The Relationship Between Body Mass Index and Psychological Distress: Exploring the Mediating Role of Physical Self-Concept

Sarah Whitson

Submitted for the Degree of

Doctor of Psychology
(Clinical Psychology)

School of Psychology
Faculty of Health and Medical Sciences
University of Surrey
Guildford, Surrey
United Kingdom
September 2017
Statement of Originality

This thesis and the work to which it refers are the results of my own efforts. Any ideas, data, images, or text resulting from the work of others (whether published or unpublished) are fully identified as such within the work and attributed to their originator in the text. This thesis has not been submitted in whole or in part for any other academic degree or professional qualification.

Name: Sarah Whitson
Overview

Obesity is considered a significant risk factor for negative physical health and psychological outcomes. However, factors which account for some of the observed relationship have been under investigation for some time, and as a result have challenged the idea that obesity itself is the cause of the physical health and psychological outcomes. The picture is known to be complex, with influence of biological, psychological, social and behavioural factors. This thesis aimed to increase understanding of the factors involved in the relationship between obesity and psychological distress. In particular, to assess the role of physical self-concept and social comparisons in this relationship. Part one of this portfolio presents a systematic literature review of the relationship between physical self-concept and psychological wellbeing. The findings of the review suggest that positive physical self-concept is associated with better psychological wellbeing, and it highlighted the importance of physical self-worth and global self-esteem on mental health outcomes. Part two presents an empirical paper that investigated the mediating role of physical self-concept in the relationship between Body Mass Index (BMI) and psychological distress in the general population. The findings suggested that physical self-concept mediates the relationship between BMI and psychological distress, and once this indirect effect is accounted for, the relationship between BMI and psychological distress changes in strength and valence. In addition, the study suggests the important influence of social comparisons and social norms in this model.
# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acknowledgements</td>
<td>1</td>
</tr>
<tr>
<td>Research Part 1 – Literature Review</td>
<td>2</td>
</tr>
<tr>
<td>Abstract</td>
<td>3</td>
</tr>
<tr>
<td>Introduction</td>
<td>4</td>
</tr>
<tr>
<td>Methods</td>
<td>8</td>
</tr>
<tr>
<td>Results</td>
<td>13</td>
</tr>
<tr>
<td>Discussion</td>
<td>36</td>
</tr>
<tr>
<td>References</td>
<td>41</td>
</tr>
<tr>
<td>Research Part 2 – Empirical Paper</td>
<td>48</td>
</tr>
<tr>
<td>Abstract</td>
<td>49</td>
</tr>
<tr>
<td>Introduction</td>
<td>51</td>
</tr>
<tr>
<td>Methods</td>
<td>64</td>
</tr>
<tr>
<td>Results</td>
<td>72</td>
</tr>
<tr>
<td>Discussion</td>
<td>96</td>
</tr>
<tr>
<td>References</td>
<td>105</td>
</tr>
<tr>
<td>List of Appendices</td>
<td>121</td>
</tr>
<tr>
<td>Appendices</td>
<td>122</td>
</tr>
<tr>
<td>Part 3 - Summary of Clinical Experience</td>
<td>158</td>
</tr>
<tr>
<td>Part 4 - Table of Assessments Completed During Training</td>
<td>163</td>
</tr>
</tbody>
</table>
Acknowledgements

First, I would like to thank the staff at the University of Surrey Clinical Psychology Training Programme, and in particular my research supervisors Lada Timotijevic and Kate Gleeson for their support, expertise and guidance in carrying out my research. In addition, I would like to thank all of my placement supervisors, who have provided me with a wealth of experience and knowledge that has prepared me well for my first job as a clinical psychologist.

I would like to thank my colleagues in Cohort 43 and in particular those in my PPD group who have been an amazing source of advice and support over the past 3 years, I can’t imagine completing this course without your support.

Finally, thank you to my family and friends, in particular my parents, sister and nan for their continued support and encouragement throughout the course. I am especially grateful to my partner, John. Thank you for your continued support and never-ending patience. You have encouraged me in everything I have done for the past 15 years, and moved around the country so I can get to where I am today. I am eternally grateful.
Research Part 1 - Literature Review

The relationship between physical self-concept and psychological wellbeing. A literature review

By

Sarah Whitson
University of Surrey

Word Count: 7826
Excluding abstract, tables, figures, references and appendices
Abstract

Literature suggests that physical self-concept is important for a number of health outcomes, and has been strongly linked to exercise behaviour. A relationship between physical self-concept and psychological wellbeing has also been suggested, however there is limited research into psychological wellbeing outcomes in an adult population. The purpose of this review is to identify and evaluate research literature relating to the strength of the relationship between physical self-concept and psychological wellbeing outcomes.

A search of published literature was conducted up to September 2016. Studies were selected if they included adult participants from a western population, used a validated measure of physical self-concept, a validated measure of psychological wellbeing, and included statistical analysis of the relationship of these two measures. Twelve studies met the inclusion criteria. Quality was reviewed and highlighted some significant limitations with the selected studies, particularly regarding sampling and limitation of measures used.

Most of the studies used a cross sectional exploratory design. Results suggest that there is a small to medium effect size in the relationship between physical self-concept and psychological wellbeing, particularly when measured as global self-esteem. However, there was variability in the strengths of the relationships found. Possible causes of this variation, and future direction for research in this area are discussed.
Introduction

Self-concept broadly refers to an individual’s perception of the self (Shavelson, Hubner, & Stanton, 1976), based on a process of self-assessment, or self-categorisation. An individual’s self-concept is made up of a collection of knowledge or beliefs about the self, otherwise known as schemas, which guide their perceptions of the environment and their future behaviour. It is a concept that has been widely researched over the past 40 years. Carl Rogers (1959) believed that an individual’s self-concept develops from self-experience, which forms the basis of a) self-perceptions; b) the values attached to these perceptions, or self-esteem; and c) the ideal self, or the self-concept an individual would most like to possess. Historically, self-concept research lacked a theoretical basis and was poorly measured, leading to lack of consistent findings regarding its role and impact (Marsh, 1990). Shavelson et al (1976) hypothesised that as well as being hierarchical, as suggested by Rogers (1959), self-concept is also structured and multifaceted. They proposed that self-concept is not a broad global construct, but instead is domain specific. This theoretical development led to the development of instruments to measure specific self-concept domains. Therefore, self-concept theory asserts that people have different perceptions of themselves in different capacities (Marsh & Shavelson, 1985), and these domain specific self-perceptions are thought to contribute to an overall and more global sense of self-concept (Harter, 1990).

Shavelson et al (1976) identified the other critical features of self-concept which include perceptions of personal behaviour in specific situations at the base, which lead to inferences about the self in broader domains, and finally a global, general self-concept at the top. They stated that the top of the hierarchy is stable and it becomes increasingly situation specific as you move down the hierarchy.
Additionally, they emphasised that self-concept is both descriptive and evaluative, with evaluations developing from comparisons with some standard. This suggests that self-concept development will be influenced by the internalised values or standards held by an individual, which are likely to be influenced by societal and cultural norms.

Measures of self-concept usually assess a variety of components including physical, moral, personal, emotional, family, social and academic/work self-concepts (Fitts & Warren, 1996; Shavelson & Bolus, 1982; Shavelson et al., 1976). A common component of many self-concept measures is physical self-concept, which refers to an individual’s beliefs about their physical self, rather than their inner self. It is also considered to be multifaceted in nature, often comprising subdomains such as physical functioning, physical appearance and physical ability (Shavelson & Bolus, 1982). However, research into physical self-concept has been plagued with inconsistency around its theoretical model and measurement, with research including combinations of physical-perceptions, physical self-worth, physical self-efficacy (Sonstroem & Morgan, 1989), self-esteem and body image. The inconsistent measurement of self-perceptions, the values attached to them, or a combination of the two, means that assessment of physical self-concept is often not comparative across research. For the purpose of this literature review, physical self-concept models and measures were only selected if they included measurement at the level of physical self-perceptions because this the core subdomain of the construct.

In support of the theory put forward by Rogers (1959), research has shown that certain experiences or knowledge of the self are likely to affect the development of physical self-concept. These include obesity (Thomas et al., 2010), exercise behaviour (Alfermann & Stoll, 2000; Annesi, 2010; Annesi & Porter, 2015; Cruz-
Ferreira et al., 2011; Legrand, 2014), diet (Yu et al., 2008), age and gender (Çaglar, 2009; Maoano, Ninot, & Bilard, 2004). The effects of an individual’s physical self-concept have also been investigated. The relationship between physical self-concept and exercise behaviours has been shown to be reciprocal, with exercise improving physical self-concept (Legrand, 2014), and higher physical self-concept increasing the likelihood that a person will exercise in the future (Marsh, Papaioannou, & Theodorakis, 2006). In addition, research literature has provided evidence demonstrating the hierarchical and multidimensional nature of the relationship between physical self-concept, its underlying subdomains, and global self-esteem (Dishman et al., 2006; Fox & Corbin, 1989). Global self-esteem is often included in physical self-concept models, however it is also strongly linked to mental health outcomes.

Self-esteem is conceptualised as an overall subjective emotional evaluation of one’s own worth. This includes a personal evaluation, based on cognitive comparison, and is considered to form part of the evaluative component of the self-concept (Campbell, 1984). Low self-esteem is closely related to mental health difficulties and diminished psychological wellbeing, it frequently accompanies psychiatric disorders such as clinical depression, anxiety disorders and personality disorders (American Psychiatric Association, 2013; Fox, 2000). Therefore, this suggests that there is a theoretical relationship between physical self-concept and psychological wellbeing outcomes. Research has suggested that there is an inverse relationship between self-esteem and severity of depression and anxiety in sample groups of psychiatric outpatients and inpatients (Beck, Brown, Steer, Kuyken, & Grisham, 2001; Van de Vliet, Knapen, Onghena, Fox, Van Coppenolle, et al., 2002), and there is some
evidence to suggest that low self-esteem may play a causal role in major depressive disorder (Maciejewski, Prigerson, & Mazure, 2000).

The complex model of physical self-concept, and its proposed relationship with self-esteem and other psychological wellbeing outcomes has attracted research over the past 40 years. Some models regard physical self-concept as a domain of global self-esteem, such as the Expanded Exercise and Self-Esteem Model (EXSEM: Sonstroem, 1997; Sonstroem et al., 1994) and Physical Self Perception Profile (PSPP: Fox & Corbin, 1989). Global self-esteem, in turn, is related to affective states, and therefore psychological wellbeing. Whilst this relationship has been theoretically proposed, there is no clear evidence base which demonstrates the strength and nature of these relationships. The aim of the current review is to identify and collate current research literature relating to the strength of the relationship between physical self-concept and psychological wellbeing outcomes.
Methods

Search Strategy

The following five databases were searched for literature:

1. Psychology Cross Search (covering PsycINFO, PsycARTICLES, Psychology and Behavioural Sciences Collection, PsycBOOKS and MEDLINE).
2. Cochrane Library.
4. EBSCO (Covering CINAHL (Cumulative Index to Nursing and Allied Health Literature) and PsycTESTS).
5. Web of Science (covering Science citation index, art & humanities citation, conference proceeding citation index-science, social science & humanities).

The strategy initially was run in Psychology Cross Search and translated to run in the other databases included in this review. The databases were chosen for their comprehensiveness in terms of the spread of journals they together encompass in relation to the field of psychology. Searches were carried out up to September 2016. The results of these searches were exported to RefWorks (reference management software) and duplicates were removed. This resulted in a total of 152 articles.

The following terms were used to search peer-reviewed article titles:
Physical self-concept OR physical self-identity OR physical self-perception OR physical self-assessment

AND
Distress* OR self-esteem OR depress* OR self-worth OR mood OR wellbeing OR well-being OR mental health OR affect OR adjust*
Screening Process (See appendix for a PRISMA flow diagram)

Titles and abstracts were screened first, with those not meeting inclusion criteria, or where exclusion criteria were met were excluded. This resulted in a pool of 49 potentially eligible articles to be assessed in full. Following the systematic database searches, during full text screening, cited and citing references from key articles were hand-searched to ensure that as many articles matching the inclusion criteria were identified as possible. This yielded a further 9 studies for consideration, taking the total number of papers for full screening to 58. During full screening, each paper assessed against the inclusion and exclusion criteria. This process yielded a total of 12 articles eligible for inclusion in the review and can be viewed in figure 1. The inclusion and exclusion criteria used in this process are presented below.

![Prisma flow diagram of screening process](image-url)
**Inclusion criteria**

Studies were eligible for inclusion in this review if they:

- Used empirical data collection methodology or were a systemic review of existing literature.
- Were studies examining both physical self-concept and psychological wellbeing. Physical self-concept measures were required to include questions that assess a person’s perception of their physical self in multiple domains, and therefore not just body weight, BMI or body image. Psychological wellbeing was defined to include any measure of depression, anxiety, affect, distress or mental health difficulty.
- Used a sample of people aged 18 years or older.
- Used populations in the ‘Western World’, due to their cultural similarities. This was defined this as countries that descended from European culture, namely Western European countries, North America, Australia and New Zealand.
- Were written in English language.
- Were published studies within a peer-reviewed journal.

**Exclusion criteria**

Studies were excluded from the review if they:

- Had participant samples which exclusively or predominantly consisted of people with an eating disorder.
- Had participant samples which exclusively or predominantly consisted of people with a physical health condition (e.g. CoPD, physical disability).
• Had participant samples which exclusively or predominantly consisted of people seeking intervention for weight loss (e.g. bariatric surgery).
• Did not include investigations of the direct relationship between physical self-concept and psychological wellbeing within the study.
• Did not use measures of physical self-concept or psychological wellbeing which were in line with the definitions favoured by this review.
• Qualitative studies offering a narrative account of the two constructs. This review was limited to quantitative studies only so that the direction and strength of the relationship between the two constructs could be clearly identified and compared across studies.

Assessment of methodological quality

There are many scales available to assess the methodological quality of journal articles in a rigorous and standardised manner. For this literature review, the Standard Quality Assessment Criteria for Evaluating Primary Research Papers from a Variety of Fields (Kmet, Lee, & Cook, 2004) was chosen. This tool is designed for use in assessing studies with heterogeneous designs, to support systematic reviews which include studies with different methodological designs, rather than the traditional approach to including randomised control trials only. The tool provides a comprehensive checklist and a scoring scale, which results in an overall quality score. The quality scoring process was used as a guide to evaluate and interpret the value and relative quality of the data in the identified studies. For this review, no study was excluded through the quality scoring process in order to preserve all available data.
Data extraction

Data extraction and methodological quality scoring were carried out for each of the 12 included studies. Each study was read thoroughly a minimum of three times; once to obtain an overall understanding of the study, a second time to extract data and conduct methodological quality scoring, and a third time to verify the extracted data and quality score. Extracted data included the authors, study method, aims/objectives, participant numbers, country in which it was conducted, setting in which it was conducted, recruitment method, age range of participants, population characteristics, independent variables, dependent variables, outcome measures used, method of data analysis, effect sizes, and overall methodological quality score.

Assessment of Risk of Bias

Guidelines provided by Cochrane (Higgins et al., 2011) were used to guide the assessment of the risk of bias in the 12 identified studies. Many of the studies were cross-sectional in design, and observational studies of this nature can suffer from a range of risks of bias, particularly with regards to the population and participants used for the study (Sedgwick, 2015). The methodological quality scoring process also helped to identify risk of some potential sources of bias, as measures of quality are often strongly related to aspects which may introduce bias (Higgins et al., 2011). Areas of consideration included study authors, participant demographics, potential for unassessed confounders, incomplete data, and methodological rigor.
Results

Using the screening process outlined, a total of twelve papers were identified. All studies included a test of the relationship between physical self-concept and psychological wellbeing either as part of, or as the sole aim of the research. The studies identified consistently found a significant relationship between physical self-concept and psychological wellbeing. However, as outlined below, the strength of the relationship was variable across the studies.

Designs

Almost all studies employed cross-sectional, observational designs (9 out of 12), collecting questionnaire measures at a single time point. One study employed a longitudinal observational design, collecting data before and after a 10-week structured exercise program (Annesi & Westcott, 2005). The remaining two studies adopted a randomised controlled design in order to assess the effectiveness of an exercise intervention by collecting questionnaire measures at multiple time points. One study collected data over 16 weeks (Knapen et al., 2005), and another over 2 years (Opdenacker, Delecluse, & Boen, 2009).

Participants and settings

The total number of participants across the twelve studies was 2,550. Of these participants, 42% (1072 individuals) were male. This means that at 58%, women were over represented in the samples. Eleven studies reported the age of participants, either as mean and standard deviation or the range of ages. Of these studies, ten recruited working age adults, with five studies recruiting university students (mean age ranged from 19-23), and five studies recruiting from a range of settings (mean age ranged
from 32-46). One study specifically sampled a group of older adults (mean age ranged from 66-69). Therefore, the range of ages sampled across the studies covers most of adulthood, although young to middle-aged adults (i.e. under 40 years) were over represented across the samples. All studies were conducted in Western populations, including Europe (Belgium, Poland, and the UK), USA, and Canada. Further details regarding sample characteristics and the setting for each study can be found in table 1.

There was no report from any of the studies regarding ethnicity of participants. Education years was reported by one study (Opdenacker et al., 2009). Whilst no other study formally reported education years, a level of university education was implicit in five studies due to their sampling of undergraduate students in the research. Overall, the reporting of demographics in each study is poor, with only gender and age reported as standard. Therefore, it is not possible to fully assess the heterogeneity of the samples used and therefore the generalisability to the general population.

**Measures of Physical Self-concept**

**Physical Self-Perception Profile (PSPP).** Ten studies used the Physical Self-Perception Profile (PSPP). The PSPP is a 30-item questionnaire developed by Fox and Corbin (1989) which assesses physical self-concept over four subdomains: perceived sports competence, perceived physical condition, perceived attractive body, and perceived physical strength, and a domain scale of physical self-worth. Its reliability and validity when used with adults has been supported in western populations (Page, Ashford, Fox, & Biddle, 1993; Sonstroem, Speliotis, & Fava, 1992), and internal consistency has been shown to be adequate to good with a UK
Table 1: Sample details, setting, and questionnaire measures used.

<table>
<thead>
<tr>
<th>Paper</th>
<th>Setting &amp; population</th>
<th>Sample size</th>
<th>Age (Mean +/- SD)</th>
<th>Physical self-concept</th>
<th>Psychological wellbeing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annesi &amp; Westcott (2005)</td>
<td>Community, women initiating a structured exercise program. USA</td>
<td>35 (all females)</td>
<td>Range: 21-65 46.3 +/- 13.4 years</td>
<td>Physical Self-concept subscale of the Tennessee Self-concept scale</td>
<td>Profile of Mood States (POM) scales of Depression &amp; Total Mood Disturbance</td>
</tr>
<tr>
<td>Fox &amp; Corbin (1989)</td>
<td>Undergraduate students. USA</td>
<td>355 (180 males, 175 females)</td>
<td>19.7 across all participants</td>
<td>PSPP</td>
<td>Rosenberg Self-Esteem Scale</td>
</tr>
<tr>
<td>Hayes et al (1999)</td>
<td>First-year university students from University of Saskatchewan, Canada</td>
<td>183 (89 males, 94 females)</td>
<td>Males: 20.03 +/- 1.99 Females: 19.46 +/- 1.51</td>
<td>PSPP</td>
<td>General Self-Worth scale of the Self-Perception Profile for College Students</td>
</tr>
<tr>
<td>Knapen et al (2005)</td>
<td>Psychiatric inpatients. Belgium</td>
<td>199 (71 males, 128 females)</td>
<td>Group 1 - 35.54 +/- 10.76 Group 2 - 32.44 +/- 10.75</td>
<td>PSPP (Dutch version)</td>
<td>Rosenberg Self-Esteem Scale; Beck Depression Inventory; Trait Anxiety Inventory (All Dutch versions)</td>
</tr>
<tr>
<td>Lachowicz-Tabaczek &amp; Sniecinska (2011)</td>
<td>University students, Poland</td>
<td>Study 1 - 195 (87 male, 108 females) Study 2 - 216 (62 males, 154 females)</td>
<td>Study 1 - Range: 19-51 (23.43 +/- 4.48) Study 2 - Range: 19-23</td>
<td>Content of Self-Concept List (COSCL)</td>
<td>Rosenberg Self-Esteem Scale (Polish version)</td>
</tr>
<tr>
<td>Sonstroem et al (1992)</td>
<td>Church community, YMCA programs, real estate firm and participants of adult fitness program. USA</td>
<td>260 (111 males, 149 females)</td>
<td>Range: 31-66 44.1 +/- 11.6</td>
<td>PSPP</td>
<td>Rosenberg Self-Esteem Scale</td>
</tr>
</tbody>
</table>
Table 1: Sample details, setting, and questionnaire measures used (continued).

<table>
<thead>
<tr>
<th>Paper</th>
<th>Setting &amp; population</th>
<th>Sample size</th>
<th>Age (Mean +/- SD)</th>
<th>Physical self-concept</th>
<th>Psychological wellbeing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sonstroem et al (1994)</td>
<td>Adults from an aerobic dance class. USA</td>
<td>216 females</td>
<td>38.4 +/- 16.2</td>
<td>PSPP</td>
<td>General Self-Worth scale of the Self-Perception Profile for Adults</td>
</tr>
<tr>
<td>Sonstroem &amp; Potts (1996)</td>
<td>University undergraduate students. USA</td>
<td>245 (126 males, 119 females)</td>
<td>No age reported</td>
<td>PSPP</td>
<td>Rosenberg Self-Esteem Scale; The Positive and Negative Affect Schedule (PANAS); Centre for Epidemiological Studies depression scale</td>
</tr>
<tr>
<td>Van de Vliet, Knapen, Onghena, Fox, David et al (2002)</td>
<td>Psychiatric inpatients with major DSM-IV diagnosis of mood disorder. Belgium</td>
<td>177 (53 males, 124 females)</td>
<td>Males: 38.69 +/- 9.95 years  Females: 33.38 +/- 10.16 years</td>
<td>The Physical Self-Perception Profile (PSPP) – Dutch version</td>
<td>Rosenberg Self-Esteem Scale; Beck Depression Inventory; State-Trait Anxiety Inventory (All Dutch versions)</td>
</tr>
</tbody>
</table>
population (α=0.73-0.9 across subscales; Page et al., 1993). The PSPP has an alternative response format, offering two opposing statements of self-descriptions and it asks participants which description is most like them on a 4-point scale.

The PSPP has been adapted for use in other languages. Within the studies identified, four used the Dutch version of the PSPP (Knapen et al., 2005; Opdenacker et al., 2009; Van de Vliet, Knapen, Onghena, Fox, David, et al., 2002; Van de Vliet, Knapen, Onghena, Fox, Van Coppenolle, et al., 2002), with the researchers based at the University in Belgium. Following confirmatory factor analysis, the Dutch version of the PSPP was adapted to use a three subdomain structure, with perceived sports competence and perceived physical condition merged into a single subdomain. The Dutch version of the scale has been shown to have good internal consistency (α=0.89-0.93; Van de Vliet et al., 2002).

**Tennessee Self-Concept Scale.** One study used the Physical Self-Concept subscale of the Tennessee Self-concept Scale. The 14-tem questionnaire developed by Fitts & Warren (1996) measures an individual’s view of their health, appearance, physical skill and sexuality. Questions on sexuality are unique to this self-concept measure, meaning it conceptualises physical self-concept differently to other measures. Each question asks individuals to respond on a 5-point Likert scale. The scale has been shown the have good internal consistency (α=0.83) and test-retest reliability over 1 to 2 weeks (r=0.79; Fitts & Warren, 1996).

**Content of Self-Concept List (COSCL).** One study used the Content of Self-Concept List (COSCL). The COSCL is a questionnaire made up of 28 items describing four groups of traits, one of which relates to physical components of self-concept (a feeling of strength and energy to act: active, full of strength, full of life, full of energy, impetuous, strengthened, strong). Participants are asked to rate the degree
to which they possess each trait on a 9-point scale from (Lachowicz-Tabaczek & Śniecińska, 2011). The energy to act factor of the COSCL was shown to have excellent internal consistency ($\alpha = 0.93$), however this has not been replicated as the scale has not been used in further research.

