

**The experience of compulsive exercise in individuals with an eating disorder:  
An Interpretative Phenomenological Analysis**

Thesis submitted in part fulfilment of the degree of

Doctorate in Clinical Psychology

(DClinPsy)

University of Leicester

By

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### **Declaration**

I confirm that this thesis and the research reported within it is an original piece of work and was written and submitted in part-fulfilment of the degree of Doctorate in Clinical Psychology. It has not been submitted for any other piece of work and was checked for errors prior to submission.

Jack Henry Roffe

# **The experience of compulsive exercise in individuals with an eating disorder: An Interpretative Phenomenological Analysis**

Jack Henry Roffe

## **Abstract**

Eating disorders are common mental health concerns that affect over 700,000 individuals in the UK. A common issue across eating disorder diagnoses is the engagement in compulsive exercise and this has been associated with the development and maintenance of eating disorders. Compulsive exercise can be one of the first symptoms to present and has been noted to impact negatively on treatment outcome. To try and explain this, researchers have focused on exploring the psychological factors, beliefs and motivations that might be associated with compulsive exercise, however, these studies have tended to rely on self-report measures.

The literature review aimed to explore the psychological factors that are associated with compulsive exercise in clinical (eating disorders) and non-clinical adolescents. Four electronic databases were searched and 16 studies met the inclusion criteria. The findings were not always consistent, however, there was evidence to suggest that compulsive exercise was associated with increased eating disorder symptomology, depression, anxiety, affect regulation, obsessionality, perfectionism and self-esteem across both clinical and non-clinical groups. However, due to the various methodologies used, further research is required to reliably establish the psychological factors associated to compulsive exercise in adolescents.

The empirical study aimed to explore the experiences of compulsive exercise in adult individuals diagnosed with an eating disorder. Semi-structured interviews were conducted with seven females diagnosed with anorexia nervosa and these were analysed using Interpretative Phenomenological Analysis. The analysis generated four superordinate themes and 13 corresponding sub-themes. The themes were discussed in relation to relevant psychological theory and previous research and the clinical implications and recommendations for future research also discussed.

The critical appraisal provides a reflection on the research process and includes the professional and personal development of the researcher from undertaking the study.

## **Acknowledgements**

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I pay tribute to my cohort. I am extremely grateful for being able to share this part of my life with such a great bunch of people. We've shared massive highs and occasional lows and it's been privilege to share them with you all. I'd especially like to acknowledge Mark and Therese for always being there for me, from early morning coffee and table tennis to late night quizzing. You've made me laugh (sometimes) and I can genuinely say that you are two of the most honest and loyal people that I have had the fortune of meeting.

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Finally, I wish to dedicate this work to the memory of my Grandad. I had the honour of sharing your wisdom, you had a massive influence on my career and taught me so much about the value of listening to and valuing people as individuals. I will forever treasure the conversations that we shared.

\* Names not presented to protect anonymity of the service

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## **Part One: Literature Review**

### **The psychological variables associated with compulsive exercise and disordered eating in adolescents: a systematic review**

*(Guidelines to authors for journal targeted for literature review can be found in Appendix A)*

## **Literature Review**

### **The psychological variables associated with compulsive exercise and disordered eating in adolescents: a systematic review**

By Jack Henry Roffe

#### **Abstract**

##### ***Aim***

This paper aimed to review the literature regarding the psychological factors that are associated with compulsive exercise in clinical (eating disorder) and non-clinical adolescents.

##### ***Background***

Compulsive exercise has been implicated in the development and maintenance of eating disorders and it is often one of the first symptoms to present. Adolescence is a risk period for the onset of an eating disorder and compulsive exercise is reported to be the most common compensatory behaviour presented by this group. Despite this, there is limited understanding about the psychological variables that are associated with exercise in this age-group.

##### ***Method***

A systematic literature search of four electronic databases (*PsychInfo, Scopus, Medline* and *Web of Knowledge*) was undertaken. A search strategy was developed and a specified inclusion criteria applied. A total of 16 studies met the inclusion criteria for the review. These were quality appraised and a narrative synthesis of the findings provided.

##### ***Results***

Several psychological variables were found to be associated with compulsive exercise across both clinical and non-clinical adolescents. The findings were not always consistent but there was evidence to suggest that compulsive exercise was linked to increased eating disorder symptomology, depression, anxiety, affect regulation, obsessionality, perfectionism and self-esteem.

##### ***Conclusions***

Adolescents with compulsive exercise were noted to present with increased levels of psychological distress. However, variation between exercise assessments and study methodologies limited the conclusions that could be made. Further research is required to reliably establish which psychological factors are associated with compulsive exercise in clinical and non-clinical adolescents.

## **1 Introduction**

### ***1.1 Background information***

Eating disorders (EDs) are severe mental health conditions that have significant rates of relapse, psychosocial impairment (Guarda, 2008; Micali & House, 2011; Morris, 2008) and mortality compared to other psychiatric conditions (NICE, 2004). The development of an ED is most prevalent during adolescence and particularly in young females (Hudson *et al.*, 2007; Sands, 2000; Swanson *et al.*, 2011). A common feature of ED diagnoses is ‘compensatory behaviours’ and these occur in response to anxious feelings about eating, whereby attempts are made to ‘undo’ food intake to influence body shape and weight. Compensatory behaviours take two forms purging (self-induced vomiting, laxative use) and non-purging (fasting, exercise), and both are associated with poorer outcomes and functional impairment (Dalle Grave *et al.*, 2009; Mitchell & Crow, 2006; Olmsted *et al.*, 1994; Stoving *et al.*, 2012).

### ***1.2 Compulsive exercise and eating disorders***

The benefits of exercise on health, well-being and quality of life are well documented (Deslandes *et al.*, 2009). However, from the earliest descriptions of EDs, clinicians have witnessed patients with an excessive drive to exercise (Gull, 1874) to accelerate weight loss and impede weight gain. This drive to exercise can complicate treatment as it can impact on prognosis, reduce relapse time and extend inpatient admission (Rigaud *et al.*, 2011; Solenberger, 2001; Strober *et al.*, 1997). Compulsive exercise has also been implicated in the development and maintenance of EDs and can be one of the first ED symptoms to present (Davis *et al.*, 1994).

### ***1.3 Compulsive exercise in eating disorders: prevalence and definitions***

Of those diagnosed with an ED over 80% will exercise in a highly-driven way during their lifetime (Shroff *et al.*, 2006). Compulsive exercise presents in up to 39% of Anorexia Nervosa (AN) adult patients and 23% of Bulimia Nervosa (BN) adult patients (Brewerton *et al.*, 1995). It has been noted in 16-85% of adolescent patients (Fietz *et al.*, 2014) and, in this group, it is considered as the most commonly used compensatory strategy (Stiles-Shields *et al.*, 2012).

The definition of ‘exercise’ and the terms used are inconsistent in the clinical literature and there is no common consensus about what constitutes problematic exercise (Shroff *et al.*, 2006). Terms such as ‘exercise addiction’, ‘exercise dependence’, ‘excessive exercise’ and ‘compulsive exercise’ are used interchangeably to capture the exercise characteristic of some patients. Irrespective of terminology, exercise definitions tend to be either quantitative or qualitative (Adkins & Keel, 2005). Typically, the term ‘excessive exercise’ refers to a quantitative definition, where the frequency, duration and intensity of exercise exceeds physical need and when the risk of injury increases (Davis & Fox, 1993). However, there is little consensus about how much is too much (Meyer & Taranis, 2011). The term ‘compulsive exercise’ is typically linked to a qualitative definition, where exercise is defined by its compulsivity. Individuals experience a rigid, driven urge to exercise where they feel unable to stop despite emaciation or injury (Taranis *et al.*, 2011). This compulsivity is motivated by appearance concerns and negative affect experienced from not exercising (Adkins & Keel, 2005). The ‘compulsive’ definition is considered more theoretically driven (Meyer & Taranis, 2011) and increased ED attitudes and behaviours are associated with ‘compulsive exercise’ across clinical and non-clinical populations (Adkins & Keel, 2005; Boyd *et al.*, 2007). Compulsive exercise has also been associated with increased physical health risks, including bone fractures (Haddad *et al.*, 1997) and changes to cardiac function (Olivares *et al.*, 2005).

#### ***1.4 Compulsive exercise and psychological comorbidity***

Given the implications that compulsive exercise has a role in the aetiology and maintenance of EDs, research has explored psychological variables that might help to explain the poorer treatment outcomes in this group. This has highlighted elevated levels of psychological distress in adults who present with compulsive exercise, across both clinical and non-clinical groups. Specifically, elevated levels of ED symptomology have been reported in those who compulsively exercise (Brewerton *et al.*, 1995; Shroff *et al.*, 2006; Solenberger, 2001; Taranis & Meyer, 2011). Compulsive exercise has also been associated with increased levels of depression (Bewell-Weiss & Carter, 2010; Davis, Woodside *et al.*, 1999; Penas-Lledo *et al.*, 2002; Shroff *et al.*, 2006), anxiety (Ackard *et al.*, 2002; Bamber *et al.*, 2000; Bewell-Weiss & Carter, 2010; Boyd *et al.*, 2007; Mond & Calogero., 2009), somatisation (Penas-Lledo *et al.*, 2002), narcissism

(Campbell & Waller, 2010), obsessive-compulsiveness (Young *et al.*, 2013), perfectionism (Ackard *et al.*, 2002; Paulson & Rutledge, 2014) and low self-esteem (Bamber *et al.*, 2000). Despite adolescence being a period of increased risk for the onset of an ED (Hudson *et al.*, 2007) and a period linked with the formation of exercise-related attitudes (Tremblay & Lariviere, 2009), research has not clearly defined the psychological variables associated with compulsive exercise in clinical and non-clinical adolescents.

### **1.5 Previous literature reviews**

Davis (1997) reviewed the animal and clinical literature on the psychobiological connections between high-level exercise and starvation. They concluded that psychosocial variables, such as obsessive-compulsiveness, body image perception, social-comparison, self-criticism and perfectionism were important factors in excessive exercise and were implicated in the onset and maintenance of EDs.

Young *et al.* (2013) reviewed the relationship between obsessive-compulsive disorder (OCD) and obsessive-compulsive personality disorder (OCPD) traits in adults diagnosed with AN (Young *et al.*, 2013). They found that OCPD traits were associated with compulsive exercise, but the findings for OCD were inconclusive. They concluded that future research needed to utilise comprehensive clinical tools and address prognostic and treatment factors for those presenting with compulsive exercise and OCPD.

Meyer *et al.* (2011) conducted a comprehensive review of the clinical and non-clinical literature and then developed what they considered to be an empirically supported model. This model has been influential in the development of interventions for compulsive exercise. The review consisted of two literature searches. First, predictors and correlates of compulsive exercise were identified in adults diagnosed with an ED. This linked compulsive exercise with eating pathology, obsessive-compulsiveness, affect regulation and perfectionism. These correlates were incorporated into a preliminary model which was then validated in a second literature review of non-clinical groups. The second review associated compulsive exercise with the same

psychological correlates as clinical samples. The studies reviewed primarily consisted of young adult female samples.

Fietz *et al.* (2014) investigated the prevalence and psychopathological correlates of compulsive exercise in adolescents diagnosed with an ED. They found that the prevalence of compulsive exercise ranged from 16.7% to 85.3%. Compulsive exercise was associated with increased ED pathology and anxiety but the findings were inconsistent in relation to depression and obsessive-compulsiveness. However, only four of the eleven studies that were reviewed considered associated psychopathology and this limited the conclusions that could be made.

### **1.6 Rationale**

Meyer *et al.* (2011) suggested that the psychological variables related to compulsive exercise are consistent across clinical and non-clinical adults. Fietz *et al.* (2014) examined the psychological variables associated with compulsive exercise in clinical adolescent groups. Adolescence is a risk period for the onset of an ED and compulsive exercise can be one of the first symptoms to present. No review has attempted to explore the psychological variables associated with compulsive exercise in clinical and non-clinical adolescents in order to inform treatment and develop a better understanding of the psychological issues associated with compulsive exercise.

### **1.7 Aims**

The aims of the current review were to systematically explore the literature regarding the psychological variables associated with compulsive exercise in clinical and non-clinical adolescents and synthesise the findings.

## **2 Method**

### **2.1 Search Strategy**

A computerised literature search was undertaken during November 2016 using *PsychInfo*, *Scopus*, *Medline* and *Web of Knowledge* and limited to peer-reviewed studies available in English language. Search terms were derived from the current review aims and incorporated strategies from previous reviews (Meyer *et al.*, 2011; Fietz *et al.*, 2014). ‘Exercise’ terms were combined with those relating to ‘eating

disorders’ and ‘adolescents’ (See Appendix B for search criteria). A grey literature search using *Google Scholar* and a visual reference list scan of key studies was also undertaken.

## **2.2 Inclusion and exclusion criteria**

Studies were included in the current review if (a) participants were 18 or younger at the time of recruitment, (b) participants were diagnosed with an ED based on DSM/ICD criteria or used a reliable ED measure with non-clinical populations, (c) ‘exercise’ was assessed either quantitatively or qualitatively, (d) psychological variables were assessed using reliable measures or methods. Studies were excluded if they recruited participants from sporting populations as the type of sport engaged in has been shown to influence eating behaviour (Engel *et al.*, 2003). In addition, binge eating disorder or obesity studies were excluded as these weren’t the focus of the current review. The current review used the term ‘compulsive exercise’ for studies that used a qualitative assessment of exercise and ‘excessive exercise’ for studies that used a quantitative assessment of exercise. Where this was unclear, ‘compulsive exercise’ was used.

## **2.3 Study selection**

The results of the search and selection process are represented in Figure.1. The initial search returned 6238 articles which was reduced to 4039 once duplicates were removed. Titles and abstracts were screened and those not related to disordered eating and compulsive exercise were excluded. Commentaries, literature reviews, treatment guidelines, policy documents and case studies were also excluded. The full texts of 125 articles were retrieved. These were screened against the inclusion/exclusion criteria and a total of 16 papers met the criteria for the review.



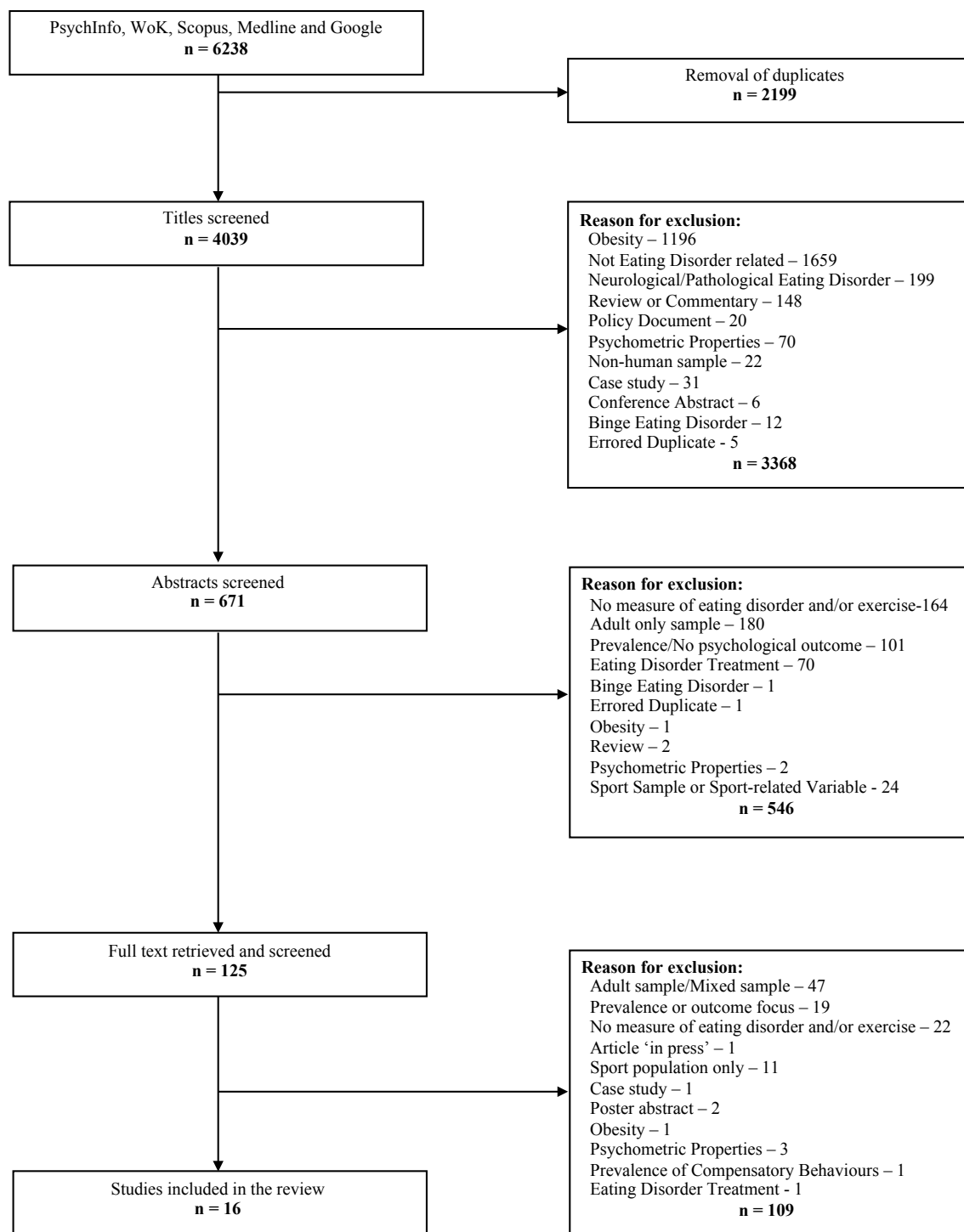


Figure 1: Flow diagram of study selection process

## **2.4 Quality assessment**

Following Fietz *et al.* (2014), a modified version of the Downs & Black Quality Index (1998) as amended by Ferro and Speechley (2009) was used to assess study quality. The Downs & Black Quality Index is a widely-used reliable measure that assesses the methodological quality of randomised and non-randomised research (Downs & Black, 1998). This modified version removes items related to randomised controlled trials (RCTs), as no studies in the current review were RCTs. The modified version had 15 items, compared to the original 27 items and each are scored as either ‘yes’ (1 point) or ‘no/unable to rate’ (0 points) resulting in three subscales; reporting, external validity and internal validity, with one item assessing study power. Based on the sum of these items, the quality of a study can be classified into one of four categories; ‘poor’, ‘fair’, ‘good’ or ‘excellent’. It was anticipated that there would be a limited amount of relevant studies available and therefore only studies that were considered as ‘poor’ were excluded from the review. The current review was therefore mindful that there was potential for a range of quality in the reviewed studies and that any studies identified as being of weaker quality would have to be interpreted with increased levels of caution. See Appendix C for a summary of the quality appraisal.

## **2.5 Data extraction and synthesis**

Data from the studies, which included study characteristics, methodology, participants, results and risks of bias, was extracted into the Cochrane Public Health Group Data Extraction and Assessment Template (Cochrane Public Health Group, 2011). A meta-analysis was not possible due to the heterogeneity of participants and measures. A narrative synthesis providing summaries of the study design, sample, findings and quality was used.

# **3 Results**

## **3.1 General description**

The 16 studies in the current review were published between 1998 and 2016, Appendix D and E summarises the study characteristics, methodologies and results. Seven of the studies had clinical samples and eight had non-clinical samples. One study had a mixed-sample (Wade & O’Shea, 2015) and used three waves of data from a female twin registry. Twins were interviewed over the telephone using the Eating Disorder

Examination (EDE; Fairburn & Cooper, 1993) and classified into one of four groups: no ED, AN, atypical-AN, or ‘restrictive and/or exerciser (RED)’. The RED group did not meet DSM-5 criteria for a threshold ED but presented with driven-exercise or fasting.

A cross-sectional design was used in eleven studies and five studies were longitudinal. The only longitudinal study that contained any clinical participants was the mixed-sample study. The total number of participants in the review was 9052, 63% of which were girls and ages ranged from 10-18 years. The sample size of the studies ranged from 30 to 1,670. Only two of the clinical studies included boys (Stiles-Shields *et al.*, 2011; Swenne, 2016). Four focused on adolescents diagnosed with AN, the remaining three studies included a range of diagnoses (AN, BN, Eating Disorder Not Otherwise Specified). All the participants in the non-clinical studies were recruited from schools. The studies were conducted in several countries: USA (five studies), Australia (four), UK (three), Poland (one), Canada (one), Germany (one) and Sweden (one).

### **3.2 Measures**

Methods used to assess psychological variables and exercise status across the studies, included: self-report questionnaires, clinical observations, structured interviews and specifically developed questions. Terms to describe exercise and methods to assess it varied between qualitative and quantitative definitions and Appendix F summarises these for the individual studies. Various standardised measures for assessing psychological variables were also used and these are detailed in Appendix E.

### **3.3 Main findings**

The specified aims of the current review directed the summary. The findings of the studies have been grouped by psychological variable with the clinical findings presented first which are immediately followed by the non-clinical findings. Any psychological variables that were infrequently reported and any non-psychological variables that were significant in the studies are summarised in Appendix G. The study by Wade and O’Shea (2015) has been presented in the non-clinical findings as the study focused on those who had not been diagnosed with an ED. Quality of the studies is then summarised.

### **3.4 Compulsive exercise and eating disorder symptomology**

#### **3.4.1 Clinical studies**

Five of the seven clinical studies explored the relationship between ED symptomology and compulsive exercise. The findings of these are summarised.

##### *Global ED symptomology*

With respect to global ED symptomology, three of the four studies that investigated this found a significant relationship to compulsive exercise. Noetel *et al.* (2016) reported that ED symptomology was positively associated with compulsive exercise in adolescents diagnosed with AN and it was also a significant predictor of the variance in compulsive exercise. Similarly, Stiles-Shields *et al.* (2011) found the same association across ED diagnoses. A positive association was also found in relation to excessive exercise by Madison and Ruma (2003) but this was moderated by athletic involvement. Contrastingly, Swenne (2016) found that there was no difference in the severity of ED symptomology between compulsive and non-compulsive exercisers.

##### *Food restriction*

Two studies investigated the relationship between food restriction and exercise and both reported significant findings. Holtkamp *et al.* (2004) found that food restriction contributed significantly to the variance in physical activity level. Likewise, Swenne (2016) reported that compulsive exercisers scored significantly higher on 'weight control' exercise which was predicted by food restraint.

##### *Bulimic attitudes*

Madison and Ruma (2003) found that higher levels of physical activity was associated with higher levels of bulimic attitudes, but this was moderated by athletic involvement.

##### *Body image*

Two studies found contrasting findings in relation to exercise and body image. Madison and Ruma (2003) reported that higher levels of physical activity was related to higher body disapproval across ED diagnoses. However, Holtkamp *et al.* (2004) found that body ideal was not associated with exercise level in AN patients.

### 3.4.2 *Non-clinical studies*

All nine of the non-clinical studies explored the relationship between ED symptomology and compulsive exercise. The findings of these are summarised.

#### *Global ED symptomology*

Two studies investigated the relationship between compulsive exercise and ED symptomology and both reported significant findings. Bentley *et al.* (2015) found that a range of 'ED features' positively correlated with excessive exercise in boys and girls, except for subjective binge eating in boys, which was not associated. Similarly, Wade and O'Shea (2015) found that girls that presented with excessive exercise had more severe ED symptomology across three time-points than controls.

#### *Bulimic attitudes*

Four studies investigated the relationship between compulsive exercise and bulimic attitudes. Three studies reported that bulimic attitudes did not predict compulsive exercise level (Goodwin *et al.*, 2011; Goodwin *et al.*, 2012; Goodwin *et al.*, 2014). However, Brehm and Steffen (1998) found that compulsive exercisers scored significantly higher on bulimic attitudes than non-compulsive exercisers.

#### *Body image*

Six studies investigated the relationship between body image and compulsive exercise and three found no significant findings. Specifically, Brehm and Steffen (1998) found comparable levels of body dissatisfaction between compulsive and non-compulsive exercisers. Similarly, Goodwin *et al.* (2012) found that body dissatisfaction did not predict compulsive exercise level and this was replicated over a 24-month period (Goodwin *et al.*, 2014).

However, three studies found significant relationships between compulsive exercise and body image. McCabe and Ricciardelli (2006) aimed to determine the predictors of compulsive over a 16-month period. They found that changes to the importance boys and girls placed on their body image predicted increases to compulsive exercise. Similarly, Wade and O'Shea (2015) found that girls who presented with excessive exercise scored significantly higher on body dissatisfaction and shape concerns than

controls. Bentley *et al.* (2015) found that shape overvaluation was positively associated with excessive exercise.

