variables entered simultaneously. AS = Autonomy Support; ST = Structure; INV = Involvement.

Predictor	R	$\mathbb{R}^2$	F	р	Beta	t
AS		nan un primer den su de la activation de la companya de la companya de la companya de la companya de la company			.132	1.244
ST					.214	1.265
INV	.225	.051	2.017	.116	341	-2.129*

Table 2. Summary of regression analysis for environmental supportiveness variables predicting post-scheme exercise. All variables entered simultaneously. AS = Autonomy Support; ST = Structure; INV = Involvement.

Predictor	R	$R^2$	F	р	Beta	t
AS	-				.055	.508
ST					074	427
INV	.080	.006	.245	.865	022	133

## Summary of regression analysis for environmental supportiveness variables predicting post-scheme autonomy and competence.

Table 3. Summary of regression analysis for environmental supportiveness variables predicting post-scheme autonomy. All variables entered simultaneously. AS = Autonomy Support; ST = Structure; INV = Involvement.

Predictor	R	$\mathbb{R}^2$	F	р	Beta	t
AS					138	-1.247
ST					.140	.816
INV	.133	.018	0.682	.565	.625	625

Table 4. Summary of regression analysis for environmental supportiveness variables predicting post-scheme competence. All variables entered simultaneously. AS = Autonomy Support; ST = Structure; INV = Involvement.

Predictor	R	$R^2$	F	р	Beta	t
AS					118	-1.107
ST	-				.310	1.832
INV	.214	.046	1.815	.148	082	513

# Summary of regression analysis for environmental supportiveness variables predicting post-scheme RAI.

Table 5. Summary of regression analysis for environmental supportiveness variables predicting post-scheme RAI. All variables entered simultaneously. AS = Autonomy Support; ST = Structure; INV = Involvement.

Predictor	R	$\mathbb{R}^2$	F	p	Beta	t
AS					023	215
ST					.100	.578
INV	.081	.006	.246	.864	013	077

## Summary of regression analysis for mid-scheme psychological need satisfaction variables predicting scheme adherence and post-scheme exercise.

Table 6. Summary of regression analysis for mid-scheme psychological need satisfaction variables predicting scheme adherence. All variables entered simultaneously. AUT1= Autonomy; COMP1= Competence; RELATE1= Relatedness.

Predictor	R	$R^2$	F	р	Beta	t
AUT1					.024	.242
COMP1					008	070
RELATE1	.073	.005	.202	.895	.067	.599

Table 7. Summary of regression analysis for mid-scheme psychological need satisfaction variables predicting post-scheme exercise. All variables entered simultaneously. AUT1= Autonomy; COMP1= Competence; RELATE1= Relatedness.

	R	$R^2$	F	р	Beta	t
Predictor						
AUT1	-				.134	1.368
COMP1					.035	.320
RELATE1	.156	.024	.937	.425	.020	.183