**Measures of psychological wellbeing**

**Global Self Esteem.** The most commonly measured form of psychological wellbeing was global self-esteem, with 11 of the 12 studies utilising a measure of global self-esteem. Three different measures were used, the Rosenberg Self-Esteem Scale, and the Global Self-Worth scales from two different versions for the Self-Perception Profile; the Self-Perception Profile for Adults and the Self-Perception Profile for College Students.

**Rosenberg Self-Esteem Scale.** Nine studies assessed global self-esteem as a measure of psychological wellbeing, using the Rosenberg Self-Esteem Scale (Rosenberg, 1965). This is a 10-item scale using a 4-point Likert format. It is one of the most widely used measures of global self-esteem. The scale reportedly has an adequate internal consistency ($\alpha=0.77$; Rosenberg, 1965). Of the nine studies using the Rosenberg Self-Esteem Scale, four used the Dutch version of the Rosenberg Self-Esteem Sale (Helbing, 1982), and one study used the Polish version of the scale (Dzwonkowska, Lachowicz-Tabaczek, & Laguna, 2008).

**General Self-Worth scale of the Self-Perception Profiles.** One study used the Global Self-Worth scale from the Self-Perception Profile for Adults (Messer & Hartner, 1986), and one study used the Global Self-Worth scale of the Self-Perception Profile for College Students (Neemann & Harter, 1986). Both measures assess global self-esteem using six questions, for which participants rate how much a description is
like themselves. The adult version of the scale was shown to have good to excellent internal consistency ($\alpha=0.87-0.92$; Messer & Hartner, 1986), however internal consistency was not reported for the College Student version of the scale.

**Depression and mood states.** Four studies measured psychological wellbeing with measures of depression, and one study measured psychological wellbeing with a general measure of positive and negative affect.

**Beck Depression Inventory.** Two studies assessed depression using the Dutch version of the Beck Depression Inventory (BDI: Bosscher, Koning, & van Meurs, 1986). This is a 21-item questionnaire that includes various mood-related questions, scored on a scale of 0 to 3. The sum of scores indicates the degree of depression, with a higher score indicating a greater degree of depression. It is a widely used measure of symptoms of depression and has been extensively validated against other clinical measures of depression. It has been shown to have an adequate to excellent internal consistency ($\alpha=0.73-0.92$), with a mean internal consistency of $\alpha=0.86$ (Beck, Steer, & Garbin, 1988).

**Centre for Epidemiological Studies depression scale.** One study used the Centre for Epidemiological Studies (CES) depression scale. This is a 20-item scale which assessed depressive symptomology in the general population (Radloff, 1977). Responses are given on a 4-point scale to assess the way the person has felt during the past week. The measure is reported to have good internal consistency ($\alpha=0.85$; Radloff, 1977).

**Profile of Mood States.** One study used the Profile of Mood States (POM) scales of Depression & Total Mood Disturbance (McNair, Lorr, & Droppleman, 1992). The POM is a 65-item scale comprising of a list of statements that describe
feelings people have, with responses on a 5-point scale. For each question, individuals indicate how they have been feeling in the past week. The measure contains six subscales, including Depression, Tension, Fatigue, Anger, Confusion and Vigor. The Depression subscale is made up for 15-items (e.g. sad, discouraged, gloomy), and the total mood disturbance score is calculated by summing the first five subscales, and subtracting the score on the Vigor scale. Internal consistency has been shown to be good to excellent (range $\alpha=0.84-0.95$ across scales), and good test retest reliability over an average of 3 weeks ranged from 0.64-0.74. Finally, concurrent validity has been assessed with conceptually similar scales, such as the BDI compared with depression subscale ($r=0.61$; McNair et al., 1992).

**The Positive and Negative Affect Schedule.** One study used the Positive and Negative Affect Schedule (PANAS). The PANAS assesses positive and negative affect through a 20-item measure comprising of a list of affect states, which are rated on a 5-point scale (Watson, Clark, & Tellegen, 1988). The measure is flexible in terms of the time period this is assessed for, from how the person feels at the present moment, to generally feel that way on average. The study that used the PANAS asked in terms of how the person generally felt as a trait measure of the tendency to experience affect (Sonstroem & Potts, 1996). At the level of general affect, PANAS reportedly has good internal consistency for both the positive affect scale ($\alpha=0.88$) and the negative affect scale ($\alpha=0.87$; Watson et al., 1988).

**Anxiety.** Two studies measured psychological wellbeing with measures of anxiety, both of which using the State-Trait Anxiety Inventory.

**State-Trait Anxiety Inventory.** Two study assessed anxiety using subscales of the State-Trait Anxiety Inventory (STAI). The STAI is a self-report questionnaire that
consists of two subscales of 20 items each for a) state anxiety; and b) trait anxiety (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). All responses are on a scale from 1 to 4, the sum of which represents an anxiety measure, with a higher score indicating a greater degree of anxiety. The state anxiety subscale represents a score indicating ‘actual’ anxiety level in a specific situation, whereas the trait anxiety subscale represents a score indicating ‘global’ anxiety level reflective of individual differences and anxiety proneness. Both studies used the Dutch version of the STAI (Hermans, 1994), one of which used the Trait anxiety subscale only. The scale has been shown to have good to excellent internal consistency (α=0.86-0.95), and good test-retest reliability over a 2-month period (r=0.65-0.75; Spielberger et al., 1983).

**Quality ratings of the studies**

Each of the 12 studies were assessed using the Standard Quality Assessment Criteria for Evaluating Primary Research Papers from a Variety of Fields (Kmet et al., 2004). The quality rating of studies included in this review ranged from 71% to 95% (see table 2). Whilst the quality ratings of the studies were assessed to be high, this is in the context of the methodology adopted. In addition to the critical appraisal of the quality ratings, the risk of sampling bias was considered. The studies present significant limitations which are outside the scope of the quality rating framework, however the framework adopted was considered to be appropriate for use in this review as it allowed comparisons of heterogenous studies with different designs which is a key for these identified studies. A key weakness identified is that of potential sampling bias, with limited reporting of sample demographics meaning sampling bias cannot be easily assessed. The research settings suggest that sampling bias is likely for many of the studies (e.g. undergraduate students, people from a
Table 2: Quality ratings of studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Question/ objective sufficiently described</th>
<th>Design evident &amp; appropriate</th>
<th>Subject selection method</th>
<th>Subject/control groups or IV characteristics sufficiently described</th>
<th>If random allocation, described?</th>
<th>If blinding possible, described?</th>
<th>Outcome measure well defined and robust?</th>
<th>Appropriate sample size?</th>
<th>Analysis described and appropriate?</th>
<th>Estimate of variance (CI, SE) reported for main results</th>
<th>Confounders controlled?</th>
<th>Results reported in detail</th>
<th>Results support conclusion</th>
<th>TOTAL SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annesi &amp; Westcott (2005)</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>N/A</td>
<td>N/A</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>N/A</td>
<td>1</td>
<td>2</td>
<td>15/20 (75%)</td>
<td></td>
</tr>
<tr>
<td>Fox &amp; Corbin (1989)</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>N/A</td>
<td>N/A</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>N/A</td>
<td>2</td>
<td>2</td>
<td>18/20 (90%)</td>
</tr>
<tr>
<td>Hayes et al (1999)</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>N/A</td>
<td>N/A</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>N/A</td>
<td>2</td>
<td>2</td>
<td>18/20 (90%)</td>
</tr>
<tr>
<td>Knapen et al (2005)</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>N/A</td>
<td>N/A</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>N/A</td>
<td>2</td>
<td>2</td>
<td>17/24 (71%)</td>
</tr>
<tr>
<td>Lachowicz-Tabaczek &amp; Sniecinska (2011)</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>N/A</td>
<td>N/A</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>N/A</td>
<td>2</td>
<td>2</td>
<td>17/20 (85%)</td>
</tr>
<tr>
<td>Opdenacker et al (2009)</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>N/A</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>21/24 (88%)</td>
</tr>
<tr>
<td>Page et al (1993)</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>N/A</td>
<td>N/A</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>N/A</td>
<td>2</td>
<td>2</td>
<td>18/20 (90%)</td>
</tr>
<tr>
<td>Sonstroem et al (1992)</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>N/A</td>
<td>N/A</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>N/A</td>
<td>2</td>
<td>2</td>
<td>19/20 (95%)</td>
</tr>
<tr>
<td>Sonstroem et al (1994)</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>N/A</td>
<td>N/A</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>N/A</td>
<td>2</td>
<td>16/20 (80%)</td>
</tr>
<tr>
<td>Sonstroem &amp; Potts (1996)</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>N/A</td>
<td>N/A</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>N/A</td>
<td>2</td>
<td>2</td>
<td>16/20 (80%)</td>
</tr>
<tr>
<td>Van de Vliet, Knapen, Onghena, Fox, David et al (2002)</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>N/A</td>
<td>N/A</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>N/A</td>
<td>2</td>
<td>2</td>
<td>19/20 (95%)</td>
</tr>
<tr>
<td>Van de Vliet, Knapen, Onghena, Fox, Van Coppenolle et al (2002)</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>N/A</td>
<td>N/A</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>N/A</td>
<td>2</td>
<td>2</td>
<td>17/20 (85%)</td>
</tr>
</tbody>
</table>

Key: 2 = Yes; 1 = Partial; 0 = No; N/A = Not applicable
single dance class, etc.). It is not possible to ascertain whether samples included in the studies are representative of the wider population.

The methodology adopted by the majority of the studies was of a cross-sectional, exploratory design. Whilst this is an appropriate design to address the research questions proposed by the studies, in most cases this led to correlation analysis, which has clear weaknesses of not providing any evidence regarding the causation of the relationship.

Key findings

**General physical self-concept and psychological wellbeing.** General physical self-concept was reported by two studies, which used a single quantitative value to represent overall physical self-concept. Annesi and Westcott (2005) assessed changes in physical self-concept and mood in women taking part in a 10-week structured exercise program in the USA. The main aim of the study was to investigate the impact of the exercise program on physical self-concept and mood, therefore results reflect changes from baseline to week 10. They found a medium effect size for the relationship between general physical self-concept, and both depression and total mood disturbance (r=0.34 and 0.38 respectively). Both of which were statistically significant at p<0.05. This is based on the widely accepted categorisation of power by Cohen (1992), who suggested the values for small (r=0.10), medium (r=0.30) and large (r=0.50) effect sizes. However, the study included a small sample size and excluded women who previously participated in regular exercise and who had elevated depression or mood disturbance scores, therefore the results may be specific to this group.
Another study which used a general physical self-concept measure was carried out by Lachowicz-Tabaczek & Śniecińska (2011) in Poland. A cross-sectional design was used to assess the relationship between domains of self-concept and self-esteem. They conducted two studies, which both found that physical self-concept (labelled as ‘energy to act’), was significantly correlated with global self-esteem, and demonstrated a large effect size (r=0.53 and 0.51), both of which are statistically significant at a p<0.001 level. Whilst this provides strong evidence for a relationship between the variables, the sample was solely made up of university students, and was overrepresented by females (63.7%), making it difficult to generalise to a wider population. In addition, there was little detail about the development of the physical self-concept measure, the COSCL. Whilst there appears to be a theoretical basis for the four factors included (agency, energy to act, morality and social acceptance), little detail was provided to explain how items on the measure were generated. The physical self-concept measure has not been used in other research, and there is little evidence of its validity and reliability as a measurement tool.

There was limited research into physical self-concept as a single, overall construct, and its relation to psychological wellbeing. This is perhaps not surprising considering the model of self-concept as a hierarchical construct. Research has more commonly focused on the multifaceted nature of physical self-concept, and how each subdomain is associated with psychological wellbeing outcomes.

Physical self-concept subdomains and psychological wellbeing. Ten of the identified studies used the Physical Self-Perception Profile (PSPP) to measure physical self-concept. The first study of this kind was by Fox and Corbin (1989), who proposed the Physical Self-Perception Model, a hypothesised hierarchical model
which identifies three domain levels: 1) subdomain level, consisting of specific perceptions of sports competence, body attractiveness, physical strength and physical condition; 2) domain level, consisting of physical self-worth; and 3) apex level, consisting of global self-esteem. The PSPP was developed to empirically test this model. During the development of the PSPP, Fox and Corbin (1989) recruited a relatively sample of undergraduate students from the USA to test the model. They found that all five domains measured by the PSPP (subdomain level: sports competence, body attractiveness, physical strength and physical condition; domain level: physical self-worth) were correlated with global self-esteem. Effect sizes ranged from small (r=0.17) to large (r=0.64), all of which were significant at the p<0.01 level.

Further investigation of the PSPP model was carried out on adults from a large church community in the USA (Sonstroem et al., 1992). The aim of this study was to test the validity of the PSPP measure with middle-aged adults. They recruited participants from a number of sources, including a church community, YMCA programs, a real estate firm and adult fitness program. Findings also supported the conclusion that all subdomains and domains of the PSPP were correlated with global self-esteem. Effect sizes ranged from small (r=0.25) to large (r=0.58), all of which were significant at the p<0.001 level. The validation of this model with middle-aged people provides support to the validity of the PSPP model with a wider population.

The cross-cultural validity of the PSPP model was tested by researchers in the UK (Page et al., 1993) using undergraduate and postgraduate university students. Findings supported previous research, with sub-domains of the PSPP found to be correlated with global self-esteem. Effect sizes ranged from small (r=0.14) to large (r=0.62), however, some were not found to be statistically significant: the relationship
between physical strength and global self-esteem for women and men, and the relationship between physical condition and global self-esteem for men. The strength of correlation coefficient reported, alongside lack of statistical significance, suggests a lack of power in the study due to sample size. The correlations that did not reach statistical significance could suggest that there is no significant relationship in the real world, or alternatively it could be due to lack of power in the study, which was not reported. The sample sizes and correlation coefficients reported equate to a power of 0.23 for the male sample and 0.55 for the female sample based on a significance level of 0.05. There is a consensus that studies should aim for 0.8 statistical power, therefore it is clear that the study did not achieve sufficient power to detect a significant result, if it exists.

Another study by Sonstroem, Harlow & Josephs (1994) reported the correlational relationship between PSPP subdomains and global self-esteem. They found effect sizes from small (r=0.29) to large (r=0.59). However, the statistical significance of the correlations was not reported therefore it is not possible to ascertain the significance of these effect sizes. In addition, the sample was limited and only included females attending an aerobic dance class in the USA, therefore the generalisability of these finding to the general population is questionable.

Sonstroem and Potts (1996) investigated the impact on psychological wellbeing further by introducing positive affect, negative affect, and depression symptomology as additional measures. Participants were undergraduate students recruited from a university in the USA. This was the only identified study that used multiple regression analysis to investigate the effect of gender and PSPP subscales on psychological wellbeing. They reported that all betas were in the direction
Table 3: *Relationships between PSPP subscales and psychological wellbeing*

<table>
<thead>
<tr>
<th>Study</th>
<th>Psychological wellbeing</th>
<th>Gender of participant</th>
<th>Sports competence</th>
<th>Physical condition</th>
<th>Body attractiveness</th>
<th>Physical strength</th>
<th>Domain level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fox &amp; Corbin (1989)</td>
<td>Global self-esteem</td>
<td>Males</td>
<td>r=0.35**</td>
<td>r=0.37**</td>
<td>r=0.48**</td>
<td>r=0.30**</td>
<td>r=0.61**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Females</td>
<td>r=0.29**</td>
<td>r=0.30**</td>
<td>r=0.48**</td>
<td>r=0.17**</td>
<td>r=0.64**</td>
</tr>
<tr>
<td>Hayes et al (1999)</td>
<td>Global self-esteem</td>
<td>Males</td>
<td>r=0.38*</td>
<td>r=0.27*</td>
<td>r=0.63*</td>
<td>r=0.21</td>
<td>r=0.67*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Females</td>
<td>r=0.28*</td>
<td>r=0.25*</td>
<td>r=0.47*</td>
<td>r=0.16</td>
<td>r=0.54*</td>
</tr>
<tr>
<td>Opdenacker et al (2009)*</td>
<td>Global self-esteem</td>
<td>All</td>
<td>r=0.24*; r=0.09</td>
<td>r=0.16; r=0.25*</td>
<td>r=0.32*; r=0.31*</td>
<td>r=0.33*; r=0.24*</td>
<td>r=0.43*; r=0.35*</td>
</tr>
<tr>
<td>Page et al (1994)</td>
<td>Global self-esteem</td>
<td>Males</td>
<td>r=0.38*</td>
<td>r=0.14</td>
<td>r=0.29*</td>
<td>r=0.14</td>
<td>r=0.39*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Females</td>
<td>r=0.38*</td>
<td>r=0.41*</td>
<td>r=0.45*</td>
<td>r=0.29</td>
<td>r=0.62*</td>
</tr>
<tr>
<td>Sonstroem et al (1992)</td>
<td>Global self-esteem</td>
<td>Males</td>
<td>r=0.476**</td>
<td>r=0.319**</td>
<td>r=0.544**</td>
<td>r=0.379**</td>
<td>r=0.566**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Females</td>
<td>r=0.294**</td>
<td>r=0.307**</td>
<td>r=0.566**</td>
<td>r=0.245**</td>
<td>r=0.580**</td>
</tr>
<tr>
<td>Sonstroem et al (1994)</td>
<td>Global self-esteem</td>
<td>All</td>
<td>r=0.35</td>
<td>r=0.39</td>
<td>r=0.51</td>
<td>r=0.29</td>
<td>r=0.59</td>
</tr>
<tr>
<td>Sonstroem &amp; Potts (1996)</td>
<td>Positive affect</td>
<td>All</td>
<td>R²=0.17***</td>
<td>R²=0.20***</td>
<td>R²=0.08***</td>
<td>R²=0.10***</td>
<td>R²=0.19***</td>
</tr>
<tr>
<td></td>
<td>Negative affect</td>
<td>All</td>
<td>R²=0.03**</td>
<td>R²=0.07***</td>
<td>R²=0.05***</td>
<td>R²=0.01</td>
<td>R²=0.07***</td>
</tr>
<tr>
<td></td>
<td>Depression</td>
<td>All</td>
<td>R²=0.07***</td>
<td>R²=0.10***</td>
<td>R²=0.07***</td>
<td>R²=0.02***</td>
<td>R²=0.13***</td>
</tr>
<tr>
<td>Van de Vliet, Knapen, Onghena, Fox, David et al (2002)</td>
<td>Depression</td>
<td>Males</td>
<td>r=0.33*</td>
<td>r=0.38**</td>
<td>r=0.32*</td>
<td>r=0.31*</td>
<td>r=0.33*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Females</td>
<td>r=0.29**</td>
<td>N/A</td>
<td>r=0.23**</td>
<td>r=0.15</td>
<td>r=0.33**</td>
</tr>
<tr>
<td></td>
<td>State anxiety</td>
<td>Males</td>
<td>r=0.19</td>
<td>N/A</td>
<td>r=0.34**</td>
<td>r=0.20</td>
<td>r=0.28**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Females</td>
<td>r=0.19*</td>
<td>N/A</td>
<td>r=0.18*</td>
<td>r=0.20*</td>
<td>r=0.29**</td>
</tr>
<tr>
<td></td>
<td>Trait anxiety</td>
<td>Males</td>
<td>r=0.29*</td>
<td>N/A</td>
<td>r=0.55**</td>
<td>r=0.34**</td>
<td>r=0.46**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Females</td>
<td>r=0.23**</td>
<td>N/A</td>
<td>r=0.19*</td>
<td>r=0.12</td>
<td>r=0.29**</td>
</tr>
<tr>
<td>Van de Vliet, Knapen, Onghena, Fox, Van Coppenolle et al (2002)</td>
<td>Global self-esteem</td>
<td>Males</td>
<td>r=0.14</td>
<td>N/A</td>
<td>r=0.22**</td>
<td>r=0.28**</td>
<td>r=0.33**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Females</td>
<td>r=0.25**</td>
<td>N/A</td>
<td>r=0.44**</td>
<td>r=0.31**</td>
<td>r=0.47**</td>
</tr>
</tbody>
</table>

*Note:* # denotes that first number represents change from pre-test to post-test, second number represents change from pre-test to follow-up. * p<0.05. ** p<0.01. *** p<0.001.
consistent with mental health, i.e. coefficients for positive affect are positive, coefficients for negative affect and depression are negative. Of the 15 possible associations between physical self-concept and life adjustment, 14 were statistically significant (see table 3). Effect sizes ranged from small ($R^2=0.01$) to medium ($R^2=0.20$).

Further validation of the PSPP model, including additional focus on possible gender differences, was completed by Hayes and his colleagues (Hayes, Crocker, & Kowalski, 1999). The study had mixed findings regarding the relationship between physical self-concept and psychological wellbeing. Significant effect sizes varied from small ($r=0.25$) to large ($r=0.67$), significant at the $p<0.05$ level. Two correlations were found not to be significant: the relationship between strength and global self-esteem for both males or females. This supports the finding by Page et al. (1993) which did not find a significant relationship for strength. However, based on the effect size found, this study also had insufficient power (power=0.51 for males and 0.34 for females). Therefore, whilst this study does not fully support the PSPP model, which could be due to problems with statistical power. The researchers did find support for gender differences in physical self-concept, with men reporting more positive physical self-concept, and gender moderating the relationship between physical self-concept and physical activity. It is also important to note that participants were undergraduate students, which restricts the application of the study findings to the general population.

From the early 2000’s, the PSPP model has been investigated by a research group in Belgium. They adapted the PSPP questionnaire for the Dutch language, a process which also reduced the subdomains from four to three, with sports competence and physical condition becoming a single subdomain (Van de Vliet,
Knapen, Onghena, Fox, Van Coppenolle, et al., 2002). The study investigated the PSPP model with a group of adults with a diagnosis of a mood disorder, and a group of adults from the general population without a diagnosis, however correlations were only reported for the general population sample. Effect sizes were small ($r=0.22$) to medium ($r=0.47$), which were statistically significant at the $p<0.05$ and $p<0.01$ levels (see table 3 for full details). One relationship was not found to be significant: the correlation between ‘sports competence and physical condition’ and global self-esteem in males. However, based on the effect size power was found to be poor (power=0.32). Despite this, overall the study does not fully support the PSPP model. A major limitation with this study is the details of recruitment method were not reported, nor were demographics of the sample other than mean age. Therefore, it is not possible to ascertain whether this finding can be generalised, or compared to the results of other studies.