### *Drive for thinness*

Seven of the nine non-clinical studies investigated the relationship between drive for thinness and compulsive exercise and only Goodwin *et al.* (2014) reported no significant findings. Specifically, drive for thinness did not predict compulsive exercise level over a 24-month period in boys or girls.

Conversely, drive for thinness was significantly higher in boys and girls who compulsively exercised (Brehm & Steffen, 1998) and was significantly higher in girls who presented with excessive exercise compared to controls (Wade & O'Shea, 2015). Two studies reported that 'drive for thinness' was the largest, and only EDI-2 predictor, of the variance in compulsive exercise (Goodwin *et al.*, 2011; Goodwin *et al.*, 2012). Moreover, Davis *et al.* (2016a) and Davis *et al.* (2016b) used trajectory analysis to determine the predictors of compulsive exercise in boys and girls respectively. After 3-years they found that 'highly driven' exercisers had greater expectations that life would improve through thinness. However, at the start of the study, girls were more likely to have higher thinness expectancies if they were in a 'decreasing exercise' group. This highlighted the links between the continued pursuit of thinness and compulsive exercise.

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### Summary of the main findings related to eating symptomology and compulsive exercise

<b>Clinical studies</b>	<ul style="list-style-type: none"> <li>• Global ED symptomology was positively associated with compulsive/excessive exercise.</li> <li>• Food restriction contributed to the variance in physical activity level.</li> <li>• The level of food restriction was higher in compulsive exercisers.</li> <li>• Bulimic attitudes were positively associated with excessive exercise.</li> <li>• The findings related to body image and excessive exercise were mixed.</li> </ul>
<b>Non-clinical studies</b>	<ul style="list-style-type: none"> <li>• Global ED symptomology was positively associated with excessive exercise.</li> <li>• Global ED symptomology was higher in excessive exercisers.</li> <li>• Level of bulimic attitudes did not predict compulsive exercise level.</li> <li>• But, compulsive exercisers reported a higher level of bulimic attitudes.</li> <li>• The findings related to body image and compulsive exercise were mixed.</li> <li>• Drive for thinness was positively associated with compulsive exercise and was a predictor of its variance.</li> </ul>

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*Table 1: Summary table of ED symptomology findings*

### 3.5 Psychological variables and compulsive exercise

The studies explored the relationship between compulsive exercise and several psychological variables. Only the main themes of depression, anxiety, emotional regulation, obsessive-compulsiveness, perfectionism and self-esteem are summarised. Those less commonly reported and significant are summarised in Appendix G.

### 3.6 Depression

#### 3.6.1 Clinical studies

With respect to the relationship between depressive symptoms and compulsive exercise, the findings were inconsistent. Four of the seven clinical studies explored this relationship and two found significant findings. Stiles-Shields *et al.* (2011) reported that higher levels of depressive symptoms were associated with a greater frequency of compulsive exercise across ED diagnoses. Similarly, Noetel *et al.* (2016) reported a significant positive association between compulsive exercise and depressive symptoms amongst female inpatients diagnosed with AN. Madison and Ruma (2003) suggested that athletic involvement moderated the relationship between depression and excessive exercise, with athletic involvement being a protective factor. However, depressive

symptoms did not contribute significantly to the variance in compulsive exercise (Noetel *et al.*, 2016) or excessive exercise level (Holtkamp *et al.*, 2004) in AN patients. Holtkamp *et al.* (2004) also reported that depressive symptoms were not associated with exercise level.

### 3.6.2 *Non-clinical studies*

The findings in the non-clinical studies were also inconsistent. Six of the nine non-clinical studies explored the relationship between depressive symptoms and compulsive exercise and three reported significant findings. Bentley *et al.* (2015) assessed psychological distress, a measure of depression and anxiety symptoms, and found that psychological distress was positively associated with excessive exercise. Davis *et al.* (2016a) and Davis *et al.* (2016b) explored whether ongoing driven exercise engagement was associated with depressive symptoms in boys and girls respectively. After 3-years, they reported that higher levels of depressive symptoms presented in highly driven exercising boys and girls. For girls, at the start of the study, higher depressive symptoms predicted membership in a 'decreasing exercise group'. It was concluded that the continued pursuit of exercise might have contributed to increased depressive symptoms.

In contrast, McCabe and Ricciardelli (2006) explored the predictors of compulsive exercise over a period of 16-months. In girls, they found that changes to depression negatively predicted changes to compulsive exercise after 16-months, no relationship was found in boys. Accordingly, Goodwin *et al.* (2011) found that depressive symptoms did not predict compulsive exercise level in a cross-sectional design or after 24-months (Goodwin *et al.*, 2014).



<b>Summary of the main findings related to depression and compulsive exercise</b>	
<b>Clinical studies</b>	<ul style="list-style-type: none"> <li>• Depressive symptoms were positively associated with compulsive exercise.</li> <li>• Depressive symptoms were higher in compulsive exercisers.</li> <li>• Depressive symptoms did not contribute significantly to the variance in compulsive/excessive exercise level in AN patients.</li> <li>• Athletic involvement was a protective factor</li> </ul>
<b>Non-clinical studies</b>	<ul style="list-style-type: none"> <li>• Mixed findings were reported.</li> <li>• Three studies found a positive association between exercise and depressive symptoms, but, three did not.</li> <li>• Changes to depression negatively predicted changes to compulsive exercise over a 16-month period.</li> <li>• Depressive symptoms did not predict compulsive exercise level.</li> <li>• However, over 3-years the continued pursuit of exercise might have contributed to increased depressive symptoms in girls.</li> </ul>

Table 2: Summary table of depressive symptoms findings

### 3.7 Emotional regulation

#### 3.7.1 Clinical studies

None of the clinical studies explicitly explored the relationship between compulsive exercise and emotional regulation. However, two studies used the Compulsive Exercise Test (Taranis *et al.*, 2011) which has two subscales related to affect: ‘avoidance and rule driven behaviour’ and ‘mood improvement’. Swenne (2016) found that the ‘avoidance and rule driven behaviour’ and the ‘mood improvement’ subscales were predicted by a range of psychological and personal variables. They concluded that adolescents with an ED might exercise to avoid low mood and to lift mood. In contrast, Noetel *et al.* (2016) found that anxiety, depression and obsessive-compulsiveness were all positively associated with the ‘avoidance and rule driven behaviour’ subscale but not the ‘mood improvement’ subscale. They concluded that compulsive exercise was reinforced by neutralising or avoiding internal distress rather than being reinforced by lifting mood.

#### 3.7.2 Non-clinical studies

One non-clinical study explored the relationship between functional and dysfunctional emotional regulation styles and compulsive exercise. Goodwin *et al.* (2012) found that in boys ‘internal functional’, ‘internal dysfunctional’ and ‘external functional’ emotional regulation styles explained 8% of the variance in compulsive exercise level. In girls both the internal emotional regulation styles explained 7% of the variance in compulsive exercise.

<b>Summary of the main findings related to emotional regulation and compulsive exercise</b>	
<b>Clinical studies</b>	<ul style="list-style-type: none"> <li>• Explored through the Compulsive Exercise Test subscales rather than explicitly.</li> <li>• Exercise was used to lift mood and avoid internal distress associated with not exercising.</li> </ul>
<b>Non-clinical studies</b>	<ul style="list-style-type: none"> <li>• Internal functional/dysfunctional and external functional emotional regulation styles were significant predictors of compulsive exercise level in boys.</li> <li>• Both internal emotional regulation styles contributed to predict compulsive exercise score in girls.</li> </ul>

Table 3: Summary table of emotional regulation findings

### 3.8 Anxiety

#### 3.8.1 Clinical studies

Three of the seven clinical studies explored the association between anxiety and compulsive exercise and all of them demonstrated significant links. Holtkamp *et al.* (2004) found that adolescents diagnosed with AN who had higher levels of exercise also reported higher levels of anxiety. Similarly, Noetel *et al.* (2016) found a significant positive association between compulsive exercise and anxiety in a group of inpatients diagnosed with AN. Madison and Ruma (2003) replicated these findings across ED diagnoses but the relationship was moderated by athletic involvement, which was a protective factor. Further, Noetel *et al.* (2016) and Holtkamp *et al.* (2004) found that anxiety contributed significantly to the variance in compulsive exercise and exercise level respectively.

#### 3.8.2 Non-clinical studies

The relationship between anxiety and compulsive exercise was investigated in four non-clinical studies and the findings were inconsistent. Bentley *et al.* (2015) found that psychological distress was positively associated with excessive exercise in boys and girls. Similarly, Wade and O'Shea (2015) noted that adolescent girls who presented with excessive exercise had a greater sensitivity towards feelings of anxiety. However, two studies found contrasting findings. Goodwin *et al.* (2011) investigated general and social physique anxiety and they found that neither were predictors of compulsive exercise. Further, Goodwin *et al.* (2014) found that in boys, after 24-months, lower levels of anxiety contributed to predict higher compulsive exercise level. It was

hypothesised that this could relate to the anxiolytic effect that exercise has in non-clinical groups.

<b>Summary of the main findings related to anxiety and compulsive exercise</b>	
<b>Clinical studies</b>	<ul style="list-style-type: none"> <li>• Anxiety was positively associated with compulsive/excessive exercise.</li> <li>• Anxiety was higher in excessive exercisers.</li> <li>• Anxiety was a predictor of the variance in compulsive/excessive exercise level.</li> </ul>
<b>Non-clinical studies</b>	<ul style="list-style-type: none"> <li>• Mixed findings were reported.</li> <li>• Anxiety was positively associated with excessive exercise (two studies).</li> <li>• One study found that anxiety did not predict compulsive exercise.</li> <li>• One study found that anxiety negatively predicted compulsive exercise score in boys after 24-months.</li> </ul>

Table 4: Summary table of anxiety findings

### 3.9 Obsessive-compulsiveness

#### 3.9.1 Clinical studies

Four clinical studies examined the association between obsessive-compulsiveness and compulsive exercise. Three studies found that it positively related to compulsive exercise. Davis, Katzman *et al.* (1999) examined obsessive-compulsive personality traits in female adolescents diagnosed with AN. They found that these traits were related to ‘commitment to exercise attitudes’ but not to exercise level. They concluded that these traits influenced exercise behaviour through exercise attitudes. Similarly, Blachno *et al.* (2016) found that OCD symptoms were positively associated with specific activities that targeted weight loss amongst patients diagnosed with AN. Although not reaching significance, they also reported a positive trend between obsessive-compulsiveness and increased exercise level ( $p = 0.07$ ). Similarly, Noetel *et al.* (2016) found that obsessive-compulsive symptoms were significantly associated with compulsive exercise. However, obsessive-compulsiveness did not contribute significantly to the variance in compulsive (Noetel *et al.*, 2016) or excessive (Holtkamp *et al.*, 2004) exercise level in AN patients.

### 3.9.2 Non-clinical studies

Three of the non-clinical studies explored the relationship between obsessive-compulsiveness and compulsive exercise and they all demonstrated significant relationships. Wade and O'Shea (2015) found that girls who presented with excessive exercise placed more importance on doing things correctly and abiding to strict routines than controls. Similarly, Goodwin *et al.* (2011) found that obsessive-compulsiveness was a significant predictor of the variance in compulsive exercise score for boys and girls, and it remained a predictor in boys after 24-months (Goodwin *et al.*, 2014). They concluded that obsessive-compulsiveness contributed to increased compulsive exercise over time and was not just associated with it.

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#### Summary of main findings related to obsessive-compulsiveness and compulsive exercise

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<b>Clinical studies</b>	<ul style="list-style-type: none"> <li>• Three studies found a significant positive association between obsessive-compulsive personality/symptoms and excessive/compulsive exercise.</li> <li>• One study reported that this related to exercise attitudes rather than exercise frequency.</li> <li>• Obsessive-compulsiveness did not predict compulsive or excessive exercise in AN patients.</li> </ul>
<b>Non-clinical studies</b>	<ul style="list-style-type: none"> <li>• Obsessive-compulsiveness was positively associated to compulsive exercise.</li> <li>• Girls who excessively exercised placed more importance on doing things correctly/abiding to routines.</li> <li>• Obsessive-compulsiveness contributed to the variance in compulsive exercise level in boys and girls (cross-sectional) and it remained a predictor for boys after 24-months.</li> </ul>

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Table 5: Summary table of obsessive-compulsiveness findings

### 3.10 Perfectionism: non-clinical studies

None of the clinical studies examined the relationship between perfectionism and compulsive exercise but four of the non-clinical studies did and all found significant associations. High personal standards and expectations were positively correlated to compulsive exercise, although scores were comparable between compulsive and non-compulsive exercisers (Brehm & Steffen, 1998). In contrast, Wade and O'Shea (2015) found that perfectionistic personal standards were significantly higher in excessive exercisers compared to controls. These differences might be explained through the assessment and definitions of exercise used by the two studies. Goodwin *et al.* (2011) explored two constructs of perfectionism, 'self-oriented' and 'socially-prescribed'

perfectionism. They found that both constructs were significant predictors of the variance in compulsive exercise in boys, with ‘self-oriented’ perfectionism being the larger predictor. In girls, only ‘self-oriented’ perfectionism was a predictor of the variance in compulsive exercise level. Goodwin *et al.* (2014) demonstrated that, after 24-months, boys’ level of ‘self-oriented’ perfectionism remained a significant predictor of compulsive exercise, although the same was not found in girls.

<b>Summary of main findings related to perfectionism and compulsive exercise</b>	
<b>Clinical studies</b>	<ul style="list-style-type: none"> <li>• Not investigated in the clinical studies</li> </ul>
<b>Non-clinical studies</b>	<ul style="list-style-type: none"> <li>• Perfectionism was positively associated with compulsive exercise.</li> <li>• Compulsive exercisers scored comparably to non-compulsive exercisers on level of perfectionism.</li> <li>• Excessive exercisers scored higher than non-excessive exercisers on level of perfectionism.</li> <li>• In boys, ‘self-oriented’ and ‘socially prescribed’ perfectionism were predictors of compulsive exercise level and ‘self-oriented’ perfectionism remained a predictor after 24-months.</li> <li>• In girls, ‘self-oriented’ perfectionism was a predictor of compulsive exercise level (cross-sectional), although this did not remain a predictor after 24-months.</li> </ul>

Table 6: Summary table of perfectionism findings

### 3.11 Self-Esteem

#### 3.11.1 Clinical study

Noetel *et al.* (2016) found that higher levels of compulsive exercise were associated with lower levels of self-esteem.

#### 3.11.2 Non-clinical study

None of the non-clinical studies explicitly explored self-esteem. However, Wade and O’Shea (2015) measured ‘ineffectiveness’ which reflects an individual feeling inadequate or worthless. They found that excessive exercisers had elevated feelings of ineffectiveness compared to controls.

### 3.12 Overall quality of the studies

The modified version of the Downs and Black Quality Index (1998) has a maximum score of 15. Each study was appraised and assigned a grade of ‘excellent’ (13-15 points), ‘good’ (10-12 points), ‘fair’ (8-9 points), ‘poor’ (<8); see Table 7. These

categories were determined pro-rata based on categories formed for the full Quality Index (O'Connor *et al.*, 2015). Simply, each of their categories was calculated as a percentage of the maximum score and the ranges then guided the formation of the categories for the current review.

<b>Author</b>	<b>Quality Index Score</b>	<b>Categorisation of study quality</b>
Bentley <i>et al.</i> (2015)	12	Good
Blachno <i>et al.</i> (2016)	8	Fair
Brehm & Steffen (1998)	12	Good
Davis, Katzman <i>et al.</i> (1999)	10	Good
Davis <i>et al.</i> (2016a)	12	Good
Davis <i>et al.</i> (2016b)	13	Excellent
Goodwin <i>et al.</i> (2011)	11	Good
Goodwin <i>et al.</i> (2012)	11	Good
Goodwin <i>et al.</i> (2014)	11	Good
Holtkamp <i>et al.</i> (2004)	11	Good
Madison and Ruma (2003)	12	Good
McCabe & Ricciardelli (2006)	13	Excellent
Noetel <i>et al.</i> (2016)	13	Excellent
Stiles-Shields <i>et al.</i> (2011)	11	Good
Swenne (2016)	12	Good
Wade and O'Shea (2015)	12	Good

Table 7: Quality appraisal score and categorisation

The quality appraisal indicated that the studies ranged from 'fair' ( $n=1$ ) to 'excellent' ( $n=3$ ), with most of the studies falling in the 'good' category ( $n=12$ ). The studies scored highly on the 'reporting' subscale with only one study deemed to not clearly describe the participants' characteristics or provide estimates of variability (Blachno *et al.*, 2016). However, seven studies failed to provide response rates and eight did not report actual probability values. The external validity was limited by the samples being unrepresentative of the population. Many of the clinical studies had participants who were Caucasian girls that were seeking treatment at specific hospitals or treatment centres and were primarily diagnosed with AN. Of the 950 adolescents in the clinical studies only 47 were male (5%). Similarly, most of the non-clinical studies recruited from select schools which mainly represented Caucasian boys and girls. All the studies

were conducted in developed countries. Thus, raising questions about the generalisability of the findings across ethnicities, gender and ED diagnoses. Fifteen of the studies used reliable and valid measures, however, there was significant diversity in the measures that were used to assess the same psychological construct, making it difficult to reliably synthesise the findings. Most of the studies appeared to have good sample sizes, however, only one study provided a power calculation (Noetel *et al.*, 2016). It is possible that studies did not achieve sufficient power to find additional significant findings.

## **4 Discussion**

The current review aimed to explore the relationship between psychological variables and compulsive exercise in clinical and non-clinical adolescents. The findings are complex but the review has demonstrated associations and increased psychological distress in adolescent compulsive exercisers, including: aspects of ED symptomology, depression, affect regulation, anxiety, obsessive-compulsiveness, perfectionism and self-esteem.

### ***4.1 Eating disorder symptomology***

In clinical groups, compulsive exercise was linked with increased general eating concerns, food restriction and bulimic attitudes, with mixed findings related to body image. Similarly, in non-clinical groups, compulsive exercise was linked with general eating concerns and drive for thinness, with mixed findings related to bulimic attitudes and body image. A drive for thinness is a fundamental characteristic of ED presentation (Bruch, 1982) and most associated to those diagnosed with AN. Further, compulsive exercise is most prevalent in AN patients (Brewerton *et al.*, 1995). Within the current review, drive for thinness was repeatedly linked to compulsive exercise in non-clinical groups and this might be an important indicator for the risk of ED development (Goodwin *et al.*, 2011). Previous literature reviews have also demonstrated that aspects of eating symptomology are increased in compulsive exercisers (Fietz *et al.*, 2014), including amongst non-clinical groups (Meyer *et al.*, 2011).

### ***4.2 Depression***

The findings related to depression and compulsive exercise yielded inconsistent results. In the clinical studies, depression was more commonly found to be associated with

compulsive exercise, including across ED diagnoses (Noetel *et al.*, 2016; Stiles-Shields *et al.*, 2011). However, depression did not contribute significantly to the variance in compulsive or excessive exercise level in AN patients. These differences might be related to the analysis used and the diagnoses studied, as Stiles-Shields *et al.* (2011) only examined associations and their sample consisted of the three main ED diagnoses. Conflicting findings were also reported in the non-clinical studies. Three studies reported a positive relationship between depressive symptoms and compulsive exercise, however two studies reported that depression did not predict changes to compulsive exercise. Further, one study found that lower levels of depression contributed to greater compulsive exercise (McCabe & Ricciardelli, 2006). In the adult literature, there are well established links between depression and compulsive exercise (Bamber *et al.*, 2000; Penas-Lledo *et al.*, 2002). This has not been reliably established in the adolescent literature and the current inconsistent findings are in line with those presented in a previous review (Fietz *et al.*, 2014).

#### **4.3 Affect regulation**

Although the relationship between emotional regulation and compulsive exercise was only explored in three studies, the findings were consistent. In clinical groups, exercise was motivated to avoid unwanted emotional experiences associated with not exercising (Noetel *et al.*, 2016; Swenne, 2016) and to lift mood (Swenne, 2016). In non-clinical groups, compulsive exercise was associated with both functional and dysfunctional emotional regulatory strategies, although functional regulatory styles were the strongest predictors of compulsive exercise (Goodwin *et al.*, 2012). Previous literature has suggested that non-clinical groups are more likely to use exercise for positive mood-related reasons, whereas clinical groups tend to use exercise to avoid difficult emotional states (De Young & Anderson, 2006).

The compulsive exercise model proposed by Meyer *et al.* (2011) identified ‘affect regulation’ as a maintenance factor, whereby exercise is positively reinforced by lifting mood or negatively reinforced by avoiding difficult emotional states associated with not exercising, such as anxiety and guilt (Bamber *et al.*, 2000). Both the clinical studies associated compulsive exercise with negative reinforcement. In non-clinical groups, it might be that exercise starts as a ‘functional’ strategy to counteract low mood and



develop into a compulsive behaviour as individuals become unable to find alternative coping strategies (Adams *et al.*, 2003). Similarly, ‘internal dysfunctional’ strategies were also used by those with higher levels of compulsive exercise (Goodwin *et al.*, 2012) and it could be that those with compulsive attitudes to exercise become more dependent on using exercise to deal with their emotions alone, in an avoidant manner.

#### **4.4 Anxiety**

In the clinical studies, increased levels of anxiety were consistently related to compulsive exercise, yet, the findings were mixed in the non-clinical studies. This difference might represent a distinguishing feature of those diagnosed with an ED who compulsively exercise. Specifically, those with an ED might experience higher levels of psychological distress. Alternatively, in non-clinical groups, the anxiolytic effect of exercise might be used positively to control anxiety. This has been evidenced across other ‘healthy’ individuals whereby exercise has served to reduce anxiety (Hale & Raglin, 2002). In clinical adult samples, there have been reliable established links between higher levels of anxiety in compulsive exercisers (Brewerton *et al.*, 1995; Penas-Lledo *et al.*, 2002) and the reviewed adolescent clinical studies are consistent with this.

#### **4.5 Obsessive-compulsiveness**

Most of the clinical studies found that obsessive-compulsiveness was related to compulsive exercise. However, obsessive-compulsiveness was not a significant predictor of the variance in compulsive exercise. A key finding was that obsessive-compulsive personality traits influenced exercise attitudes and not exercise frequency which highlights the importance for clinicians to gain an understanding of the function attached to exercise (Adkins & Keel, 2002). In the non-clinical studies, obsessive-compulsiveness was found to be associated with compulsive exercise and, in boys, contributed to increased compulsive exercise over a 2-year period. Obsessive-compulsive personality traits have been associated with adult compulsive exercise and EDs (Davis, 1997; Penas-Lledo *et al.*, 2002; Young *et al.*, 2013). The model of compulsive exercise (Meyer *et al.*, 2011) linked this compulsivity to feelings of guilt and the avoidance of perceived consequences of not exercising. Interventions could

consider incorporating OCD treatment principles into exercise interventions, which might help to break the compulsivity attached to exercise.

#### **4.6 Perfectionism**

Perfectionism is a trait linked to ED presentation (Bruch, 1973) and those diagnosed with an ED often report higher levels (Bulik *et al.*, 2003). Perfectionism has also been noted in the sport and exercise literature (Flett & Hewitt, 2005) and in the model of compulsive exercise put forward by Meyer *et al.* (2011). Despite this, perfectionism was not explored by any of the clinical studies, but its importance noted in the non-clinical studies. Specifically, compulsive exercisers experienced high levels of self-imposed standards and perfectionism contributed to increases in compulsive exercise over 2-years (Goodwin *et al.*, 2014). The adult literature has acknowledged the importance of perfectionism in compulsive exercise (Ackard *et al.*, 2002; Davis, 1997; Shroff *et al.*, 2006) and these findings need to be replicated in clinical adolescent groups.

#### **4.7 Self-esteem**

Only one clinical study explored self-esteem which makes it difficult to draw any reliable conclusions about its relationship to compulsive exercise. In that study, lower levels of self-esteem were associated with higher compulsive exercise. This finding has also been noted in the adult clinical literature (Bamber *et al.*, 2000). However, this should be interpreted with caution as findings in the adult literature have also noted that patients diagnosed with AN who compulsively exercise might present with higher levels of self-esteem (Bewell-Weiss & Carter, 2010). This difference might be related to the increased feelings of self-worth associated with pride, achievement and the positive feedback obtained following changes to appearance.

#### **4.8 Limitations of reviewed studies**

Only seven clinical studies and one mixed-sample study explored psychological variables and compulsive exercise in adolescents and four of these were included in a previous review (Fietz *et al.*, 2014). Only three additional papers were identified in the current review and so further research in this area is required, particularly exploring the relationship between perfectionism, self-esteem and compulsive exercise.

Several non-clinical studies reported ‘subclinical’ levels of compulsive exercise, disordered eating and general psychological distress which makes it important to replicate these findings in clinical samples. Despite this, four benefitted from using a longitudinal design which allowed the researchers to track changes over time. All the clinical studies used cross-sectional designs which limited inferences being made about causality.

All the studies used self-report measures which are prone to self-report bias and response error. In particular, clinical groups tend to underreport their exercise level (Bratland-Sanda *et al.*, 2010) and asking patients to recall their exercise retrospectively is vulnerable to recall bias (Davis *et al.*, 1994).

The definition of exercise varied between the studies with some assessing qualitative ‘compulsivity’ whilst others assessed quantitative ‘excess’. The mixed findings regarding some relationships might be attributable to this. Specifically, in those studies that used a quantitative assessment, as psychological variables have been most strongly associated with compulsivity to exercise (Holland *et al.*, 2014).

Finally, body image concerns in boys have been related to a drive for muscularity rather than a drive for thinness (Cafri *et al.*, 2005). No studies in the current review considered this component of body image, despite its links to compulsive exercise and disordered eating (Tod & Edwards, 2015). As a result, some body image concerns, particularly for males, which may be related to a drive for muscularity will not have been represented.

#### **4.9 Limitations of the current review**

Although the psychological correlates of exercise have been demonstrated as consistent across clinical and non-clinical adult samples (Meyer *et al.*, 2011), the findings of the current review should be interpreted with caution and would need to be replicated independently in clinical and non-clinical adolescents. Only studies available in English were included in the current review, which may have excluded relevant studies. Moreover, the methodologies and analyses used by the studies varied significantly which made it difficult to reliably compare the findings. The current review was conducted by one researcher who was responsible for the search, article selection,

interpretation and write-up which increased the risk of biased selection and interpretation. However, to help reduce this risk, the researcher was in regular discussion with a research supervisor.

#### ***4.10 Clinical implications and future research***

Based on the findings of the current review and those of a previous review (Meyer *et al.*, 2011) it seems that there is a link between compulsive exercise and emotional regulation. Patients, particularly severe ED cases, are often restricted or prevented from exercising. This could cause additional problems when exercise might function to regulate emotion. Adolescents should be encouraged and supported to develop adaptive emotional regulation strategies. Emotional regulation needs to be studied over longer periods to assess whether the association with exercise becomes more dysfunctional over time. Consideration could be given to controlled exercise interventions with patients and these have demonstrated improvements to quality of life, well-being and treatment compliance (Moola *et al.*, 2013).

Drive for thinness seems to be an important feature of compulsive exercise and evident in a number of non-clinical studies. The pursuit of thinness and associated exercise could be important indicators for the development of an ED and research into how this relationship develops over time should be undertaken. In addition, the importance of the drive for muscularity and its relationship to compulsive exercise in adolescents appears to be under researched and this might also have important implications for the development of an ED, particularly in male adolescents.

Although not included in the main results section of the review but included in a summary table in Appendix G, there is an important finding related to childhood activity level. Specifically, children that were more physically active before being diagnosed with an ED were more likely to present with excessive exercise (Davis, Katzman *et al.*, 1999). Similarly, compulsive exercise score at age 12-14 was significantly related to compulsive exercise 24-months later (Goodwin *et al.*, 2014). This suggested that compulsive exercise may have developed before age 12. Prevention strategies should be considered prior to adolescence where a compulsion to exercise may not have developed and attention should then be given to emerging psychological-

related difficulties. Such prevention strategies might take place in schools during physical education lessons and in local communities through sports and athletics clubs rather than in mental health services and could focus on the relationships children have with exercise, the potential benefits of exercise to health and well-being and the importance of participating in social sport. These could be delivered by mental health professionals, teachers and coaches. To help facilitate this, prevention strategies, guidance and support could be directed towards the parents, coaches and teachers to help identify potential problematic relationships with exercise and ED symptoms. This would be supported by a study that explored the strategies used by coaches to identify disordered eating (Plateau *et al.*, 2014). They found that, although coaches used physical, social and performance indicators, many strategies were contraindicated and it was recommended that coaches should be given more support, guidance and advice.

The current review has identified several areas that require further research to be undertaken and prioritised. Most notably, there was a limited amount of research that has explored the relationship between compulsive exercise and EDs in adolescent boys. In the non-clinical studies, both perfectionism and obsessive-compulsiveness were demonstrated to be associated with compulsive exercise and also lead to increased levels of compulsive exercise over-time, these factors warrant exploration amongst clinical adolescents. Furthermore, in the non-clinical studies, there was strong evidence to suggest that higher levels of perfectionism are associated with higher levels of compulsive exercise. Despite this, there were no clinical studies that explored the relationship between compulsive exercise and perfectionism, this is somewhat surprising given the well-established links between perfectionism and EDs and studies exploring this relationship should be considered.

Finally, further research should be undertaken with both clinical and non-clinical groups to develop a greater understanding of the relationship between self-esteem and compulsive exercise. In the adult literature, the findings are inconsistent with both higher and lower levels of self-esteem being observed in compulsive exercisers. If further clarity could be provided amongst adolescence this could have important clinical implications whereby individuals could be supported to develop alternative ways to feel better about themselves.

Clinicians should be encouraged to explore exercise beliefs, attitudes and functions rather than focus on how much someone is exercising. Amongst adolescents, further research needs to be undertaken to explore exercise beliefs. This could be achieved through questionnaires that target exercise motivations and core beliefs or through qualitative methodology drawing on the child's experiences.

#### ***4.11 Conclusions and recommendations***

The review has highlighted the complexity of the relationship between compulsive exercise and psychological variables in clinical and non-clinical adolescents. However, there is some evidence to suggest that compulsive exercise is associated with: worsening ED symptomology, depression, affect regulation, anxiety, obsessive-compulsiveness, perfectionism and self-esteem. The clinical data is limited, particularly amongst males, and research is needed to replicate and clarify these findings. It is important that further research is undertaken to reliably establish the psychological variables that are most associated with compulsive exercise in clinical and non-clinical adolescents which will help the development of effective interventions. Further, prevention programmes should be targeted prior to adolescence around emotional coping strategies and to help children develop positive beliefs and relationships with exercise.

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\* Denotes a study included in the review

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## **Part Two: Research Report**

### **The experience of compulsive exercise in individuals with an eating disorder: An Interpretative Phenomenological Analysis**

# **The experience of compulsive exercise in individuals with an eating disorder: An Interpretative Phenomenological Analysis**

By Jack Henry Roffe

## **Abstract**

### ***Background***

Compulsive exercise is associated with the aetiology and maintenance of eating disorders and has been associated with medical complications and poorer treatment outcomes. Research has focused on exploring the psychological variables associated with compulsive exercise. However, there is little understanding about the subjective experiences and meanings that individuals attach to exercise. The current study aimed to explore how individuals diagnosed with an eating disorder and who engage in compulsive exercise, experience and make sense of their behaviour.

### ***Method***

Semi-structured interviews were conducted with seven females diagnosed with Anorexia Nervosa to explore their experience of compulsive exercise. The interviews were transcribed and then analysed using Interpretative Phenomenological Analysis.

### ***Results***

The analysis generated four superordinate themes: 'Lost in a world of exercise', 'Exercise Identity', 'Capturing self-worth through exercise' and 'Multi-functionality of exercise'. Each of these themes were supported by sub-themes which captured the convergence and divergence of the participants' experiences.

### ***Conclusions***

The findings of the study highlighted the multi-faceted and complex experience of compulsive exercise. The themes were discussed in relation to identity theory, the transdiagnostic model of eating disorders and existing literature on pride, shame, emotional regulation and control. Clinical implications for the assessment and treatment of compulsive exercise are presented. These included undertaking a detailed assessment of exercise history, exploring feelings of pride and shame in relation to exercise and helping patients to develop emotional regulation strategies.

## **1 Introduction**

### ***1.1 Eating disorders***

In the United Kingdom (UK) eating disorders (EDs) are a common and serious mental health concern that affect over 700,000 individuals (BEAT, 2015). Anorexia Nervosa (AN), Bulimia Nervosa (BN) and Other Specified Feeding and Eating Disorders (OSFED) are recognised diagnostic categories of the Diagnostic and Statistical Manual of Mental Disorders (5<sup>th</sup> ed.; DSM-5; American Psychiatric Association, 2013). Without early recognition and support the consequences of an ED can be fatal, with estimated mortality rates ten times greater than the general population (Morris, 2008) and the highest across all mental health diagnoses (Arcelus *et al.*, 2011; Hoek & van Hoeken, 2003). This is further complicated by difficulties in treatment, with individuals presenting as ambivalent about change (Geller *et al.*, 2005), often relapse (Guarda, 2008) and many remain chronically ill throughout their life (Steinhausen, 2002).

### ***1.2 Compulsive exercise***

An issue among some individuals diagnosed with an ED is the engagement in compulsive exercise, which is reported to present in up to 46% of patients (Brewerton *et al.*, 1995; Dalle Grave *et al.*, 2008; Shroff *et al.*, 2006). It is associated with medical complications (Shroff *et al.*, 2006), and, in AN, extends hospitalisation and interferes with weight gain (Solenberger, 2001). Exercise has been considered a ‘compensatory’ behaviour used to control shape and such motivations do explain some of the preoccupations with exercise that certain patients experience (Brewerton *et al.*, 1995; Shroff *et al.*, 2006). However, research has also suggested that exercise might play an important role in emotional regulation (Boyd *et al.*, 2007; Bratland-Sanda *et al.*, 2011; Meyer & Taranis, 2011) and in the aetiology and maintenance of EDs (Davis *et al.*, 1994).

Despite recognised associations between compulsive exercise and EDs, there is little consensus in the literature about how it is best defined. Numerous related terms, such as; ‘compulsive exercise’, ‘excessive exercise’, ‘obligatory exercise’, ‘exercise dependence’ and ‘exercise addiction’ are used in the literature and it is not always clear whether these are describing the same experience. However, definitions tend to be either quantitative or qualitative (Adkins & Keel, 2005). The term ‘excessive exercise’

commonly captures a quantitative definition and suggests that exercise becomes problematic when its frequency, duration and intensity exceeds a physical health need and the risk of injury increases (Davis & Fox, 1993). Whereas, ‘compulsive exercise’ commonly captures a qualitative definition and suggests that exercise is defined by its compulsivity, whereby individuals experience a rigid and driven urge to exercise, feel unable to stop despite severe emaciation and is associated with anxiety when exercise is postponed (Adkins & Keel, 2005; Taranis *et al.*, 2011). These two definitions are likely to be related and best captured on a continuum, where excessive exercise leads to compulsive exercise as it becomes more entrenched and prioritised over other activities (LeGrange & Eisler, 1993). Compulsive exercise is considered the more theoretically and clinically important concept, with studies associating it with increased ED attitudes (Adkins & Keel, 2005; Meyer & Taranis, 2011) and less so in ‘excessive’ exercisers (Siegel & Hetta, 2001).

### ***1.3 Is all exercise problematic?***

Carefully designed treatment programs that allow for controlled exercise in medically stable patients have shown some positive effects (Chantler *et al.*, 2006). Controlled exercise might contribute to increased quality of life, well-being and treatment compliance without impacting negatively on weight gain (Moola *et al.*, 2013). They might also help patients reduce their over-concern with body image and increase social exercise (Duesund & Skarderud, 2003). If programs could allow patients to talk about their thoughts and feelings before, during and after exercise this might serve to change unhealthy exercise behaviours, however, using exercise to promote weight gain is likely to perpetuate unhealthy exercise (Calogero & Pedrotty, 2004).

### ***1.4 Quantitative studies exploring exercise***

Compulsive exercise has been associated with increased psychological distress, including: ED psychopathology, anxiety, depression, obsessive-compulsiveness, perfectionism and self-esteem (Ackard *et al.*, 2002; Bewell-Weiss & Carter, 2010; Brewerton *et al.*, 1995; Penas-Lledo *et al.*, 2002; Shroff *et al.*, 2006;). Compulsive exercisers have reported strong feelings of guilt when they miss exercise (Mond *et al.*, 2004) and the engagement in exercise has been linked to patients being unable to tolerate strong emotional states (Geller *et al.*, 2000) and experiencing elevated levels of



negative affect (Penas-Lledo *et al.*, 2002). These psychological variables are thought to influence exercise beliefs rather than impact directly on exercise behaviour (Davis *et al.*, 1999). A comprehensive cognitive-behavioural model by Meyer *et al.* (2011), applicable to clinical and non-clinical groups, has incorporated some of these constructs and has contributed towards the development of more appropriate interventions. Their model highlights the importance of cognitions that relate to weight and shape and the role of affect regulation, compulsivity (guilt and perceived consequences of not exercising), perfectionism (high standards and self-criticism) and rigidity.

### **1.5 Qualitative studies exploring exercise**

Only four studies have used qualitative methodology. Bamber *et al.* (2000a) explored ‘exercise dependence’ using grounded theory in sixteen individuals. They aimed to examine the profiles of those classified as exercise dependent, exercise dependent with ED symptomology, ED symptomology alone or control. They found that those presenting with exercise and ED symptomology experienced guilt, anxiety and preoccupations with exercise. They concluded that exercise dependence always presented in the context of ED symptomology and this comorbidity contributed to greater psychological distress.

A single case ethnographic study by Axelsen (2009) considered the journey of the author who was diagnosed with AN from the identity of an ‘anorexic’ to a ‘triathlete’. The author shared her story of how exercise began as a means of escaping difficult emotions and progressed to a compulsive activity that governed her life. Axelsen received psychological and medical support and managed to gain some weight before deciding to leave treatment, after which exercise became more excessive. The turning point is described as when she commenced triathlon training and she began to gain weight and view her body more favourably. She described how the participation promoted pride and allowed her to share camaraderie with other athletes and enabled her to form new identities as a ‘friend’, ‘athlete’ and ‘team member’.

Moola *et al.* (2015) used thematic analysis to explore physical activity over the course of illness in eleven Canadian women who had been previously hospitalised for treatment of AN. The participants described how their exercise was complex and driven

by weight loss, reducing anxiety and they experienced pleasure, pain and punishment. Many participants were left confused about whether their physical activity was healthy or a symptom of an ED. Furthermore, the participants spoke about how their exercise impeded their treatment and how services focused on restricting their engagement.

Kolnes (2016) and Kolnes and Rodriguez-Morales (2016) used Interpretative Phenomenological Analysis (IPA) and aimed to explore the meaning of compulsive exercise in six Norwegian women diagnosed with AN. This study resulted in two publications which were published during the recruitment phase of the current study. They found two overarching themes: ‘diverging experiences of exercise’ and ‘paradoxical functions of exercise’. The first theme considered how participants experienced a continuous cycle of exercise engagement that consumed time and energy, interfered with social activity and how the wording used by the participants attempted to downplay their immersion in exercise (Kolnes, 2016). The second theme encompassed the participants’ experience of using exercise to regulate emotion, embody emotional states, offer a ‘time-out’ and how exercise contributed to personal identity (Kolnes & Rodriguez-Morales, 2016). Compulsive exercise was defined ‘quantitatively’ as ‘moderate to vigorous’ exercise for more than 6 hours per week for a minimum of one month prior to hospitalisation.

## **1.6 Rationale**

Exercise in the context of an ED is complex and there remains confusion about how it is best understood and managed. The literature has highlighted associations between increased psychological distress and compulsive exercise amongst ED groups. However, only two studies have given attention to the personal perceptions, experiences and meanings attached to exercise (Moola *et al.*, 2015; Kolnes, 2016; Kolnes & Rodriguez-Morales, 2016). This is despite the recognition that exercise beliefs and motivations influence psychological distress (Davis *et al.*, 1999). The IPA study conducted by Kolnes (2016) and Kolnes and Morales-Rodriguez (2016) assessed ‘compulsive’ exercise using a ‘quantitative’ exercise assessment, where adults were defined as compulsive exercisers if they engaged in more than six hours of exercise per week. However, no study has considered a ‘qualitative’ assessment of compulsive exercise, where individuals are assessed for their rigidity and drive to exercise and

feelings related to being unable to stop exercising. The latter ‘qualitative’ exercise definition being the more theoretically driven and clinically important concept, with links to increased ED attitudes (Adkins & Keel, 2005). Such a study might help inform a better understanding of this complex relationship and could have important implications for future research and the development of exercise-focused interventions.

### **1.7 Aims**

The current study aimed to expand on the limited qualitative data by exploring how individuals diagnosed with an ED and who engage in compulsive exercise, experience and make sense of their exercise behaviour. The study focused on exercise ‘compulsivity’ which was assessed independently by an experienced clinician rather than by a measure of exercise quantity. Exploring the experience of compulsive exercise was the main aim but it was anticipated that further questions might be explored:

- What thoughts and feelings are associated with exercising?
- What are the functions of exercising?
- What is the experience of exercise being stopped?
- Does the relationship change over time?
- How does exercise fit into everyday life?

## **2 Method**

### **2.1 Design**

The current study aimed to explore the subjective experiences and perceptions of compulsive exercise amongst individuals diagnosed with an ED and how they understand and make sense of this behaviour. Therefore, a qualitative approach was employed. Qualitative research offers a committed way of studying phenomenon in an interpretative, naturalistic and reflexive manner that seeks to capture the participant’s experience and encourage active participation of the researcher (Willig, 2008).

Interpretative Phenomenological Analysis (IPA) was selected as the most in-keeping with the aims of the study. IPA is a bottom-up approach that is dedicated to a detailed exploration of the individual experience with a focus on the meanings and personal perceptions that people ascribe to their life (Smith & Osborn, 2008). IPA is concerned with the person-in-context and it considers the subjective human experience and the

meaning of such experiences. IPA is rooted in hermeneutics, the theory of interpretation, in that the researcher attempts to consider what it might mean for the participant to have such experiences (Larkin *et al.*, 2006).

## **2.2 *Epistemological position of the researcher***

The current study was conducted from a critical realist position (Appendix H).

## **2.3 *Research Context***

The research was undertaken within a specialist Eating Disorder Service that offers inpatient and outpatient treatment for adults aged 18 years and above that are referred with eating difficulties. The service covers a large geographical area which represents people from diverse socio-economic backgrounds. The team is multi-disciplinary and consists of a range of healthcare professionals including: clinical psychologists, psychiatrists, nurses, occupational therapists, dieticians, nutritionists and researchers.

## **2.4 *Participants***

### **2.4.1 *Sample size***

As an idiographic approach, it is recommended that small samples are used within IPA research as the emphasis is placed on hearing rich detailed accounts of individual perceptions, rather than making generalisations based on superficial descriptions from numerous individuals (Smith *et al.*, 2009). Therefore, the study aimed for a sample of five to eight participants and seven were recruited.

### **2.4.2 *Inclusion/exclusion Criteria***

Individuals were eligible to participate in the study if they were 18 years of age or older at the time that informed consent was provided. They had to be able to speak proficient English, were diagnosed with AN, BN, or OSFED and presented with compulsive exercise and were accessing treatment with the recruiting service. The study had initially proposed that anyone with a BMI below 15 would be excluded on the grounds of safety. However, a non-substantial ethical amendment was submitted which removed this criterion (Appendix I for approval letter). This decision was made in collaboration with the referring service and the study sponsor as it was deemed to be over restrictive and ignored individual differences. Instead, clinical judgement by the referring clinician

was used about whether they felt the individual would be able to meet the demands required of participating in the study.

#### *2.4.3 Compulsive exercise assessment*

As part of the routine service assessment, individuals are asked about their exercise engagement. Specifically, they are asked about the frequency and intensity of their exercise and then asked questions that relate to compulsivity. These questions include whether the individual feels driven or compelled to exercise, how much they feel exercise interferes with day-to-day functioning and whether they experience a strong negative emotional reaction to times they can't exercise. Based on these responses the clinician makes a judgement as to whether compulsive exercise is part of the presenting problem, those identified as having a compulsion to exercise were eligible for participation in the study.

### **2.5 Recruitment**

Recruitment took place between July 2016 and February 2017. The service manager and the clinical psychologist within the service provided potential participants with an invitation letter (Appendix J) and a Participant Information Leaflet (PIL; Appendix K) which outlined the aims and details of the study. These were given to individuals that they deemed to meet the inclusion criteria and eligibility was then checked by the researcher. The invitation letter outlined the steps required for the individual to take part in the study or if they wanted to find out more information. Specifically, they could either complete their contact details on the invitation letter and return it to the ED service or they could contact the researcher directly from the details provided in the invitation letter. Once contact had been established and the individual wished to take part a suitable time and venue for the interview to take place was arranged.

#### *2.5.1 Participants*

The demographic details are limited to maintain the confidentiality of the participants. Seven female participants were interviewed, all of whom had been diagnosed with Anorexia Nervosa and were White British. The age of the participants ranged from 19 to 57 years, with six participants between 19 and 22. The BMI of the sample ranged between 13.1 and 22.1 (mean = 16.73), one participant did not wish to provide this

information. To ensure protection of anonymity, each participant was assigned a pseudonym.

## **2.6 Procedure**

### *2.6.1 Materials*

Participants were invited to take part in the study using an invitation letter and further details about the study requirements and aims were presented in a PIL. Those that wished to take part were asked to provide written Informed Consent (Appendix L) prior to the interview. A short demographic information sheet was developed, this included information about the participant's age, gender, ethnicity, diagnosis, BMI and exercise. The interview was guided by a flexible topic guide (Appendix M) which detailed possible topic areas and consisted of broad questions that could be followed-up and modified based on the participant's responses. A small audio recording device was used to record the interviews.

### *2.6.2 Ethical considerations*

The research proposal was peer-reviewed by University staff and a service-user reference group. Ethical approval was sought from the NHS Research Ethic Committee (Appendix N for approval letter) and the governance and legal compliance of the study was assessed by the Health Research Authority (Appendix O for approval letter), both were obtained via the Independent Research Application System (IRAS). A chronology of the research process is detailed in Appendix P.

Prior to any research procedures commencing, each participant was required to provide their written informed consent to take part in the study. The interview had the potential for participants to feel distressed and get upset as they were being asked to talk about sensitive experiences. Participants were reminded that they did not have to answer all the questions and that they had the right to withdraw from the study at any time up until the point that the analysis had been completed.

The participants were informed about confidentiality and its limits by the PIL and again by the researcher prior to the interview. The personal data obtained from the demographic information sheet was stored securely and treated in the strictest

confidence. The interview recordings and subsequent transcripts were stored securely on a University server and were password protected. Any identifiable information contained in the transcripts was removed. Participants were informed that if they disclosed any information that posed a risk to themselves or others then confidentiality would be broken and the information would be shared with relevant professionals.

### 2.6.3 Interviews

In IPA studies, it is recommended that interviews are guided by a flexible topic guide (Smith *et al.*, 2009) that allows for the participant to shape their own responses and help the interviewer to move succinctly into areas of interest in a conversational manner. A topic guide was developed from discussions and feedback from the research supervisor and clinicians and was used for all seven interviews. The topic guide included a prompt for the researcher to ask the participant about ‘affect’. The rationale for doing this was to remind the researcher to ask questions that related to how different experiences felt for the participants. In doing so, it was hoped that this would allow the researcher to get closer to the individual experience of exercise and demonstrate that the researcher was attentive and interested to hear this personal account.

Six semi-structured interviews were conducted in a private, quiet office in the outpatient department of the ED service. One interview took place in a private office at the University at the participant’s request. Once the PIL had been reviewed and any questions the participant asked had been answered, written informed consent was obtained. The participant was then asked to complete the short demographic information sheet and then the interview began. The interviews ranged from 46 to 68 minutes.

### 2.6.4 Analysis

The audio recordings were transcribed verbatim by the researcher following the interview and each participant was assigned a pseudonym to protect their identity. All the transcriptions were checked against the original recordings to ensure that they had been accurately transcribed. The data was then analysed using IPA based on the stages outlined by Smith *et al.* (2009); see Appendix Q for a detailed description of these stages.

## **2.7 Quality issues**

### **2.7.1 Quality**

To ensure that IPA studies are of high quality, Smith *et al.* (2009) recommended the quality criteria outlined by Yardley (2000). These criteria include sensitivity to context, commitment and rigour, coherence and transparency, and impact and importance. The quality of the current study was considered of paramount importance from the outset. The current study was peer-reviewed and the researcher engaged in a detailed literature review to ascertain previous relevant studies.