This study was replicated by the same research group, recruiting people receiving treatment at a psychiatric inpatient unit who also engaged in regular psychomotor therapy (Van de Vliet, Knapen, Onghena, Fox, David, et al., 2002). They also expanded their psychological wellbeing measures to include depression, state anxiety and trait anxiety. Of the 24 possible associations between PSPP subdomains and psychological wellbeing, 20 were found to be statistically significant. Effect sizes were found to be small ($r=0.18$) to large ($r=0.55$). The relationships which were not found to be statistically significant included: correlation between physical strength and depression in females; correlation between physical strength and state anxiety in males; correlation between ‘sports competence and physical condition’ and state anxiety in males; and correlation between physical strength and trait anxiety in females. However, this sample was overrepresented by
<table>
<thead>
<tr>
<th>Paper</th>
<th>Methodology</th>
<th>Relevant statistical analysis</th>
<th>Comparisons made</th>
<th>Effect size</th>
</tr>
</thead>
</table>
| Annesi & Westcott (2005)      | Non-comparative. Exploratory | Pearson’s r correlations                                                                      | Physical self-concept and a) depression; b) total mood disturbance               | Depression: $r = 0.34^*$  
Total Mood Disturbance: $r = 0.38^*$ |
| Fox & Corbin (1989)           | Non-comparative. Exploratory | Pearson’s r correlations                                                                      | 5 PSPP subscales and global self-esteem Split by gender                          | Males: $r = 0.30^{**}$-0.61**  
Females: $r = 0.17^{**}$-0.64** |
| Hayes et al (1999)            | Non-comparative. Exploratory | Pearson’s r correlations                                                                      | 5 PSPP subscales and global self-esteem Split by gender                          | Males: $r = 0.21-0.67^*$  
Females: $r = 0.16-0.54^*$ |
| Knapen et al (2005)           | Randomised Controlled Trial  | Pearson’s r correlations                                                                      | PSPP physical self-worth subscale and a) global self-esteem; b) depression; c) anxiety | $r = 0.45^{**}$-0.81**     |
| Lachowicz-Tabaczeck & Sniecinska (2011) | Non-comparative. Exploratory | Multiple regression and Pearson’s r correlations                                              | Physical self-concept and global self-esteem                                    | Study 1: $r = 0.53^{***}$  
Study 2: $r = 0.51^{***}$ |
| Odenacker et al (2009)        | Randomised Controlled Trial  | Pearson’s r correlations                                                                      | 5 PSPP subscales and global self-esteem                                          | $r = 0.09-0.43^*$          |
| Page et al (1993)             | Non-comparative. Exploratory | Pearson’s r correlations                                                                      | 5 PSPP subscales and global self-esteem Split by gender                          | Males: $r = 0.29-0.62^*$  
Females: $r = 0.14-0.39^*$ |
| Sonstroem et al (1992)        | Non-comparative. Exploratory | Pearson’s r correlations                                                                      | 5 PSPP subscales and global self-esteem Split by gender                          | Males: $r = 0.319^{***}$-0.566***  
Females: $r = 0.245^{***}$-0.58*** |
| Sonstroem et al (1994)        | Non-comparative. Exploratory | Pearson’s r correlations                                                                      | 5 PSPP subscales and global self-esteem                                          | $r = 0.13-0.59$ (no significance reported) |
| Sonstroem & Potts (1996)      | Non-comparative. Exploratory | Multiple regression analysis                                                                  | 5 PSPP subscales and a) positive affect; b) negative affect; c) depression       | Positive affect: $R^2 = 0.08^{***}-0.20^{***}$  
Negative affect: $R^2 = 0.01-0.07^{***}$  
Depression: $R^2 = 0.02^{***}-0.13^{***}$ |
| Van de Vliet, Knapen, Onghena, Fox, David et al (2002) | Non-comparative. Exploratory | Pearson’s r correlations                                                                      | 5 PSPP subscales and a) depression; b) state anxiety; c) trait anxiety. Split by gender | Depression -  
Males: $r = 0.31^{*}$-0.38**  
Females: $r = 0.15$-0.33**  
State anxiety -  
Males: $r = 0.19-0.34$  
Females: $r = 0.18$-0.29**  
Trait anxiety -  
Males: $r = 0.29^{*}$-0.55**  
Females: $r = 0.12$-0.29** |
Females: $r = 0.25^{**}$-0.47** |

**Note:** * = $p<0.5$. ** = $p<0.01$. *** = $p<0.001$. **
women (70%), and may have suffered from lack of power. Calculations suggest that the power for these correlations was poor (power=0.26-0.38). A final key point related to this study is based on their comparison of physical self-concept for ‘depressed’ and ‘normal’ groups. They found that the ‘depressed’ group also had significantly lower self-perceptions, particularly for their physical self-worth. This highlights the lack of data regarding the causal direction in these relationships, and at least suggests it could be bidirectional.

Another study based in Belgium used a longitudinal design and recruited adults who were receiving treatment at an inpatient psychiatric unit, this time not specifically recruiting people with mood disorders. Participants were randomly allocated to a treatment group within the unit: a general program of psychomotor therapy or psychomotor fitness training. Psychological wellbeing was assessed in terms of global self-esteem, depression and anxiety. Both groups saw significant improvements in physical self-concept, across all PSPP subscales, after 16 weeks. In addition, participants in both groups saw significant improvements in global self-esteem, depression and anxiety (Knapen et al., 2005). Correlation analysis was carried out on the relationship between changes in physical self-worth (a domain of physical self-concept) and changes in global self-esteem, depression and anxiety. The study does not detail individual correlations, therefore it is not possible to compare details of the results with other studies, however effect size was reported to be medium (r=0.45) to large (r=0.81), which are stated to be statistically significant correlations.

The final study recruited older adults from the general population to participate in a physical activity program. The study aimed to assess the long-term effect of physical activity interventions using a longitudinal observational design (Opdenacker et al., 2009). The relationship between PSPP subscales and
psychological wellbeing, as assessed by global self-esteem, was analysed for participants in the intervention groups. Significant associations were found for 8 out of a possible 10 correlations, with effect sizes small ($r=0.24$) to medium ($r=0.43$). Full detail of the effect sizes can be found in tables 3 and 4.

**Mediating effect of physical self-worth**

Many of the studies outlined above conducted additional analysis to assess the relationship between PSPP subdomains and psychological wellbeing outcomes, controlling for the PSPP domain of physical self-esteem. Fox and Corbin (1989) found that only one correlation remained significant after physical self-worth was controlled for. Physical condition continued to have a significant relationship with global self-esteem for women only (small effect size $r=0.20$), at a $p<0.05$ level.

Further evidence for some independent relationship between physical self-concept subdomains and global self-esteem was demonstrated by Sonstroem and colleagues (1992), who found a significant correlation remained between physical condition and global self-esteem for women, between sports competence and global self-esteem for men, and between body attractiveness and global self-esteem for both men and women (small effect size $r=0.16-0.22$), at a $p<0.05$ to $p<0.01$ level respectively. They concluded that physical self-worth serves as a mediator between subdomains and global self-esteem for the strength and sports competence subscales only. Another study found two significant correlations remained: between body attractiveness, physical condition and global self-esteem for men only (small to medium effect size $r=0.28-0.31$), at a $p<0.05$ level (Hayes et al., 1999). Interestingly, for both studies above, after controlling for physical self-worth, physical condition
and global self-esteem were negatively correlated, which is opposite to the expected relationship direction.

Further support for a partial mediation was found by Page et al. (1993), who reported a significant correlation remained between sports conditioning and global self-esteem for males only (small effect size r=0.22) at a p<0.05 level. Finally, another study found only the correlation between body attractiveness and global self-esteem remained significant for women (small effect size r=0.20) at a p<0.05 level (Van de Vliet, Knapen, Onghena, Fox, Van Coppenolle, et al., 2002). All studies found only partial support that physical self-worth mediates the relationship between PSPP subdomains and global self-esteem.

**Mediating effect of global self-esteem**

One of the studies outlined conducted additional analysis to assess the relationship between PSPP subdomains (including physical self-worth) and psychological wellbeing outcomes, whilst controlling for global self-esteem. Sonstroem and Potts (1996) investigated whether physical self-concept predicts psychological wellbeing over and above the contribution of global self-esteem to other psychological wellbeing measures. Their findings support this hypothesis for positive affect, with PSPP subscales having a medium effect size for men and women (R²=0.09 and R²=0.15 respectively), reflecting statistical significance at p<0.05 and p<0.001 respectively. No significance was found for the effect of PSPP on negative affect and on depression after controlling for global self-esteem.

Further evidence for this mediation relationship was found by Van de Vliet and colleagues (Van de Vliet, Knapen, Onghena, Fox, David, et al., 2002), who repeated their initial correlation analysis controlling for global self-esteem. They
found that of the 24 possible correlations, only two remained significant. The correlation between physical self-worth and state anxiety remained significant for females only (small effect size $r=0.18$), and the correlation between body attractiveness and trait anxiety remained significant for men only (medium effect size $r=0.35$), both at a $p<0.05$ level. In comparison, before global self-esteem was controlled for, 20 of the correlations were shown to be statistically significant. This is strong evidence for global self-esteem having at least a partial mediation effect. However, due to the number of statistical comparisons completed by this study, and lack of correction for this, it is possible that the statistically significant results found represent a Type 1 error.

**Summary**

Consolidation of the statistical findings of the included studies suggest that:

- All studies reported correlations between physical self-concept and psychological wellbeing.
- Psychological wellbeing measures correlate as expected with physical self-concept. Physical self-concept is positively correlated with global self-esteem and positive affect. Physical self-concept is negatively correlated with depression, negative affect and anxiety.
- There is substantial variability in the effect size found between physical self-concept and psychological wellbeing, from small to large.
- When physical self-concept is considered as a multifaceted construct (as in the PSPP model), the subdomains separately relate to psychological wellbeing outcomes.
- The strength of these relationships is different for men and women.
• Some evidence from mediation analyses suggest that physical self-worth partially mediates the relationship between physical self-concept and psychological wellbeing.

• Some evidence from mediation analysis suggests that global self-esteem mediates the relationship between physical self-concept and other psychological wellbeing outcomes, such as depression and anxiety.

The variability found in the results, alongside the evidence of a mediation effect, suggests that the role of additional factors needs to be considered when assessing the relationship between physical self-concept and psychological distress, particularly factors of physical and global self-worth or self-esteem. The correlational relationships found between the self-perception domains of physical self-concept and psychological distress appears to be an over-simplified conceptualisation of the relationship.
Discussion

The aim of the current review was to identify and collate current research literature relating to the strength of the relationship between physical self-concept and psychological wellbeing outcomes. Twelve studies were identified that investigated this relationship. A small number of measures were used repeatedly across studies, most notably the Physical Self-Perception Profile (PSPP) and the Rosenberg Self-Esteem Scale. In general, studies found a small or medium effect size (see table 3), suggesting that the association between physical self-concept and psychological wellbeing is relatively strong.

In most of the 12 studies identified, the main purpose of the study was not to investigate the relationship between physical self-concept and psychological wellbeing. Six were exploring the factor structure and validity of the PSPP model with a particular population (Fox & Corbin, 1989; Hayes et al., 1999; Page et al., 1993; Sonstroem et al., 1994, 1992; Van de Vliet, Knapen, Onghena, Fox, Van Coppenolle, et al., 2002); three aimed to explore the impact of an exercise program on both physical self-concept and psychological wellbeing (Annesi & Westcott, 2005; Knapen et al., 2005; Opdenacker et al., 2009); and one investigated the relationship between different domains of self-concept and psychological wellbeing (Lachowicz-Tabaczek & Śniecińska, 2011). In only two studies was this relationship the primary focus (Sonstroem & Potts, 1996; Van de Vliet, Knapen, Onghena, Fox, David, et al., 2002).

The majority of studies adopted a cross sectional, exploratory study design, with correlation analysis. This means that while the strength of the association is shown to be small to medium, the direction of this relationship cannot be ascertained. Therefore, it is possible that physical self-concept causes psychological wellbeing
outcomes, or vice versa. Alternatively, the relationship may be bi-directional. The lack of longitudinal research into the development of physical self-concept is a significant limitation. The longitudinal studies that were identified investigated the effect of the physical activity intervention, and they suggested that physical self-concept caused the change in psychological wellbeing, although this could not clearly be ascertained from the studies due to their methodology. This suggestion was supported by an intervention study which found that changes in physical self-concept occurred before changes in depression symptoms (Legrand, 2014). However, it is still possible that another, unmeasured mechanism caused both changes.

The PSPP questionnaire was used by the majority of studies, with ten papers adopting it as their physical self-concept measure. Whilst this makes results of different studies more comparable, it is concerning that a single questionnaire has provided most of the evidence. The internal consistency of the measure is reported to be good, however there have been questions raised about its factor structure due to high inter-correlations found (Sonstroem et al., 1994). It has been suggested that the high inter-correlations may be partly due to the idiosyncratic response scale used (Marsh, Asci, & Tomás, 2002; Marsh, Richards, Johnson, Roche, & Tremayne, 1994). The inclusion of studies which used other physical self-concept measurement tools would have been beneficial to this review. Other tools, such as the physical self-description questionnaire (PSDQ) have been shown to be superior (Marsh et al., 2002), however up to now it has primarily been used in studies with children, and to investigate sport and exercise ability, rather than to assess psychological wellbeing outcomes.

Psychological wellbeing was mostly measured as global self-esteem. This is a useful global psychological wellbeing measure because it has been shown to be
related to severity in certain mental health outcomes, such as depression and anxiety (Beck et al., 2001; Van de Vliet, Knapen, Onghena, Fox, Van Coppenolle, et al., 2002). However, the PSPP model proposes a hierarchical relationship between specific physical self-perceptions, physical self-worth and global self-esteem (Fox & Corbin, 1989). Therefore, the measure conceptualises physical self-concept as a subdomain of global self-esteem, which may have biased its development. This review would have benefitted from the inclusion of more studies that used other psychological wellbeing measures, such as of depression, anxiety, or general affect. These measures were only used by four of the 12 included studies. The studies which adopted outcomes other than global self-esteem found a similar pattern of statistically significant effects, which suggests that the effect of physical self-concept on psychological wellbeing is broader than just in global self-esteem. However, more evidence from further studies would help to confirm or disprove this hypothesis.

The substantial variability in effect sizes found, often with the same measures, highlights methodological inconsistencies across studies. This may be caused by the narrow populations used by many of the studies (e.g. undergraduate students, people from a specific group or location, such as psychiatric inpatients), and therefore suggests that there may be many moderators in the relationship between physical self-concept and psychological wellbeing, such as gender, age, ethnicity. In addition, whilst many of the studies found at least one relationship which did not reach statistical significance, none reported the statistical power. Calculations carried out for this review suggest that many of the studies has insufficient power to detect a statistically significant effect. Therefore, it is not possible to ascertain whether this result is a true rejection of the hypothesis, or whether a type I error has been made.
Overall, the research evidence partially supports the PSPP and EXSEM models, which both propose a hierarchical structure of subdomains of physical self-perceptions that impact on global self-esteem through physical self-worth (Fox & Corbin, 1989; Sonstroem & Morgan, 1989). Full support for these models was not found because some studies did not find all relationships to be significant, and mediation analysis found only partial mediation.

Future research in this area have the potential to make substantial contributions to our understanding of these relationships. A number of areas could be explored, including a longitudinal analysis of the development of physical self-concept to assess the direction of the relationship between physical self-concept and psychological wellbeing. Another area for future research would be to investigate the relationship with a larger sample of people from the general population, which has not been done to this date. This would allow further investigation of the moderating factors which may be involved. Finally, the expansion of measurement tools may make a substantial contribution to the literature, particularly due to the concerns raised about the PSPP measure. A wider perspective of psychological wellbeing beyond global self-esteem was only adopted by three studies, and therefore this could be investigated further.

Conclusions

This review has collated and summarised the literature which directly assesses the relationship between physical self-concept and psychological wellbeing. Overall a relationship was found, although the strength of the relationship was variable across the studies with some not finding a significant relationship, to others which found moderate effect sizes. The possible reasons for this, including a limited consideration
of mediating factors, was discussed. A number of methodological issues were highlighted, and future directions for research which may help to address these issues were suggested.
References


Considered (pp. 67–97). New Haven, CT: Yale University Press.


Van de Vliet, P., Knapen, J., Onghena, P., Fox, K., Van Coppenolle, H., David, A., …


Research Part 2 - MRP Empirical Paper

The relationship between Body Mass Index and psychological distress:

Exploring the mediating role of physical self-concept.

By

Sarah Whitson
University of Surrey

Word Count: 9975
Excluding abstract, tables, figures, references and appendices
Abstract

**Background:** The relationship between Body Mass Index (BMI) and psychological distress has been the subject of large amounts of research, with general consensus that the effect is bidirectional. Research has suggested that BMI impacts psychological distress through mediation pathways, including social and cognitive factors. Physical self-concept, socially constructed beliefs about oneself, has not been considered by the literature. This study aims to look at the relationship between BMI and psychological distress in the general population, and to examine whether a moderated mediation model can explain the relationship, with physical self-concept as mediator and social comparisons and self-concept clarity as moderators.

**Methods:** A quantitative cross-sectional design was used. Online questionnaires were administered to 265 adults. Measures included BMI, physical self-concept, psychological distress, social comparisons, and self-concept clarity. Moderated mediation analyses were conducted using the bootstrapping method.

**Results:** Higher BMI was not directly associated with increased psychological distress; however, it was indirectly associated with psychological distress through physical self-concept. Once physical self-concept was accounted for the relationship between BMI and psychological distress became stronger and the opposite direction to expected, with higher BMI associated with lower psychological distress. Analysis of moderators showed mixed results, however there was evidence that the effect of physical self-concept on psychological distress was only present when a person makes unfavourable comparisons of themselves to others, and when they have a weak self-concept clarity.

**Conclusions:** Overall, the results support the theory for multiple mediation pathways between BMI and psychological distress, with the mediators accounting for
psychological distress outcomes rather than BMI itself. The study suggests that social context and social norms will shape the interpretation of physical self-concept in terms of impact on affect and distress. Limitations of the study, implications for public health policy and future research directions are discussed.
Introduction

The importance of physical health and psychological wellbeing in the general population has become increasingly accepted in the past five years, with the UK government introducing a national well-being programme which measures physical health, mental health, and subjective wellbeing (Office for National Statistics, 2011). In order to add to our understanding of factors that influence psychological wellbeing, this research aimed to examine whether psychological distress is related to Body Mass Index (BMI), and whether this relationship could be caused by physical self-concept, or the beliefs a person has about their physical self.

It is well established that obesity is a significant health issue in the UK. Obesity, defined as having ‘excess’ amounts of body fat, is known to increase the risk of many physical health problems, leading to significant direct and indirect costs (Dixon, 2010; Morgan & Dent, 2010). A recent national survey showed that, when assessed in terms of BMI, 68% of adult males and 58% of adult females were overweight or obese, with 27% of males and females categorised as obese (Health and Social Care Information Centre, 2015). Whilst UK policy is heavily focused on interventions to reduce obesity, such as through lifestyle changes (Department of Health, 2015), there is conflicting evidence about the health outcomes of obesity. Some researchers argue that it is possible to be ‘metabolically healthy’ and obese, meaning obesity without any metabolic consequences (Rey-Lopez, de Rezende, Pastor-Valero, & Tess, 2014), with better health outcomes in obesity often linked to higher fitness levels (Ortega et al., 2013). However, other researchers report that metabolically healthy obese individuals continue to be at higher risk of mortality and cardiovascular events than those who are metabolically healthy and normal weight (Kramer, Zinman, & Retnakaran, 2013; Van Vliet-Ostaptchouk et al., 2014),
suggesting that there is a fundamental increased risk to health associated with obesity. Therefore, the relationship between obesity and physical health appears to be complex and dependent on several factors, including lifestyle and fat distribution, with waist circumference shown to be a stronger predictor of health risk than BMI (Janssen, Katzmarzyk, & Ross, 2004). The conflicting findings about the health outcomes of obesity could also be a limitation of the current literature. The underpinning mechanisms involved in the observed relationship between obesity and health risks continue to be the subject of investigation, with more recent evidence suggesting that overweight and obesity is not necessarily associated with the significant physical health risks as previously believed (Flegal, Graubard, Williamson, & Gail, 2005). This presents an interesting challenge to public health policy in the UK, which focuses on obesity, its relationship with negative physical health outcomes, and public health interventions aim to reduce levels of obesity.

Another factor which can significantly impact on wellbeing is psychological distress. Psychological distress is usually conceptualised in terms of mental health disorders such as depression, or can be viewed more generally in terms of positive and negative emotions, or affect. A national UK survey found that 16.2% of adults met the diagnostic criteria for at least one common mental health disorder (The NHS Information Centre for Health and Social Care, 2009). Therefore, mental health disorders have the potential to significantly impact the lives of people in the UK. There is evidence that wellbeing is slowly improving in the UK (Office for National Statistics, 2015), however, the improvements are not even across the UK population and suggest increasing inequality in wellbeing. The proportion of people reporting very high personal wellbeing is growing faster than the proportion reporting low levels of personal wellbeing. Therefore, increased understanding of the factors that
lead to poor wellbeing may help the development of interventions to reduce this inequality.

**Obesity and psychological distress**

Considering the prevalence rates of obesity and mental health disorders, it is not surprising that some people who are overweight or obese also experience psychological distress. A U-shaped relationship has been found between BMI and depression, with the highest rates of depression found among underweight and obese patients (Carey et al., 2014; de Wit, van Straten, van Herten, Penninx, & Cuijpers, 2009). This suggests that there may be a direct causal relationship or an underlying mechanism resulting in the observed comorbidity, however evidence has been conflicting. Whilst some studies found no significant relationship (Luppino et al., 2010), overall the evidence suggests a bidirectional causal effect and that obesity has a small to moderate effect on psychological distress (Ali & Linstrom, 2006; Atlantis & Baker, 2008; Bruffaerts et al., 2008; Carr, Friedman, & Jaffe, 2007; de Wit et al., 2010; Johnston, Johnson, McLeod, & Johnston, 2004; Luppino et al., 2010; Pasco, Williams, Jacka, Brennan, & Berk, 2013; Roberts, Deleger, Strawbridge, & Kaplan, 2003; Rooke & Thorsteinsson, 2008; Simon et al., 2006, 2008). A meta-analysis found that overweight and obesity at baseline increased the risk of onset of depression at follow-up odds ratio of 1.27 and 1.55 respectively (Luppino et al., 2010), which equates to a small effect size in terms of Cohen’s d (d=0.13 for overweight and d=0.24 for obesity [Borenstein, Hedges, Higgins, & Rothstein, 2009; Cohen, 1988]). The concept of metabolically healthy obese individuals has also been considered in this literature, and there is evidence that the risk of depression is higher in obese individuals who are metabolically unhealthy (Jokela, Hamer, Singh-Manoux, Batty, &
Kivimäki, 2014). This could suggest that the risk of depression in obesity is partly explained by the metabolic health conditions commonly associated with obesity, and therefore that the relationship is not direct.

The inconsistent evidence regarding the direct relationship between BMI and psychological distress may be due to the use of the bivariate model without examining possible underlying mechanisms (Faith, Matz, & Jorge, 2002). It was suggested that future research should address these issues with prospective designs and moderator-mediator frameworks (Faith, Calamaro, Dolan, & Pietrobelli, 2004). The mechanisms through which obesity may impact on psychological distress have since been investigated more rigorously, and a model outlining the factors associated with the relationship between obesity and common mental health disorders has been developed. The bidirectional model argues that obesity can impact on mental health through four main mechanisms: behavioural, cognitive, social and physiological (Markowitz, Friedman, & Arent, 2008; Napolitano & Foster, 2008). The behavioural mechanism identifies behavioural outcomes such as functional impairment, repeated dieting, binge eating, and reduced exercise. The cognitive mechanism identifies factors including body image dissatisfaction and low self-esteem. The social mechanism focuses on the effect of stigma and reduced social support. Finally the physiological mechanism identifies hypothalamic-pituitary-adrenocortical dysregulation and sleep problems (Markowitz et al., 2008; Napolitano & Foster, 2008). This model was formulated out of previous research literature, but was not tested statistically. The model highlights key factors in the relationship, however it is limited in that it does not attempt to define the role of each factor as mediating, moderating or confounding. Despite this, the model gives evidence to suggest a complex causal pathway between BMI and psychological distress which comprises of
a combination of biological, behavioural, psychological and social factors. Furthermore, the research literature suggests that when the complex causal pathway is accounted for, BMI is not the major determinant of psychological distress in obesity (Carr et al., 2007; Dierk et al., 2006).

More recently, a systematic review identified variables associated with the relationship between obesity and depression. These included severity of obesity, educational attainment, body image, psychological factors (such as self-esteem), physical health, interpersonal effectiveness, binge eating, and stigma (Preiss, Brennan, & Clarke, 2013). The factors are broadly in line with the model suggested by Napolitano & Foster (2008). However, studies included in this review used logistic regression analysis rather than moderation and mediation, as previously suggested by Faith et al. (2004). Furthermore, as highlighted previously the specific role of each factor in the relationship between BMI and depression is conceptually unclear. Research has not investigated the temporal order in which the factors develop, which would help ascertain the role of the variables.

Factors which may influence the strength or direction of the relationship between obesity and psychological distress, known as moderators, have also received some interest. Research has identified that being female (Atlantis & Baker, 2008; Bookwala & Boyar, 2008; Ul-Haq, Mackay, Fenwick, & Pell, 2014), younger (Brandheim, Rantakeisu, & Starrin, 2013; Ul-Haq et al., 2014), and severely obese (M. A. Friedman & Brownell, 1995; Stunkard, Faith, & Allison, 2003) is associated with a stronger relationship between BMI and psychological distress. Socioeconomic status has also been suggested to be important in this relationship, however there is some disagreement as to the direction of the association, with some studies suggesting low socioeconomic status is a risk factor in comorbid obesity and depression.
(Johnston et al., 2004), whilst others suggest that high socioeconomic status is a risk factor (e.g. Stunkard et al., 2003). Markowitz et al. (2008) went on to suggest that those of lower socioeconomic status may be more likely to experience depression or obesity, but among people who are obese, high socioeconomic status may result in increased risk for depression. This highlights how research has struggled to demonstrate consistent evidence of these relationships, possibly due to their complex nature, variations in methodologies, population characteristics and measures used.

Obesity has been measured in several ways in the literature, including measured or self-reported weight and height, or asking individuals about their subjective perception of their weight. It is widely acknowledged that the use BMI, which is calculated from weight and height data, is problematic when investigating obesity. BMI is a proxy measure of the underlying problem of excess body fat, and individuals with high levels of muscle mass can be identified as obese by using BMI as a measurement tool. However, it continues to be a widely used tool for practical reasons; it is an easy, cheap and non-invasive way of assessing excess body fat (National Obesity Observatory, 2009). Studies that assessed subjective weight perceptions found that those which deviate from societal and cultural ideals are more consistently associated with psychological distress than actual weight status, regardless of whether the weight perception is accurate or a misperception (Atlantis & Ball, 2008; Jones, Grilo, Masheb, & White, 2010). This suggests that people have internalised a negative judgement, based on the cultural and societal context, and it is this which is associated with psychological distress rather than the excess body fat itself. Most research in this area has been carried out in ‘western culture’, which refers to the majority culture in Europe and the United States. It is generally accepted that these cultures value a thin female physique and a lean and muscular male physique.
(Garner, Garfinkel, Schwartz, & Thompson, 1980; Swami et al., 2010). These culturally-specific representations of the body, which are linked to psychological distress, can be conceptualised as a component of physical self-concept. These may form part of the causal mechanism in the observed relationship between BMI and psychological distress.

**Physical self-concept**

The importance of an individual’s subjective perception of their body weight highlights the significance of self-schema, which are organised cognitive generalisations about the self, derived from past experiences. The self-schema for body weight is believed to be universal, meaning all individuals have some concept of their body weight (Markus, Hamill, & Sentis, 1987). Self-schemas are seen as the cognitive framework which form part of the broader physical self-concept, which is the set of beliefs held about their physical self. General self-concept comprises different socially-constructed self-labelling’s, or self-schemas which become distinctive in a given social situation (Markus & Kunda, 1986; Markus & Wurf, 1987). Literature has investigated cognitive mechanisms such as body image in mediating the relationship between BMI and psychological distress (K. E. Friedman, Reichmann, Costanzo, & Musante, 2002). Body image refers to an individual’s belief about their shape and body size, and therefore only captures a proportion of all the beliefs we can hold about our physical selves. Physical self-concept more broadly covers the set of beliefs we hold about our physical selves. The significance of subjective weight perception and body image in the relationship between BMI and psychological distress suggests that the broader physical self-concept may have a
significant role, however this has not been investigated in the literature assessing the relationship between BMI and psychological distress.

Carl Rogers (1959) believed that an individual’s self-concept develops from self-experience, which forms the basis of our self-perceptions; the values attached to these perceptions, or self-esteem; and the ‘ideal self’. This suggests a hierarchical structure with perceptions of ourselves in specific situations at the base, inferences about the self in the middle and a general self-concept at the apex (Shavelson, Hubner, & Stanton, 1976). Shavelson et al. (1976) also emphasised that self-concept is both descriptive and evaluative, with evaluations developing from comparisons with some standard, which could be based on individual, social or cultural values. Therefore, self-concept is socially constructed and not a purely cognitive process based on objective reality. Self-concept develops from self-knowledge, which can be gathered through self-perception, feedback from others and comparisons with others; alongside the broader cultural representations and values associated with this knowledge. Therefore, it is expected that socially constructed self-knowledge and cultural values could shape both the development of the self-perception domain of self-concept, and the effect these perceptions have on affect.

Shavelson, Hubner and Stanton (1976) hypothesised that self-concept is structured and multifaceted. Self-concept is domain specific, and individuals will have different perceptions of themselves in different capacities (Marsh & Shavelson, 1985). These domain specific self-perceptions are thought to contribute to an overall and more global sense of self-concept (Harter, 1990). The multifaceted nature of self-concept has led to some disagreement over its key components, however physical self-concept is a component shared by many models (Fitts & Warren, 1996; Shavelson & Bolus, 1982). Physical self-concept is defined as an individual’s beliefs
about their physical self, such as physical appearance and physical ability (Shavelson & Bolus, 1982) and is influenced by BMI (Thomas et al., 2010), exercise behaviours and skills (Alfermann & Stoll, 2000; Annesi, 2010; Annesi & Porter, 2015; Cruz-Ferreira et al., 2011; Legrand, 2014). Self-concept theory also recognises that these beliefs about the self can be clearly and confidently defined, or unclear (Campbell, 1990). Self-concept clarity has been shown to mediate the relationship between stress and wellbeing, and people with a clear self-concept report better wellbeing (Campbell & Lavallee, 1993; Ritchie, Sedikides, Wildschut, Arndt, & Gidron, 2011). Therefore, it could be expected that the positive effect of self-concept on wellbeing will be stronger when self-concept is clear and confidently defined.

The strong relationship between physical self-concept and exercise behaviour (Alfermann & Stoll, 2000) supports its hypothetical role in the relationship between BMI and psychological distress. It is well-established that engaging in exercise has a positive effect on psychological wellbeing (Edwards, 2006; Josefsson, Lindwall, & Archer, 2014; Malcolm, Evans-Lacko, Little, Henderson, & Thornicroft, 2013), and the reasons for this are likely to be wide ranging and complex, including biological, psychological and social components. Within Western societies, there is a positive attitude towards people who engage in positive health behaviours such as regular exercise (Drouin, Varga, & Gammage, 2008; Martin, Sinden, & Fleming, 2000; Rodgers, Hall, Wilson, & Berry, 2009). In addition, despite current prevalence, overall cultural attitudes towards overweight and obesity continue to be negative, and are associated with stigma and negative attitudes (Hiller, 1981; Puhl & Heuer, 2009). Given that physical self-concept is partly emergent out of the social representations and cultural values associated with certain characteristics, such as the importance of thinness, exercise and dieting, social norms are likely to be a strong moderator of
people’s evaluations of their physical self and their affective response to it, and therefore influence psychological distress. BMI and exercise behaviour are likely to influence the development of physical self-concept to a degree, whilst other factors that are likely to have an impact include negative thinking styles such as those found in depression (A. T. Beck, Rush, Shaw, & Emery, 1979). Therefore, the relationship between physical self-concept and psychological distress may be bidirectional and cyclical.

There is a theoretical basis to suggest a role of physical self-concept in the relationship between BMI and psychological distress. The significant influence of social and cultural context in the development of physical self-concept also suggests that this is an area that warrants further investigation. However, neither of these concepts have been directly assessed by research into the relationship between BMI and psychological distress. Physical self-concept has been found to be a significant factor when considered separately in its relationship with BMI (Agarwal, Bhalla, Kaur, & Babbar, 2013) and its relationship with psychological distress (Annesi & Westcott, 2005; Fox & Corbin, 1989; S. D. Hayes, Crocker, & Kowalski, 1999; Knapen et al., 2005; Lachowicz-Tabaczek & Śniecińska, 2011; Opdenacker, Delecluse, & Boen, 2009; Page, Ashford, Fox, & Biddle, 1993; Sonstroem, Harlow, & Josephs, 1994; Sonstroem, Speliotis, & Fava, 1992; Sonstroem & Potts, 1996; Van de Vliet, Knapen, Ongena, Fox, David, et al., 2002; Van de Vliet, Knapen, Ongena, Fox, Van Coppenolle, et al., 2002). Therefore, the lack of direct assessment of the mediating role of physical self-concept in the relationship between BMI and psychological distress represents a significant gap in our current knowledge base. This is an area that would benefit from further research to clarify the effect of the identified constructs on psychological distress.
Social comparisons

Social comparisons are the framework in which people form their self-perceptions (Festinger, 1954), and can result in negative affect if compared ‘unfavourably’ as constructed by societal norms or cultural values. One of the first applications of this framework to obesity was through social network theory, which highlighted the influence of social relationships in obesity (Christakis & Fowler, 2007). This theory posits that obesity spreads from person to person through social ties due to changing norms about the acceptability of being overweight, by directly influencing behaviours such as food consumption and exercise, or both. Therefore, perceived social norms are a key factor influencing the outcome of any social comparison. People are motivated to make comparisons between themselves and those in their social network for a number of reasons, such as a need to form an accurate self-concept (Trope, 1975). The self-evaluation maintenance model (Tesser, 1988) postulates that the performance of other people can affect our self-evaluation, particularly when comparing ourselves to those we are psychologically close to. Comparisons that identify others as ‘outperforming’ us in an attribute result in a greater sense of threat to the self, resulting in negative affect. Similarly, upward and downward social comparisons theories (Gibbons, 1986; Tesser, Millar, & Moore, 1988; Wills, 1981) suggest that making ‘downward’ comparisons with those worse off than ourselves can increase subjective wellbeing. Therefore, social comparisons could moderate the relationship between physical self-concept and its outcome on affect, with those comparing themselves unfavourably to others experiencing more negative psychological outcomes. As discussed previously, social comparisons have not been addressed in the research literature alongside physical self-concept, which has focused on comparisons with the ‘ideal self’, or the objective comparison of
sporting achievement (Chanal, Marsh, Sarrazin, & Bois, 2005). Development in this area may be constrained by the lack of measurement tools available to capture the subjective physical social comparison. The current research aims to address this gap in the literature and develop a measurement tool which can be used to capture the social comparisons associated with physical self-concept.

The focus of this study is on role of physical self-concept, social comparisons and self-concept clarity in the relationship between BMI and psychological distress in the general population. It appears that the relationship between BMI and psychological distress occurs through mediating, or causal pathways including biological, psychological and social factors. This study proposes that physical self-concept, a socially constructed set of beliefs about our physical self, could mediate the relationship between BMI and psychological distress. A moderated mediation model is proposed, with self-concept clarity and social comparisons moderating, or changing the strength or direction of the relationship.

The proposed project three main research questions:

1. What is the relationship between BMI and psychological distress?

2. What is the role of physical self-concept in the relationship between BMI and psychological distress?

3. Is the relationship between physical self-concept and psychological distress moderated by self-concept clarity and social comparisons?
The hypotheses are:

1. Higher BMI will be related to higher levels of psychological distress.

2. The effect of BMI on psychological distress will occur through the indirect effect of physical self-concept. Higher BMI will have a negative effect on physical self-concept, and poor physical self-concept will result in increased psychological distress.

3. This indirect effect through physical self-concept will be moderated by social comparisons. It is expected that the indirect effect of higher BMI on increased psychological distress will be stronger when people compare themselves unfavourably with others.

4. This indirect effect through physical self-concept will be moderated by self-concept clarity. It is expected that the indirect effect of higher BMI on increased psychological distress will be stronger when self-concept clarity is weak.
Methods

Design

The study adopted a cross-sectional survey design, using questionnaires administered online through Qualtrics software\(^1\). The independent variable is self-reported BMI. Mediating variables were components of physical self-concept: physical self-perceptions and physical self-esteem. Moderating variables were self-concept clarity and social comparisons. Finally, the dependent variable was psychological distress, defined in terms of positive and negative affect, and depression and anxiety symptoms. The proposed model is shown in figure 1.

Participants

An opportunity sampling procedure was used to recruit participants aged 18 or older from the general population. Participants were 265 individuals, recruited from various locations, including: social media; online forums (netmums); and gyms and community centres in Surrey were asked to display posters advertising the study. The poster (Appendix A) allowed participants to request a physical copy of the questionnaires, however this option was not used by any participants. Participants were required to be aged 18 or older to take part.

Sample size. The sample size required by this study was calculated to carry out the mediation analysis with 0.8 statistical power at the 5\% level. Fritz and MacKinnon (2007) provided sample sizes based on simulated mediation models. Using the percentile bootstrap procedure with effect sizes identified by previous

\(^1\) The online questionnaire was designed and hosted using Qualtrics software, copyright © 2017 Qualtrics Insight, Qualtrics and all other Qualtrics product or service names are registered trademarks of Qualtrics, Provo, UT, USA.
studies (Agarwal et al., 2013; Annesi & Westcott, 2005), the minimum sample size required was 126.

Measures

The survey involved participants completing several questionnaires, described below in the order of the model (see figure 1).

**Independent variable: BMI.** Participants were asked to report their weight and height, which was used to calculate an individual’s BMI using the standard equation of: \( \text{BMI} = \frac{\text{weight in KG}}{\text{height in m}^2} \).

**Mediating variable: Physical self-concept.** Physical self-concept was measured using the Physical Self-Description Questionnaire – Short Version (PSDQ-S; Marsh, Martin, & Jackson, 2010). This is a short form of the full 70-item PSDQ (Marsh, Richards, Johnson, Roche, & Tremayne, 1994), and comprises 40 questions with an 11-factor structure, including nine measures of physical self-perception domains (self-perception of: activity, appearance, coordination, body fat, endurance, flexibility, health, sports ability, strength); one of physical self-esteem; and one of global self-esteem (see Appendix B). A higher score on each of the factors, and a higher overall score, represents a more positive physical self-concept. The factors of the PSDQ-S have shown consistently high reliabilities and invariant factor structures (Marsh et al., 2010). The PSDQ has shown good construct validity as it correlates well with external criteria for physical fitness (Guérin, Marsh, & Famose, 2004; Marsh et al., 1994) and with another widely used physical self-concept measure (Marsh, Asci, & Tomás, 2002).
There is a well-established relationship between global self-esteem and psychological distress (American Psychiatric Association, 2013; A. T. Beck, Brown, Steer, Kuyken, & Grisham, 2001; Fox, 2000; Van de Vliet, Knapen, Onghena, Fox, Van Coppenolle, et al., 2002), and evidence that low self-esteem may play a causal role in major depressive disorder (Maciejewski, Prigerson, & Mazure, 2000). Therefore, to prevent the relationship between global self-esteem and psychological distress confounding the results, the general self-esteem factor was removed from analysis. The PSDQ-S was separated into two factors: physical self-perception and physical self-esteem.

**Moderating variables.**

**Social comparison.** This questionnaire was developed for this research, and aimed to assess the social context of the participant, based on the social comparison model. Each of the nine items on the measure directly corresponds to a factor within the PSDQ-S and asks individuals to compare themselves to their close friends and family on each domain (see Appendix F). The questionnaire was designed to identify the average, or norm, which would be the basis of the individual’s social comparisons. A low score on this questionnaire would suggest an individual rates themselves unfavourably compared to their close friends and family, whilst a high score would suggest an individual rates themselves favourably. Information about psychometric properties of this scale are presented in the results.

**Self-concept clarity.** The Self-Concept Clarity Scale (Campbell et al., 1996) was used to measure the extent to which an individual’s self-concept is clearly and confidently defined, consistent and stable over time. This 12-item questionnaire explores a general physical self-concept (see Appendix E). A higher score suggests a
clearer, more consistent and stable self-concept, which has been shown to be related to positive wellbeing. Therefore, this may affect the strength of the relationship between physical self-concept variables and psychological distress outcomes. The scale has been found to have good construct validity in terms of its ability to predict the stability and consistency of self-descriptions (Campbell et al., 1996).

Dependent variable: Psychological distress. Psychological distress was measured in two ways, first through the experience of depression and anxiety symptoms, and second through the wider lens of experience of positive and negative affect. For the purpose of this study, psychological distress is operationally defined as higher depression and anxiety symptoms, higher negative affect or lower positive affect.

Depression and anxiety symptoms. Depression and anxiety symptoms were measured using the Kessler Psychological Distress Scale (K10; Kessler et al., 2002; Kessler & Mroczek, 1992). This is a 10-item questionnaire covering general psychological distress through the experience of depression and anxiety symptoms over the past 30 days (see Appendix C). A higher K10 score suggests more depression and anxiety symptoms. It has been used to measure psychological distress in obese adults (e.g. Atlantis & Ball, 2008) and in large sample surveys of the general population in Australia. The K10 has been shown to have good internal consistency, and to have good criterion validity in terms of diagnosis for depressive and/or anxiety disorders across different cultures (Fassaert et al., 2009). There are suggested cut-off scores associated with the K10 measure which indicates the presence of mild-severe depression and anxiety symptoms (Victorian Government Department of Human Services, 2002).
**Positive and Negative Affect.** The Positive and Negative Affect Scales (PANAS; Watson, Clark, & Tellegen, 1988) is a 20-item questionnaire which measures the experience of positive and negative affect over the past few weeks (see Appendix D). The affect questionnaire captures a broader concept of psychological wellbeing outside of the confines of mental health symptomology. The PANAS measure has been found to have good internal consistency and construct validity when compared to other validated measures of psychological distress (Crawford & Henry, 2004). Percentiles are provided for each raw score, with high percentiles on the negative affect scale coupled with low percentiles on the positive affect scale indicating a clinical concern.

**Extraneous variables.**

**Subjective weight perception.** Subjective weight perception was captured to assess the accuracy of participant’s weight perception when compared to their measured BMI. Participants were asked to answer the following question about weight perception, as used by Atlantis and Ball (2008) “Do you consider yourself to be acceptable weight, underweight or overweight?”.

**Physical health.** Physical health was captured to identify whether poor physical health confounded results of the proposed model. A single question measure which has been widely used in survey research: the Self-Rated Health 5 (SRH-5; Eriksson, Undén, & Elofsson, 2001). It asked “In general, would you say your health is…..a) Excellent; b) Very good; c) Good ; d) Fair; e) Poor”. This single-item measure is a widely used indicator of general health status in population health research and has high predictive validity for subsequent mortality (Idler & Benyamini, 1997; Idler,
Russell, & Davis, 2000), however some difficulties have been found with reliability, particularly in disadvantaged sociodemographic groups (Zajacova & Dowd, 2011).

**Weight change.** Weight loss and gain behaviours were captured to identify dissatisfaction with body weight. This was measured with a self-report question: “Are you actively trying to lose or gain weight at the moment?” If participants respond yes, they are asked to give further information as to how, through diet, exercise, medical intervention or other.

**Demographics.** Participants were asked to report their age, gender, ethnicity, marital status, employment, and level of education.

**Procedure**

All participants were presented with an information sheet and consent form prior to participating in the study (see appendix G & H). Participants who proceeded to complete the survey were presented with the questionnaires. At the end of the study, participants were given the opportunity to provide contact details for two separate purposes: to enter a prize draw to win one of three £50 Amazon Vouchers, and to receive a summary of the study results.

**Ethical Issues**

Ethical approval was granted by the Faculty of Health and Medical Sciences (FHMS) ethics committee (see Appendix I). Data collected using Qualtrics software was downloaded to the University of Surrey’s School of Psychology server. Participants were informed via the information sheet that they could withdraw from the study while completing the questionnaires and that they did not have to answer
every question. As data was anonymised, participant’s data could not be withdrawn after completing the survey. Furthermore, participants identified as experiencing high levels of psychological distress could not be identified, but organisations who provide mental health support were highlighted in the information sheet. Partially completed survey responses were not saved. Participants were asked to provide an email address via a separate Qualtrics questionnaire to opt into the prize draw or to receive the study results.

Analysis Strategy

Data was exported from Qualtrics, and was analysed using IBM SPSS Statistics version 23. Data was first checked for missing or invalid values, and these issues addressed. Reliability and validity analysis, including confirmatory factor analysis (CFA), was completed for the PSDQ-S because the measure was not used as designed by Marsh and colleagues (2010). The CFA was completed to assess whether the proposed factor structure held in the collected sample. Reliability and validity analysis was also completed for the Social Comparison questionnaire because it is not a previously validated measure. Cronbach’s alphas were calculated for each of the measures to assess reliability. Pearson’s correlation coefficients were calculated for each pair of variables to assess the presence and strength of linear relationships.

The bootstrapping method was used for mediation analysis. The bootstrapping method is widely considered to be more statistically powerful approach to mediation analysis than the traditional Baron & Kenny (1986) causal steps approach (Fritz & MacKinnon, 2007). Therefore, bootstrapping analysis using 5000 bias-corrected bootstrap resamples was carried out to test for indirect effects using PROCESS for
SPSS (version 2.16; Hayes, 2016). A number of tests were carried out to ensure the data did not violate the assumptions of the mediation model.

To test hypothesis one, regression analysis was carried out. To test hypothesis two, Hayes’ (2013) model of sequential simple mediation analysis was carried out (see Figure 1 for a conceptual diagram). To test hypothesis three and four, Hayes’ (2013) model of moderated mediation was carried out (see Figure 2 for a conceptual diagram).

Figure 1: *Conceptual model to test hypothesis two*

Figure 2: *Conceptual model to test hypothesis three and four.*
Results

Participant Characteristics

Participants were mostly female (220 participants, 83.0% of the sample), with 44 males participating (16.6%) and one person who identified as transgender (0.4%). Most participants were aged under 40 years, with 48.7% of the sample being aged 25-34 years. Participants ranged from ‘18-24 years’ to ‘70-74 years’ (see figure 3). Demographic information can be found in table 1.

Figure 3: Age distribution of participants
Table 1: Summary of participant demographics

<table>
<thead>
<tr>
<th>Demographic</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White British</td>
<td>223</td>
<td>84.2</td>
</tr>
<tr>
<td>Other white background</td>
<td>27</td>
<td>10.2</td>
</tr>
<tr>
<td>Mixed ethnicity: White and black Caribbean</td>
<td>3</td>
<td>1.1</td>
</tr>
<tr>
<td>White and Asian</td>
<td>3</td>
<td>1.1</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>0.4</td>
</tr>
<tr>
<td>Asian</td>
<td>5</td>
<td>1.9</td>
</tr>
<tr>
<td>Caribbean</td>
<td>1</td>
<td>0.4</td>
</tr>
<tr>
<td>Arab</td>
<td>2</td>
<td>0.8</td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>63</td>
<td>23.8</td>
</tr>
<tr>
<td>Cohabiting</td>
<td>78</td>
<td>29.4</td>
</tr>
<tr>
<td>Married</td>
<td>113</td>
<td>42.6</td>
</tr>
<tr>
<td>Separated</td>
<td>4</td>
<td>1.5</td>
</tr>
<tr>
<td>Divorced</td>
<td>6</td>
<td>2.3</td>
</tr>
<tr>
<td>Widowed</td>
<td>1</td>
<td>0.4</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No qualifications</td>
<td>1</td>
<td>0.4</td>
</tr>
<tr>
<td>A level/NVQ 3 (or equivalent) or below</td>
<td>43</td>
<td>16.2</td>
</tr>
<tr>
<td>Degree, higher degree (or equivalent)</td>
<td>216</td>
<td>81.5</td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
<td>1.9</td>
</tr>
<tr>
<td><strong>Employment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed (full or part time)</td>
<td>211</td>
<td>79.6</td>
</tr>
<tr>
<td>Self-employed</td>
<td>26</td>
<td>9.8</td>
</tr>
<tr>
<td>Military</td>
<td>2</td>
<td>0.8</td>
</tr>
<tr>
<td>Out of work (looking)</td>
<td>3</td>
<td>1.1</td>
</tr>
<tr>
<td>Out of work (not looking)</td>
<td>3</td>
<td>1.1</td>
</tr>
<tr>
<td>Student</td>
<td>8</td>
<td>3.0</td>
</tr>
<tr>
<td>Homemaker</td>
<td>7</td>
<td>2.6</td>
</tr>
<tr>
<td>Retired</td>
<td>5</td>
<td>1.9</td>
</tr>
</tbody>
</table>

Most participants described their health as good (34.7%) or very good (37.4%; see figure 4). Finally, 62.6% of participants reported that they were actively trying to lose weight through several methods including: changes in diet (47.9%); exercise (46.8%); medical intervention (0.4%) or other (3.8%). Those in higher BMI categories
more frequently reported that they were trying to change their weight (see figure 5), suggesting that dissatisfaction with BMI is common in the sample.