The researcher also attended an IPA workshop hosted by a reputable researcher where there was opportunity for independent peer scrutiny of the analysis. Each transcription was analysed in isolation before similarities and differences were explored. To ensure accuracy of transcription, all transcripts were checked back to the original source data. Any emerging themes were discussed in supervision and related back to the data. An audit trail was kept throughout the study which documented any decisions that were made.

### **2.7.2 Reflexivity**

IPA places an emphasis on the interactive role that the researcher has on interpreting and making sense of the data (Smith & Osborn, 2008). Reflexivity considers how the researcher brings their own experience and thinks about the impact that this might have on the outcomes. As a Trainee Clinical Psychologist, the researcher acknowledged their experience of working therapeutically with EDs and having knowledge about the adolescent literature following an extensive literature review. These elements were considered and discussed in supervision. A reflective diary was kept which detailed reflections on the research process, personal feelings and interests which helped to detach these from the analysis. The researcher was also part of a qualitative research group within the University where emerging themes could be discussed.

## **3 Results**

Following the detailed analysis of individual transcripts, a cross-case review of the entire data led to the development of four superordinate themes. A diagrammatic representation of the themes can be seen in Figure 2.



The first superordinate theme '*Becoming lost in a world of exercise*' considered how participants became powerless and consumed by exercise which took the upmost priority in their lives. The second superordinate theme '*Exercise identity*' explored how the participants had an attachment to exercise which they grappled with as their exercise became problematic. The third superordinate theme '*Capturing self-worth through exercise*' considered the sense of pride and shame that was experienced through exercise. The final superordinate theme '*Multi-functionality of exercise*' explored the compensatory and emotional regulatory role of exercise. The sub-themes of each superordinate theme are described and supporting quotes are provided. A frequency table of the themes is presented in Appendix R.

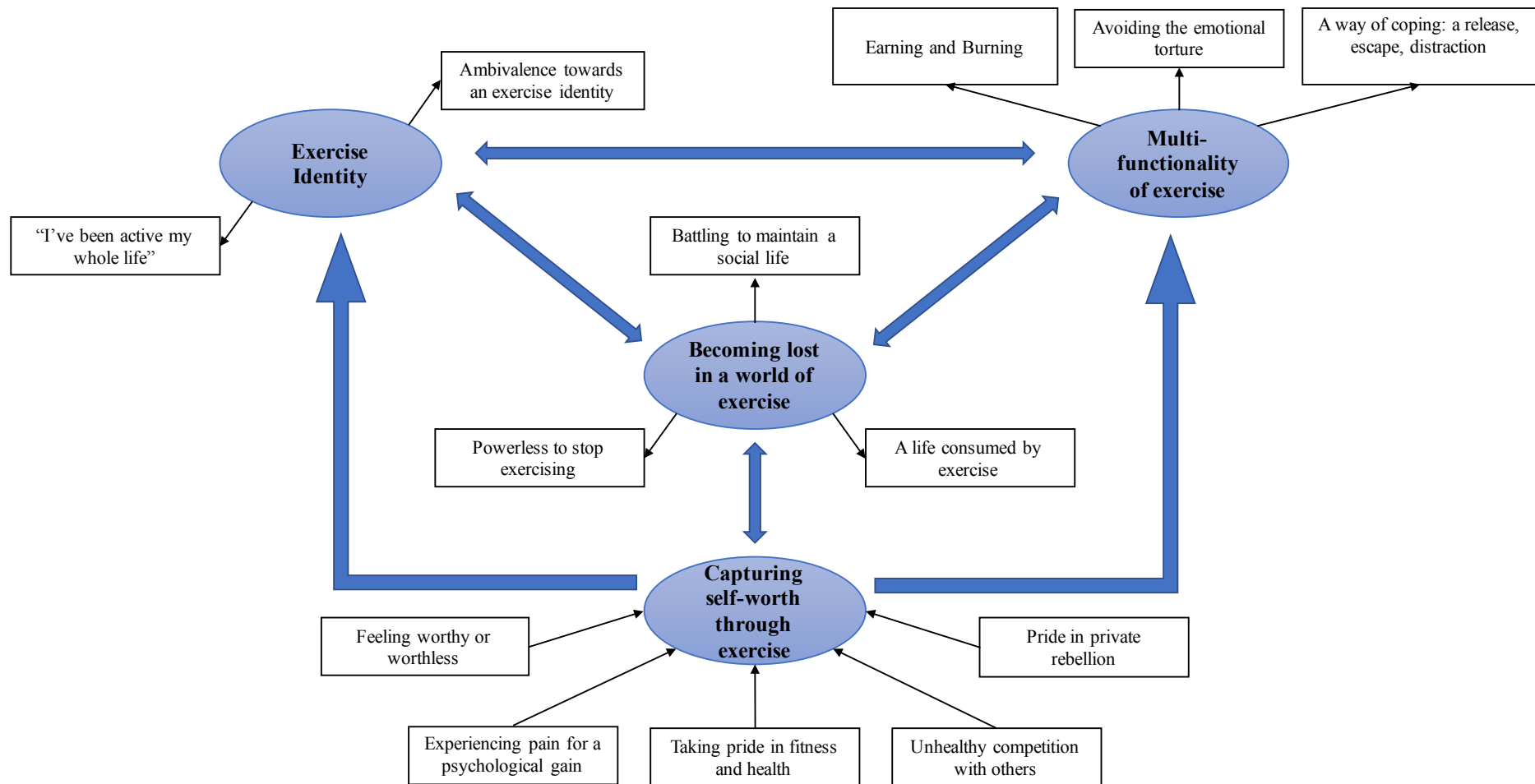


Figure 2: Visual representation of themes

### 3.1 *Becoming lost in a world of exercise*

This superordinate theme aimed to capture the centrality of exercise in the life of the participants as they became powerless and consumed by exercise. In combination, these impacted significantly on the social lives of the participants.

#### 3.1.1 *Powerless to stop exercising*

This sub-theme explored how the participants struggled to retain control of their exercise and despite conflicting feelings and severe ill-health, they felt unable to stop exercising. Exercise engagement was no longer a choice:

*It kind of got to a stage where...<sup>1</sup> I needed to, it wasn't a sociable thing, it was kind of needed to do it. It didn't matter what the weather was like, it didn't matter where, I had to do it. So, it turned from a kind of doing it at my own leisure to an absolute must (Lucy)*

The participants felt like they “*had to do it*” which reflected their powerlessness and the strength of the urge to exercise. This drive often conjured conflicting feelings of dread and exhaustion, yet, the participants remained unable to appropriately respond to these feelings:

*I get quite tearful sometimes (...) <sup>2</sup> full of frustration because I know it's beating me and I want to beat it, but when I know it's completely taken over my mind and its absolute torture and it will be painful sometimes, like my ankle will be killing me or my feet will be bleeding (Jessica)*

Jessica talked about feeling frustrated and upset as she struggled to “*beat it*” and appeared to be in a constant losing battle against exercise. Her description of exercise as being “*torture*” encapsulated the extent of the psychological and physical pain that was experienced. Similarly, Lucy questioned “*when's it going to be over*” as if she couldn't wait for the ‘torture’ to end. The loss of control was emphasised when some participants continued to exercise despite ill-health:

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<sup>1</sup> Illustrate a pause

<sup>2</sup> Illustrate hesitations, duplication, where words have been removed if they've not adding meaning, or used when the researcher offered a validating response.

*I would do anything in my power to keep doing it, so when I was in hospital, I did have a drip, a heart monitor all attached to me and I had people trying to get in the bathroom to stop me, but that didn't stop me, like I kept going, like even when people were trying to restrain me...I was still exercising (Amy)*

Amy felt that she was “*doing anything in her power*” to continue exercising and pushed her body to extremes, despite the efforts of others to stop her. This suggested that, in fact, she had no power and stopping was an impossibility. A minority of participants could retain some control, particularly around the frequency and intensity of exercise. Kate acknowledged that her exercise was “*driven*” but she retained enjoyment by staying within her “*comfort zone*”.

### *3.1.2 A life consumed by exercise*

This sub-theme explored the extent to which the participants lives became consumed by exercise. This was captured through the engagement in strict routines, constantly seeking opportunities and being preoccupied with thoughts about exercise:

*My routine was 9-12. Then I would have half an hour break, then I would start from quarter to one until half four, then have a half an hour break, and then 5 to 6 that's when my parents would get home and then I would have to be sitting downstairs from about 6 until half 9 and then I would go up in my bedroom and do sort of exercises until about one in the morning (Amy)*

The strictness of the routines might be suggestive that the participants were trying to take back some control by imposing certain rules. Similarly, Jessica engaged in a time-consuming routine that she did “*only seven times a day*” which suggested a minimisation of the extent of her engagement. Outside of the routine she would “*go and pace*” and most participants shared in the experience of constantly pursuing activity:

*Like just doing some sit-ups or stretching you know like(...) I'd do some sit-ups or (...) squat, just exercises and yeah just kind of tried to fit it in wherever and walk most places (Olivia)*

Olivia reflected a shared experience that exercise was always at the forefront of the participants' mind. Others described exercise related thoughts "every breathing minute" and exercise as the "upmost important thing". The mind was 'infested' by exercise:

*I would probably visualise what I was going to do at the gym when I was still at college, before it got to the point where I couldn't even go to college because all I could think about was the gym. I'd be writing down routines and thinking about what I was going to do, it would just completely take over my head, people would be talking to me and all I would be thinking about was what I was going to do in the gym (Lucy)*

The participants were left constantly preoccupied with exercise, which interrupted their ability to function with daily activity and the engagement in social relationships. For Rachel, exercise became a fundamental part of life, as if she was on "auto-pilot" and likened her engagement to "when you wind something up and you just let it go".

### *3.1.3 Battling to maintain a social life*

This sub-theme illustrated how the loss of control and consuming nature of exercise impacted upon the social lives of the participants. The participants shared contrasting experiences, with some of them able to retain a life outside of exercise:

*I was always kind of like out doing exercise, it was okay because...the house that I lived in they were quite active as well (...) but, like if we went out or something I'd always I'd have to go to class first and then come home and like literally have like 15 minutes to get ready and then (...) go out (...) I tried to still fit everything in with it, I tried to not let it, but it was a struggle (Olivia)*

Olivia tried to juggle the demands of remaining connected socially whilst ensuring that she exercised, which “*always*” took a precedence. Olivia justified her exercise as the same as her active friends, which made it acceptable. However, for most participants, the drive to exercise was so strong it became prioritised and socialising became a source of inconvenience:

*Sometimes I won't have visitors because they'll interrupt my daily routine and I'll have to be sat with my visitors and it's sad because even the ones you love the absolute most you won't tolerate time to spend with them if you're having a bad day. (Jessica)*

Even those that Jessica loved “*the absolute most*” were placed beneath her need to exercise and it felt easier to disconnect from her family to ensure that she could meet her exercise goal. Similarly, ‘life’ became an inconvenience for Amy who shifted everything to accommodate exercise: “*didn't have to fit it in because I wouldn't go to school*”. Being sociable and working were not important and friends were pushed away:

*I pushed a lot of people away (...) because I wouldn't meet up with them because I'd go to the gym (...) I went to go and live with one of my best friends because he lived in [removed] (...) and I'd been banned from all the gyms (...) and I went to go and live with him pretty much so I could go to the gym (...) I think he worked it out after a while (Lucy)*

Lucy ‘used’ one friend to facilitate gym access and this epitomised the self-focused stance taken by some participants, where the feelings of others were unnoticed.

### **3.2 Exercise identity**

This superordinate theme aimed to illustrate how the participants’ positive engagement in exercise as children had shaped their personal identity and this was then battled with as exercise became problematic, leaving many wary of exercise.

### 3.2.1 “I’ve been active my whole life”

This sub-theme aimed to illustrate how being an ‘exerciser’ had contributed to the personal identity of the participants. Prior to any eating concerns, exercise had played a significant role in the lives of six participants who had engaged in sport during their childhood:

*I’ve always been an active child. I remember the start of my secondary school, I think I was in every school team going (...), so exercise has always been kind of in my life (...) I’ve always been an active person*  
**(Lucy)**

Lucy, and others, described exercise as their “life” suggestive that it was everything to them and contributed to their sense of self. As exercise became problematic, the previous identity offered a justification for exercise, as if they were just “*keeping up what is me*”. Such an exercise identity extended beyond the self and helped form positive relationships:

*I would always imagine that exercise brings me and my husband a lot of enjoyment (...) so without that I think both of us would be very bereft. No, it’s a big element in our pleasure of life. Walking or cycling you know we, when we go on holiday we take our bikes with us, you know we build it into our holiday* **(Kate)**

Kate’s language shifted from “I” to “us” and “we” which highlighted the value that exercise had in ‘their’ happiness. She appeared fearful of how their relationship might be without exercise and implied that it could lead to isolation and sadness. Other participants spoke about sport within the family narrative and Amy talked about how her parents “*wanted their children to enjoy it as well and almost a talent*”. The importance of having “*talent*” strengthened the ‘exercise identity’, as the participants sought making others proud and gaining recognition:

*It became fun and when I started to get good as well (...) you want to keep up that reputation and I was like team captain, I got badges, you get rewarded (...) you wanted to win because you wanted to show off and you wanted to get all the attention and all the praise for it (Jessica)*

As exercise became problematic, the social element was lost, however, it had contributed to the early formation of an ‘exercise identity’. Jessica placed emphasis on engaging in “*team sport*” and being immersed in exercise because “*everyone did it*”. Similarly, Olivia valued “*meeting new people and having friends*” and these shaped a sense of belonging, acceptance and camaraderie.

### *3.2.2 Ambivalence towards an exercise identity*

The ‘exercise identity’ was challenged when the participants’ exercise had been defined as ‘compulsive’ and this sub-theme captured this struggle. Two participants remained positive about their exercising self. Kate repeatedly attached “*enjoyment*” and “*pleasure*” to her exercise and Rachel was reluctant to lose her exercising identity:

*I think because I’ve been fit and active my whole life, I don’t want the fact that I’ve got myself into this eating disorder situation to make me unfit (Rachel)*

Rachel wanted to retain some control over her ED by not allowing it to intrude on who she defined herself as. Despite this, Kate apologised towards the end of her interview after feeling that her “*answers aren’t very conclusive*” and Rachel felt wary about pursuing exercise alone due to a fear of losing control. These remarks could be suggestive of the ‘push-pull’ dilemma between wanting to hold on to their ‘exercising self’ whilst recognising the negative impact that it had had. More commonly, the participants were “*sceptical*” of exercise. Amy was concerned that she would use “*the fact that I’ve always been sporty as an excuse for the eating disorder to sort of takeover*”:



*I can't say what my relationship with it (...) I'm very wary, I'm very sceptical. I don't know what is my head and what is what my eating disorder wants so at the minute I'm sort of on the fence (Amy)*

Amy demonstrated her ambivalence by using “*on the fence*” this reflected the participants’ uncertainty around what exercise meant and where it sat with their diagnosis. Despite this, there remained a draw to an exercising self: “*it still means a hell of a lot to me*”. Similarly, Lucy was “*missing it*” which implied a bereavement reaction, perhaps to her loss of identity. She was also confused about whether exercise was a symptom of her ED and became “*scared of losing weight*”, feared going “*back to my old ways*” and questioned whether she’d done too much:

*It's been so long since I kind of haven't done anything (...) I felt like if I'd done too much, I had to kind of make up for it and it was kind of the complete opposite of where I'd ever been. It was, you know like I've walked 5 minutes more I felt like I had to eat like 100 calories more because what if I'd lost weight (Lucy)*

### **3.3 Capturing self-worth through exercise**

This superordinate theme aimed to explore how compulsive exercise influenced the self-worth and esteem of the participants. Exercise acted as a gateway for them to feel a sense of achievement, or punish themselves for their self-perceived failings which could be experienced through a variety of means.

#### **3.3.1 Feeling worthy or worthless**

This sub-theme demonstrated how exercise facilitated feelings of self-worth and achievement or was used to dispel feelings of being unworthy by punishing the self through exercise. Exercise was frequently described as giving the participants meaning to their lives:

*I think the ultimate goal with exercise is to make you feel like you've accomplished something today because we don't do much in a day, like I don't have a job, I don't go to college, so exercise is like my job to*

*myself. So, the more I do the prouder I feel in a day because at the end of the day I can review actually you've worked really hard today (Jessica)*

This extract demonstrated how exercise promoted feelings of accomplishment and self-pride. Jessica, and others, referred to exercise as a “job” which could be “reviewed” and if it had gone as planned, it impacted positively on self-worth. Similarly, Jessica remarked “you don’t get a day off” suggestive that repeated exercise engagement contributed to maintain self-worth. Pride was also gained from the ability to self-motivate:

*You know if it's cold and horrible but you've got up and ran five kilometres before like 9am you feel good about yourself, don't you? (...) just like I had achieved something (...) I was doing things that other people wanted to do but weren't (Rachel)*

Engaging in exercise took willpower which facilitated feelings of accomplishment, particularly when it was perceived that they were outperforming others. Exercise also allowed some of the participants to escape feeling “as if they were a failure at everything” and could be used to punish themselves for their perception of being bad:

*I think it was just...a punishment, I was just upsetting all my family around me, everyone was just literally... so distraught about what I was doing and that almost made me be like 'you're a horrible horrible person you need to just feel absolutely dead' (...) and that is why I exercised because the pain of it, it felt as if I was killing myself (Amy)*

For some participants, exercise was motivated to counteract feelings of shame. Amy viewed herself as a “horrible person” and she felt as though others might have been looking down on her selfishness, she exercised to relieve this distress. Nicola also felt the need to “discipline” herself because otherwise she would be “out of control”, which she would feel ashamed about.

### 3.3.2 *Experiencing pain for a psychological gain*

This sub-theme explored how the participants experienced a sense of achievement when they had pushed their body during exercise. Central to this feeling was the tangible experience of the body aching and being in pain which signified that they “*had done a good job*”:

*I would literally destroy that part of my body for about 4 hours (...) as soon as I walked out of the gym I was like ‘oww’ that really hurts and I was like ‘I did it well’ (...) if I was completely aching I’d done a really good job (Lucy)*

The word “*destroy*” implied Lucy’s objective was to maximise the time she was working out so she left “*completely aching*”. In doing so, she felt a great sense of satisfaction. Similarly, Jessica wanted to feel physically exhausted:

*I think the more I do the more full of adrenaline I am, so if it’s absolutely exhausted me and I’m breathless, my heart’s racing then I’ll just feel like euphoric, like you’ll just want to keep going (...) especially when you feel your heart beating, that’s what you want to feel that, that exhaustion and so you feel (...) like constant and...you feel achieved (Jessica)*

The participants aimed to push their body to its limit. For Jessica, it was important for her to notice her heartbeat and breathing and these connected to positive emotional states ‘*euphoric*’, ‘*constant*’ and ‘*achieved*’. This led to positive self-worth and likely pushed the participants to keep exercising:

*I think when you’re in for example a gym class (...) and they’re shouting at you to keep going and your muscles are burning but actually, like, you can keep going, I think it’s that determination within yourself and there’s quite a sense of achievement like 3 minutes of jumping lunges (...) and that horrible burn but then after it’s like ‘oh, I’ve done that, nice, go me’ (Rachel)*

Rachel captured the importance of overcoming “*muscles burning*” which required self-determination and these fostered feelings of pride. The need to experience ‘pain’ was likely to represent the need for the participants to experience a physical and psychological benefit post-exercise. Without this pain, the participants were left feeling that their exercise had been a “*waste of time*” and were probably left feeling disappointed and worthless.

### 3.3.3 *Taking pride in fitness and health*

This sub-theme illustrated how the participants used exercise to drive towards a perception of being fit and healthy which created feelings of either pride or shame in relation to their body:

*I know I look underweight, I feel ashamed of the way I look, I would like to have bigger muscles (...) and then I would feel proud of them, and myself, I would feel proud of myself (Kate)*

Being fit and healthy was closely linked to muscles, tone and being perceived as athletic. These traits might be considered as socially-desirable and, by not hitting these standards, Kate felt ashamed and inferior to others. Indeed, appearing externally muscular has connotations of physical strength, yet, muscle also signified competence to “*prove that you are capable*”. Some participants held a view that exercise could bolster physical appearance and that this would showcase them as good people:

*I was determined to be viewed as really toned and really fit and really healthy (...) it's attractive to others, whereas I think the main thing about it is if I look good on the outside then I'm a good person on the inside (...) so how I look physically determines what sort of person I am (...) so if I am fit and healthy and active that sort of shows that I've got a good personality (Amy)*

For Amy, exercise promoted an image that would be appealing to others and she hoped that this external self would positively represent the internal self. The external ‘fit and healthy’ might operate to deflect gaze from her internal feeling of not being good

enough. Similarly, pride was taken from being committed to fitness which perpetuated feelings of superiority to others:

*I want to have a good level of fitness, we're young, we live in a world where there's people that are obese or they've got you know really bad... I want to be able to be fit (Rachel)*

#### 3.3.4 Unhealthy competition with others

This sub-theme encapsulated the drive to be better than others, which made the participants feel good about themselves. However, it was this shift to be better than others that commonly precipitated a problematic exercise relationship:

*When I was in a team I used to enjoy it, it would be something you could do with someone and then when you wanted to do more than everyone else and wanted to be the best then you had to do it individually because you had to do extra outside the team (Jessica)*

Jessica captured the experience of needing to do more than others and this led the participants to withdraw, exercise in isolation and impacted on their enjoyment. Being in competition was often done covertly, perhaps to protect the participants from experiencing failure:

*It's the competitive element (...) but as sort of a not very nice competitive because it's a little bit subversive (...) well in that it's not overt, it's not like you know 'I want to exercise because...for an hour because you've exercised for half an hour' (Kate)*

Kate was competing against someone else in a secretive manner and this emphasised her need to feel superior. To make this more achievable, the participants often shaped their comparison criteria so they could ensure that they were exceeding others which protected against feeling inferior:

*I think I realised that I wasn't as good as the others, so what could I be the best at? (...) I seemed to be the best at keeping going, you know I didn't moan about being tired (...) I always had this keeping going (...) it was like a motor and I just couldn't stop (Rachel)*

Rachel perceived that she was not as good as others. To counteract this, she found something that she could be better at. This became her template for success and to achieve the same level of self-worth, she had to, at least, maintain this standard. For others, it was about being the best at everything. Lucy wanted to be the “fittest”, “fastest” and “strongest” and this drove exercise to high standards that couldn't slip. Similarly, it was important be better than other patients:

*My friend told me what she was doing and I thought 'wow, I need to be doing that amount', so then I sort of upped the level of what I was doing (...) I sort of tried to copy the same routine she was doing (...) Because I felt that I had to be as good as them (Nicola)*

### 3.3.5 *Pride in private rebellion*

This sub-theme explored the sense of pride that the participants experienced for going ‘against the rules’ during their treatment. For most participants, they experienced excitement and feelings of achievement when they were undertaking exercise in secret and this perpetuated exercise engagement:

*People like banned me from doing any obvious sport, I'd do secretive exercise (...) like the walking or say, for instance I'd be like 'oh, I'm just taking the bin out mum' and then I'd like run round the block and then come back (...) that again gave you just a sort of like buzz because you're doing something wrong and when you're doing something wrong it just makes you go for it even quicker (Jessica)*

When others tried to impede exercise, Jessica found alternatives and, like others, facing this challenge added to the “buzz”. Similarly, Olivia thrived from this “buzz” which made her feel like a “stronger person” and suggested that the participants took pride in

preserving control. Likewise, Lucy spoke about the fear of being caught which elicited a fight-flight response from doing something ‘forbidden’:

*It was the same if I ever exercised here, it was always that kind of fear that someone is going to catch you and you had to do it quickly and you were doing something that you weren't supposed to do so you got a really big adrenaline kick out of it (Lucy)*

The fear of being caught pushed Lucy's exercise behaviour and when exercise was interrupted the participants often felt “angry”. This anger was possibly directed towards the self for being caught and at others for stopping exercise. By being stopped, a process that could lead to feelings of pride was interrupted. Through secretive exercise the participants could retain some control:

*It feels like it's something that's mine and mine only (...) I like the fact that no one else knows about it (...) but the secrecy (...) it feels exciting, no one else has to know about it, it's just mine (...) I deserve something that is just mine (...) I shouldn't have to involve them in something so secretive and exciting about my life because I don't want to give them that part (Amy)*

The repetition of “mine” captured Amy's ownership of exercise and her need to retain some autonomy in her life which was emphasised in her closing sentence “I don't want to give them that part”. This demonstrated how little personal agency she had left, as her life was being governed by others. Exercise was like a ‘forbidden fruit’, where the participants pushed for indulgence whilst knowing it was wrong and this made them want it more and drove feelings of pride when it was achieved.

### **3.4 Multi-functionality of exercise**

This superordinate theme aimed to illustrate the various functions that exercise served for the participants and consisted of three sub-themes. The sub-themes centred around exercise being used as compensatory strategy for food consumption and a way to regulate emotion. The three sub-themes represented each of the functions of exercise

that all the participants explicitly described and experienced and were identified as being important motivators in them continuing to engage in exercise.

#### *3.4.1 Earning and burning*

This sub-theme illustrated the experience of using exercise to earn the right to eat and burn off this consumption. All the participants shared this experience and by engaging in exercise the participants felt that they had earned permission to eat:

*I can eat my food and enjoy it because I've actually earned this food and then it makes you enjoy your meals more, like I can feel hungry for a meal therefore I need this meal, so it's a nice meal...whereas if I haven't done it and I'm eating I'm just like 'why the hell am I eating, I'm not even hungry, I don't need this (Jessica)*

Jessica could relax around food if she felt it had been earned, yet, she would berate herself if it felt unjustified. Jessica, and others, mentioned needing to feel hungry and exercise served to stimulate this feeling, moreover it likely promoted physical hunger and emotional satisfaction that it was okay to eat:

*Exercise gives permission to eat and the exercise makes the eating okay. The exercising makes you feel hungry, that for me is important because if I feel hungry, I feel quite fine about eating. If I don't exercise I don't feel so hungry, so the exercise brings that significant benefit (Kate)*

Regardless of whether food had been earned and hunger experienced, the participants also needed to burn off their food. Olivia felt that if she ate that she had to “burn, like at least do something” and she limited treats “unless I was doing something to compensate”. Similarly, the participants often planned their exercise in advance, so that they could ensure that they had sufficiently compensated for times that they expected their food intake to be higher. The goal of exercise centred on controlling weight and some participants imposed a rule that they should eat less after they had exercised:



*The more you exercise the less you have to eat, because you've say burned 500 calories you then can't eat 500 because you've earned 500, why go and waste it by eating something? So, the higher amount of calories you've burned, the longer you've been doing it for, the less you have to eat (Amy)*

Amy implied that she felt rewarded by doing more exercise and did not want to “waste” her efforts. Whereas, other participants valued exercise as a strategy to balance out what had been eaten to protect against weight gain.

### 3.4.2 *A way of coping: a release, escape and distraction*

This theme encapsulated how all the participants engaged in exercise to cope with and control difficult feelings. Specifically, exercise offered a physical release, distraction and escape from these feelings and Kate used exercise cathartically to release anger:

*To release that anger just the action, the motion, the repetitiveness of the walking, just that, it's like being on a treadmill I suppose, it just gets it out, it pounds it out of your system (Kate)*

Kate valued the repetition of exercise and found the motion itself to be emotionally containing and she used it to channel pent-up frustrations. The “pounding out” of tension suggested that exercise helped to relieve physical tension. Further, exercise could be used as an escape mechanism:

*I think because I found exercise such a release, not only did it help me kind of control my food intake and my body image and stuff like that, but it also took me away from my problems of being anti-social and having lost out on my career and stuff like that (Lucy)*

The participants used exercise to avoid difficult emotions, thoughts and situations. Lucy found it easier to engage in an activity that took her away from the difficult events in her life and her own personal insecurities associated with pushing people away. Likewise, for Amy, exercise offered an escape from negative contextual stimuli:

*Just after I was diagnosed I got some disappointing A 'level results and I would instead of doing social sports, I would go out by myself (...) and my boyfriend at the time I would often be going to the gym rather than seeing him as a stress relief (Amy)*

Through the context of the interview Amy spoke about being attuned to feeling stressed, noticing bodily tension and changes to her heart rate and exercise helped her to regulate these feelings. For others, exercise provided a short-term distraction from the 'real-world':

*I kind of zone out (...) all I'm really thinking about is the exercise and like if you're doing a routine you're always, you're counting in your head, you're like 1, 2...so you can't really think about anything else (Nicola)*

Nicola described 'zoning out' and others felt "numb" during exercise which characterised how they could dissociate and switch-off from difficult thoughts and emotions. The participants often became dependent on exercise to regulate emotion and struggled to cope when they were unable to exercise. Olivia became "very emotional" when she was stopped exercising and she noticed feeling angry at herself which she displaced on to others.

### *3.4.3 Avoiding the emotional torture*

This sub-theme aimed to illustrate the negative emotional reaction the participants experienced when they were unable to exercise and how exercise became motivated to alleviate this distress. One such response, was the need to avoid intolerable feelings of guilt after eating:

*I think the fear around food and weight gain sort of gives you a massive rush to just, it's like if you're being shot at you just, you know that feeling, you're filled with such fear that nothing else can stop you, you're out of control with yourself (Jessica)*

Jessica compared the level of guilt to “*being shot at*”, this implied that she was fighting for her life and had to keep exercising until these feelings had subsided. Most of the participants made sense of exercise as an “*addiction*” that they were “*unable to function without*”. Specifically, the participants experienced “*stress*”, “*tension*” and “*irritability*” when they couldn’t exercise:

*You feel panicked, annoyed, angry and that forces you to do extra and more and even just start again (...) you have to find that time to fit it in (...) Otherwise, you’d just beat yourself up, you can’t settle, your mind’s not straight, you can’t concentrate on anything because it’s in the back of your mind, it’s ticking over the whole day (Jessica)*

When Jessica’s exercise had been interrupted, she experienced an array of difficult mixed emotions and self-blame, which had the potential to persist the whole day. Indeed, the main aim of the participants was to avoid having to encounter these emotions rather than ‘test the water’ of their coping ability:

*I don’t know if I give it the chance to know that it doesn’t...so maybe it is avoidant (...) I think that’s why I’ve plateaued with my weight for quite a while (...) I’ve not given it the chance to put on weight to see if I feel tense or whatever I think I’m going to feel...apparently. So, I think maybe it’s the same (...) I could probably survive a day chilling but (...) I don’t ever do it (Rachel)*

Rachel asserted “*whatever I think I’m going to feel*” which implied that she feared a negative consequence of not exercising, but hadn’t experienced it, probably due to avoidance. This was consistent across the participants who feared the overwhelming emotional experience of not exercising. Simply it was easier to exercise:

*It’s more of a mental agony, like, you do not want, you are just so exhausted, like from not sleeping, but, no matter what... if you stop, your head the pain it will give you is just horrific (Amy)*

## 4 Discussion

### 4.1 Summary of research findings

The current study aimed to explore the experience of compulsive exercise in individuals diagnosed with an ED. Four superordinate themes were identified; ‘becoming lost in a world of exercise’, ‘exercise identity’, ‘capturing self-worth through exercise’ and ‘multi-functionality of exercise’. The process of IPA has allowed for a rich exploration of how the individuals made sense of their exercise and to examine the emergent themes, they are placed in a wider context of psychological theory and previous research (Smith *et al.*, 2009).

### 4.2 *Becoming lost in a world of exercise*

This superordinate theme captured the central role that exercise took in the lives of the participants as they became powerless, consumed and preoccupied with exercise. The participants engaged in strict routines that they rigidly adhered to and this might have reflected an attempt to impose control over exercise and their lives. Kolnes (2016) also found that patients with AN felt “*compelled*”, structured in their routines and had lost control of their exercise behaviour. Similarly, Bamber *et al.* (2000a) noted how individuals presenting with ‘exercise dependence’ and ED symptomology experienced preoccupations with exercise. In the ED literature, a struggle for control has also been noted. Williams and Reid (2010) found that patients often describe feelings of ambivalence about whether they have control or are being controlled by their ED. Similarly, as ED behaviours become more entrenched, patients have described feeling like they are being controlled (Reid *et al.*, 2008) and this appeared to be experienced in the current study.

The loss of control over their exercise led the participants to continue exercising despite severe ill-health and conflicting feelings towards exercise. Previous research has also reported that AN patients continued to exercise despite physical exhaustion, pain and ill-health, regardless of thoughts telling them to rest (Kolnes, 2016; Moola *et al.*, 2015). Further, it has been noted that as physical condition worsens the compulsion to exercise increases, enjoyment is lost and pain is experienced (Davis, 1997).

#### *4.2.1 Battling to maintain a social life*

For most of the participants, exercise was the most important activity undertaken and this resulted in social commitments being missed and relationships lost. The current findings are in line with a study by Kolnes (2016) who found that exercise routines significantly impeded involvement in the social world. Similarly, high levels of exercise have been found to impact negatively on social relationships and lead to isolation (Serpell *et al.*, 1999). This should be given clinical attention as maintaining social relationships is considered an important factor in effective treatment of EDs (Pettersen & Rosenvinge, 2002).

#### *4.3 Exercise identity*

Six of the seven participants had been involved in sport and exercise throughout school and it had significantly contributed to their lives and how they defined themselves. Further, exercise had helped them to form social relationships and strengthen their self-esteem through being recognised for having sporting “*talent*”. As exercise became problematic the participants tried to retain their identity of an ‘exerciser’. Kolnes and Rodriguez-Morales (2016) reported a similar experience in their participants who had also been involved in exercise and competition from a young age. This had contributed to their sense of self and identity which they wanted to retain despite developing an ED. Indeed, individuals who are more active premorbidly have been noted to have an increased risk of developing a compulsivity towards exercise (Kostrzewa *et al.*, 2013).

The findings of this superordinate theme might be linked with identity theory which suggests that individuals form specific roles and adopt the meanings that are assumed of this role (Stets & Burke, 2000). An ‘exercise identity’ would suggest self-concept is formed through the engagement in exercise and this then shapes future behaviour (Anderson & Cychosz, 1995). Such an ‘exercise identity’ has been associated with ‘exercise dependence’ (Murray *et al.*, 2013). The participants in the current study often tried to hold on to their ‘exercising self’. This would be consistent with identity theory which proposes that people will attempt to activate their identity by engaging in behaviours that are consistent with it and, in doing so, they will experience positive affect and self-efficacy (Stryker & Burke, 2000).

#### **4.4 Capturing self-worth through exercise**

All the participants used exercise to evoke feelings of pride about themselves. Participants were proud that they had done something with their day, pushed their body to its limit, rebelled against authority, competed with others and were perceived as fit and healthy. For some participants, exercise was also used as a form of punishment for self-perceived failings and shame directed towards the self.

##### **4.4.1 Exercise and pride**

Exercise was experienced as an activity that evoked feelings of pride and achievement if the participants felt that they had performed to a desired level. This was often signified by the experience of physical pain. Compulsive exercise has been associated to higher-levels of self-esteem and this is thought to relate to the rewarding experience that exercise can bring as it lifts how individuals feel about themselves (Bewell-Weiss & Carter, 2010). Goss and Gilbert (2002) suggested that pride may play an important role in the maintenance of an ED and the participants appeared to use exercise to experience ‘internal’ pride. Specifically, ‘internal’ pride is experienced when an individual can value the qualities and accomplishments of the self (Mascolo & Fischer, 1995) and exercise offered an easy, ‘quick-method’ to increasing self-worth.

The participants wanted to feel superior to others which enabled them to feel pride in themselves and they often searched for ways to feel that they were outdoing others. Gilbert (1998) would consider this to be ‘external’ pride which is defined as feelings of social success obtained from the perception of outperforming others. In a qualitative study, patients with AN took pride in their ‘extraordinary’ ability to restrict food when others failed (Skarderud, 2007). In the current study, participants took pride in their ability to do “*things that other people wanted to do*”, which might have left them feeling that they were also doing something ‘extraordinary’.

Pride, achievement and excitement were also experienced when the participants felt that they had rebelled against the ‘orders’ of authority figures and kept exercising. The participants described pushing themselves harder for fear of being caught and this fostered an adrenaline reaction. In the ED literature, Goss and Allan (2009) noted that the ability to resist internal urges and external orders promotes feelings of pride in the

self. Further, the participants also expressed feeling angry when their exercise had been stopped. Anger is a common response directed towards services or individuals that are trying to remove a source of pride (Goss & Allan, 2009). Similarly, in a study by Moola *et al.* (2015) participants felt that they were being punished when their exercise had been stopped and this led many to an increased pursuit of exercise.

#### *4.4.2 Exercise and shame*

Shame reflects a self-perception that the self is a failure, flawed or that others will look down negatively on the self (Goss *et al.*, 1994). Increased levels of shame have been reported in ED patients (Goss & Gilbert, 2002). The participants often engaged in exercise to cover for failings and Amy described being a “*horrible person*” that needed to “*feel absolutely dead*” which captured her ‘internal’ shame (Gilbert, 1998). Similarly, the participants placed importance on being perceived as fit and healthy which was signified by having muscles and an athletic image. When this was not achieved, the participants felt ashamed and inferior to others. Only two studies have explored compulsive exercise and shame. Troop *et al.* (2006) found that the level of body shame predicted excessive exercise in women with and without a history of an ED. Similarly, Meyer *et al.* (2013) found that in non-clinical adults, those with unhealthy eating attitudes were more likely to exercise for appearance related reasons to prevent negative social consequences and reduce shame.

### **4.5 Multi-functionality of exercise**

Exercise served many functions in the lives of the participants, which included using exercise to control weight through food compensation and by helping them to regulate difficult emotions.

#### *4.5.1 Earning and burning*

All the participants used exercise to compensate for food intake and this reflected the core concern they had about weight and shape. Fairburn and Beglin (1994) proposed that a compulsion to exercise is driven by the need to burn off calories. Similarly, the transdiagnostic model of EDs (Fairburn *et al.*, 2003) suggests that all weight control behaviours, including exercise, arise from the same core dysfunctional beliefs about body weight, appearance and their control. As noted in the current study, exercise

became reinforced, in part, by schemas related to weight control. Research has consistently demonstrated that exercise undertaken to influence weight change is one aspect of compulsive exercise that is most associated to ED symptomology (Mond *et al.*, 2004) and compulsive exercise has been associated with higher levels of ED symptoms, dietary restraint and weight concerns (Dalle Grave *et al.*, 2008; Shroff *et al.*, 2006).

#### *4.5.2 A way of coping: a release, escape, distraction*

Exercise was frequently used by the participants to cope with difficult emotions as it offered a means of escape, distraction or release, where they could “*zone out*” or channel frustrations into exercise. However, this commonly led to an over-dependence on exercise to regulate emotion. This finding is in line with previous research that has suggested compulsive exercise often starts as a short-term strategy to regulate emotion but becomes the dominant strategy as other strategies aren’t formed (Adams *et al.*, 2003; Geller, 2006). However, it could be argued that, for at least some of the participants, exercise was used as a functional strategy to alleviate distress, and this has also been reported in clinical samples (Hausenblas *et al.*, 2008). The participants in a study by Kolnes and Rodriguez-Morales (2016) also reported that exercise was used to regulate emotions and escape difficult feelings. More broadly in the ED literature, female AN patients have been found to do whatever it takes to silence difficult emotions (Geller *et al.*, 2000) and exercise might be one avenue to do this. Research has also suggested that ED patients lack emotional awareness (Gilboa-Schechtman *et al.*, 2006; Nowakowski *et al.*, 2013). The current findings suggested that the participants could recognise emotions but could not manage them. This has implications for interventional work, as emotional recognition and learning to tolerate them has been implicated in the recovery process (Federici & Kaplan, 2008).

#### *4.5.3 Avoiding the emotional torture*

The participants engaged in exercise to avoid difficult emotions such as guilt, anxiety and anger. These were commonly experienced when exercise was not completed, interrupted or stopped and many participants felt unable to “*cope*” without exercise. There is considerable evidence for the experience of affective withdrawal-like symptoms in those who compulsively exercise, whereby exercise becomes maintained



and reinforced to avoid these negative affective states (Bamber *et al.*, 2000b; Hausenblas & Symons Downs, 2002; Meyer *et al.*, 2011). The most frequently avoided emotions are guilt, anxiety and irritability (Bamber *et al.*, 2000b) and the experience of guilt when exercise is not undertaken is one of the compulsive exercise ‘features’ most strongly associated to ED symptoms and reduced quality of life (Mond & Calogero, 2009). Similarly, Moola *et al.* (2015) noted that patients were motivated to exercise to avoid feelings of anxiety. The participants also described feeling fearful in anticipation of these negative emotions and exercise became a way of avoiding them before the feelings were present. This resembled experiential avoidance, a dysfunctional regulatory strategy, where attempts are made to avoid distressing feelings, but in doing so the individual is prevented from experiencing a natural dissipation in distress (Hayes *et al.*, 1996).

#### **4.6 Clinical implications**

The identified themes highlight a range of internal conflicts that are experienced in response to exercise and these reiterate the importance that clinicians undertake a detailed assessment of the beliefs, motivations and functions attached to exercise. An assessment of exercise frequency does not appear sufficient.

##### **4.6.1 Exercise identity**

This superordinate theme highlighted the attachment that the participants had to exercise. The literature has previously highlighted that compulsive exercise is one of the first ED symptoms to present (Davis *et al.*, 1994) and children who are more active premorbidly are more likely to present with compulsive exercise post-diagnosis (Davis *et al.*, 1999). Clinicians should be mindful of this during their assessment of exercise and could place emphasis on a detailed examination of exercise history. Those who have been long-term engagers in exercise might have an increased likelihood of adopting an ‘exercise identity’ which may impact on how their self-concept is formed. To help such individuals, it might be important to help them develop alternative strategies to promote their self-esteem. In line with the findings of Axelsen (2009), individuals might be encouraged to form new ‘identities’ around team sport.

#### 4.6.2 *Shame and pride*

Exercise promoted feelings of pride and shame in numerous ways in the current study. It may be important to consider the role that pride and shame might be playing in those presenting with an ED and compulsive exercise and this could be aided by using self-report scales and through a detailed assessment. There appeared to be a fine line between the participants experiencing pride and shame in relation to their exercise. Not meeting their own expectations, or falling short of others, can quickly lead to feeling worthless. The current study would provide support for interventions that help to address high levels of shame, most notably Compassion Focused Therapy (Gilbert, 2012). Interventions could benefit from helping individuals to find alternative ways to feel good about themselves and alternative sources of pride.

Given that exercise is associated with pride and increased self-esteem, this has important implications for the management of exercise. Specifically, clinicians should consider the impact of stopping individuals from exercising as this could have a detrimental effect on well-being and lead to increased secretive exercise. Consideration could be given to services offering controlled exercise programmes which have been found to impact positively on well-being, quality of life and treatment compliance (Moola *et al.*, 2013).

#### 4.6.3 *Emotional regulation*

The current study, in combination with the established literature, has recognised the important role that exercise plays in regulating emotions. Interventions for this group should focus on helping clients to develop alternative strategies to help manage difficult emotions, such as thought challenging, relaxation and mindfulness. Similarly, the participants frequently described exercising to avoid feared negative emotional responses associated with not exercising. Alongside alternative coping strategies, clients may benefit from psychoeducation on anxiety and behavioural plans akin to graded-exposure. Such plans could be tailored to help individuals gradually reduce exercise behaviour and cope with the associated feelings.

#### *4.6.4 Practical applications of the findings*

Within a clinical context, the results suggest that it may be important for clinicians to undertake a thorough assessment of both the current and historical beliefs and motivations attached to exercise which will help professionals to develop a greater awareness of the underlying driving factors to exercise. Further, exercise might play an important role in the formation of self-concept, the promotion of feelings of pride, the protection against feelings of shame and the regulation of affect.

These findings would provide support for clinical interventions that target to address these difficult feelings, most notably Compassion Focused Therapy (Gilbert, 2012). Compassion Focused Therapy proposes that individuals have three distinct affect regulation systems (threat, drive, soothe) and difficulties arise when these become unable to regulate each other. Specifically, it has been suggested that individuals diagnosed with an ED report higher levels of shame, self-criticism and experience lower levels of self-compassion (Goss & Allan, 2010; Kelly *et al.*, 2014) and that the behaviours associated with EDs might serve to regulate negative affect associated with a threat system. The findings of the current study might suggest that the drive system (achievement) might be activated to regulate the threat system by enabling them to feel pride; which could be achieved in several ways through exercise. Alternatively, exercise might be a response to being stuck in the threat system, whereby exercise is used as an avoidant strategy to suppress feeling of self-disgust and shame. By adopting a compassion focused formulation model, clinicians could help individuals to activate their self-soothe system by developing self-compassion and empathy towards the self. Further, research has suggested that incorporating compassion focused interventions into the treatment of individuals diagnosed with an eating disorder has a positive impact on treatment outcomes (Gale *et al.*, 2014; Kelly *et al.*, 2016).

#### *4.7 Strengths and limitations*

The current study has contributed to an increased understanding of the experience of exercise in a group of female patients diagnosed with AN. By using an IPA qualitative approach this has provided a rich and detailed account of an experience that had previously been neglected. The study sample was homogenous in terms of their engagement in compulsive exercise and was within the recommended sample size for

IPA studies (Smith *et al.*, 2009). It is the first IPA study that has been conducted in the UK that has explored compulsive exercise and EDs and the findings are in line with previous studies (Kolnes, 2016; Kolnes & Rodriguez-Morales, 2016; Moola *et al.*, 2015). Specifically, the current findings support the experience of loss of control, the interruption in social life, the persistence of strict routines, forming an exercise identity and using exercise to regulate emotion. The current study has also highlighted the importance of shame and pride and how these served to maintain exercise.

The researcher acknowledged their role and the potential impact this could have on the research process. It should be noted that the researcher was the lead analyst, although codes and themes were discussed regularly with the research supervisor. The findings of the study are from a small sample and therefore caution should be taken when considering the generalisability of the findings. The participants in the study were all white British females, diagnosed with AN and recruited from a single ED service. The findings may therefore not be representative across other settings and would need to be replicated. Further, the presence of compulsive exercise was assessed by an experienced clinician. A validated measure of compulsive exercise could have been used during the screening process to increase the reliability of its presence, such as the Compulsive Exercise Test (Taranis *et al.*, 2011).

Additionally, one interview was considered by the researcher as being of weaker quality. Specifically, it was felt that the data obtained during this interview lacked richness and this was evidenced by shorter responses given by the participant during the second half of the interview. This may have been perpetuated by the researcher shifting to ask more closed questions as a result. Despite this, the interview data was still fully transcribed and underwent the same analytic process as all the other interviews and quotes, codes and themes could all still be extracted from the data. The decision to include the interview in the final analysis was reflected on and discussed with the research supervisor.

#### ***4.8 Recommendations for future research***

The findings of the study are based solely on females diagnosed with AN and would need to be replicated across other EDs and in male and adolescent populations. The next step could consider the experience of compulsive exercise in patients diagnosed with BN and compare their experiences to the current findings. The current study has also raised important questions about the role that pride and shame might play in perpetuating compulsive exercise. However, there is limited literature that has explored this relationship. This warrants further investigation, because if high-levels of shame are related to compulsive exercise this will have important implications for interventional work, through helping individuals develop strategies to promote pride and acceptance towards themselves. Previous ED research has noted that patients experience an ‘anorexic voice’ that is feared, obeyed and controls behaviours (Tierney & Fox, 2010). A study exploring this ‘voice’ specifically in relation to exercise behaviour could also be considered.

#### ***4.9 Conclusions***

This study has provided an in-depth exploration of the experience of compulsive exercise in a group of female individuals diagnosed with AN. The study has helped develop a greater understanding of the multi-faceted nature of compulsive exercise and the various complex functions and meanings it serves.

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### **Part 3: Critical Appraisal**

### ***1.1 Introduction***

The purpose of this paper is to share my reflections on the experience of conducting the research and how this journey has impacted on my personal and professional development. I will consider the early stages of the research process through to collating the data, the analysis and the final write-up. A reflexive diary was kept throughout the research which was used to help facilitate the reflections that are made.

### ***1.2 Choosing a research topic***

Prior to developing ideas, I entered training with an interest in health research and was particularly interested in the understanding and treatment of eating disorders and the associated behaviours. The research topic was also guided by my own personal interest in sport and exercise and its relation to mental health. I have always been someone who enjoyed sport and valued the positive experience that exercise had on my own well-being. Similarly, as a keen runner, I had often reflected on the fine line that existed in some people between being a recreational, social runner or being someone who compulsively ran.