Figure 4: Self-reported physical health status

Figure 5: Percentage of participants reporting they are actively trying to change their weight, by BMI category (as defined by the World Health Organisation, 2006).
Missing data

Two data-points were missing within the PSDQ-S questionnaire. One participant did not answer question three (from physical self-perception: flexibility factor) and another participant did not answer question six (from physical self-perception: health factor). A mean substitution method was adopted, with the missing value replaced by the mean for that specific factor.

BMI was calculated from self-reported weight and height where valid data was recorded. The data was checked for invalid data points, such as extreme and missing values. Of the 34 participants highlighted in this process, six did not enter one or both pieces of information needed to calculate BMI; six entered data that was assessed to be invalid (i.e. extreme value); and 22 made a data entry error by entering data into the wrong box, for example entering 5 in ‘height in inches’ and 3 in ‘height in centimetres’. This was recoded as 63 inches (5feet 3inches). Valid BMI data was available for 253 participants who were included in the mediation analysis. All other data below is based on a sample of 265 participants.

Reliability and Validity of the PSDQ-S

The reliability and validity of the PSDQ-S was found to be good, with the following assumptions met (Hair, Black, Babin, & Anderson, 2010) as shown in table 2:

- Reliability: Composite Reliability>0.7
- Convergent validity: Average Variance Extracted (AVE)>0.5
- Discriminant validity: Maximum Shared Variance<AVE
Table 2: PSDQ-S reliability and validity statistics

<table>
<thead>
<tr>
<th>PSDQ subscale</th>
<th>Composite reliability</th>
<th>Average variance extracted</th>
<th>Maximum shared variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP</td>
<td>0.86</td>
<td>0.68</td>
<td>0.36</td>
</tr>
<tr>
<td>CO</td>
<td>0.92</td>
<td>0.75</td>
<td>0.36</td>
</tr>
<tr>
<td>ST</td>
<td>0.91</td>
<td>0.76</td>
<td>0.53</td>
</tr>
<tr>
<td>FL</td>
<td>0.89</td>
<td>0.74</td>
<td>0.23</td>
</tr>
<tr>
<td>EN</td>
<td>0.87</td>
<td>0.69</td>
<td>0.65</td>
</tr>
<tr>
<td>HE</td>
<td>0.85</td>
<td>0.53</td>
<td>0.14</td>
</tr>
<tr>
<td>GP</td>
<td>0.92</td>
<td>0.80</td>
<td>0.39</td>
</tr>
<tr>
<td>ES</td>
<td>0.87</td>
<td>0.58</td>
<td>0.36</td>
</tr>
<tr>
<td>AC</td>
<td>0.95</td>
<td>0.83</td>
<td>0.65</td>
</tr>
<tr>
<td>BF</td>
<td>0.91</td>
<td>0.78</td>
<td>0.39</td>
</tr>
<tr>
<td>SP</td>
<td>0.94</td>
<td>0.85</td>
<td>0.53</td>
</tr>
</tbody>
</table>

Note: AC=activity, AP=appearance, BF=body fat, CO=coordination, EN=endurance, FL=flexibility, HE=health, SP=sports ability, ST=strength, GP=global physical self-esteem, ES=global self-esteem.

Confirmatory factor analysis was completed to ascertain whether the proposed factor structure held in the collected sample after removing global self-esteem from the measure. Results can be found in Appendix J. Internal consistency is excellent (Cronbach’s α=0.94) when all 40 items are considered and when global self-esteem items were removed (Cronbach’s α=0.94).

Reliability and Validity of the Social Comparison Questionnaire

The social comparison questionnaire aimed to assess the social context of the participant by making social comparisons on nine areas of the physical self (see appendix F). Inter-correlations between questionnaire items are shown in table 3. All
items significantly correlated below $\rho=0.8$, therefore no correlations were considered to be very high. The measure was found to have a good internal consistency (Cronbach’s $\alpha=0.85$). Reliability analysis of individual items suggested that no individual items had a significant effect on the internal validity, therefore all items are included.

Table 3: *Inter-correlations of the social comparison questionnaire* ($\rho$)

<table>
<thead>
<tr>
<th></th>
<th>AC</th>
<th>AP</th>
<th>BF</th>
<th>CO</th>
<th>EN</th>
<th>FL</th>
<th>HE</th>
<th>SP</th>
<th>ST</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AP</td>
<td>0.28*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BF</td>
<td>0.40*</td>
<td>0.43*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO</td>
<td>0.36*</td>
<td>0.28*</td>
<td>0.27*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EN</td>
<td>0.67*</td>
<td>0.32*</td>
<td>0.36*</td>
<td>0.45*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FL</td>
<td>0.35*</td>
<td>0.26*</td>
<td>0.30*</td>
<td>0.47*</td>
<td>0.30*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HE</td>
<td>0.35*</td>
<td>0.24*</td>
<td>0.21*</td>
<td>0.28*</td>
<td>0.42*</td>
<td>0.12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP</td>
<td>0.53*</td>
<td>0.35*</td>
<td>0.28*</td>
<td>0.47*</td>
<td>0.47*</td>
<td>0.41*</td>
<td>0.24*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ST</td>
<td>0.50*</td>
<td>0.31*</td>
<td>0.21*</td>
<td>0.48*</td>
<td>0.50*</td>
<td>0.39*</td>
<td>0.28*</td>
<td>0.54*</td>
<td></td>
</tr>
</tbody>
</table>

*Note:* AC=activity, AP=appearance, BF=body fat, CO=coordination, EN=endurance, FL=flexibility, HE=health, SP=sports ability, ST=strength. * = $p<0.01$.

To assess the validity of the new measure, each item was correlated with the nine factors of the PSDQ-S, from which they were developed and for which they aimed to provide social comparison information. As expected, each item on the social comparison questionnaire has a strong positive relationship with its counterpart factor on the PSDQ-S (see table 4). This suggests that each question assessed the intended physical self-concept construct. The health question was the weakest factor in the confirmatory factor analysis of the PSDQ-S, and therefore this may reflect ‘health’ being a poorly constructed concept.
Table 4: *Inter-correlations between the social comparison questionnaire & PSDQ-S (\( \rho \)).*

<table>
<thead>
<tr>
<th></th>
<th>AC</th>
<th>AP</th>
<th>BF</th>
<th>CO</th>
<th>EN</th>
<th>FL</th>
<th>HE</th>
<th>SP</th>
<th>ST</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC</td>
<td>0.78**</td>
<td>0.19**</td>
<td>0.35**</td>
<td>0.25**</td>
<td>0.66**</td>
<td>0.25**</td>
<td>0.07</td>
<td>0.56**</td>
<td>0.45**</td>
<td>0.67**</td>
</tr>
<tr>
<td>AP</td>
<td>0.21**</td>
<td>0.72**</td>
<td>0.31**</td>
<td>0.29**</td>
<td>0.28**</td>
<td>0.26**</td>
<td>0.16*</td>
<td>0.34**</td>
<td>0.37**</td>
<td>0.48**</td>
</tr>
<tr>
<td>BF</td>
<td>0.25**</td>
<td>0.25**</td>
<td>0.72**</td>
<td>0.20**</td>
<td>0.41**</td>
<td>0.24**</td>
<td>0.08</td>
<td>0.23**</td>
<td>0.15*</td>
<td>0.45**</td>
</tr>
<tr>
<td>CO</td>
<td>0.42**</td>
<td>0.24**</td>
<td>0.15*</td>
<td>0.64**</td>
<td>0.38**</td>
<td>0.44**</td>
<td>0.12*</td>
<td>0.54**</td>
<td>0.46**</td>
<td>0.62**</td>
</tr>
<tr>
<td>EN</td>
<td>0.63**</td>
<td>0.20**</td>
<td>0.24**</td>
<td>0.33**</td>
<td>0.78**</td>
<td>0.20**</td>
<td>0.14*</td>
<td>0.49**</td>
<td>0.47**</td>
<td>0.64**</td>
</tr>
<tr>
<td>FL</td>
<td>0.37**</td>
<td>0.21**</td>
<td>0.16*</td>
<td>0.27**</td>
<td>0.27**</td>
<td>0.71**</td>
<td>-0.01</td>
<td>0.34**</td>
<td>0.33**</td>
<td>0.47**</td>
</tr>
<tr>
<td>HE</td>
<td>0.36**</td>
<td>0.20**</td>
<td>0.17**</td>
<td>0.18**</td>
<td>0.36**</td>
<td>0.14*</td>
<td>0.50**</td>
<td>0.26**</td>
<td>0.30**</td>
<td>0.43**</td>
</tr>
<tr>
<td>SP</td>
<td>0.45**</td>
<td>0.25**</td>
<td>0.18**</td>
<td>0.40**</td>
<td>0.44**</td>
<td>0.27**</td>
<td>0.03</td>
<td>0.75**</td>
<td>0.49**</td>
<td>0.59**</td>
</tr>
<tr>
<td>ST</td>
<td>0.48**</td>
<td>0.27**</td>
<td>0.11</td>
<td>0.31**</td>
<td>0.44**</td>
<td>0.29**</td>
<td>0.08</td>
<td>0.54**</td>
<td>0.72**</td>
<td>0.57**</td>
</tr>
<tr>
<td>Tot</td>
<td>0.68**</td>
<td>0.40**</td>
<td>0.43**</td>
<td>0.49**</td>
<td>0.69**</td>
<td>0.47**</td>
<td>0.19**</td>
<td>0.69**</td>
<td>0.63**</td>
<td>0.84**</td>
</tr>
</tbody>
</table>

*Note: AC=activity, AP=appearance, BF=body fat, CO=coordination, EN=endurance, FL=flexibility, HE=health, SP=sports ability, ST=strength. * = p<0.05. ** = p<0.01.*
Measure outcomes

Means, medians, standard deviations and Cronbach’s alphas were calculated for all measures and can be found in Table 6. All measures had high Cronbach’s alpha scores (>0.8), except the self-concept clarity scale (SCCS). This suggests low consistency between items which may have occurred for several reasons. Analysis showed that removing items 6 (‘I seldom experience conflict between the different aspects of my personality’) and item 11 (‘In general, I have a clear sense of who I am and what I am’) would improve the internal consistency. Despite the low Cronbach’s alpha, the scale was included in its full form to allow comparison with other studies.

Using the standard BMI categories (World Health Organisation, 2006), participants spanned the full range of BMI categories, with 51% of the sample overweight or obese (see table 5). This is lower than found in the general population, where in 2015 68% of men and 58% of women were overweight or obese in England (Health and Social Care Information Centre, 2015). Participants were asked their perception of whether they were underweight (N=3, 1.1%), acceptable weight (N=126, 47.5%) or overweight (N=136, 51.3%). Proportions are broadly similar to those found in the corresponding BMI categories. When compared to BMI, 83.4% of participants were considered ‘accurate’ (with ‘acceptable weight’ being equivalent to ‘normal weight’ in BMI terms).

Three measures assessed psychological distress: K10 (depression and anxiety symptoms); PANAS positive (positive affect); PANAS negative (negative affect). Research into the K10 has suggested cut-offs scores to identify severity of depression and anxiety symptoms (Victorian Government Department of Human Services, 2002). Responses suggested experiences of depression and anxiety across the full range of
severity: 53.6% of the sample were ‘well’, 24.5% were experiencing mild symptoms, 14% experiencing moderate symptoms and 7.9% experiencing severe symptoms.

The scores on the PANAS positive and PANAS negative were compared to the percentiles suggested by Crawford and Henry (2004). Whilst no cut-off scores are provided to suggest clinical significance, they do suggest that high percentiles in the negative affect with low percentiles in the positive affect would suggest psychological distress. In the sample, the percentiles spanned the full range, from 1 to >99 for positive affect (mean=54.6, S.D.=32.0) and from 12 to >99 for negative affect (mean=70.1, S.D.=23.3). Negative affect percentile rank was subtracted from positive affect percentile rank to identify cases that fulfil Crawford and Henry’s (2004) suggestion of ‘clinical significance’ in terms of mental health. The possible range of scores is -99 to 88, which an extreme negative score suggesting clinical significance. Actual scores ranged from -98 to 86 (mean=-15.2, S.D.=47.6) (see figure 6).

All three psychological distress outcome measures showed some skew. The K10 and negative affect scales showed positive skew, whilst the positive affect scale showed negative skew. This spread of data is expected given the sampled non-clinical population (see Appendix K for histograms).
Table 6: Summary of measure outcomes.

<table>
<thead>
<tr>
<th>Measure</th>
<th>No. of Items</th>
<th>Min Score (Sample min)</th>
<th>Max Score (Sample max)</th>
<th>Mean</th>
<th>Median</th>
<th>S.D.</th>
<th>Cronbach’s α</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (Kg)</td>
<td>1</td>
<td>0 (45)</td>
<td>∞ (131)</td>
<td>72.8</td>
<td>70</td>
<td>16.01</td>
<td>-</td>
</tr>
<tr>
<td>Height (M)</td>
<td>1</td>
<td>0 (1.5)</td>
<td>∞ (1.9)</td>
<td>1.7</td>
<td>1.7</td>
<td>0.08</td>
<td>-</td>
</tr>
<tr>
<td>BMI</td>
<td>1</td>
<td>0 (17.6)</td>
<td>∞ (46.3)</td>
<td>26.0</td>
<td>25.1</td>
<td>5.41</td>
<td>-</td>
</tr>
<tr>
<td>PSDQ-S: Physical self-perception</td>
<td>32</td>
<td>32 (57)</td>
<td>192 (185)</td>
<td>122.9</td>
<td>124</td>
<td>27.85</td>
<td>0.93</td>
</tr>
<tr>
<td>PSDQ-S: Physical self-esteem</td>
<td>3</td>
<td>3 (3)</td>
<td>18 (18)</td>
<td>10.1</td>
<td>11</td>
<td>4.13</td>
<td>0.92</td>
</tr>
<tr>
<td>PANAS: Positive affect</td>
<td>10</td>
<td>10 (13)</td>
<td>50 (50)</td>
<td>33.2</td>
<td>33</td>
<td>8.34</td>
<td>0.91</td>
</tr>
<tr>
<td>PANAS: Negative affect</td>
<td>10</td>
<td>10 (10)</td>
<td>50 (48)</td>
<td>20.4</td>
<td>19</td>
<td>7.27</td>
<td>0.88</td>
</tr>
<tr>
<td>K10: Depression and anxiety</td>
<td>10</td>
<td>10 (10)</td>
<td>50 (46)</td>
<td>20.1</td>
<td>19</td>
<td>6.81</td>
<td>0.89</td>
</tr>
<tr>
<td>SCCS: Self-concept clarity</td>
<td>12</td>
<td>12 (13)</td>
<td>60 (60)</td>
<td>37.4</td>
<td>37</td>
<td>9.88</td>
<td>0.77</td>
</tr>
<tr>
<td>Social comparison</td>
<td>9</td>
<td>9 (9)</td>
<td>45 (45)</td>
<td>27.7</td>
<td>28</td>
<td>6.44</td>
<td>0.85</td>
</tr>
</tbody>
</table>

*Note:* Minimum and maximum possible scores for weight, height and BMI are shown as 0 and ∞ respectively in this table to highlight them as a scale. In practice, extreme high and low values have been excluded.
Correlation analysis

The results of the correlation analysis showed that the outcome measures (K10, PANAS negative and PANAS negative scales) were significantly correlated with each other with a medium to large effect size (using Cohen’s (1988) benchmark’s for Pearson’s correlation coefficients) (see Table 7). As expected, the K10 was strongly positively correlated with the PANAS negative scale, and both the K10 and PANAS negative scales were negatively correlated with the PANAS positive scale. Also, as expected, BMI was significantly negatively correlated with the physical self-perception and physical self-esteem, and with the social comparison questionnaire, all with a medium effect size (see Appendix L for scatterplots).
Table 7: *Pearson correlation coefficients of relationships between variables (r)*

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. BMI</td>
<td></td>
<td>0.11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Perceived health</td>
<td>-0.01</td>
<td>-0.30**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. PSDQ-S: Physical Self-Perception</td>
<td>-0.06</td>
<td>-0.37**</td>
<td>0.56**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. PSDQ-S: Physical Self-Esteem</td>
<td>-0.03</td>
<td>-0.38**</td>
<td>0.50**</td>
<td>0.68**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. PSDQ-S: Global Self-Esteem</td>
<td>-0.03</td>
<td>-0.06</td>
<td>0.41**</td>
<td>0.50**</td>
<td>0.54**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. SCCS: Self-concept clarity</td>
<td>0.20**</td>
<td>-0.01</td>
<td>0.38**</td>
<td>0.24**</td>
<td>0.31**</td>
<td>0.50**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Social comparison</td>
<td>-0.02</td>
<td>-0.41**</td>
<td>0.47**</td>
<td>0.82**</td>
<td>0.55**</td>
<td>0.39**</td>
<td>0.13*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. K10: Depression and anxiety</td>
<td>-0.14*</td>
<td>0.10</td>
<td>-0.43**</td>
<td>-0.37**</td>
<td>-0.39**</td>
<td>-0.61**</td>
<td>-0.61**</td>
<td>-0.27**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. PANAS: Positive affect</td>
<td>0.09</td>
<td>-0.02</td>
<td>0.44**</td>
<td>0.47**</td>
<td>0.43**</td>
<td>0.58**</td>
<td>0.45**</td>
<td>0.40**</td>
<td>-0.59**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. PANAS: Negative affect</td>
<td>-0.15*</td>
<td>0.05</td>
<td>-0.34**</td>
<td>-0.30**</td>
<td>-0.31**</td>
<td>-0.51**</td>
<td>-0.57**</td>
<td>-0.27**</td>
<td>0.77**</td>
<td>-0.47**</td>
<td></td>
</tr>
</tbody>
</table>

*Note: Perceived health represents an ordinal measure, with 1=poor and 5=excellent.*

* = p<0.05. ** = p<0.01
Regression analysis

Regression analyses were carried out to assess the direct relationship between BMI and the outcome variables (see table 8). Hypothesis one was not supported by the regression analysis, with no significant relationship between BMI and the three outcome variables.

Table 8: Regression analysis of effect of BMI on the outcome variables.

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Outcome variable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Depression and anxiety</td>
</tr>
<tr>
<td></td>
<td>Negative affect</td>
</tr>
<tr>
<td></td>
<td>Positive affect</td>
</tr>
<tr>
<td>β</td>
<td>0.10</td>
</tr>
<tr>
<td>R²</td>
<td>0.01</td>
</tr>
<tr>
<td>F(1)=</td>
<td>2.28</td>
</tr>
<tr>
<td>p</td>
<td>0.13</td>
</tr>
</tbody>
</table>

|           | 0.05                      |
|           | 0.00                      |
|           | 0.53                      |
|           | 0.47                      |
|           | -0.02                     |
|           | 0.00                      |
|           | 0.12                      |
|           | 0.73                      |

Physical self-perception and physical self-esteem as mediators

The results of the correlation and regression analysis for hypothesis one indicated that there was no significant relationship between BMI and the outcome variables (depression and anxiety, negative affect and positive affect). The first assumption of Baron & Kenny’s (1986) causal steps approach, which postulates that the IV should predict the DV, was not supported by the regression analysis. However, this aspect of the causal steps approach has been criticised (A. F. Hayes, 2009). Zhao, Lynch & Chen, (2010) argue that ‘path c’ does not need to be significant for mediation to occur, as an ‘indirect-only mediation’ can occur without this. In this case, the recommendations are that the whole effect is referred to as an indirect effect (A. F. Hayes, 2009).
In order to ascertain whether a serial or parallel mediator model should be used, a partial correlation analysis was carried out to assess whether a relationship remains between physical self-perception and physical self-esteem variables after controlling for BMI (A. F. Hayes, 2013). The results supported the use of a serial mediation model ($r=0.60$, $n=253$, $p<0.001$). Mediation analysis using a serial mediator model therefore accounts for the predicted causal relationship between physical self-perception and physical self-esteem.

Bootstrapping analysis using 5000 bias-corrected bootstrap resamples was carried out to test for indirect effects. All regression coefficients in the indirect pathway were found to be significant for all outcome variables (see figure 7 and table 9). The indirect pathway indicated that higher BMI was directly related to poorer physical self-perception and poorer physical self-esteem, both of which were related to higher depression and anxiety, higher negative affect and lower positive affect. Poor physical self-perception was also directly related to poor physical self-esteem.

The results revealed that the direct effect (path c’) was not significantly different from zero for depression and anxiety or negative affect, but was significantly different from zero for positive affect. Interestingly, the direct effects have opposite signs to that expected, with higher BMI being related with more positive affect, less negative affect and less symptoms of depression and anxiety. However, this was only statistically significant for positive affect. The different signs between the direct effect (c’) and total effect (c) coefficients suggest that an inconsistent mediation model has been identified, specifically a suppressor effect (MacKinnon, Fairchild, & Fritz, 2007; MacKinnon, Krull, & Lockwood, 2000).
Figure 7. **Mediation model indicating direct relationships between BMI and outcome variables (depression and anxiety, negative affect and positive affect), and the indirect effect through physical self-perception and physical self-esteem as serial mediators.**

*Figures are unstandardised regression coefficients.*

Bootstrap analysis of the indirect effect pathways suggests that all three possible indirect effect pathways are significant (see table 10). However, for positive affect the physical self-perception pathway is significantly stronger than the two other indirect pathways. It is not possible to report an overall effect size for the mediation model because the widely-used effect size statistic of ‘ratio of indirect to total effects’ is not recommended for use with inconsistent models (Wen & Fan, 2015). Due to the non-significant relationships between BMI and the outcome variables, the model is considered in terms of indirect effects only.
Table 9: Summary of sequential mediation analysis for hypothesis two with mediators physical self-perception (M1) and physical self-esteem (M2).