I began to explore the research literature around exercise amongst eating disorder patients, and in truth, the extent of the relationship came at quite a surprise. I guess I held a 'traditional' stance in that exercise was driven as a means to control weight and shape. I became intrigued by the complex relationship, the compulsivity and the multitude of associated psychological factors, beliefs and motives that were attached to exercise. It came as a further surprise to find that whilst I was developing a research question, only two notable clinical qualitative studies had considered the subjective experience of compulsive exercise in eating disorders (Axelsen, 2009; Bamber *et al.*, 2000) and I was keen to add to the research base.

### ***1.3 Compulsive versus excessive exercise***

I entered this study with a very basic understanding of how exercise might present in those diagnosed with an eating disorder, but I wasn't aware of the differences and lack of consensus in how it was assessed, defined and termed. In a quick review of the literature, I noted down 20+ exercise related terms and I was left feeling unclear and confused about whether they were describing the same or different concepts. Following



conversations with the research supervisor and as my reading progressed, I noted that these definitions tended to fall on a continuum between exercise excess (the amount) and exercise compulsion (feeling compelled). At this point, I made the decision to take a consistent approach with using ‘excessive’ or ‘compulsive’. To aid this process of distinguishing definitions, I returned to my ‘running self’ and thought about the context of my fellow runners and how runners might be socially perceived. I acknowledged that to others I might run more than the ‘norm’, but, if injured, or unable to exercise for any reason, this is not a problem.

Returning to my ‘running self’ allowed me to reflect on the clinical significance of compulsive exercise and how I couldn’t imagine being in a position where exercise was so compulsive that nothing else mattered. The importance of compulsivity was also reflected in the literature as the more theoretically driven (Meyer & Taranis, 2011) and there was a clear gap in the literature to explore the qualitative experience of compulsive exercise in those diagnosed with an eating disorder. Further, the service that I was beginning to establish links with routinely assessed exercise compulsivity.

#### ***1.4 Deciding on a methodological approach***

Given the aims of the research topic, I felt that a qualitative research was most aligned to my aims. On a personal level, qualitative methodology fits with how I understand human experience, which was heavily influenced by my Grandad, who as a GP, recounted his experiences of listening to the individual stories that presented and using this information to guide treatment and identify the ‘problem’. Similarly, as a Trainee Clinical Psychologist, I hold this in mind and value formulating the client’s difficulties from multiple perspectives and I felt this could flourish through qualitative research.

Several qualitative analyses were considered, most notably IPA, Grounded Theory and Thematic Analysis. Grounded Theory was suggested as a possible appropriate methodology following an internal peer review of the research proposal. Grounded Theory is commonly used to discover and propose theory about social psychological processes (Corbin & Strauss, 1990) and often used when there is limited information available around a given topic. However, the purpose of the research was to explore the individual experience of compulsive exercise and models of compulsive exercise had

already been proposed (for example, Meyer *et al.* 2011). Further consideration was given to Thematic Analysis (Braun & Clarke, 2006), however, as a Trainee Clinical Psychologist, it felt important to retain a dual focus on the individual participant experience and on patterning meanings across participants. Although, Thematic Analysis does allow individual experience, I was also mindful that recruitment might have been difficult and I wanted to ensure an emphasis was placed on obtaining rich and detailed accounts from a smaller number of individuals (Smith *et al.*, 2009).

### ***1.5 Navigating research ethics***

I commenced this study with a background in clinical research and I looked forward to going through the ethical approval process. I was aware of the IRAS form requirements, the importance of Good Clinical Practice and felt that I was in a good position to develop study documents and a trial file. I had anticipated the likely introduction of the HRA prior to submission. Unfortunately, I submitted the IRAS form around the time that the HRA became active and I believe this had a significant delay in the study gaining governance approval. I was fortunate to get through the REC approval relatively quickly without the need to respond to any questions to the panel. The HRA process was a little more time consuming.

### ***1.6 Collating data***

#### ***1.6.1 Recruitment***

Recruitment took place within a Tier 4 adult eating disorder service that offered inpatient, outpatient and day-programme treatment. The links were established through a previous clinical supervisor during training. The service manager and the field supervisor sent out regular emails to the team which included details about the study in an attempt to facilitate recruitment. Further, I attended the service CPD teaching and formally presented my research to the team and gave detailed information related to the inclusion and exclusion criteria for the study. The initial recruitment was strong, with three people providing their contact details in the first couple of weeks and these interviews were swiftly arranged.

Subsequently, recruitment ground to a halt for several months, with minimal interest, despite frequent emails across the team. Through frequent liaising with the service and

the field supervisor we were able to keep the study as an agenda on the weekly allocation meetings. This persistence helped to reignite interest in the study and four more individuals made contact to take part in the study. Due to various reasons, these potential participants all cancelled their interview on the day, most commonly due to deteriorations in health or not feeling ready to share their experiences. I was quickly reminded of the problems in research recruitment and this pushed back the recruitment phase and subsequent analysis phase. Still short of participants, I met with the service manager to think about how we could promote participation in the study and it was suggested that I spent time on the 'ground floor' of the inpatient ward. This yielded significant results with immediate interest from three individuals and these were all interviewed over the course of a week. The final participant was a keen individual from the outpatient team.

On reflection, being present on the ward significantly impacted on the ability to recruit into the study. Potential participants could ask direct questions about the study to the researcher, arrange suitable times to meet with the researcher, but also, I believe that just being visible helped to alleviate anxieties of taking part in a research study.

### *1.6.2 The interview process*

As a 'novice' IPA researcher, I spent a lot of time reading around the interview process which helped me to feel more confident. This was further facilitated by the construction of an appropriate topic guide, which was developed in collaboration with the service and research supervisor. I believe this guide helped me to avoid 'leading' the participants and helped me to retain a 'researcher' role, rather than a clinician. I found this difficult and often found myself being drawn into a position of reflecting, summarising, offering empathy and asking questions that might be more akin to being a 'reflective practitioner'. As the interviews progressed, I think I became better at catching myself switching between roles and was more able to remain a 'researcher'. Similarly, as an 'exerciser' myself and with clinical experience of working with eating disorders I tried my best to remain open to ideas during the interviews and not make assumptions about what the experience might be like, based on pre-conceived ideas.

Prior to the start of the interview process, I don't think I fully appreciated the lengths that some of the participants would be prepared to go to in order to engage in exercise. This was captured in the obstacles that some of the participants were prepared to overcome. I left with an overwhelming feeling that, as exercise became more entrenched, nothing else mattered. I found the interviews themselves to be extremely enlightening, but also quite emotionally draining at times. I think this reflected my anxiety around being in a research role and trying to ask the 'right' questions to elicit good responses and was also influenced by my surprise at the level of compulsivity that was experienced.

I think there were times across some of the interviews where I may have closed a topic area down earlier than I would have ideally liked. This was noted during the transcription phase as I reflected on questions that I wished I had followed up on, which might have added further richness to the interview data. This seemed to reflect my relative inexperience as a qualitative researcher and perhaps a lack of confidence, at times, to move away from topic guide. This might have also been a response to the answers offered by the participants. Specifically, if they were finding it difficult to answer a particular question, I tended to move towards more closed questions which didn't facilitate help to facilitate any further discussion. Further, I think there were also times when I questioned if I had stayed too rigidly to the researcher role and not offered enough empathy and support when the participants were describing distressing experiences. I took away the importance of being able to balance the clinician and researcher remits and used research supervision to consider the impact that these had on me, the participants and the data.

### *1.6.3 Needing an ethical amendment*

In my haste to recruit participants to hit my sample target and with the DClinPsy deadline looming, I made a recruitment mistake. Specifically, I had recruited a couple of participants whose BMI were below 15, which in the original proposal was an exclusion criteria. I reflected on my disappointment and frustration with the research supervisor and we discussed the error, but also, how it hadn't caused any problems to participant safety and would likely need either a formal acknowledgement or a non-substantial amendment. Following these discussions and subsequent ones with the study

sponsor, a non-substantial ethical amendment was approved by the study sponsor on the grounds that individual differences should have been accounted for and that the error hadn't compromised the study data or participant safety. Looking back on this situation, I now experience a huge sense of relief. At the time, I experienced a sense of "will this ever end?" and I was concerned that I wouldn't have enough data to suitably analyse. In hindsight, the initial criteria was overly restrictive and if the study were repeated the criteria would be expanded.

## **1.7 Data Analysis**

### **1.7.1 Homogeneity of the sample**

Following each interview, I detailed my reflections on the experience for the individual and my reactions to what I had heard. A key part of this was trying to capture the stance of the participant in relation to exercise in a few short sentences. This allowed me to recognise the individual differences between the experiences and how this then played out in the content of the interview. For example, one participant remained extremely positive about her experience of exercise and although she recognised it as compulsive, she found it very hard to say a negative word against it. Contrastingly, one participant, who I described in my diary as "*good intentions gone awry*", spoke extremely negatively about exercise and felt that it had given her months of pain, hard graft and had been a complete waste of time. Although the stance of these two participants was completely different, they shared a common experience of being compulsive exercisers. Using IPA allowed me to capture the divergent subjective experiences and meaning-making, which is unavoidable given the nature of human experience. Indeed, this was in-line with my epistemological position. Through a critical realist perspective, I could recognise that reality can be constructed from various layers and perspectives and this enabled me to make sense of these experiences during the write up.

This study was open to those diagnosed with Anorexia Nervosa, Bulimia Nervosa and Other Specified Feeding or Eating Disorder (OSFED), however, all the respondents were females diagnosed with Anorexia Nervosa. This inadvertently increased the homogeneity of the study through 'the experience of compulsive exercise in women diagnosed with anorexia nervosa'. This might also be a reflection that compulsive

exercise is more commonly experienced in those diagnosed with anorexia nervosa (Shroff *et al.*, 2006).

### *1.7.2 Coding and developing emerging themes*

Prior to conducting any analysis, I spent some time reading around the analysis process, as described by Smith *et al.* (2009). This enabled me to gain an increased insight into the processes required at each stage. I also attended an IPA workshop hosted by a reputable researcher which gave me a comprehensive outline and opportunity to consider interview material with fellow researchers. I was also mindful that I was approaching the research having completed a literature review and having worked therapeutically with adults diagnosed with eating disorders and being an exerciser and I attempted to distance myself from this potential influence.

On the whole, the analysis process was more time-consuming than I had envisaged. Initially, I listened to all the audio-recordings and noted down areas of interest in the spoken word on the transcripts, which helped me to become immersed in the data. Moving forward, I spent time going through each transcription repeatedly to ensure I was keeping close to the individual experience. As I began to cross-compare the emerging themes between cases, I was aware that it could become very easy to lose the individual experience when trying to match up ‘coherent’ themes. Some themes did seem clear given the vivid descriptions of offered by the participants and these felt easier to hold in mind when constructing superordinate themes. Other themes felt hidden in the data and time was spent trying to deconstruct their meaning and how they might link to other experiences across the interviews.

Working with seven sets of data presented an additional challenge and, at times, it felt an insurmountable task to sit with the quantity of codes and themes that were being generated. This was aided by visual representations which allowed me to move themes around and guided reflections and discussions with the research supervisor. This also gave me the space to think about where sub-themes were best captured and whether further merging into higher order constructs might be better suited. For future IPA studies, I would have no concerns if only five participants were recruited.

I was often left wondering “am I doing this right?” and “am I being interpretative?” and this particularly played out when forming themes. I wanted to ensure that I had followed the ‘guidelines’ and treat every subjective experience as just that, without influence of prior knowledge. Detaching from this knowledge felt a struggle. Most notably when forming the ‘*avoiding mental torture*’ sub-theme, as although it felt extremely important in the participants’ experience, I repeatedly engaged in open reflection about whether it had been formed because of my awareness of negative reinforcement as proposed in the compulsive exercise model (Meyer *et al.*, 2011). Through this reflective process and engaging with other researchers and the research supervisor, I was able recognise that the experience was important and rooted in the data.

Although analysed, I felt that one interview was of weaker quality. This was first noted during the transcription phase when I noticed that the responses given by the participant became much shorter and ‘to the point’. I decided to treat the interview like any other and undertook the same rigorous analytic process on the transcript. After doing this, I sought advice on how to best use the data with my research supervisor and an external IPA researcher. These discussions resulted in several options for the interview data, which were considered. Firstly, it was suggested that it could be reported that the study used an ‘over-sampling’ approach, whereby more participants were recruited than what was required in case any interviews were ‘weaker’. Secondly, it was advised that the data could be used to compare the emerging themes from the other participants and include the quotes as additional support, rather than being used as an idiographic dataset. Thirdly, it could continue to be treated as a fully included interview and incorporated into the final analysis and write-up. As the transcript had been subjected to the same scrutiny as all the other transcripts and there was clear evidence of emerging themes that were both similar and contrasting to some of the experiences reported by the other participants, it was decided that the latter option would be most appropriate. On reflection, I think this particular interview was the ‘weakest’ in the context of this sample. Yet, if the same interview had been considered in isolation, or perhaps in the context of a different sample of participants, it may not have been seen by myself in this way.

### *1.7.3 The write-up*

To ensure a succinct write-up of the report, I followed the guidelines outlined by Smith *et al.*, (2009). I entered the write-up process wanting to be over-inclusive and capture every nuance within each sub-theme. I quickly realised that, due to the restrictions in the word count, I had to be selective of those that encapsulated the essence of the participants experience. In doing this, I wanted to retain the richness of the individual, whilst having space for my own interpretative accounts of their experience, in keeping with the double hermeneutic process in IPA (Larkin *et al.*, 2006). With the number of sub-themes that emerged from the data, it often felt that I was doing the participants an injustice by only offering a few quotes per theme, brief interpretation and could only select these from a few of the participants. The interview themselves felt so much more enriching and it made me realise that, although so much is gained from qualitative research, a richness is also lost by the need to be selective. On reflection, I felt a sense of privilege for the position that I was in. The seven participants all shared their honest experiences and I was fortunate to witness them. I think this left me feeling a great sense of responsibility to capture and articulate their stories in a sensitive and meaningful manner. I was reassured to find that this was a common experience shared amongst qualitative researchers (Dickson-Swift *et al.*, 2007).

## **1.8 Strengths and weaknesses**

### *1.8.1 Sensitivity to context: (Yardley, 2000)*

Throughout the research process, my role as a Trainee Clinical Psychologist and an exerciser was considered throughout. I acknowledged my interest and knowledge obtained from working therapeutically with eating disorders and the risk of bias that might have resulted from the literature review that was undertaken in the same field. I was also aware of my role as a researcher may have been influenced by my experience as a therapist and I was mindful to try and keep a neutral, curious position throughout the interview process. This was more notable in the earlier interviews, where I tended to offer my reflections, summaries and occasional interpretations as if it was a therapeutic encounter. Similarly, the opening conversation with the participants tended to be about the onset of their eating disorder and although this was not part of the aims of the study, it felt an important process to undertake to build rapport which helped to facilitate access to the individual experience (Ceglowski, 2000; Goodwin *et al.*, 2003).



### *1.8.2 Recruitment and analysis*

The final recruitment fell within the proposed range outlined by Smith *et al.* (2009) and ensured that each transcript could be afforded time to explore codes, themes and offer interpretations about their meanings. No one was excluded from the study who wished to take-part and a suitable amendment was submitted after the initial inclusion criteria was deemed to be too restrictive. To ensure the analysis process remained transparent all the stages of the analysis have been recorded. Coding tables and theme maps have been saved and photos have been taken of the creative methods used to arrange themes (post-it notes on the lounge floor). However, the total number of quotes that could be used was restricted by the word count.

### *1.9 Personal and professional development*

I leave this research with a greater understanding about compulsive exercise in the context of an eating disorder, but also how it might present in other ‘non-clinical’ groups. More broadly, it has made me realise the range of reactions a person can experience from any single behaviour, which I will hold on to in clinical practice when undertaking assessments and formulations.

I have always been extremely passionate about research and although I have previously been part of an international clinical trials team which involved the ethical process, recruitment and data-collection, this is the first experience I have had of conducting qualitative research as the lead researcher. In some ways, this project has reinvigorated my love of being involved in health research. Although the journey has been, at times, tough and many hours have been spent sat analysing what felt like overwhelming amounts of data, I look back fondly at taking an initial idea right through to developing and describing meaningful reflections of the participants’ experience.

The process has also made me mindful of planning ahead and anticipating obstacles during research and having appropriate research supervision to overcome and manage these. Similarly, the foundations to good recruitment rely on the development of strong connections with recruiting services. The service that took part in this study were on board from the moment that the initial discussions took place and remained so right through to the end of the study. Problems were encountered with recruitment in a very

proactive service, without their support I question whether the target sample would have been reached. Similarly, I recognise the importance of being visible as a researcher during recruitment.

In completing the study, I feel more confident about conducting research again in the future, a skill that is recognised as a competency of a Clinical Psychologist. I have refined my skills in navigating the research world and have gained invaluable experience of conducting qualitative interviews and analysing the data within an IPA methodological framework. Similarly, with the help of the research supervisor, my 'research writing' has developed and although it is still not a 'gold standard', I have learnt so much about what is best captured in a research report.

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## Appendices

### *Appendix A – Guidelines to authors for journal targeted for literature review\**

#### *Author Guidelines*

The British Journal of Clinical Psychology publishes original contributions to scientific knowledge in clinical psychology. This includes descriptive comparisons, as well as studies of the assessment, aetiology and treatment of people with a wide range of psychological problems in all age groups and settings. The level of analysis of studies ranges from biological influences on individual behaviour through to studies of psychological interventions and treatments on individuals, dyads, families and groups, to investigations of the relationships between explicitly social and psychological levels of analysis.

All papers published in The British Journal of Clinical Psychology are eligible for Panel A: Psychology, Psychiatry and Neuroscience in the Research Excellence Framework (REF).

The following types of paper are invited:

- Papers reporting original empirical investigations
- Theoretical papers, provided that these are sufficiently related to the empirical data
- Review articles which need not be exhaustive but which should give an interpretation of the state of the research in a given field and, where appropriate, identify its clinical implications
- Brief reports and comments

#### 1. Circulation

The circulation of the Journal is worldwide. Papers are invited and encouraged from authors throughout the world.

#### 2. Length

The word limit for papers submitted for consideration to BJCP is 5000 words and any papers that are over this word limit will be returned to the authors. The word limit does not include the abstract, reference list, figures, or tables. Appendices however are included in the word limit. The Editors retain discretion to publish papers beyond this length in cases where the clear and concise expression of the scientific content requires greater length. In such a case, the authors should contact the Editors before submission of the paper.

#### 3. Submission and reviewing

All manuscripts must be submitted via [Editorial Manager](#). The Journal operates a policy of anonymous (double blind) peer review. We also operate a triage process in which submissions that are out of scope or otherwise inappropriate will be rejected by the editors without external peer review to avoid unnecessary delays. Before submitting, please read the [terms and conditions of submission](#) and the [declaration of competing interests](#). You may also like to use the [Submission Checklist](#) to help you prepare your paper.

#### 4. Manuscript requirements

- Contributions must be typed in double spacing with wide margins. All sheets must be numbered.

- Manuscripts should be preceded by a title page which includes a full list of authors and their affiliations, as well as the corresponding author's contact details. You may like to use [this](#) template. When entering the author names into Editorial Manager, the corresponding author will be asked to provide a CRediT contributor role to classify the role that each author played in creating the manuscript. Please see the [Project CRediT](#) website for a list of roles.

- The main document must be anonymous. Please do not mention the authors' names or affiliations (including in the Method section) and refer to any previous work in the third person.

- Tables should be typed in double spacing, each on a separate page with a self-explanatory title. Tables should be comprehensible without reference to the text. They should be placed at the end of the manuscript but they must be mentioned in the text.

- Figures can be included at the end of the document or attached as separate files, carefully labelled in initial capital/lower case lettering with symbols in a form consistent with text use. Unnecessary background patterns, lines and shading should be avoided. Captions should be listed on a separate sheet. The resolution of digital images must be at least 300 dpi. All figures must be mentioned in the text.

- All papers must include a structured abstract of up to 250 words under the headings: Objectives, Methods, Results, Conclusions. Articles which report original scientific research should also include a heading 'Design' before 'Methods'. The 'Methods' section for systematic reviews and theoretical papers should include, as a minimum, a description of the methods the author(s) used to access the literature they drew upon. That is, the abstract should summarize the databases that were consulted and the search terms that were used.

- All Articles must include Practitioner Points – these are 2–4 bullet points to detail the positive clinical implications of the work, with a further 2–4 bullet points outlining cautions or limitations of the study. They should be placed below the abstract, with the heading 'Practitioner Points'.

- For reference citations, please use APA style. Particular care should be taken to ensure that references are accurate and complete. Give all journal titles in full and provide DOI numbers where possible for journal articles.

- SI units must be used for all measurements, rounded off to practical values if appropriate, with the imperial equivalent in parentheses.

- In normal circumstances, effect size should be incorporated.

- Authors are requested to avoid the use of sexist language.

- Authors are responsible for acquiring written permission to publish lengthy quotations, illustrations, etc. for which they do not own copyright. For guidelines on editorial style, please consult the [APA Publication Manual](#) published by the American Psychological Association.

If you need more information about submitting your manuscript for publication, please email Melanie Seddon, Managing Editor ([bjc@wiley.com](mailto:bjc@wiley.com)) or phone +44 (0) 1243 770 108.

## 5. Brief reports and comments

These allow publication of research studies and theoretical, critical or review comments with an essential contribution to make. They should be limited to 2000 words, including references. The abstract should not exceed 120 words and should be structured under these headings: Objective, Method, Results, Conclusions. There should be no more than one table or figure, which should only be included if it conveys information more efficiently than the text. Title, author name and address are not included in the word limit.

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## 8. Colour illustrations

Colour illustrations can be accepted for publication online. These would be reproduced in greyscale in the print version. If authors would like these figures to be reproduced in colour in print at their expense they should request this by completing a Colour Work Agreement form upon acceptance of the paper. A copy of the Colour Work Agreement form can be downloaded [here](#).

#### 9. Pre-submission English-language editing

Authors for whom English is a second language may choose to have their manuscript professionally edited before submission to improve the English. A list of independent suppliers of editing services can be found at [http://authorservices.wiley.com/bauthor/english\\_language.asp](http://authorservices.wiley.com/bauthor/english_language.asp). All services are paid for and arranged by the author, and use of one of these services does not guarantee acceptance or preference for publication.

#### 10. Author Services

Author Services enables authors to track their article – once it has been accepted – through the production process to publication online and in print. Authors can check the status of their articles online and choose to receive automated e-mails at key stages of production. The author will receive an e-mail with a unique link that enables them to register and have their article automatically added to the system. Please ensure that a complete e-mail address is provided when submitting the manuscript. Visit <http://authorservices.wiley.com/bauthor/> for more details on online production tracking and for a wealth of resources including FAQs and tips on article preparation, submission and more.

#### 11. The Later Stages

The corresponding author will receive an email alert containing a link to a web site. A working e-mail address must therefore be provided for the corresponding author. The proof can be downloaded as a PDF (portable document format) file from this site. Acrobat Reader will be required in order to read this file. This software can be downloaded (free of charge) from the following web site: <http://www.adobe.com/products/acrobat/readstep2.html>.

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#### 12. Early View

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Further information about the process of peer review and production can be found in this document: [What happens to my paper?](#) Appeals are handled according to [the procedure recommended by COPE](#).



***Appendix B – Literature review search criteria***

<i>Eating Disorder Terms</i>	<i>Exercise Terms</i>	<i>Adolescence Terms</i>
Eating Disorder*	Exercis*	Adolescen*
Anorexi*	Physical Activit*	Teen*
Bulimi*	Compulsive Exercis*	Child*
EDNOS	Excessive Exercis*	Youth*
OSFED	Obsessive Exercis*	Young Person
Eating Problem*	Obligatory Exercis*	Paediatric* OR Pediatric*
Eating Concern	Addict* Exercis*	Minor*
Eating Psychopathology	Exercis* Dependen*	Juvenile*
Disorder* Eating	Habitual Exercis*	
	Over-exercis*	
	Driven Exercis*	
	Exercis* Abuse	
	Problematic Exercis*	
	Exercis* Commitment	
	Anorexi* Athletica	

*Grey Literature Search:*

*Exercise and Eating Disorders*  
*Compulsive Exercise in Adolescents*

**Appendix C - Modified Version of the Downs & Black Quality Index (Ferro & Speechley, 2009; amended from Downs & Black, 1998).**

Author	Quality Items															Total
	Hypothesis clearly described	Main outcomes clearly described	Characteristics of patients clearly described	Main findings clearly described	Estimates of random variability	Actual probability values used	Response rate described	Participants representative of population of recruitment	Final sample representative of population	Staff, place and facilities representative	Evidence of data dredging	Statistical test appropriate	Outcome measures valid/reliable	Adjusting for confounding	Sample size or power calculation	
Bentley <i>et al.</i> (2015)	1	1	1	1	1	0	1	1	0	1	1	1	1	1	0	12
Blachno <i>et al.</i> (2016)	1	1	0	1	0	1	0	0	0	1	1	1	1	0	0	8
Brehm & Steffen (1998)	1	1	1	1	1	1	1	0	0	1	1	1	1	1	0	12
Davis, Katzman <i>et al.</i> (1999)	1	1	1	1	1	1	0	0	0	1	1	1	1	0	0	10
Davis <i>et al.</i> (2016a)	1	1	1	1	1	0	1	0	1	1	1	1	1	1	0	12
Davis <i>et al.</i> (2016b)	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	13
Goodwin <i>et al.</i> (2011)	1	1	1	1	1	0	0	1	0	1	1	1	1	1	0	11
Goodwin <i>et al.</i> (2012)	1	1	1	1	1	0	0	1	0	1	1	1	1	1	0	11
Goodwin <i>et al.</i> (2014)	1	1	1	1	1	0	0	1	0	1	1	1	1	1	0	11
Holtkamp <i>et al.</i> (2004)	1	1	1	1	1	1	0	0	0	1	1	1	1	1	0	11
Madison & Ruma (2003)	1	1	1	1	1	1	1	0	0	1	1	1	1	1	0	12
McCabe & Ricciardelli (2006)	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0	13
Noetel <i>et al.</i> (2016)	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	13
Stiles-Shields <i>et al.</i> (2011)	1	1	1	1	1	1	0	0	0	1	1	1	1	1	0	11
Swenne (2016)	1	1	1	1	1	0	1	1	1	1	1	1	0	1	0	12
Wade & O'Shea (2015)	1	1	1	1	1	0	1	1	0	1	1	1	1	1	0	12

## *The Modified Quality Index*

### Reporting:

1. Is the hypothesis/objective of the study described clearly?
2. Are the main outcomes to be measured clearly described in the introduction or methods section?
3. Are the characteristics of the patients included in the study clearly described?
4. Are the main findings of the study clearly described?
5. Does the study provide estimates of the random variability (e.g. standard error, standard deviation, confidence intervals, inter-quartile range) in the data for the main outcomes?
6. Have actual probability values been reported (e.g. 0.035 rather than  $<0.05$ ) for the main outcomes except where the probability value is less than 0.001?
7. Is the response rate clearly described?

### External Validity

8. Were the patients asked to participate in the study representative of the entire population from which they were recruited?
9. Were patients who were prepared to participate representative of the entire population from which they were recruited?
10. Were the staff, places, and facilities where the patients were studied representative of the entire population from which they were recruited?

### Internal Validity

11. If any of the results of the study were based on “data dredging”, was this made clear?
12. Were the statistical tests used to assess the main outcomes appropriate?
13. Were the main outcome measures used valid and reliable?
14. Was there adequate adjustment for confounding in the analyses from which the main results were drawn?

### Power

15. Did the study provide a sample size or power calculation to detect important effects where the probability value for a difference being due to chance is less than 0.5?

### Appendix D – Characteristics of the reviewed studies

Authors (year) Country	Aims of study	Study design	Clinical/Non- clinical	Sample size	Age – mean	F/M	Additional Information
<b>Bentley <i>et al.</i> (2015) Australia</b>	To examine sex differences in psychosocial impairment related to ED features (excessive exercise).	Cross-sectional	Non-clinical School based sample	1,670	Male – 14.85 Female – 15.51	M – 531 F – 1,135 N/A - 4	
<b>Blachno <i>et al.</i> (2016) Poland</b>	To explore the relationship between obsessive-compulsive symptoms and physical activity among AN patients.	Cross-sectional	Clinical	76	14.8 $\pm$ 1.8 years	F - 76	DSM5 & ICD-10 inpatients diagnosed AN
<b>Brehm &amp; Steffen (1998) USA</b>	To determine the prevalence of ED cognitions and behaviours amongst adolescent obligatory exercisers.	Cross-sectional	Non-clinical High school sample	250	14.61	M – 117 F - 133	
<b>Davis, Katzman <i>et al.</i> (1999) Canada</b>	To examine the associations between excessive exercise, addictive personality and obsessive-compulsive personality in adolescent girls diagnosed with AN.	Cross-sectional	Clinical	84	15.36	F - 84	DSM-IV inpatients diagnosed AN
<b>Davis <i>et al.</i> (2016a) USA</b>	To determine if the engagement or development of driven exercise behaviour could be predicted by ED risk factors and depressive symptoms.	Longitudinal - assessments at 7-times points between 5 <sup>th</sup> and 8 <sup>th</sup> grade)	Non-clinical Elementary school through to middle school	631	10.33 (at study initiation)	M - 631	Ethnicity: European American 60.9%, African American 18.7%, Hispanic 8.2%, Asian 2.9%, Middle Eastern 0.4% Other 8.8%
<b>Davis <i>et al.</i> (2016b) USA</b>	To study the trajectories and development of compensatory exercise and fasting in the absence of binge eating and purging in adolescent school girls.	Longitudinal - assessments at 7-times points between 5 <sup>th</sup> and 8 <sup>th</sup> grade)	Non-clinical Elementary school through to middle school	564	10.33 (at study initiation)	F - 564	Ethnicity as Davis <i>et al.</i> (2016a).

Authors (year) Country	Aims of study	Study design	Clinical/Non- clinical	Sample size	Age – mean	F/M	Additional Information
<b>Goodwin <i>et al.</i> (2011) UK</b>	To identify predictors of compulsive exercise in non-clinical adolescents.	Cross-sectional	Non-clinical School based sample	1,488	12.98 (range – 12-14)	M – 683 F - 805	
<b>Goodwin <i>et al.</i> (2012) UK</b>	To examine the association between emotional regulation and compulsive exercise.	Cross-sectional	Non-clinical School based sample	1,630	12.89 (range 12-14)	M – 756 F - 874	
<b>Goodwin <i>et al.</i> (2014) UK</b>	To investigate psychological predictors of compulsive in non-clinical adolescents.	Longitudinal – initial assessment and 24-month follow-up	Non-clinical School based sample	369	12.89 14.82 (at f/u)	M – 148 F - 221	
<b>Holtkamp <i>et al.</i> (2004) Germany</b>	To investigate the relationship between psychological factors, dietary restraint and level of physical activity in adolescents diagnosed with AN.	Cross-sectional	Clinical	30	14.6	F - 30	DSM-IV inpatients diagnosed AN ANR <sup>3</sup> = 23, ANBP <sup>4</sup> = 7.
<b>Madison &amp; Ruma (2003) USA</b>	To investigate ED symptomology and general psychopathology in athletes, casual athletes and non-athletes diagnosed with an ED.	Cross-sectional	Clinical	110	15.7 (range 14-18)	F - 110	DSM-IV diagnosed ANR = 17, ANBP = 9, BNBE <sup>5</sup> = 31, BNBP <sup>6</sup> = 1, EDNOS = 52. Athletes = 42, casual athletes = 31, non-athletes = 37.

<sup>3</sup> ANR – Anorexia Nervosa Restricting type

<sup>4</sup> ANBP – Anorexia Nervosa Binge-Purging type

<sup>5</sup> BNBE – Bulimia Nervosa Binge Eating type

<sup>6</sup> BNBP – Bulimia Nervosa Binge non-purging type

Authors (year) Country	Aims of study	Study design	Clinical/Non- clinical	Sample size	Age – mean	F/M	Additional Information
<b>McCabe &amp; Ricciardelli (2006)</b> Australia	To determine the predictors of exercise dependence and food supplements among adolescent boys and girls.	Longitudinal – initial assessment and then follow-up at 8-months and 16-months	Non-clinical High-school based sample	847	Study completion: M – 14.77 F – 14.22 Range at study start (12-15)	M – 411 F - 436	
<b>Noetel <i>et al.</i> (2016)</b> Australia	To develop a clinical profile of compulsive exercise in adolescents with AN by exploring compulsive exercise, eating pathology and general psychopathology.	Cross-sectional	Clinical	60	15.02 (range 12-17)	F - 60	DSM-IV inpatients diagnosed AN AN = 54, atypical AN = 6. Ethnicity (n) Caucasian – 56, Asian – 2, Other – 2
<b>Stiles-Shields <i>et al.</i> (2011)</b> USA	To evaluate the prevalence and the clinical characteristics of driven exercise in adolescents with an ED.	Cross-sectional	Clinical	380	14.9 (range 7-18)	M – 35 F – 345 (90.8%)	AN = 155, BN = 53, EDNOS = 172.
<b>Swenne (2016)</b> Sweden	To examine the factor structure of the CET and the relationship of the CET with ED cognitions, body weight and exercise frequency in ED diagnosed adolescents	Cross-sectional	Clinical	210	15.2 (at assessment)  14.4 (at top weight)	M – 12 F - 198	Referrals to ED unit, diagnosed according to DSM-IV. AN = 26, BN = 6, EDNOS = 178
<b>Wade &amp; O'Shea (2015)</b> Australia	To examine what Unspecified Feeding and ED might look like in adolescent girls and compare to AN/no ED.	Longitudinal – 3 waves mean duration between time 1-2 = 1.15 years, time 1-3 = 2.96 years	Mixed Sample Twin registry	699 <b>653</b> <sup>7</sup>	T1 = 13.96 T2 = 15.10 T3 = 16.90 Range 12-15	F - 653	No ED=593, AN = 14, A-AN = 13, RED = 33

<sup>7</sup> The article provides numbers of participants classified in each of the four groups as part of the analysis: No ED=593, AN = 14, A-AN = 13, RED = 33. This sample total = 653 and is the used value for the current review participant statistics.

## Appendix E – Methodology and results of the reviewed studies

Author Country	Psychological Outcome Measures	Significant results relevant for the review	Limitations
<b>Bentley <i>et al.</i> (2015)</b> Australia	<ul style="list-style-type: none"> <li>EDE-Q (Fairburn &amp; Beglin, 1994).</li> <li>Kessler Psychological Distress Scale (Kessler <i>et al.</i>, 2002).</li> <li>Pediatric Quality of Life Inventory 4.0-Short Form (Varni <i>et al.</i>, 2001).</li> </ul>	<ol style="list-style-type: none"> <li>Boys: excessive exercise positively associated with dietary restriction, objective binge eating, purging, psychological distress and negatively associated with quality of life.</li> <li>Girls: excessive exercise positively associated with dietary restriction, objective binge eating, subjective binge eating, purging and psychological distress.</li> <li>Significant main effects of excessive exercise for both psychological distress and quality of life.</li> </ol>	<ol style="list-style-type: none"> <li>Cross-sectional design - prevents conclusions about causality or directions of associations.</li> <li>Bias - Eating Disorder Features assessed using self-report.</li> <li>No assessment of drive for muscularity.</li> </ol>
<b>Blachno <i>et al.</i> (2016)</b> Poland	<ul style="list-style-type: none"> <li>Leyton Obsessional Inventory-Child Version (LOI-CV; Berg <i>et al.</i>, 1988) adapted to Polish.</li> </ul>	<ol style="list-style-type: none"> <li>46% classified as ‘high risk’ group for OC (scoring 25+ on the LOI-CV).</li> <li>‘High-risk’ group spent significantly more time studying in a standing position.</li> <li>Non-high-risk group used elevators rather than the steps significantly more than the high-risk group.</li> <li>Physical activity was directed to activities related to weight loss.</li> <li>Caregiver’s perception of physical activity was positively associated with the number of ‘yes’ responses on the LOI-CV.</li> </ol>	<ol style="list-style-type: none"> <li>Cross-sectional study design.</li> <li>Assessment of exercise limited to self-reported level and type of physical activity.</li> <li>Data obtained from AN patients only.</li> </ol>
<b>Brehm and Steffen (1998)</b> USA	Eating Disorder Inventory (EDI; Garner <i>et al.</i> , 1983) assessing eating attitudes and ‘Ineffectiveness’, ‘Perfectionism’, ‘Interpersonal Distrust’, ‘Interoceptive Awareness’ and ‘Maturity Fears’.	<ol style="list-style-type: none"> <li>Obligatory exercisers scored significantly higher on the EDI subscales of ‘drive for thinness’ and ‘bulimia’.</li> <li>Obligatory exercise score was positively associated to ‘drive for thinness’, ‘bulimia’, ‘perfectionism’, ‘interoceptive awareness’ and number of exercise hours.</li> <li>Obligatory exercise score was negatively associated to ‘ineffectiveness’.</li> <li>For the total sample the overall model was significant and explained 29% of variance in obligatory exercise score. ‘Drive for thinness’, ‘gender’, ‘activity hours’ and ‘interpersonal distrust’ contributed significantly to the</li> </ol>	<ol style="list-style-type: none"> <li>High Attrition - 30% of the total available sample did not returned consent forms.</li> <li>Enrolment in different sports (e.g. ballet, rugby, cross country, weight lifting) was limited and analysis could not be conducted on these subgroups.</li> <li>Cross-sectional design.</li> </ol>

Author Country	Psychological Outcome Measures	Significant results relevant for the review	Limitations
		<p>variance.</p> <p>5. For boys, the overall model was significant and explained 21% of variance in obligatory exercise score. ‘Drive for thinness’, ‘interpersonal distrust’ and ‘activity hours’ contributed significantly to the variance.</p> <p>6. For girls, the overall model was significant and explained 32% of variance in obligatory exercise score. ‘Drive for thinness’, ‘interpersonal distrust’ and ‘activity hours’ contributed significantly to the variance</p>	
<b>Davis, Katzman <i>et al.</i> (1999)</b> Canada	<ul style="list-style-type: none"> <li>Addictive personality scale of the Eysenck Personality Questionnaire-Revised (Eysenck &amp; Eysenck, 1991).</li> <li>Obsessive-Compulsiveness Personality assessed by the sum of six subscales designed to assess the ‘obsessional’ and ‘anal’ personality types from psychoanalytic theory (Lazare <i>et al.</i> 1966).</li> </ul>	<ol style="list-style-type: none"> <li>Addictive personalities, obsessive-compulsive personalities and exercise status were significantly positively associated with exercise attitudes.</li> <li>Significantly more pathological attitudes towards exercise in excessive exercisers and those with higher childhood physical activity.</li> <li>Childhood activity status and exercise attitudes predicted increased excessive exercise.</li> </ol>	<ol style="list-style-type: none"> <li>Cross-sectional study design.</li> <li>Data obtained from AN patients only.</li> <li>Limited psychological variables explored.</li> <li>Retrospective assessment which increased bias.</li> </ol>
<b>Davis <i>et al.</i> (2016a)</b> USA	<ul style="list-style-type: none"> <li>EDE-Q (Fairburn &amp; Beglin, 1994).</li> <li>Center for Epidemiological Studies-Depression Scale (CES-D; Radloff, 1977).</li> <li>Eating Expectancy Inventory (EEI; Hohlstein <i>et al.</i>, 1998) to assess the expectancy that eating helps to manage negative affect.</li> <li>Thinness and Restricting Expectancy Inventory (TREI; Hohlstein <i>et al.</i>, 1998).</li> <li>Pubertal Development Scale (PDS; Petersen <i>et al.</i>, 1988).</li> </ul>	<ol style="list-style-type: none"> <li>5<sup>th</sup> grade: Boys in the ‘high’ and ‘decreasing’ exercise groups scored significantly higher on depression, expectancies that eating alleviates negative affect and expectancies of generalised improvement from thinness than ‘low’ exercisers.</li> <li>5<sup>th</sup> grade: driven exercise was positively associated with fasting, depression, thinness expectancies and pubertal status.</li> <li>8<sup>th</sup> grade: boys in the ‘high’ exercise group scored significantly higher on depression, eating expectancies and thinness expectancies than the other two groups.</li> <li>Boys that were in both the driven exercise and fasting group reported significantly more depression symptoms than those in the driven exercise group alone.</li> </ol>	<ol style="list-style-type: none"> <li>Risk of bias - self-report measures.</li> <li>No measurement of BMI.</li> <li>Boys were asked to report engagement in the behaviours over the 2-week preceding the assessment.</li> <li>There was no assessment of drive for muscularity.</li> <li>The study did not investigate if eating behaviour was a mediator between expectancy endorsement and non-purging compensatory behaviours.</li> <li>Binge Eating Disorder excluded.</li> </ol>



Author Country	Psychological Outcome Measures	Significant results relevant for the review	Limitations
<b>Davis <i>et al.</i> (2016b)</b> USA	<ul style="list-style-type: none"> <li>EDE-Q (Fairburn &amp; Beglin, 1994). Three questions relating to fasting and compensatory exercise from the Child adaptation of the EDE-Q (Cooper &amp; Fairburn, 1993) to assess eating symptomology.</li> <li>EEI; Hohlstein <i>et al.</i>, 1998).</li> <li>TREI (Hohlstein <i>et al.</i>, (1998).</li> <li>CES-D (Radloff, 1977).</li> <li>Pubertal Development Scale (PDS; Petersen <i>et al.</i>, 1988).</li> </ul>	<ol style="list-style-type: none"> <li>5<sup>th</sup> grade: Increased levels of depression and thinness expectancies had a significant predictive effect on the probability of girls being in the ‘decreasing’ exercise group.</li> <li>5<sup>th</sup> grade: lower expectancies of reinforcement from eating significantly predicted membership in the ‘increasing’ group.</li> <li>8<sup>th</sup> grade: higher levels of depression and thinness expectancies significantly predicted membership in the increasing exercise group</li> <li>8<sup>th</sup> grade: higher eating expectancies predicted membership in the ‘decreasing’ group.</li> </ol>	<ol style="list-style-type: none"> <li>Risk of bias - self-report measures.</li> <li>No measurement of BMI was included.</li> <li>Girls were asked to report engagement in the behaviours over the 2-week preceding the assessment.</li> <li>Compulsive exercise was not measured in addition to compensatory exercise.</li> <li>Binge Eating Disorder excluded.</li> </ol>
<b>Goodwin <i>et al.</i> (2011)</b> UK	<ul style="list-style-type: none"> <li>EDI-2 (Garner, 1991).</li> <li>Child and Adolescent Perfectionism Scale (CAPS; Flett <i>et al.</i> 1992) - self-oriented and socially-prescribed perfectionism subscales.</li> <li>Spence Child Anxiety Scale- Obsessive Compulsive Subscale (Spence, 1997;1998) used to assess obsessive-compulsiveness.</li> <li>Hospital Anxiety and Depression Scale (HADS; Zigmond &amp; Snaith, 1983)</li> <li>Social Physique Anxiety Scale (SPAS; Hart <i>et al.</i>, 1989).</li> </ul>	<ol style="list-style-type: none"> <li>For boys, the overall model was significant and explained 39% of variance in compulsive exercise total. ‘Drive for thinness’, self-oriented perfectionism, obsessive-compulsiveness and socially prescribed perfectionism contributed significantly to the variance.</li> <li>For girls, the overall model was significant and explained 34% of variance in compulsive exercise total. ‘Drive for thinness’, self-oriented perfectionism and obsessive-compulsiveness contributed significantly to the variance.</li> </ol>	<ol style="list-style-type: none"> <li>Cross-sectional study design.</li> <li>Risk of bias - self-report measures.</li> <li>Lower levels of compulsive exercise and psychopathology were demonstrated across the measures in comparison to what would be expected in clinical samples.</li> <li>Predominantly white British sample.</li> <li>The HADS had a Cronbach alpha of 0.56 for their sample - has previously been demonstrated to be reliable and valid.</li> </ol>

Author Country	Psychological Outcome Measures	Significant results relevant for the review	Limitations
<b>Goodwin <i>et al.</i> (2012)</b> UK	<ul style="list-style-type: none"> <li>• EDI-2 (Garner, 1991).</li> <li>• Regulation of Emotions Questionnaire (REQ; Phillips &amp; Power, 2007).</li> </ul>	<ol style="list-style-type: none"> <li>1. For boys, the overall model was significant and explained 29% of variance in compulsive exercise total. 'Drive for thinness', 'internal functional', 'internal dysfunctional' and 'external functional' contributed significantly to the variance. 8% of variance was attributable to the emotional regulation predictors.</li> <li>2. For girls, the overall model was significant and explained 28% of variance in compulsive exercise total. 'Drive for thinness', 'internal dysfunctional' and 'internal functional' contributed significantly to the variance. 7% of variance was attributable to the emotional regulation predictors.</li> </ol>	<ol style="list-style-type: none"> <li>1. Lower levels of compulsive exercise and eating pathology as compared to what would be expected in clinical samples.</li> <li>2. Risk of bias - self-report measures.</li> <li>3. No assessment of anxiety which precludes the results from identifying whether functional strategies of emotional regulation were more anxiolytic than the dysfunctional strategies.</li> <li>4. No measurement of exercise quantity which makes it hard to determine if emotional regulation is linked to exercise compulsivity.</li> <li>5. Predominantly white British sample.</li> </ol>
<b>Goodwin <i>et al.</i> (2014)</b> UK	<ul style="list-style-type: none"> <li>• EDI-2 (Garner, 1991).</li> <li>• CAPS (Flett <i>et al.</i> 1992).</li> <li>• Spence Child Anxiety Scale- Obsessive Compulsive Subscale (Spence, 1997;1998).</li> <li>• HADS (Zigmond &amp; Snaith, 1983).</li> </ul>	<ol style="list-style-type: none"> <li>1. For boys, the overall model was significant and explained 47% of variance in compulsive exercise total. 'Dummy variables' (related to the difference in level of compulsive exercise score across participating schools), baseline CET score, obsessive-compulsive score, self-oriented perfectionism and lower anxiety contributed significantly to the variance after 24-months.</li> <li>2. For girls, the overall model was significant and explained 24% of the variance of compulsive exercise total. School dummy variables and CET baseline contributed significantly to the variance after 24-months.</li> </ol>	<ol style="list-style-type: none"> <li>1. Lower levels of compulsive exercise and eating pathology as compared to clinical samples.</li> <li>2. It is unknown whether baseline compulsive exercise led to increased predictor variables (e.g. eating pathology) as these were not measured at time 2.</li> <li>3. Predominantly white British sample.</li> <li>4. No assessment of behavioural level of exercise, precluding discussion of whether compulsive exercise attitudes lead to unhealthy volume or type of exercise.</li> <li>5. HADS Cronbach alpha of 0.60 for their sample. Demonstrated to be reliable and valid.</li> </ol>

Author Country	Psychological Outcome Measures	Significant results relevant for the review	Limitations
<b>Holtkamp <i>et al.</i> (2004)</b> <b>Germany</b>	<ul style="list-style-type: none"> <li>Symptom Check-List-90-Revised (SCL-90-R; Schmitz <i>et al.</i>, 2000)</li> <li>SIAB used to assess food restriction and status of body image/slimness ideal.</li> </ul>	<ol style="list-style-type: none"> <li>Level of food restriction and anxiety were positively associated to physical activity level.</li> <li>Overall model significant, explained 64% of variance in physical activity. Anxiety and food restriction contributed significantly to the variance.</li> </ol>	<ol style="list-style-type: none"> <li>Small sample.</li> <li>Level of food restriction assessed retrospectively.</li> <li>SCL-90-R only validated for use with those aged 14+, 9 participants were aged 13-14.</li> <li>Physical activity level obtained via self-report.</li> </ol>
<b>Madison and Ruma (2003)</b> <b>USA</b>	<ul style="list-style-type: none"> <li>EDI-2 (Garner, 1991).</li> <li>Millon Adolescent Clinical Inventory (MACI; Millon, 1993) used to assess personality and psychopathology.</li> </ul>	<ol style="list-style-type: none"> <li>Exercise levels were positively associated with bulimic attitudes for non-athletes and casual athletes.</li> <li>Exercise levels were positively associated with body disapproval for non-athletes.</li> <li>Exercise levels were positively associated with anxious feelings for non-athletes and casual athletes.</li> <li>The relationship between exercise level and psychopathology was moderated by athletic involvement – with athletic involvement being a protective factor.</li> </ol>	<ol style="list-style-type: none"> <li>Assessment of exercise was limited by self-report data.</li> <li>Exercise group classification was classified by retrospective reports from participant's only.</li> </ol>
<b>McCabe and Ricciardelli (2006)</b> <b>Australia</b>	<ul style="list-style-type: none"> <li>'Drive for Thinness' and 'Bulimia' subscales of the EDI-2 (Garner, 1991).</li> <li>Depression scale of the Depression Anxiety Stress Scales (Lovibond &amp; Lovibond, 1995).</li> <li>Body Image and Body Change Inventory (McCabe &amp; Ricciardelli, 2001).</li> <li>Positive Affect subscale of the Positive and Negative Affect Schedule (PANAS; Watson <i>et al.</i> 1988).</li> </ul>	<ol style="list-style-type: none"> <li>For boys, there were significant changes to exercise dependence between time 1 and 2 (0-8 months) and the significant predictors were changes to positive affect and body importance. Positive affect a protective factor.</li> <li>For boys, there were significant changes to exercise dependence between time 1 and time 3 (0-16 months) and the significant predictor was changes to body image importance.</li> <li>For girls, there were significant changes to exercise dependence between time 1 and 2 and the significant predictors were changes to body dissatisfaction and body.</li> <li>For girls, there were significant changes to exercise dependence between time 1 and time 3 and the significant predictors were changes in depression, positive affect and body importance.</li> </ol>	<ol style="list-style-type: none"> <li>Only assessed compulsive exercise.</li> <li>Risk of bias – self-report measures.</li> <li>The participants were largely from a white middle class backgrounds.</li> </ol>