<table>
<thead>
<tr>
<th>DV</th>
<th>Unstandardised Regression Coefficients</th>
<th>Effect of IV on</th>
<th>Effect of IV on</th>
<th>Effect of M1 on</th>
<th>Effect of M1 on</th>
<th>Effect of M2 on</th>
<th>Direct effect</th>
<th>Effect of IV on</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>M1 (Path $a_1$)</td>
<td>M2 (Path $a_2$)</td>
<td>M2 (Path $a_3$)</td>
<td>DV (Path $b_1$)</td>
<td>DV (Path $b_2$)</td>
<td>(Path $c'$)</td>
<td>DV (Path $c$)</td>
</tr>
<tr>
<td>Depression and anxiety</td>
<td></td>
<td>-1.91*</td>
<td>-0.11*</td>
<td>0.089*</td>
<td>-0.054*</td>
<td>-0.48*</td>
<td>-0.12</td>
<td>0.12</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td>0.30</td>
<td>0.038</td>
<td>0.0074</td>
<td>0.019</td>
<td>0.13</td>
<td>0.078</td>
<td>0.078</td>
</tr>
<tr>
<td>t</td>
<td></td>
<td>-6.35</td>
<td>-3.01</td>
<td>11.97</td>
<td>-2.88</td>
<td>-3.80</td>
<td>1.56</td>
<td>1.51</td>
</tr>
<tr>
<td>p</td>
<td></td>
<td>0.0000</td>
<td>0.0028</td>
<td>0.0000</td>
<td>0.0044</td>
<td>0.0002</td>
<td>0.1194</td>
<td>0.1325</td>
</tr>
<tr>
<td>Negative affect</td>
<td></td>
<td>-1.91*</td>
<td>-0.11*</td>
<td>0.089*</td>
<td>-0.050*</td>
<td>-0.36*</td>
<td>-0.14</td>
<td>0.061</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td>0.30</td>
<td>0.038</td>
<td>0.0074</td>
<td>0.021</td>
<td>0.14</td>
<td>0.087</td>
<td>0.083</td>
</tr>
<tr>
<td>t</td>
<td></td>
<td>-6.35</td>
<td>-3.01</td>
<td>11.97</td>
<td>-2.41</td>
<td>-2.54</td>
<td>-1.58</td>
<td>0.73</td>
</tr>
<tr>
<td>p</td>
<td></td>
<td>0.0000</td>
<td>0.0028</td>
<td>0.0000</td>
<td>0.0165</td>
<td>0.0118</td>
<td>0.1147</td>
<td>0.4671</td>
</tr>
<tr>
<td>Positive affect</td>
<td></td>
<td>-1.91*</td>
<td>-0.11*</td>
<td>0.089*</td>
<td>0.12*</td>
<td>0.54*</td>
<td>0.35*</td>
<td>-0.033</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td>0.30</td>
<td>0.038</td>
<td>0.0074</td>
<td>0.021</td>
<td>0.14</td>
<td>0.089</td>
<td>0.097</td>
</tr>
<tr>
<td>t</td>
<td></td>
<td>-6.35</td>
<td>-3.01</td>
<td>11.97</td>
<td>5.60</td>
<td>3.72</td>
<td>3.92</td>
<td>-0.35</td>
</tr>
<tr>
<td>p</td>
<td></td>
<td>0.0000</td>
<td>0.0028</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0002</td>
<td>0.0001</td>
<td>0.7301</td>
</tr>
</tbody>
</table>

* = p<0.05.
Table 10: *Summary of bootstrapping results for hypothesis two with mediators physical self-perception (M₁) and physical self-esteem (M₂). All figures are unstandardised regression coefficients.*

<table>
<thead>
<tr>
<th>DV</th>
<th>Total indirect effect</th>
<th>IV to M₁ to DV (path $a_1+b_1$)</th>
<th>IV to M₁ to M₂ to DV (path $a_1+a_3+b_2$)</th>
<th>IV to M₂ to DV (path $a_2+b_2$)</th>
<th>Path $a_1+b_1$ minus path $a_2+b_2$</th>
<th>Path $a_1+a_3+b_2$ minus path $a_2+b_2$</th>
<th>Path $a_1+a_3+b_2$ minus path $a_2+b_2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression and anxiety</td>
<td><strong>Beta</strong></td>
<td>0.24*</td>
<td>0.10*</td>
<td>0.082*</td>
<td>0.055*</td>
<td>0.021</td>
<td>0.047</td>
</tr>
<tr>
<td></td>
<td><strong>Lower</strong></td>
<td>0.16</td>
<td>0.027</td>
<td>0.037</td>
<td>0.019</td>
<td>-0.099</td>
<td>-0.061</td>
</tr>
<tr>
<td></td>
<td><strong>Upper</strong></td>
<td>0.34</td>
<td>0.19</td>
<td>0.15</td>
<td>0.11</td>
<td>0.13</td>
<td>0.15</td>
</tr>
<tr>
<td>Negative affect</td>
<td><strong>Beta</strong></td>
<td>0.20*</td>
<td>0.096*</td>
<td>0.061*</td>
<td>0.041*</td>
<td>0.035</td>
<td>0.055</td>
</tr>
<tr>
<td></td>
<td><strong>Lower</strong></td>
<td>0.11</td>
<td>0.022</td>
<td>0.016</td>
<td>0.011</td>
<td>-0.081</td>
<td>-0.046</td>
</tr>
<tr>
<td></td>
<td><strong>Upper</strong></td>
<td>0.29</td>
<td>0.19</td>
<td>0.12</td>
<td>0.098</td>
<td>0.15</td>
<td>0.16</td>
</tr>
<tr>
<td>Positive affect</td>
<td><strong>Beta</strong></td>
<td>-0.38*</td>
<td>-0.23*</td>
<td>-0.091*</td>
<td>-0.062*</td>
<td>-0.14*</td>
<td>-0.17*</td>
</tr>
<tr>
<td></td>
<td><strong>Lower</strong></td>
<td>-0.51</td>
<td>-0.34</td>
<td>-0.16</td>
<td>-0.13</td>
<td>-0.28</td>
<td>-0.30</td>
</tr>
<tr>
<td></td>
<td><strong>Upper</strong></td>
<td>-0.27</td>
<td>-0.13</td>
<td>-0.038</td>
<td>-0.022</td>
<td>-0.013</td>
<td>-0.035</td>
</tr>
</tbody>
</table>

* = statistical significance as bootstrap confidence intervals do not cross zero
Health was conceptually considered to be an important factor in the model, however the role of health in the model is unclear (i.e. confounding variable or moderator between BMI and the outcome variables). Therefore, it was decided to construct the model without controlling for self-perceived health. Results of the mediation analysis when controlling for self-perceived health can be found in appendix M which shows a similar pattern of results and an inconsistent model.

To test the assumptions of mediation model a number of tests were carried out. Histograms of each variable, histograms of the standardised residuals for each pairing of variables and P-P plots were generated to test for normality. Upon visual inspection, they were approximately normally distributed (see Appendix L). Scatterplots of each correlation, and scatterplots of each variable pairing with standardised residuals were generated to test for homoscedasticity. Cook’s distances were calculated to test for influential cases. As no cases had a Cook’s distance above one, no cases were excluded (Cook & Weisberg, 1982). Finally, multicollinearity was assessed by investigating the Variance Inflation Factor (VIF) for each predictor variable in the model. Investigation of the VIF identified no significant issues with multicollinearity, with a suggested cut-off of 10 (Myers, 1990).

**Tests of moderated mediation**

Hypotheses three and four identified the role of possible moderators in the model: social comparisons and self-concept clarity. The hypotheses were tested in SPSS, using PROCESS (A. F. Hayes, 2016). The originally proposed model (see figure 2) was modified and BMI was removed from the analysis for moderated mediation. This was done for several reasons. First and foremost, the PROCESS software does not have the capability to assess a serial mediation model with
moderators, and therefore a different analytical approach would be required to test the original model. Second, the inconsistent mediation model identified could indicate that the proposed serial mediation model is incorrect (MacKinnon et al., 2000). Third, the relationship between BMI and the outcome variables was not found to be significant in the serial mediation model. Finally, the hypothesised moderating effects occur on the pathway between the mediators and the outcome variables. Therefore, the serial mediation model was reduced to a single mediator model, with IV as physical self-perception and mediator as physical self-esteem (see figure 8 and 10 for model).

**Social comparisons.** The moderated mediation model had mixed results, with one significant moderation effect out of a possible six: social comparisons significantly moderate the relationship between physical self-perception and depression and anxiety symptoms (see table 11). Analysing the moderated mediation model with just one moderator (social comparisons) or with both moderators together (social comparisons and self-concept clarity) gave the same pattern of results. Therefore, in order to identify the specific effect of each moderator they are considered separately. Analysis with both moderators can be found in appendix N.

Figure 8 shows the conditional effect of physical self-perceptions on depression and anxiety symptoms, with physical self-esteem as the mediator and social comparisons as the moderator. It suggests that poorer physical self-perceptions are directly related to greater depression and anxiety only when an individual rates themselves unfavourably (-1s.d.) or average in their social comparisons. When a person makes a favourable (+1s.d.) comparison of themselves to others the effect of
poorer physical self-perception relating to greater depression and anxiety is not significant (see figure 9).

Figure 8. Diagram indicating a moderated mediation effect of physical self-perception on the outcome variables (depression and anxiety, negative affect and positive affect), with the indirect effect through physical self-esteem as a mediator, and social comparison as moderator. Figures are unstandardised regression coefficients.

Figure 9: Simple slopes of the conditional effect of physical self-perception on K10 score, with general physical esteem as the mediator and social comparison as the moderator (LLCI=Lower confidence interval; ULCI=Upper confidence interval).
Table 11: Summary of moderated mediation analysis for hypothesis three, with physical self-perception (IV), physical self-esteem (M) as mediator, and social comparisons (V) as moderator.

<table>
<thead>
<tr>
<th>DV</th>
<th>Unstandardised Regression Coefficients</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Effect of IV on M (Path a)</td>
<td>Effect of M on DV (Path b)</td>
<td>Effect of IV on DV (Path c')</td>
<td>Effect of V on DV</td>
<td>Moderation (V x b)</td>
</tr>
<tr>
<td>Depression and anxiety</td>
<td>B</td>
<td>0.10*</td>
<td>-0.19</td>
<td>-0.27*</td>
<td>-0.69*</td>
</tr>
<tr>
<td></td>
<td>SE</td>
<td>0.0067</td>
<td>0.54</td>
<td>0.081</td>
<td>0.27</td>
</tr>
<tr>
<td></td>
<td>t</td>
<td>14.84</td>
<td>-0.35</td>
<td>-3.28</td>
<td>-2.53</td>
</tr>
<tr>
<td></td>
<td>p</td>
<td>0.0000</td>
<td>0.7240</td>
<td>0.0012</td>
<td>0.0121</td>
</tr>
<tr>
<td>Negative affect</td>
<td>B</td>
<td>0.10*</td>
<td>-0.64</td>
<td>-0.11</td>
<td>-0.51</td>
</tr>
<tr>
<td></td>
<td>SE</td>
<td>0.0067</td>
<td>0.61</td>
<td>0.091</td>
<td>0.31</td>
</tr>
<tr>
<td></td>
<td>t</td>
<td>14.84</td>
<td>-1.06</td>
<td>-1.24</td>
<td>-1.67</td>
</tr>
<tr>
<td></td>
<td>p</td>
<td>0.0000</td>
<td>0.2908</td>
<td>0.2150</td>
<td>0.0967</td>
</tr>
<tr>
<td>Positive affect</td>
<td>B</td>
<td>0.10*</td>
<td>1.05</td>
<td>-0.0086</td>
<td>-0.17</td>
</tr>
<tr>
<td></td>
<td>SE</td>
<td>0.0067</td>
<td>0.64</td>
<td>0.097</td>
<td>0.32</td>
</tr>
<tr>
<td></td>
<td>t</td>
<td>14.84</td>
<td>1.63</td>
<td>-0.089</td>
<td>-0.54</td>
</tr>
<tr>
<td></td>
<td>p</td>
<td>0.0000</td>
<td>0.1052</td>
<td>0.9289</td>
<td>0.5921</td>
</tr>
</tbody>
</table>
**Self-concept clarity.** This moderated mediation model also gives mixed results, with one significant moderation effect out of a possible six: self-concept clarity significantly moderates the relationship between physical self-esteem and positive affect (see table 12). Figure 10 shows the conditional indirect effect of physical self-perceptions on positive affect, with physical self-esteem as the mediator and self-concept clarity as the moderator. It suggests that poorer physical self-esteem is related to less positive affect only when an individual rates as having a poor self-concept clarity (-1s.d.). When a person has an average or ‘good’ (+1s.d.) self-concept clarity the effect of poorer physical self-esteem relating to less positive affect is no longer significant (see figure 11).

**Figure 10. Diagram indicting a moderated mediation effect of physical self-perception on psychological distress outcomes (depression and anxiety, negative affect and positive affect), with the indirect effect through physical self-esteem as mediator, and self-concept clarity as moderator. Figures are unstandardised regression coefficients.**
Table 12: *Summary of moderated mediation analysis for hypothesis four, with physical self-perception (IV), physical self-esteem (M) as mediator, and self-concept clarity (V) as moderator.*

<table>
<thead>
<tr>
<th>DV</th>
<th>Unstandardised Regression Coefficients</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Effect of IV on M</td>
<td>Effect of M on DV</td>
<td>Effect of IV on DV</td>
<td>Effect of V on DV</td>
<td>Moderation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Path a)</td>
<td>(Path b)</td>
<td>(Path c')</td>
<td></td>
<td>V x b</td>
<td>V x c'</td>
<td></td>
</tr>
<tr>
<td>Depression and anxiety</td>
<td>0.10*</td>
<td>-0.67</td>
<td>-0.069</td>
<td>-0.59*</td>
<td>0.013</td>
<td>0.0008</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.0067</td>
<td>0.38</td>
<td>0.058</td>
<td>0.15</td>
<td>0.0095</td>
<td>0.015</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14.84</td>
<td>-1.89</td>
<td>-1.19</td>
<td>-4.02</td>
<td>1.34</td>
<td>0.52</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.0000</td>
<td>0.0752</td>
<td>0.2345</td>
<td>0.0001</td>
<td>0.1806</td>
<td>0.6013</td>
<td></td>
</tr>
<tr>
<td>Negative affect</td>
<td>0.10*</td>
<td>-0.039</td>
<td>-0.13*</td>
<td>-0.70*</td>
<td>-0.0011</td>
<td>0.0026</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.0067</td>
<td>0.43</td>
<td>0.066</td>
<td>0.17</td>
<td>0.011</td>
<td>0.0017</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14.84</td>
<td>-0.091</td>
<td>-2.05</td>
<td>-4.12</td>
<td>-0.10</td>
<td>1.53</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.0000</td>
<td>0.9273</td>
<td>0.0417</td>
<td>0.0001</td>
<td>0.9171</td>
<td>0.1266</td>
<td></td>
</tr>
<tr>
<td>Positive affect</td>
<td>0.10*</td>
<td>1.48*</td>
<td>0.044</td>
<td>0.45</td>
<td>-0.033*</td>
<td>0.0013</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.0067</td>
<td>0.49</td>
<td>0.075</td>
<td>0.19</td>
<td>0.012</td>
<td>0.0019</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14.84</td>
<td>3.01</td>
<td>0.59</td>
<td>2.34</td>
<td>-2.66</td>
<td>0.67</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.0000</td>
<td>0.0028</td>
<td>0.5542</td>
<td>0.0203</td>
<td>0.0084</td>
<td>0.5022</td>
<td></td>
</tr>
</tbody>
</table>
Figure 11: Simple slopes of the conditional indirect effect of physical self-perception on positive affect, with physical self-esteem as the mediator and self-concept clarity as the moderator (LLCI=Lower confidence interval; ULCI=Upper confidence interval).
Discussion

The aim of the current study was to investigate the relationship between BMI and psychological distress, defined as higher depression and anxiety symptoms, higher negative affect or lower positive affect. The results did not support hypothesis one, which proposed that BMI will be related to psychological distress. Hypothesis two proposed that higher BMI causes psychological distress through physical self-concept. The data supported this hypothesis for all measures of psychological distress through the indirect effect pathway. Hypothesis three and four proposed a moderated mediation model, with social comparisons and self-concept clarity moderating the relationship between physical self-concept and psychological distress. Results were mixed, with significant moderation effects found in two out of 12 interactions.

BMI and psychological distress

Higher BMI was not associated with increased psychological distress. Whilst this finding conflicts with the wider literature on the association between BMI and mental health outcomes, many previous studies failed to find a significant direct relationship between BMI and psychological distress. One explanation for the apparent inconsistency is the different methodology and analysis adopted, with previous studies often using categorical data. A meta-analysis found considerable disparity between studies, with stronger effects when depressive disorder was analysed rather than depressive symptoms, stronger effects for baseline obesity than overweight, and stronger effects for USA than European population, with some studies reporting nonsignificant findings (Luppino et al., 2010). In the current study 16.2% of the sample was categorised as obese, which may have contributed to the nonsignificant effect. Previous research has often involved large sample sizes, and the
smaller sample in this study may have resulted in insufficient power to detect an effect.

The self-selected sample of participants were not representative of the general population and were skewed in favour of being female, younger, having high levels of education, and being in paid employment. These are known to be protective factors linked to lower levels of depression in the general population (Akhtar-Danesh & Landeen, 2007; Lorant et al., 2007). Despite these protective factors, 46.4% of the sample reported mild to severe depression and anxiety symptoms, and a significant proportion reported high percentile negative affect and low percentile positive affect (see figure 6). Therefore, it is not likely that the nonsignificant relationship was due to low levels of psychological distress in the sample. The characteristics reported by the majority of participants have been shown to increase the risk of depression as a result of higher BMI (Atlantis & Baker, 2008; Bookwala & Boyar, 2008; Brandheim et al., 2013; Stunkard et al., 2003; Ul-Haq et al., 2014). Therefore, it is interesting that no relationship was found despite reports of psychological distress and the presence of factors which might increase the risk of developing depression as a result of high BMI.

**The mediating role of physical self-concept**

It was hypothesised that higher BMI would have a negative effect on physical self-concept, and that lower physical self-concept would result in higher psychological distress. Higher BMI was indirectly associated with higher psychological distress through physical self-concept. Therefore, it can be concluded that physical self-concept accounts for some of the previously observed relationship between BMI and psychological distress. However, an inconsistent model was found.
After accounting for the indirect effect pathway, the direct effect of BMI on psychological distress changed direction and increased in strength. This could suggest that the hypothesised conceptual model is incorrect (MacKinnon et al., 2000). Alternatively, it suggests that after accounting for the effect of socially-constructed self-beliefs about the physical self, higher BMI leads to lower levels of psychological distress. This is a novel finding and challenges current policy which focuses on obesity as a cause of mental and physical health problems. Possible explanations for this protective relationship include biological mechanisms, such as the ‘jolly fat’ hypothesis. This proposes that overweight people have lower risk for depression due to factors such as the higher consumption of certain nutrients that are helpful in reducing or preventing depressive symptoms (Crisp & McGuiness, 1976; Crisp, Queenan, Sittampain, & Harris, 1982). In addition, genetic studies have found a specific gene which predisposes people to obesity and also relates to lower levels of depression (Samaan et al., 2013).

Despite the unexpected finding, overall it supports models that suggest a complex interplay of factors contribute to the relationship between BMI and psychological distress, such as behavioural, cognitive, social and physiological causal pathways (Napolitano & Foster, 2008). Physical self-concept, a socially constructed self-knowledge, could be considered part of the social and cognitive pathways. This study challenges the large body of evidence suggesting that higher BMI leads to greater psychological distress, and provides evidence that social and cognitive factors may play a causal role rather than BMI itself. Whilst higher BMI is associated with more negative physical self-concept, physical self-concept is influenced by more than just BMI. Exercise behaviour, physical health and social context will also influence its
development. Therefore, the development of a positive physical self-concept may protect against psychological distress, regardless of an individual’s BMI.

**The moderating role of social comparisons**

It was hypothesised that the indirect effect of BMI on psychological distress would be stronger when people compare themselves unfavourably with others. The model was analysed without BMI. The moderated mediation analysis partially supported the hypothesis, with one significant effect: Social comparisons moderated the relationship between physical self-perceptions and depression and anxiety symptoms. Negative physical self-perception resulted in increased depression and anxiety symptoms only when an individual made a more unfavourable social comparison. This could be explained by the self-evaluation maintenance model (Tesser, 1988) and the downward comparison theory (Wills, 1981) which state that comparisons that identify ourselves as favourable on a characteristic will result in more subjective wellbeing and less negative affect. It is possible for people to rate themselves favourably compared to others even when they have a negative physical self-perception. Social comparison score and physical self-concept are strongly correlated, which suggests either that people can be accurate in their social comparison ratings, or that there is an underlying mechanism, such as a propensity to positive self-cognitions that influences both. However, it is difficult to separate these effects because it is not possible to consider this physical self-concept in isolation of the social and cultural context. Social comparisons will likely influence the development of an individual’s physical self-concept, as well as moderate the effect physical self-concept on psychological distress.
The moderating role of self-concept clarity

It was hypothesised that the indirect effect of BMI on psychological distress would be stronger when self-concept clarity is weak. The moderated mediation analysis found one significant effect: self-concept clarity moderated the relationship between physical self-esteem and positive affect. However, it was not in the direction expected. Positive physical self-esteem resulted in increased positive affect only when an individual had poor self-concept clarity. It would be expected, due to self-concept clarity’s association with positive wellbeing (Campbell & Lavallee, 1993; Ritchie et al., 2011) that those with a strong self-concept clarity would show a stronger relationship between physical self-concept and positive affect. This counterintuitive result may suggest that, for people who have a strong self-concept clarity, other components of their self-concept are dominant in contributing to positive affect, and the physical component of their self-identity becomes less important to their psychological wellbeing. It could be concluded that, for those with poor self-concept clarity, the development of a positive physical self-esteem would increase their experience of positive affect and therefore be protective against psychological distress.

Strengths and limitations of the study

Measurement issues. BMI is commonly used to assess obesity in research, however, this is problematic for several reasons. Whilst BMI is a cheap and non-invasive assessment of excess body fat, it is a proxy measure and can incorrectly classify people with high levels of muscle mass as obese (National Obesity Observatory, 2009). In addition, the self-report method of collecting weight and height may have captured incorrect data as people often under report their weight and
over report their height (Connor Gorber, Tremblay, Moher, & Gorber, 2007). It is recommended that weight and height is used alongside waist circumference to identify obesity (National Institute for Health and Care Excellence, 2014). The study used self-reported weight and height to calculate BMI for practical reasons, as it is common for individuals to know their weight and height, whilst asking for waist circumference may have presented a barrier to participating in the study. Therefore, BMI was the most appropriate measure.

The self-concept clarity scale was found to have low internal consistency, which suggests that is less likely to be measuring a single construct. The literature lacks an alternative scale which could have been used to measure this construct, therefore the scale would benefit from further development to improve its validity. Finally, the lack of established tools to assess social comparisons meant that a measurement tool was developed for this study. Whilst it would have been beneficial to use an established and validated tool, this allowed the study to develop a scale to fulfil a specific purpose in this study.

**Participant sample.** The present study did not sample equally from all areas of the general population. Participants were mostly young, female, educated and in employment. These are common characteristics found in survey responders (Goyder, 1987; Goyder, Warriner, & Miller, 2002), possibly due to access or motivation to engage in research. Study posters were distributed to local community centres and gyms to widen the possible participants beyond the online setting, however it is not possible to know the level of uptake from these sources.

**Design.** Many studies that have investigated the relationship between BMI and psychological distress have used large samples and longitudinal designs. In the currently study, online recruitment was used to enable fast data collection, and to
maximise the breadth of participants in terms of geographical location. The cross-sectional design prevents the study from confidently drawing conclusions about causation. It is plausible that there are circular paths of effects with, for example, poorer psychological wellbeing leading to poorer physical self-concept.

**Implications to clinical psychology and future research**

**Clinical application.** The results have implications for the identification of those at risk of psychological distress, and the focus of interventions. The study suggest that the risk of psychological distress is related to poor physical self-concept rather than BMI, and therefore interventions should identify and target those with poor physical self-concept rather than targeting all overweight and obese individuals. An existing example of this is ‘Well Now’, a “health gain” and “size acceptance” programme was introduced to the Scottish National Health Service (NHS Highland, n.d.) in 2012 to replace normative weight management programmes that focused on reducing BMI. Further support for this approach is provided by the Health At Every Size campaign, which aims to promote good health and respect for people of every size (Health At Every Size, 2014).

The change of focus in identifying risk of psychological distress could be beneficial in primary care settings, such as GP practices, who primarily focus on the physical health outcomes associated with BMI. This could allow earlier identification of risk and the application of preventative interventions such as increased exercise as beneficial for both physical and mental health. However, this would create disparity between the agendas of mental health and physical health communities, with physical health primarily focused on obesity. This disparity would need to be addressed.
Those involved in health promotion and education may wish to target beliefs or cognitions that form physical self-concept. This could be done by encouraging engagement in behaviours that support the development of positive physical self-concept, such as exercise, or though exploring and supporting people to change any cognitive biases about the physical self, as may be done in cognitive therapy (J. S. Beck, 1995).

**Future research.** Given that there is cross-sectional evidence of a moderated mediation model, further research could aim to assess the temporal development of these factors. This would allow more confident conclusions to be made about causation. In addition, a longitudinal study could include other possible mediators, such as behavioural, social and physiological factors to identify the contribution of each. It may be interesting to investigate the factors that lead to the development of physical self-concept and factors that may protect against a negative physical self-concept, such as engagement in exercise in childhood. Should previous behaviour influence current physical self-concept, this may highlight other strategies and interventions to prevent psychological distress.

This was the first identified study which explored social comparisons in relation to physical self-concept. Whilst results are mixed, further investigation into the role of social comparisons in relation to physical self-concept may be helpful. Lastly, a qualitative study, that explores physical self-concept, and how people experience their physical identity in relation to their BMI and psychological distress would perhaps provide a richer and more complete picture of the concepts and their relevance to individual experience.
Conclusions

The study investigated the relationship between BMI, physical self-concept, social comparisons and psychological distress. The findings suggest that BMI is related to psychological distress, but only indirectly through physical self-concept. This contributes to the evidence base for the relationship between BMI and psychological distress, and highlights the importance of social context. Overall the results suggest that the relationship is complex and requires the investigation of mediating and moderating variables, and in particular that cognitive and social factors are important in this relationship. BMI and physical self-concept account for a small proportion of psychological distress outcomes, but have the potential to significantly impact on an individual’s wellbeing. Therefore, increased understanding of factors contributing to psychological distress, and with that improved identification of those at risk and the development of interventions that may prevent psychological distress, are vital to reduce levels of psychological distress in the general population. Longitudinal research in this area may clarify if physical self-concept has a causal role. In contrast to public health policy, this study suggests that physical self-concept rather than obesity should be the focus of interventions for psychological distress. This could support a move from the negative messages about obesity perpetuated in western society to a more supportive message of positive wellbeing regardless of BMI.
References


Friedman, K. E., Reichmann, S. K., Costanzo, P. R., & Musante, G. J. (2002). Body image partially mediates the relationship between obesity and psychological distress. *Obesity*
Research, 10(1), 33–41.


Psychological Bulletin, 42(1), 24–35.


## List of Appendices

<table>
<thead>
<tr>
<th>Appendix</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appendix A</td>
<td>Recruitment poster</td>
<td>122</td>
</tr>
<tr>
<td>Appendix B</td>
<td>Physical Self-Description Questionnaire – Short Version (PSDQ-S)</td>
<td>123</td>
</tr>
<tr>
<td>Appendix C</td>
<td>Kessler Psychological Distress Scale (K10)</td>
<td>125</td>
</tr>
<tr>
<td>Appendix D</td>
<td>Positive and negative affect scales (PANAS)</td>
<td>126</td>
</tr>
<tr>
<td>Appendix E</td>
<td>Self-concept clarity scale</td>
<td>127</td>
</tr>
<tr>
<td>Appendix F</td>
<td>Social comparison scale</td>
<td>128</td>
</tr>
<tr>
<td>Appendix G</td>
<td>Information Sheet</td>
<td>130</td>
</tr>
<tr>
<td>Appendix H</td>
<td>Consent Form</td>
<td>133</td>
</tr>
<tr>
<td>Appendix I</td>
<td>Ethical approval</td>
<td>135</td>
</tr>
<tr>
<td>Appendix J</td>
<td>Analysis of PSDQ-S</td>
<td>136</td>
</tr>
<tr>
<td>Appendix K</td>
<td>Histograms of raw scores</td>
<td>140</td>
</tr>
<tr>
<td>Appendix L</td>
<td>Correlation and regression tests</td>
<td>142</td>
</tr>
<tr>
<td>Appendix M</td>
<td>Results controlling for self-perceived health</td>
<td>154</td>
</tr>
<tr>
<td>Appendix N</td>
<td>Combined analysis of moderators self-concept clarity and social comparisons</td>
<td>157</td>
</tr>
</tbody>
</table>
Body and wellbeing

We are looking for anyone aged 18+ to answer some questions about the way you think about your body and your wellbeing.

The study involves answering some questions and takes about 20 minutes. The study can be found online at https://goo.gl/y4LWst

If you are interested in participating but do not have access to the internet, please call (or text) xxxxxx with your name, and contact number. I will return your call.

Everyone who completes the survey will have the option to enter into a draw to win one of three £50 Amazon Vouchers.

The study has been reviewed and received a Favourable Ethical Opinion from the Faculty of Health and Medical Sciences Ethics Committee, at the University of Surrey.
Appendix B: Physical Self-Description Questionnaire – Short Version (PSDQ-S)

Instructions
This is a chance to look at yourself. There are no right answers and everyone will have different answers. Be sure that your answers show how you feel about yourself.

The purpose of these questions is to see how people describe themselves physically. In the following pages you will be asked to think about yourself physically: Answer each sentence quickly as you feel now. Please do not leave any sentence blank.

When you are ready to begin, please read each sentence and decide your answer. There are six possible answers for each question – “True”, “False”, and four answers in between. There are six boxes next to each sentence, one for each of the answers. Please circle/select the number which is the most correct statement about you.

Scale:

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>False</td>
<td>Mostly false</td>
<td>More false than true</td>
<td>More true than false</td>
<td>Mostly true</td>
<td>True</td>
</tr>
</tbody>
</table>

1. I feel confident when doing coordinated movements.
2. I am a physically strong person.
3. I am quite good at bending, twisting and turning my body.
4. I can run a long way without stopping.
5. Overall, most things I do turn out well.
6. I usually catch whatever illnesses (flu, virus, colds etc) is going around.*
7. Controlling movements of my body comes easily to me.
8. I often do exercise or activities that make me breathe hard.
9. My waist is too large.*
10. I am good at most sports.
11. Physically, I am happy with myself.
12. I have a nice looking face.
13. I have a lot of power in my body.
14. My body is flexible.
15. I am sick so often that I cannot do all the things I want to do.*
16. I am good at coordinated movements.
17. I have too much fat on my body.*
18. I am better looking than most of my friends.
19. I can perform movements smoothly in most physical activities.
20. I do physically active things (e.g. jog, dance, bicycle, aerobics, gym, swim) at least three times a week.
21. I am overweight.*
22. I have good sports skills.
23. Physically, I feel good about myself.
24. Overall, I am no good.*
25. I get sick a lot.*
26. I find my body handles coordinated movements with ease.
27. I do lots of sports, dance, gym, or other physical activities.
28. I am good looking.
29. I could do well in a test of strength.
30. I can be physically active for a long period of time without getting tired.
31. Most things I do, I do well.
32. When I get sick, it takes me a long time to get better.*
33. I do sports, exercise, dance or other physical activities almost every day.
34. I play sports well.
35. I feel good about who I am physically.
36. I think I would perform well on a test measuring flexibility.
37. I am good at endurance activities like long distance running, aerobics, bicycling, swimming or cross-country skiing.
38. Overall, I have a lot to be proud of.
39. I have to go to the doctors because of illness more than most people my age.*
40. Nothing I ever do seems to turn out right.*

Note: * indicates reverse scored item

Items loading on each factor:
Activity: 8, 20, 27, 33
Appearance: 12, 18, 28
Body fat: 9, 17, 21
Coordination: 1, 7, 16, 19, 26
Endurance: 4, 30, 37
Flexibility: 3, 14, 36
Health: 6, 15, 25, 32, 39
Sport: 10, 22, 34
Strength: 2, 13, 29
General physical self-esteem: 11, 23, 35
Global self-esteem: 5, 24, 31, 38, 40
Appendix C: Kessler Psychological Distress Scale (K10)

Instructions
These questions concern how you have been feeling over the past 30 days.

Scale:

<table>
<thead>
<tr>
<th></th>
<th>None of the time</th>
<th>A little of the time</th>
<th>Some of the time</th>
<th>Most of the time</th>
<th>All of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

During the last 30 days, about how often did you feel…..
1. Tired out for no good reason?
2. Nervous?
3. So nervous that nothing could calm you down?
4. Hopeless?
5. Restless or fidgety?
6. So restless you could not sit still?
7. Depressed?
8. That everything was an effort?
9. So sad that nothing could cheer you up?
10. Worthless?
Appendix D: Positive and Negative Affect Scales (PANAS)

Instructions
This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you have felt this way during the past few weeks. Use the following scale to record your answers:

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>very slightly or</td>
<td>a little</td>
<td>moderately</td>
<td>quite a bit</td>
<td>extremely</td>
</tr>
<tr>
<td>not at all</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Interested (P)
2. Distressed (N)
3. Excited (P)
4. Upset (N)
5. Strong (P)
6. Guilty (N)
7. Scared (N)
8. Hostile (N)
9. Enthusiastic (P)
10. Proud (P)
11. Irritable (N)
12. Alert (P)
13. Ashamed (N)
14. Inspired (P)
15. Nervous (N)
16. Determined (P)
17. Attentive (P)
18. Jittery (N)
19. Active (P)
20. Afraid (N)

Note: P denotes positive affect scale item. N denotes negative affect scale item.
Appendix E: Self-concept clarity scale

Instructions
Please rate each of the following statements with the following scale:

1 2 3 4 5
1. Strongly disagree Disagree Neither agree or disagree Agree Strongly agree

1. My beliefs about myself often conflict with one another.*
2. On one day I might have one opinion of myself and on another day I might have a different opinion.*
3. I spend a lot of time wondering about what kind of person I really am.*
4. Sometimes I feel that I am not really the person that I appear to be.*
5. When I think about the kind of person I have been in the past, I'm not sure what I was really like.*
6. I seldom experience conflict between the different aspects of my personality.
7. Sometimes I think I know other people better than I know myself.*
8. My beliefs about myself seem to change very frequently.*
9. If I were asked to describe my personality, my description might end up being different from one day to another day.*
10. Even if I wanted to, I don't think I could tell someone what I'm really like.*
11. In general, I have a clear sense of who I am and what I am.
12. It is often hard for me to make up my mind about things because I don't really know what I want.*

Note: * indicates reverse scored item.
Appendix F: Social comparison scale

Please rate the following statements by comparing yourself to your friends and family that you have the most contact with:

I am more physically active than the average in my friends and family
   1) Strongly disagree: “I am much less physically active than the average in my friends and family”
   2) Disagree: “I am less physically active than the average in my friends and family”
   3) Neither agree or disagree: “I am as physically active as the average in my friends and family”
   4) Agree: “I am more physically active than the average in my friends and family”
   5) Strongly agree: “I am much more physically active than the average in my friends and family”

I am more physically attractive than the average in my friends and family
   1) Strongly disagree: “I am much less physically attractive than the average in my friends and family”
   2) Disagree: “I am less physically attractive than the average in my friends and family”
   3) Neither agree or disagree: “I am as physically attractive as the average in my friends and family”
   4) Agree: “I am more physically attractive than the average in my friends and family”
   5) Strongly agree: “I am much more physically attractive than the average in my friends and family”

I have less body fat than the average in my friends and family
   1) Strongly disagree: “I have much more body fat than the average in my friends and family”
   2) Disagree: “I have more body fat than the average in my friends and family”
   3) Neither agree or disagree: “I have about the same amount of body fat as the average in my friends and family”
   4) Agree: “I have less body fat than the average in my friends and family”
   5) Strongly agree: “I have much less body fat than the average in my friends and family”

I am better at performing coordinated movements than the average in my friends and family
   1) Strongly disagree: “I am much worse at performing coordinated movements than the average in my friends and family”
   2) Disagree: “I am worse at performing coordinated movements than the average in my friends and family”
   3) Neither agree or disagree: “I am as good at performing coordinated movements as the average in my friends and family”
   4) Agree: “I am better at performing coordinated movements than the average in my friends and family”
   5) Strongly agree: “I am much better at performing coordinated movements than the average in my friends and family”
I have more physical endurance (ability to be physically active for long periods) than the average in my friends and family
   1) Strongly disagree: “I have much less endurance than the average in my friends and family”
   2) Disagree: “I have less endurance than the average in my friends and family”
   3) Neither agree or disagree: “I have as much endurance as the average in my friends and family”
   4) Agree: “I have more endurance than the average in my friends and family”
   5) Strongly agree: “I have much more endurance than the average in my friends and family”

I am more physically flexible than the average in my friends and family
   1) Strongly disagree: “I am much less flexible than the average in my friends and family”
   2) Disagree: “I am less flexible than the average in my friends and family”
   3) Neither agree or disagree: “I am as flexible as the average in my friends and family”
   4) Agree: “I am more flexible than the average in my friends and family”
   5) Strongly agree: “I am much more flexible than the average in my friends and family”

I have better general physical health (i.e. less illness) than the average in my friends and family
   1) Strongly disagree: “I am in much worse physical health than the average in my friends and family”
   2) Disagree: “I am in worse physical health than the average in my friends and family”
   3) Neither agree or disagree: “I am in the same physical health as the average in my friends and family”
   4) Agree: “I am in better physical health than the average in my friends and family”
   5) Strongly agree: “I am in much better health than the average in my friends and family”

I am better at sport than the average in my friends and family
   1) Strongly disagree: “I am much worse at sport than the average in my friends and family”
   2) Disagree: “I am worse at sport than the average in my friends and family”
   3) Neither agree or disagree: “I am as good at sport as the average in my friends and family”
   4) Agree: “I am better at sport than the average in my friends and family”
   5) Strongly agree: “I am much better at sport than the average in my friends and family”

I am more physically strong than the average in my friends and family
   1) Strongly disagree: “I am much less strong than the average in my friends and family”
   2) Disagree: “I am less strong than the average in my friends and family”
   3) Neither agree or disagree: “I am as strong as the average in my friends and family”
   4) Agree: “I am stronger than the average in my friends and family”
   5) Strongly agree: “I am much stronger than the average in my friends and family”
Appendix G: Study information sheet

Participant Information Sheet (06/12/2015 v.2)

Body and Wellbeing

Introduction
I am a Trainee Clinical Psychologist and as part of my doctoral research I am carrying out a study into the relationship between the way we think about our bodies and our wellbeing.

I would like to invite you to take part in a research project. Before you decide you need to understand why the research is being done and what it will involve for you. Please take the time to read the following information carefully.

What is the purpose of the study?
This study seeks to investigate the relationship between the way you think about your body and your wellbeing.

Why have I been invited to take part in the study?
Because we are inviting people aged 18 or over from a wide variety of backgrounds and with different experiences in the general population. We are aiming to invite up to 250 people to take part in the study.

Do I have to take part?
No, you do not have to participate. There will be no adverse consequences if you decide not to participate.

[Online version] If you decide to take part, you can withdraw from the study whilst completing it by closing your browser window. If you withdraw in this way before the end of the study your responses will not be saved. You are not obliged to answer every question within the study.
[Paper version] You are not obliged to answer every question within the study.

[Online version] Once you have submitted your responses the data will not be identifiable, therefore it will not be possible to withdraw your responses at a later date.
[Paper version] Once your responses are received they will be stored separately to any identifiable information you provide, therefore it will not be possible to withdraw your responses at a later date.

What will my involvement require?
You will be asked to [answer questions on an online survey / complete a questionnaire]. The questions will ask you to think about your body and your wellbeing, including psychological distress. The questions should take approximately 20 minutes to answer.

What will I have to do?
If you decide you would like to take part, [please press the continue button when you reach the bottom of this page and follow the instructions to complete the survey / please complete the consent form and questionnaire enclosed in this pack].
What are the possible disadvantages or risks of taking part?
Due to the topic of the study it is possible that you may find that some of the questions distressing. You will be asked to think about your body and your wellbeing, including psychological distress. If you do experience any distress whilst completing the survey you can contact the following organisations for support:

**Samaritans** - Provides confidential, non-judgmental emotional support for people experiencing feelings of distress or despair, including those that could lead to suicide. Tel: 116 123
Email: Jo@samaritans.org

**Mind** - Mind provides confidential mental health information services.
Tel: 0300 123 3393 (9am-5pm Monday to Friday)
Email: info@mind.org.uk

What are the possible benefits of taking part?
It is unlikely that the results of the study will benefit you directly. We hope that the study will add to our understanding of the relationship between the way we think about our body and our wellbeing.

At the end of the survey you will have the opportunity to provide contact details in order to be entered into a prize draw to win one of three £50 Amazon vouchers. Three people will be selected randomly once the study is complete.

What happens when the research study stops?
Once the study ends the findings will be written up as part of my doctorate thesis and also written up in the form of a summary. At the end of the survey you will have the opportunity to provide contact details if you would like to receive a copy of this summary.

What if there is a problem?
Any complaint or concern about any aspect of the study will be addressed; please contact my supervisor, Dr Lada Timotijevic, on l.timotijevic@surrey.ac.uk. You may also contact the Head of School, Derek Moore, on d.g.moore@surrey.ac.uk.

Will my taking part in the study be kept confidential?
Yes. All of the information you give will be anonymous so it will not be possible to identify your answers. The findings will be summarised so that it will not be possible to identify people who contributed to the study.

If you choose to give a contact email address for entry into the prize draw or to receive a summary of the findings these will not be linked to your answers.

Data will be stored securely for 10 years in accordance with the Data Protection Act 1998.

Who has reviewed the project?
The study has been reviewed and received a Favourable Ethical Opinion from the Faculty of Health and Medical Sciences Ethics Committee, at the University of Surrey.
Thank you for taking the time to read this Information Sheet.

Sarah Whitson (Trainee Clinical Psychologist)
s.whitson@surrey.ac.uk

Supervised by Dr Lada Timotijevic (Senior Research Fellow)
l.timotijevic@surrey.ac.uk
Appendix H: Participant consent form

Consent Form (06/12/2015 v.2)

Body and Wellbeing

Please initial (/tick on online version) each box

- I have read and understood the Information Sheet provided (version 2, date 06/12/2015). I have been given a full explanation by the investigators of the nature, purpose, and likely duration of the study, and of what I will be expected to do.

- I have been advised about any disadvantages to my health and well-being which may result. I have been given the opportunity to ask questions on all aspects of the study and have understood the advice and information given as a result.

- I agree to comply with the requirements of the study as outlined to me to the best of my abilities.

- I understand that all project data will be held for at least 6 years and all research data for at least 10 years in accordance with University policy and that my personal data is held and processed in the strictest confidence, and in accordance with the UK Data Protection Act (1998).

- I agree for the researchers to contact me to provide me with a study results summary. I understand that I have the option to provide contact details for this purpose at the end of the study.

- I understand that all data collected during the study may be looked at for monitoring and auditing purposes by authorised individuals from University of Surrey, and from regulatory authorities, where it is relevant to my taking part in this research. I give permission for these individuals to have access to my data.

- I understand that I am free to withdraw at any time before submitting my responses at the end of the questionnaire without needing to justify my decision.

- I understand that once I have submitted my responses it will not be possible for the research team to identify my data and therefore it will not be possible to withdraw my data at a later date.

- I confirm that I have read and understood the above and freely consent to participating in this study. I have been given adequate time to consider my participation.
[Paper version]
Name of volunteer (BLOCK CAPITALS) ..............................................................

Signed ..................................................

Date ..........................................

[Online version]
If you consent to participate in the study, please select yes below.
If you would not like to continue with the study, please select no below or close this window.
Appendix I: Ethical approval

Faculty of Health and Medical Sciences
Ethics Committee

Chair’s Action
Proposal Ref: 1145-PSY-15
Name of Student/Trainee: SARAH WHITSON
Supervisor: Dr Lada Timotijevic
Date of submission: 11th November 2015

The above Research Project has been re-submitted to the Faculty of Health and Medical Sciences Ethics Committee and has received a favourable ethical opinion on the basis described in the protocol and supporting documentation.

The final list of documents reviewed by the Committee is as follows:

Ethics Application Form
Covering letter
Summary of the project (included in the Application Form Section A1.)
Detailed protocol for the project
Participant Information sheet
Consent Form
Risk Assessment (if appropriate)
Insurance Documentation (if appropriate)

All documentation should be retained by the student/trainee in case this project is selected for an audit.

Signed and Dated: [Signature]
Professor Bertram Opitz
Co-Chair

Please note:
If there are any significant changes to your proposal which require further scrutiny, please contact the Faculty of Health and Medical Sciences Ethics Committee before proceeding with your Project.
Appendix J: Analysis of PSDQ-S

**Confirmatory Factor analysis.** Factor analysis to confirm the factor structure of the PSDQ-S was performed on the sample data. This was carried out using IBM Amos 23. The initial 11-subdomains model, proposed by Marsh, Martin and Jackson (2010) fit adequately with the present data (CFI=0.94 and RMSEA=0.054). A 10-subdomain model was also analysed after removing global self-esteem factor. This also fit adequately with the present data (CFI=0.952 and RMSEA=0.053) based on cut-off values suggested by Hu and Bentler (1999). Factor loadings of individual items can be found in Table J1. Inter-correlation between two of the subdomains was very high (>0.8), and inter-correlation between two other subdomains was close to the very high range (see table J2). The aim of the confirmatory factor analysis was to ascertain the model fit to support subsequent analysis, therefore model improvements were not attempted.

The adequate model fit suggests that the PSDQ-S data can be treated as 11 factors. Due to the close relationship of global self-esteem with psychological wellbeing, this factor was removed from physical self-concept analysis, leaving items which specifically correspond to the physical self.
Table J1: PSDQ-S factor loadings

<table>
<thead>
<tr>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q8. I often do exercise or activities that make me breathe hard.</td>
</tr>
<tr>
<td>Q20. I do physically active things (e.g. jog, dance, bicycle, aerobics, gym, swim) at least three times a week.</td>
</tr>
<tr>
<td>Q27. I do lots of sports, dance, gym, or other physical activities.</td>
</tr>
<tr>
<td>Q33. I do sports, exercise, dance or other physical activities almost every day.</td>
</tr>
<tr>
<td>Q12. I have a nice looking face.</td>
</tr>
<tr>
<td>Q18. I am better looking than most of my friends.</td>
</tr>
<tr>
<td>Q28. I am good looking.</td>
</tr>
<tr>
<td>Q9. My waist is too large.</td>
</tr>
<tr>
<td>Q17. I have too much fat on my body.</td>
</tr>
<tr>
<td>Q21. I am overweight.</td>
</tr>
<tr>
<td>Q1. I feel confident when doing coordinated movements.</td>
</tr>
<tr>
<td>Q7. Controlling movements of my body comes easily to me.</td>
</tr>
<tr>
<td>Q16. I am good at coordinated movements.</td>
</tr>
<tr>
<td>Q19. I can perform movements smoothly in most physical activities.</td>
</tr>
<tr>
<td>Q26. I find my body handles coordinated movements with ease.</td>
</tr>
<tr>
<td>Q4. I can run a long way without stopping.</td>
</tr>
<tr>
<td>Q30. I can be physically active for a long period of time without getting tired.</td>
</tr>
<tr>
<td>Q37. I am good at endurance activities like long distance running, aerobics, bicycling, swimming or cross-country skiing.</td>
</tr>
<tr>
<td>Item</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>Q3.</td>
</tr>
<tr>
<td>Q14.</td>
</tr>
<tr>
<td>Q36.</td>
</tr>
<tr>
<td>Q6.</td>
</tr>
<tr>
<td>Q15.</td>
</tr>
<tr>
<td>Q25.</td>
</tr>
<tr>
<td>Q32.</td>
</tr>
<tr>
<td>Q39.</td>
</tr>
<tr>
<td>Q10.</td>
</tr>
<tr>
<td>Q22.</td>
</tr>
<tr>
<td>Q34.</td>
</tr>
<tr>
<td>Q2.</td>
</tr>
<tr>
<td>Q13.</td>
</tr>
<tr>
<td>Q29.</td>
</tr>
<tr>
<td>Q11.</td>
</tr>
<tr>
<td>Q23.</td>
</tr>
<tr>
<td>Q35.</td>
</tr>
<tr>
<td>Q5.</td>
</tr>
<tr>
<td>Q24.</td>
</tr>
<tr>
<td>Q31.</td>
</tr>
<tr>
<td>Q38.</td>
</tr>
<tr>
<td>Q40.</td>
</tr>
</tbody>
</table>

Note: AC=activity, AP=appearance, BF=body fat, CO=coordination, EN=endurance, FL=flexibility, HE=health, SP=sports ability, ST=strength, GP=general physical self-esteem, ES=global self-esteem.
Table J2. Intercorrelations between factors of the PSDQ-S

<table>
<thead>
<tr>
<th></th>
<th>AC</th>
<th>AP</th>
<th>BF</th>
<th>CO</th>
<th>EN</th>
<th>FL</th>
<th>HE</th>
<th>SP</th>
<th>ST</th>
<th>GP</th>
<th>ES</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AP</td>
<td>0.19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BF</td>
<td>0.25</td>
<td>0.22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO</td>
<td>0.29</td>
<td>0.30</td>
<td>0.19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EN</td>
<td>0.80*</td>
<td>0.29</td>
<td>0.43</td>
<td>0.34</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FL</td>
<td>0.33</td>
<td>0.36</td>
<td>0.26</td>
<td>0.47</td>
<td>0.32</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HE</td>
<td>0.10</td>
<td>0.15</td>
<td>0.21</td>
<td>0.09</td>
<td>0.14</td>
<td>0.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP</td>
<td>0.56</td>
<td>0.36</td>
<td>0.24</td>
<td>0.60</td>
<td>0.62</td>
<td>0.42</td>
<td>0.06</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ST</td>
<td>0.52</td>
<td>0.46</td>
<td>0.12</td>
<td>0.61</td>
<td>0.59</td>
<td>0.48</td>
<td>0.13</td>
<td>0.73*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GP</td>
<td>0.42</td>
<td>0.60</td>
<td>0.63</td>
<td>0.38</td>
<td>0.60</td>
<td>0.40</td>
<td>0.31</td>
<td>0.49</td>
<td>0.49</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ES</td>
<td>0.24</td>
<td>0.60</td>
<td>0.20</td>
<td>0.35</td>
<td>0.35</td>
<td>0.28</td>
<td>0.38</td>
<td>0.41</td>
<td>0.50</td>
<td>0.60</td>
<td></td>
</tr>
</tbody>
</table>

*Note: AC=activity, AP=appearance, BF=body fat, CO=coordination, EN=endurance, FL=flexibility, HE=health, SP=sports ability, ST=strength, GP=general physical self-esteem, ES=global self-esteem. * denotes intercorrelations deemed to be high.*
Appendix K: Histograms of raw scores

BMI

PDSQ Self Perception

PDSQ General physical esteem

K10 total

PANAS positive emotions score

PANAS negative emotions score
Appendix L: Correlation and regression tests (1 - scatterplot; 2 - histogram of regression standardised residuals; 3 – P-P plot of regression standardised residuals; and 4 - homoscedasticity plot)

L1: BMI and physical self-perception
L2: BMI and physical self-esteem

Histogram
Dependent Variable: PDSQ General Physical esteem

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: PDSQ General Physical esteem

Scatterplot
Dependent Variable: PDSQ General Physical esteem
L3: BMI and K10

Histogram
Dependent Variable: K10 total score

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: K10 total score

Scatterplot
Dependent Variable: K10 total score
L4: BMI and positive affect

Histogram
Dependent Variable: PANAS positive emotions

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: PANAS positive emotions

Scatterplot
Dependent Variable: PANAS positive emotions
L5: BMI and negative affect

Histogram
Dependent Variable: PANAS negative emotions

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: PANAS negative emotions

Scatterplot
Dependent Variable: PANAS negative emotions
L6: Physical self-perception and physical self-esteem

Histogram
Dependent Variable: PDSQ General Physical esteem

Mean = 1.74E-16
Std. Dev. = 0.006
N = 265

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: PDSQ General Physical esteem

Scatterplot
Dependent Variable: PDSQ General Physical esteem
L7: Physical self-perception and K10

Histogram
Dependent Variable: K10 total score

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: K10 total score

Scatterplot
Dependent Variable: K10 total score
L8: Physical self-perception and positive affect

Histogram
Dependent Variable: PANAS positive emotions

Mean = 1.525.15
Stdev = 0.608
N = 355

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: PANAS positive emotions

Expected Cum Prob

0.4
0.2
0.0
0.0
0.2
0.4
0.6
0.8
1.0
0.9
2.0
4.0
6.0
8.0
10.0
-3
-2
-1
0
1
2
3
Regression Standardized Residual

Scatterplot
Dependent Variable: PANAS positive emotions
L9: Physical self-perception and negative affect

- **Histogram**
  
  - Dependent Variable: PANAS negative emotions
  
  - Frequency
  
  - Regression Standardized Residual
  
  - Mean = -0.295, SE = 0.096
  
  - N = 205

- **Scatterplot**
  
  - Dependent Variable: PANAS negative emotions
  
  - Scatterplot
  
  - Regression Standardized Residual

- **Normal P-P Plot of Regression Standardized Residual**
  
  - Dependent Variable: PANAS negative emotions
  
  - Expected Cum Prob
  
  - Observed Cum Prob
L10: Physical self-esteem and K10

Histogram
Dependent Variable: K10 total score

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: K10 total score

Scatterplot
Dependent Variable: K10 total score
L11: Physical self-esteem and positive affect
L12: Physical self-esteem and negative affect
Appendix M: Results controlling for self-perceived health

Figure M1: Diagram indicting a direct relationship between BMI and psychological distress outcomes (depression and anxiety, negative affect and positive affect), and the indirect effect through physical self-perception and physical self-esteem as serial mediators. The model controls for self-perceived health. All figures shown are unstandardised regression coefficients.
Table M1: Summary of sequential mediation analysis for hypothesis two with mediators physical self-perception ($M_1$) and physical self-esteem ($M_2$). All figures are unstandardised regression coefficients of the model controlling for self-perceived physical health.

<table>
<thead>
<tr>
<th>DV</th>
<th>Unstandardised Regression Coefficients</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Effect of IV on $M_1$ (Path $a_1$)</td>
<td>Effect of IV on $M_2$ (Path $a_2$)</td>
<td>Effect of $M_1$ on $M_2$ (Path $a_3$)</td>
<td>Effect of $M_1$ on DV (Path $b_1$)</td>
<td>Effect of $M_2$ on DV (Path $b_2$)</td>
<td>Direct effect (Path $c'$)</td>
<td>Effect of IV on DV (Path $c$)</td>
<td></td>
</tr>
<tr>
<td>Depression and anxiety</td>
<td>$B$</td>
<td>$-1.18^*$</td>
<td>$-0.10^*$</td>
<td>$0.078^*$</td>
<td>$-0.025$</td>
<td>$-0.39^*$</td>
<td>$-0.15^*$</td>
<td>$-0.046$</td>
</tr>
<tr>
<td></td>
<td>$SE$</td>
<td>$0.27$</td>
<td>$0.038$</td>
<td>$0.084$</td>
<td>$0.019$</td>
<td>$0.12$</td>
<td>$0.075$</td>
<td>$0.074$</td>
</tr>
<tr>
<td></td>
<td>$t$</td>
<td>$-4.31$</td>
<td>$-2.71$</td>
<td>$9.26$</td>
<td>$-1.31$</td>
<td>$-3.14$</td>
<td>$-2.01$</td>
<td>$-0.62$</td>
</tr>
<tr>
<td></td>
<td>$p$</td>
<td>$0.0000$</td>
<td>$0.0071$</td>
<td>$0.0000$</td>
<td>$0.1913$</td>
<td>$0.0019$</td>
<td>$0.0451$</td>
<td>$0.5373$</td>
</tr>
<tr>
<td>Negative affect</td>
<td>$B$</td>
<td>$-1.18^*$</td>
<td>$-0.10^*$</td>
<td>$0.078^*$</td>
<td>$-0.026$</td>
<td>$-0.28^*$</td>
<td>$-0.16$</td>
<td>$-0.076$</td>
</tr>
<tr>
<td></td>
<td>$SE$</td>
<td>$0.27$</td>
<td>$0.038$</td>
<td>$0.084$</td>
<td>$0.022$</td>
<td>$0.14$</td>
<td>$0.085$</td>
<td>$0.082$</td>
</tr>
<tr>
<td></td>
<td>$t$</td>
<td>$-4.31$</td>
<td>$-2.71$</td>
<td>$9.26$</td>
<td>$-1.21$</td>
<td>$-2.00$</td>
<td>$-1.90$</td>
<td>$-0.93$</td>
</tr>
<tr>
<td></td>
<td>$p$</td>
<td>$0.0000$</td>
<td>$0.0071$</td>
<td>$0.0000$</td>
<td>$0.2282$</td>
<td>$0.0464$</td>
<td>$0.0583$</td>
<td>$0.3554$</td>
</tr>
<tr>
<td>Positive affect</td>
<td>$B$</td>
<td>$-1.18^*$</td>
<td>$-0.10^*$</td>
<td>$0.078^*$</td>
<td>$0.089^*$</td>
<td>$0.44^*$</td>
<td>$0.38^*$</td>
<td>$0.19^*$</td>
</tr>
<tr>
<td></td>
<td>$SE$</td>
<td>$0.27$</td>
<td>$0.038$</td>
<td>$0.084$</td>
<td>$0.022$</td>
<td>$0.14$</td>
<td>$0.086$</td>
<td>$0.090$</td>
</tr>
<tr>
<td></td>
<td>$t$</td>
<td>$-4.31$</td>
<td>$-2.71$</td>
<td>$9.26$</td>
<td>$4.06$</td>
<td>$3.10$</td>
<td>$4.39$</td>
<td>$2.09$</td>
</tr>
<tr>
<td></td>
<td>$p$</td>
<td>$0.0000$</td>
<td>$0.0071$</td>
<td>$0.0000$</td>
<td>$0.0001$</td>
<td>$0.0021$</td>
<td>$0.0000$</td>
<td>$0.0380$</td>
</tr>
</tbody>
</table>

* = p<0.05
Table M2: Summary of bootstrapping results for hypothesis two with mediators physical self-perception ($M_1$) and physical self-esteem ($M_2$). All figures are unstandardised regression coefficients of the model controlling for self-perceived physical health.

<table>
<thead>
<tr>
<th>DV</th>
<th>Total indirect effect</th>
<th>IV to $M_1$ to DV (path $a_1+b_1$)</th>
<th>IV to $M_1$ to $M_2$ to DV (path $a_1+a_3+b_2$)</th>
<th>IV to $M_2$ to DV (path $a_2+b_2$)</th>
<th>Path $a_1+b_1$ minus path $a_1+a_3+b_2$</th>
<th>Path $a_1+b_1$ minus path $a_1+a_3+b_2$</th>
<th>Path $a_1+a_3+b_2$ minus path $a_2+b_2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression and anxiety Effect</td>
<td>0.11*</td>
<td>0.030</td>
<td>0.036*</td>
<td>0.040*</td>
<td>-0.0063</td>
<td>-0.010</td>
<td>-0.0041</td>
</tr>
<tr>
<td>Lower</td>
<td>0.052</td>
<td>-0.018</td>
<td>0.011</td>
<td>0.0091</td>
<td>-0.084</td>
<td>-0.090</td>
<td>-0.048</td>
</tr>
<tr>
<td>Upper</td>
<td>0.18</td>
<td>0.084</td>
<td>0.075</td>
<td>0.097</td>
<td>0.057</td>
<td>0.060</td>
<td>0.038</td>
</tr>
<tr>
<td>Negative affect     Effect</td>
<td>0.086*</td>
<td>0.031</td>
<td>0.026*</td>
<td>0.029*</td>
<td>0.0050</td>
<td>0.0020</td>
<td>-0.0030</td>
</tr>
<tr>
<td>Lower</td>
<td>0.029</td>
<td>-0.017</td>
<td>0.0026</td>
<td>0.0034</td>
<td>-0.065</td>
<td>-0.071</td>
<td>-0.038</td>
</tr>
<tr>
<td>Upper</td>
<td>0.17</td>
<td>0.089</td>
<td>0.063</td>
<td>0.082</td>
<td>0.070</td>
<td>0.071</td>
<td>0.027</td>
</tr>
<tr>
<td>Positive affect     Effect</td>
<td>-0.19*</td>
<td>-0.11*</td>
<td>-0.041*</td>
<td>-0.045*</td>
<td>-0.065</td>
<td>-0.060</td>
<td>0.0046</td>
</tr>
<tr>
<td>Lower</td>
<td>-0.29</td>
<td>-0.19</td>
<td>-0.088</td>
<td>-0.10</td>
<td>-0.15</td>
<td>-0.15</td>
<td>-0.045</td>
</tr>
<tr>
<td>Upper</td>
<td>-0.11</td>
<td>-0.048</td>
<td>-0.014</td>
<td>-0.012</td>
<td>0.0035</td>
<td>0.024</td>
<td>0.047</td>
</tr>
</tbody>
</table>

* = bootstrap confidence intervals do not cross zero
Appendix N: Combined analysis of moderators self-concept clarity and social comparisons

Table N1: Summary of moderated mediation analysis for hypothesis three and four, with physical self-perception (IV), physical self-esteem (M) as mediator, and self-concept clarity (Q) and social comparisons (V) as moderators.

<table>
<thead>
<tr>
<th>DV</th>
<th>B</th>
<th>se</th>
<th>t</th>
<th>p</th>
<th>Unstandardised Regression Coefficients</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Effect of IV on DV (Path c)</td>
<td>Effect of M on DV (Path b)</td>
<td>Effect of Q on DV</td>
<td>Effect of V on DV</td>
<td>Q x b</td>
<td>Q x c</td>
<td>V x b</td>
<td>V x c</td>
<td>Direct effect of IV on DV (Path c')</td>
<td>Effect of IV on DV (Path c)</td>
</tr>
<tr>
<td>Depression and anxiety</td>
<td>-0.30*</td>
<td>0.089</td>
<td>-0.53*</td>
<td>-0.79*</td>
<td>0.0007</td>
<td>0.011</td>
<td>0.0086*</td>
<td>-0.026</td>
<td>-0.089</td>
<td>0.12</td>
</tr>
<tr>
<td></td>
<td>0.091</td>
<td>0.57</td>
<td>0.15</td>
<td>0.24</td>
<td>0.0015</td>
<td>0.0093</td>
<td>0.0024</td>
<td>0.017</td>
<td>0.068</td>
<td>0.078</td>
</tr>
<tr>
<td></td>
<td>-3.26</td>
<td>0.16</td>
<td>-3.50</td>
<td>-3.32</td>
<td>0.50</td>
<td>1.18</td>
<td>3.60</td>
<td>-1.57</td>
<td>-1.31</td>
<td>1.51</td>
</tr>
<tr>
<td></td>
<td>0.0013</td>
<td>0.8760</td>
<td>0.0006</td>
<td>0.0010</td>
<td>0.6166</td>
<td>0.2381</td>
<td>0.0004</td>
<td>0.1166</td>
<td>0.1928</td>
<td>0.1325</td>
</tr>
<tr>
<td>Negative affect</td>
<td>-0.23*</td>
<td>0.35</td>
<td>-0.67*</td>
<td>-0.67*</td>
<td>0.0029</td>
<td>-0.0056</td>
<td>0.0045</td>
<td>-0.0084</td>
<td>-0.11</td>
<td>0.061</td>
</tr>
<tr>
<td></td>
<td>0.11</td>
<td>0.66</td>
<td>0.18</td>
<td>0.28</td>
<td>0.0017</td>
<td>0.011</td>
<td>0.0028</td>
<td>0.020</td>
<td>0.079</td>
<td>0.083</td>
</tr>
<tr>
<td></td>
<td>-2.15</td>
<td>0.53</td>
<td>-3.77</td>
<td>-2.44</td>
<td>1.67</td>
<td>-0.52</td>
<td>1.62</td>
<td>-0.43</td>
<td>-1.33</td>
<td>0.73</td>
</tr>
<tr>
<td></td>
<td>0.0326</td>
<td>0.5963</td>
<td>0.0002</td>
<td>0.0155</td>
<td>0.0968</td>
<td>0.6041</td>
<td>0.1071</td>
<td>0.6686</td>
<td>0.1843</td>
<td>0.4671</td>
</tr>
<tr>
<td>Positive affect</td>
<td>-0.040</td>
<td>1.85*</td>
<td>0.25</td>
<td>0.22</td>
<td>0.0019</td>
<td>-0.027*</td>
<td>0.0012</td>
<td>-0.019</td>
<td>0.32</td>
<td>-0.033</td>
</tr>
<tr>
<td></td>
<td>0.12</td>
<td>0.74</td>
<td>0.20</td>
<td>0.31</td>
<td>0.0019</td>
<td>0.012</td>
<td>0.0031</td>
<td>0.022</td>
<td>0.088</td>
<td>0.097</td>
</tr>
<tr>
<td></td>
<td>-0.34</td>
<td>2.52</td>
<td>1.30</td>
<td>0.73</td>
<td>0.97</td>
<td>-2.22</td>
<td>0.38</td>
<td>-0.86</td>
<td>3.64</td>
<td>-0.35</td>
</tr>
<tr>
<td></td>
<td>0.7323</td>
<td>0.0125</td>
<td>0.1952</td>
<td>0.4653</td>
<td>0.3313</td>
<td>0.0272</td>
<td>0.7042</td>
<td>0.3926</td>
<td>0.0003</td>
<td>0.7301</td>
</tr>
</tbody>
</table>
Part 3 – Summary of Clinical Experience

Adult Mental Health Placement

During my first year, I completed a year-long placement in an adult community mental health team. I worked with adults aged between 18 and 65 with a severe or enduring mental health difficulty. My supervisor’s main model of therapy was Cognitive Behavioural Therapy (CBT) and this year enabled me to gain a good grounding in applying CBT and using a formulation based approach with people who had a range of different mental health diagnoses including psychosis, depression, bipolar disorder and anxiety disorders. In addition to one-to-one psychological intervention, I co-facilitated an 8-week CBT for bipolar group, which helped me to gain confidence in delivering group interventions. I also developed and strengthened my skills in neuropsychological assessment with individuals who were referred following concerns around their cognitive functioning, using the Wechsler Adult Intelligence Scale – Fourth Edition (WAIS-IV) and the Wechsler Memory Scale – Fourth Edition (WMS-IV). I delivered a presentation on Acceptance and Commitment Therapy (ACT) to the team, and a presentation on the psychological management of bipolar disorder to a bipolar support group, which helped me develop my skills in presenting to different groups.

Learning Disabilities Placement

My second placement was split between an inpatient assessment and treatment service and a community health team for people with learning disabilities. I provided assessments and interventions to adults over the age of 18 years, with learning disabilities, autism spectrum conditions (ASCs), challenging behaviours, attachment
difficulties and/or mental health difficulties such as anxiety, depression and bipolar disorder. This placement provided opportunities for me to work within a wider range of models, such as CBT, psychodynamic, systemic and behavioural (Positive Behavioural Support) approaches. I completed one-to-one therapy with three people.

The rest of my work involved working systemically with carers and organisations. I also gained experience of assessing people with suspected autism and learning difficulties, and people with Downs Syndrome and suspected dementia. I learned to adapt my verbal and written communication to engage people with communication difficulties. In addition to clinical work, I developed resources for those working with people with learning disabilities and bipolar disorder, and I presented these resources to the teams. I also had the opportunity to supervise an assistant psychologist.

**Older Adults Placement**

My older adults placement was in a community mental health team. I provided assessments and interventions to adults over the age of 65 years with mental health and/or suspected organic conditions. This placement provided opportunities to work within a variety of models including CBT, Dialectical Behaviour Therapy (DBT), attachment-based, Cognitive Analytic Therapy (CAT) and Systemic. For example, I carried out an intervention with a gentleman with anxiety, hoarding behaviour and emotion regulation difficulties using a DBT based approach. I delivered a case presentation to the team based on this intervention. On this placement I gained experience of working systemically with people’s families and care homes in the context of challenging behaviour. I also gained experience of neuropsychological assessments used with people with suspected dementia, including the WAIS-IV,
WMS-IV, DKEFS, TEA, Hayling & Brixton and TOPF. I co-facilitated a 6-week Dementia Information Group for people who were recently diagnosed and their family members. I organised and coordinated a variety of speakers for this group, and I delivered sessions on the psychological management of dementia.

**Child and Family Placement**

This placement was based within an inpatient unit, and consisted of providing assessments and interventions to young people aged 12-18, and providing consultation and psychological formulation to the MDT. The placement included working with young people with experiences of anxiety, depression, trauma, attachment disorders, emotion regulation difficulties, body image disturbance, ASCs, eating disorders and self-harm behaviours. During this placement I also worked with a specialist community eating disorder service, providing assessments and interventions to young people with an eating disorder. I used a variety of approaches including CBT, DBT, compassion focused, systemic, behavioural, ACT and behavioural approaches. Additionally, I attended a feeding clinic for younger children with feeding difficulties. I also completed two neuropsychological assessments, including one assessment of a possible learning disability, which enabled me to develop my neuropsychological assessment skills further by using the Wechsler Intelligence Scale for Children – Fourth Edition (WISC-IV). This placement provided me with invaluable experience of developing and running groups, and I had the opportunity to develop and co-facilitate five different groups for the young people in the inpatient unit. This taught me skills in adapting interventions to meet specific needs. I delivered a presentation to the psychology team on physical self-concept in young people with eating disorders.
and the findings of my research into physical self-concept and psychological distress. This placement also strongly emphasised multidisciplinary and multi-agency working, for example, with social services and educational establishments that were involved in the young person’s life.

**Specialist Placement**

My specialist placement was in an inpatient neurorehabilitation unit for people with acquired brain injury. During this placement I completed assessments and interventions with people who had experienced a brain injury, primarily Strokes, which ranged from mild to severe. Other presentations included Multiple Sclerosis, Traumatic Brain Injury, Parkinson’s Disease and Encephalitis. The placement included carrying out formal neuropsychological assessments of cognitive functioning and providing psychoeducation regarding any changes in functioning and compensatory strategies. This included sharing neuropsychological assessment results and suggested strategies with family members. This improved my skills in neuropsychological assessment and gave me experience of the WAIS-IV, WMS-IV, TEA, DKEFS, VOSP, BMIBP, Hayling & Brixton, BADS, and the modified WCST. Interventions also included CBT and/or supportive sessions for individuals who were experiencing adjustment difficulties or a mental health problem, such as anxiety or depression. In cases where the injury resulted in challenging behaviour, I also used a behavioural approach with the multidisciplinary team to understand and manage the behaviour. I developed and co-facilitated a Memory Group for individuals to develop compensatory strategies to manage their memory difficulties. I presented a training session to the MDT on active listening skills and working with people in distress.
Throughout each of my placements, I completed comprehensive risk assessments with individuals who were at risk to themselves or others, and collaboratively developed risk plans with the individual, which were regularly reviewed and updated. I ensured to inform my supervisor and the wider multi-disciplinary team where risk management was shared. I have been involved in Mental Capacity Act assessments and Best Interest Decision processes. I have also worked with individuals of different abilities, racial, cultural, religious, educational, and sexual orientation backgrounds.
### Year I Assessments

<table>
<thead>
<tr>
<th>ASSESSMENT</th>
<th>TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAIS</td>
<td>WAIS Interpretation (online assessment)</td>
</tr>
<tr>
<td>Practice Report of Clinical Activity</td>
<td>Cognitive Behaviour Therapy with a woman in her forties presenting with symptoms of depression.</td>
</tr>
<tr>
<td>Audio Recording of Clinical Activity with Critical Appraisal</td>
<td>Critical appraisal of an audio recording of a CBT intervention session for health anxiety with a man in his twenties.</td>
</tr>
<tr>
<td>Report of Clinical Activity N=1</td>
<td>Cognitive Behaviour Therapy with a man in his twenties presenting with symptoms of health anxiety.</td>
</tr>
<tr>
<td>Major Research Project Literature Survey</td>
<td>The association between Body Weight and Psychological Distress: Is the relationship mediated by self-concept?</td>
</tr>
<tr>
<td>Service-Related Project</td>
<td>An Audit of Psychological Therapy Provision for Service Users with a Diagnosis of Psychosis and Schizophrenia – Does the Service Comply with NICE Guidelines?</td>
</tr>
</tbody>
</table>

### Year II Assessments

<table>
<thead>
<tr>
<th>ASSESSMENT</th>
<th>TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPLD Process Account</td>
<td>Reflections on my experience as part of a PPLD group.</td>
</tr>
</tbody>
</table>

### Year III Assessments

<table>
<thead>
<tr>
<th>ASSESSMENT</th>
<th>TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presentation of Clinical Activity</td>
<td>Cognitive Behaviour Therapy based intervention with a man in his 80’s with emotion regulation difficulties.</td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td>------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Report of Clinical Activity</td>
<td>Assessment and treatment of a young female in her teens with anorexia nervosa using a compassion focused approach.</td>
</tr>
<tr>
<td>Final Reflective Account</td>
<td>On becoming a clinical psychologist: A retrospective, developmental, reflective account of the experience of training</td>
</tr>
</tbody>
</table>