Author Country	Psychological Outcome Measures	Significant results relevant for the review		Limitations
Noetel <i>et al.</i> (2016) Australia	<ul style="list-style-type: none"><li>Youth Eating Disorder Examination-Questionnaire (YEDE-Q; Goldschmidt <i>et al.</i>, 2007).</li><li>Revised Child Anxiety and Depression Scale (RCADS; Chorpita <i>et al.</i>, 2000).</li><li>Children’s Obsessional Compulsive Inventory-Revised (ChOCI-R; Shafran <i>et al.</i>, 2003).</li><li>Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1979).</li></ul>	<ol style="list-style-type: none"><li>CET total score was significantly related to estimated exercise frequency over the last month.</li><li>Participants that had not been prescribed medication reported significantly lower levels of compulsive exercise.</li><li>Compulsive exercise score was positively associated to eating pathology, obsessive-compulsiveness, anxiety and depression and negatively associated to self-esteem.</li><li>The ‘avoidance and rule driven’ subscale of the CET was significantly related to all the variables.</li><li>The overall model was significant and explained 55% of the variance of compulsive exercise total. Total YEDE-Q (eating pathology) and RCADS total anxiety contributed significantly to the variance.</li></ol>	<ol style="list-style-type: none"><li>Cross-sectional study design.</li><li>Female only sample.</li><li>Retrospective assessment of exercise frequency over the last 4 weeks and year.</li></ol>	
Stiles-Shields <i>et al.</i> (2011) USA	<ul style="list-style-type: none"><li>EDE (Fairburn &amp; Cooper, 1993) used to asses eating symptomology.</li><li>The Beck Depression Inventory (BDI; Beck, 1987).</li></ul>	<ol style="list-style-type: none"><li>Frequency of driven exercise was positively associated with eating disorder pathology and depressive symptomology.</li><li>These relationships strengthened when self-induced vomiting and driven exercise were assessed.</li><li>Driven exercisers were more likely to be male, younger and had lower BMIs than those reporting self-induced vomiting or both.</li></ol>	<ol style="list-style-type: none"><li>Cross-sectional design preventing conclusions to be made about causality or direction of associations.</li><li>Psychological correlates limited to ED and depressive symptomology.</li><li>Exercise only assessed using qualitative definition.</li></ol>	
Swenne (2016) Sweden	<ul style="list-style-type: none"><li>EDE-Q Youth Version (Carter <i>et al.</i>, 2001).</li><li>The Montgomery-Asberg Depression Rating Scale-Self-Report (MADRS-S; Svanborg &amp; Asberg, 1994).</li></ul>	<ol style="list-style-type: none"><li>‘Non-exercisers’ scored significantly higher on ‘lack of exercise enjoyment’ CET but lower on all other CET subscales than ‘exercisers’.</li><li>‘avoidance and rule driven behaviour’, ‘weight control exercise’, ‘mood improvement’ and ‘lack of exercise enjoyment all significantly correlated with the global EDE-Q score.</li><li>The ‘avoidance and rule driven behaviour’ subscale was significantly predicted by EDE-Q ‘shape concern’, exercise frequency and depressive symptoms.</li><li>The ‘weight control exercise’ subscale was significantly predicted by EDE-Q ‘restraint’, ‘shape concern’, age at presentation, BMI and exercise frequency.</li><li>The ‘mood improvement’ subscale was significantly</li></ol>	<ol style="list-style-type: none"><li>Cross-sectional design.</li><li>As the study also explored the factor structure of the CET a limitation is that there was no reference population to compare the results against.</li></ol>	

Author Country	Psychological Outcome Measures	Significant results relevant for the review	Limitations
		<p>predicted by EDE-Q ‘shape concern’, premorbid BMI, age at presentation, weight loss and exercise frequency.</p> <p>6. The ‘lack of exercise enjoyment’ subscale was significantly predicted by depressive symptoms and exercise frequency.</p>	
<b>Wade and O’Shea (2015)</b> <b>Australia</b>	<p>Not all repeated at each wave.</p> <ul style="list-style-type: none"> <li>Four subscales of the EDI (Garner <i>et al.</i>, 1983): ‘Drive for Thinness’, ‘Interceptive Awareness’, ‘Body Dissatisfaction’ and ‘Ineffectiveness’.</li> <li>The ‘Personal Standards’ subscale of the Multidimensional Perfectionism Scale (MPS; Frost <i>et al.</i>, 1990).</li> <li>Thin-Ideal Internalisation subscale from the Multi-Dimensional Media Influence Scale (Cusumano &amp; Thompson, 2001).</li> <li>Weight-related peer teasing subscale from the McKnight Risk Factor Survey (McKnight Investigators, 2003).</li> <li>Perceived Sociocultural Pressure Scale (Stice <i>et al.</i>, 1996).</li> <li>‘Just Right Subscale’ of the Vancouver Obsessional Compulsive Inventory (VOCI; Thordarson <i>et al.</i>, 2004).</li> <li>Childhood Anxiety Sensitivity Index (Silverman <i>et al.</i>, 1991).</li> </ul>	<p>1. 33 girls (4.7%) were classified as RED, 85% of which used driven exercise either alone or in conjunction with fasting.</p> <p>2. Across all three waves those classified as RED scored significantly higher than the control group on global ED pathology.</p> <p>3. At Wave 1, the RED group scored significantly higher on importance of weight related teasing, internalisation of the thin ideal, ineffectiveness, body dissatisfaction, obsessionality and pressure to be thin than the control group.</p> <p>4. At waves 1-2, importance of shape was significantly higher for the RED group as compared to the control group.</p> <p>5. At waves 1-3, feelings of fatness were significantly higher in the RED group as compared to the control group across all three waves.</p> <p>6. At wave 2, the RED group reported significantly higher personal standards, anxiety sensitivity and weight-related peer teasing than the control group.</p> <p>7. At wave 3, the RED group scored significantly higher on drive for thinness than the no ED group.</p>	<p>1. The co-occurrence of cognitive symptoms of EDs could not be established for those identified as RED as the focus of the assessment was on established DSM5 EDs.</p> <p>2. The study only had a 49% response rate.</p> <p>3. Referral information was offered to participants with an ED, which may have impacted results over time.</p> <p>4. 85% of the RED cases presented with driven exercise and therefore some of the associations might have been related to fasting.</p> <p>5. As binge eating and purging often emerge in early adulthood some of the RED cases may well migrate into other ED diagnoses.</p> <p>6. Not all measures were repeated across all waves of the study.</p> <p>7. Only 4.7% of the participants presented with driven-exercise.</p>

## Appendix F – Exercise definition and assessment in reviewed studies

Author	Exercise Term	Assessment of Exercise Status
Bentley <i>et al.</i> (2015)	‘Excessive Exercise’	Assessed using the Eating Disorder Examination-Questionnaire (EDE-Q; Fairburn & Beglin, 1994).  Excessive exercise was present if the participant had exercised in a hard, driven or compulsive way as a means of controlling weight or shape on average at least five times per week during the past 4 weeks.
Blachno <i>et al.</i> (2016)	‘Physical Activity’	Assessment of the level and type of physical activity using the Physical Activity Questionnaire, A two-part questionnaire completed by patient and a caregiver.
Brehm & Steffen (1998)	‘Obligatory Exercise’	Participants completed the Obligatory Exercise Questionnaire (OEQ; Pasman & Thompson, 1988) a 20-item measure that explores exercise quantity and obligatory exercise attitudes. Those scoring 50 or above on this measure were categorised as an obligatory exerciser.
Davis, Katzman <i>et al.</i> (1999b)	‘Excessive Exercise’	Excessive exercise was assessed through a structured interview. Excessive exercise defined as strenuous exercise exceeding one hour/day for at least 6 days/week. Exercise attitudes were assessed using the Commitment to Exercise Scale (Davis <i>et al.</i> , 1993).  Childhood Activity level was assessed by asking the participants if they had been “more physically active” than the average girl during her childhood and before the onset of an ED.
Davis <i>et al.</i> (2016a)	‘Driven Exercise’	The EDE-Q was used to assess driven exercise along with two additional questions: ‘Over the past 2 weeks, have you exercised a lot to control your weight or because you ate a lot?’. Those answering ‘yes’ were then asked ‘on how many days of the last 14 have you done this?’. Based on the response to this second question a score was determined (e.g. 0 = no days of exercise)
Davis <i>et al.</i> (2016b)	‘Compensatory Exercise’	The EDE-Q (as Davis <i>et al.</i> , 2016a)
Goodwin <i>et al.</i> (2011)	‘Compulsive Exercise’	The Compulsive Exercise Test (CET; Taranis <i>et al.</i> , 2011) was used to assess the level of compulsive exercise. The CET is a 24-item self-report measure that assesses the level of compulsivity towards exercise across five subscales: Avoidance and Rule-Driven Behaviour; Weight Control; Mood Improvement; Lack of Exercise Enjoyment; and Exercise Rigidity. A total compulsive exercise score can be calculated.
Goodwin <i>et al.</i> (2012)	‘Compulsive Exercise’	The CET was used to assess the level of compulsive exercise (as Goodwin <i>et al.</i> , 2011)
Goodwin <i>et al.</i> (2014)	‘Compulsive Exercise’	The CET was used to assess the level of compulsive exercise.

Author	Exercise Term	Assessment of Exercise Status
Holtkamp <i>et al.</i> (2004)	‘Physical Activity Level’	Utilised the Structured Interview of Anorexia and Bulimia Nervosa (SIAB; Fichter <i>et al.</i> , 1998) which assesses five levels of physical activity (planned and spontaneous), ranging from no excessive physical activity to very strong excessive physical activity over the last 3 months.
Madison & Ruma (2003)	‘Exercise and Athletic Participation’	<p>Athletic participation/involvement was established using the Personal History Questionnaire. Participants were asked “are you active in a sport now or sometime within the last year?” and responded into one of seven categories. Each participant was then classified as either an ‘athlete’, ‘casual athlete, non-athlete’.</p> <p>The level of exercise was measured by self-report based on hours that were spent on some form of exercise per week (0 to more than 14 hours)</p>
McCabe and Ricciardelli (2006) Australia	‘Exercise Dependence’	Exercise dependence was assessed using the Exercise Dependence Scale (McCabe & Vincent, 2002), a nine-item questionnaire. Each item is rated on a five-point scale ranging from never to always. Example item: ‘How often do you feel angry or upset if you do not exercise?’
Noetel <i>et al.</i> (2016) Australia	‘Compulsive Exercise’	<p>Compulsive exercise was assessed using the Compulsive Exercise Test (CET; Taranis <i>et al.</i>, 2011).</p> <p>An estimate of exercise quantity was obtained by retrospective self-report ratings of: the number of weeks of participation, average number of weekly sessions, average duration of sessions and level of intensity. This was rated for all exercise activities according to the last 4 weeks and the past year. Participants were also asked whether they considered themselves a current or former athlete as well as their highest level of competition.</p>
Stiles-Shields <i>et al.</i> (2011) USA	‘Driven Exercise’	The Eating Disorder Examination (EDE; Fairburn & Cooper, 1993) was used to assess driven exercise which asks questions such as, ‘have you felt driven or compelled to exercise over the last 4 weeks?’ Higher scores indicate a higher frequency of driven exercise.
Swenne (2016)	‘Compulsive Exercise’	During the assessment conducted by a paediatrician an attempt was made to establish whether exercise was a feature of the participant’s presentation. The CET (translated to Swedish) was subsequently used to assess the level of compulsive exercise and this was supplemented by an additional question ‘How many days do you usually exercise?’
Wade & O’Shea (2015)	‘Driven Exercise’	Driven exercise was assessed using ‘driven exercise’ questions in the EDE and was present if it occurred for at least an hour 5 days/week for a 3-month period with no breaks more than 2 weeks. Specific questions were asked separately for competitive sport and other forms of exercise, where only exercise for weight and shape was included. Exercise for fitness or recreation was excluded.

***Appendix G – Significant findings related to infrequently reported psychological variables and non-psychological variables***

<b>Summary of other significant findings</b>	
<b>Not commonly reported psychopathological variables</b>	<ul style="list-style-type: none"> <li>• McCabe and Ricciardelli (2006) found that changes to positive affect protected against compulsive exercise for boys after 8-months and for girls after 16-months</li> <li>• Davis, Katzman <i>et al.</i> (1999) found that an addictive personality was associated to ‘commitment to exercise attitudes’.</li> <li>• Brehm and Steffen (1998) found that lower levels of interpersonal distrust, a trait that reflects a reluctance to form close relationships, predicted compulsive exercise.</li> <li>• Brehm and Steffen (1998) found that ‘interoceptive awareness’, which is the ability to recognise internal states and feelings, was positively associated to compulsive exercise</li> <li>• But, there were no significant differences on interoceptive awareness between compulsive exercises and non-compulsive exercisers (Brehm &amp; Steffen, 1998; Wade &amp; O’Shea, 2015).</li> </ul>
<b>Significant non-psychopathological variables</b>	<ul style="list-style-type: none"> <li>• Davis, Katzman <i>et al.</i> (1999) found significantly higher levels of childhood physical activity in current excessive exercisers.</li> <li>• Goodwin <i>et al.</i> (2014) found that baseline levels of compulsive exercise were significantly associated to compulsive exercise two years later.</li> <li>• Noetel <i>et al.</i> (2016) found that compulsive exercise had no impact on treatment, clinical presentation, length of hospital stay or readmission rate.</li> <li>• Noetel <i>et al.</i> (2016) found that prescribed medications were more likely to given to compulsively exercisers.</li> <li>• Bentley <i>et al.</i> (2015) found that quality of life was reduced in excessive exercisers.</li> <li>• Wade and O’Shea (2015) found that two socio-cultural constructs ‘internalisation of the thin ideal’ and ‘perceived pressure to be thin’ were significantly higher in those reporting driven exercise than in controls.</li> <li>• There was no relationship between BMI and compulsive exercise in clinical or non-clinical groups (Brehm &amp; Steffen, 1998; Goodwin <i>et al.</i>, 2012; Holtkamp <i>et al.</i>, 2014; McCabe &amp; Ricciardelli, 2006; Stiles-Shields <i>et al.</i>, 2011).</li> </ul>



### ***Appendix H – Epistemological Position\****

The researcher took a critical realist epistemological position. Such a stance acknowledges that there is a reality, however, some aspects of reality can exist independently from our knowledge of it (Sayer, 1992). Therefore, it is paramount to this position that reality is not limited to what is empirically known and that human knowledge only captures a small part of reality (Bhaskar, 1978). A critical realist is also able to hold a position that access to this truth is limited due to the individual differences in meaning-making. Specifically, there is an appreciation that each person will experience different parts of reality (Fade, 2004). Therefore, as a researcher holding a critical realist perspective, there is an attempt to develop a greater sense of what is ‘really’ happening in the world, but, appreciating that we don’t have access to reality and that the data gathered through research is unlikely to provide access to this reality (Willig, 2008). Rather ‘truth’ will be partially accessed through the subjective representation, experience and interpretation of reality (Madill *et al.*, 2000).

As a result of acknowledging that some of reality is not directly observable, it follows that each participant involved in qualitative research will have a different perception and experience of reality. This stance supports the methodological framework of Interpretative Phenomenological Analysis (IPA). IPA focuses on subjective lived-experiences and personal perceptions and assumes that the data provided by the participants tells us something about how they make sense of their experience in the context of their own reality (Smith *et al.*, 2009). The researcher is then able to interpret these meanings beyond the spoken word, although this is limited by the researcher’s own experiences and beliefs and therefore a critical realist position acknowledges that knowledge of the reality is approximate and context dependent.

Critical realism integrates realism and relativism. IPA acknowledges that the researcher can influence the research and therefore a relativist standpoint is indicated. The researcher recognised that his own beliefs and knowledge of ‘compulsive exercise’ which was obtained from literature reading and working clinically in an ED setting would shape the research findings. However, within a realist stance, the researcher also appreciated that this understanding was limited within the context of the interview, the researcher and the participant.

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## Appendix I – Non-substantial amendment approval letter\*



Mr Jack Roffe  
Trainee Clinical Psychologist

24<sup>th</sup> February 2017

Dear Jack

**RE: The Experience of Compulsive Exercise in Individuals with an Eating Disorder - An Interpretative Phenomenological Analysis**

<b>Study Codes:</b>		<b>IRAS (REC) Reference:</b>	
<b>Trust Reference:</b>		<b>Portfolio ID:</b>	N/A
<b>EDGE ID:</b>			
<b>Funder Reference:</b>	N/A		
<b>Study Sponsor:</b>			

Thank you for contacting my office in the capacity of Sponsor, and for submitting a revised version of the study protocol (V3). I can confirm that the adjustment to the inclusion/exclusion criteria for this study is classified as a non-substantial, non-notifiable amendment, and that there is no need to seek further approval via HRA/REC.

<b>APPROVAL STATUS</b>	
Full Approval	<input checked="" type="checkbox"/> Approval in Principle <input type="checkbox"/> Approval refused <input type="checkbox"/>
Date of Final HRA Approval <sup>1</sup>	22 <sup>nd</sup> June 2016
Date of NHS Permission	1 <sup>st</sup> July 2016

The conduct of your study (including examination of the site file) at this site may be subject to audit for protocol adherence and other monitoring. This approval is subject to the accuracy of the following information:

<b>Study Summary</b>			
<b>Chief Investigator (Supervisor):</b>			
<b>Principal Investigator (Local):</b>	Mr Jack Roffe	<b>CRN Delivery Co-ordinator</b>	N/A
<b>Other Investigators:</b>			
<b>Indemnity Provider:</b>		<b>Start Date (Local)</b>	1 <sup>st</sup> July 2016
<b>NIHR Portfolio:</b>	No	<b>End Date (Local)</b>	31 <sup>st</sup> March 2017
<b>Student Project</b>	Yes	<b>Target Recruitment</b>	5-10
<b>Funding Source:</b>		<b>Amount:</b>	£300
<b>Local NHS Support Costs:</b>	Yes/No (Amount)		

<sup>1</sup> Where required; studies may not begin if final HRA Approval not secured.

The table below lists the documentation listed as approved for use in this study. Any changes to this may require an amendment notification to the Research Ethics Committee and Research Office.

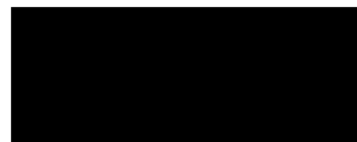
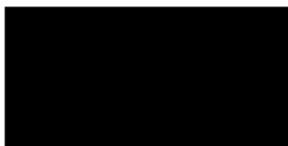
Recognised Documentation (Revised)		
Title	Version Number	Date
Research Protocol	3	20/02/2017

I hope that your analysis of the participant data (5 recruited?) goes well, and look forward to seeing a summary of the final results in due course.

Kind regards



## *Appendix J – Study Invitational Letter*



### **Letter of Invitation to Participants**

#### **The Experience of Compulsive Exercise in Individuals with an Eating Disorder**

June 2016

Dear Participant,

I am contacting you about a current study that you might be interested in hearing about. The study is being conducted by me, Jack Roffe. I am currently a second year trainee on the University of Leicester Doctorate of Clinical Psychology training programme.

**Aim of the study:** The purpose of this study is to explore how individuals with an eating disorder who engage in exercise experience and make sense of exercising. In particular, I am interested in hearing about what you perceive to be important factors to consider.

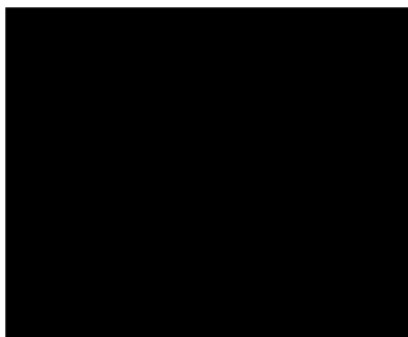
Please take your time to read the attached Participant Information Leaflet (Version 2.0, dated 3<sup>rd</sup> June 2016) which will provide further details about the study. If you decide that you would like to take part, you will be asked to sign a written consent form before participating in a one to two-hour interview. The interview will either take place in a private room on an [REDACTED] at your home or at an alternative venue which is convenient to you. The interview will take place on a one-to-one basis with myself and you will be asked questions relating to your experiences of an eating disorder and exercising. Your input would be very valuable and it is hoped the results of this study will help aid understanding of exercise in eating disorders and potentially help inform the provision of interventions.

If you would like to take part in this study either contact me directly on the details below (email preferable) or return the attached form to your [REDACTED] service who will then pass on the details to me.

Please feel free to contact me with any questions about the study on the contact details below. I would like to thank you for taking the time to read this letter.

Yours Sincerely,

**Jack Roffe**



**Expression of Interest****Study: The Experience of Compulsive Exercise in Individuals with an Eating Disorder**

I am interested in hearing more about the above study. I am happy for Jack Roffe the Principal Researcher to contact me to discuss the study further. Please contact me on the following details:

Name:

Phone Number:

If you do not answer can I leave a voicemail? (please circle): Y / N

Email:

How would you preferred to be contacted? (please circle): Phone / Email

Thank you for your interest in taking part in the research study. I will be in contact with you shortly.

Yours Sincerely,  
**Jack Roffe**

## Appendix K – Participant Information Leaflet\*



### Participant Information Sheet

Study Title: The Experience of Compulsive Exercise in Individuals with an Eating Disorder

Principal Researcher: Jack Roffe ([jr321@le.ac.uk](mailto:jr321@le.ac.uk))

#### Invitation

You are being invited to take part in an interview study which is being undertaken by Jack Roffe (Chief Investigator) as part fulfilment of a Doctor of Clinical Psychology Course at the University of Leicester. The research will be supervised by [REDACTED]

Joining the study is entirely up to you, before you decide whether you wish to take part, it is important for you to understand the aims of the study and what it will involve for you. Please take your time to read the following information carefully and take time to decide whether or not you wish to take part. You might also find it helpful to talk to others about the study.

Please ask the researcher if anything remains unclear.

#### Summary

This research study is interested in exercise and eating disorders. In particular, how individuals with an eating disorder experience and make sense of their exercise behaviour. Exercise is widely regarded as being good for our health and well-being and we are frequently encouraged to undertake regular exercise. However, for some individuals who have an eating disorder research has found that their exercise behaviour may cause additional difficulties and increased health risks.

From a clinical point of view, professionals have been interested in assessing how frequently someone with an eating disorder is engaging in exercise. However, recent research has revealed that it may be more important to understand the reasons behind why a person is exercising. It is hoped that by interviewing people with an eating disorder about their experiences of exercise we will develop a greater understanding of this relationship.

#### What is the purpose of the study?

The aim of the study is to explore how those who have been diagnosed with an eating disorder and who have assessed as having a difficult relationship with exercise actually experience and make sense of this behaviour.

#### Why have I been invited to take part?

You have been invited to take part in this study because you are currently or have recently received treatment for an eating disorder and described exercise as a problematic behaviour, in that you felt unable to stop or control your exercise behaviour. The researcher would like to talk to you about your experiences of engaging in exercise.

#### Do I have to take part?

Participation in the study is entirely voluntary, you do not have to take part in this study if you do not wish to. If you decide to take part, we will ask you to sign a consent form to show your agreement. Regardless of

Participant Information Sheet, Version 2.0, 3<sup>rd</sup> June 2016

whether you participate in the study or not your medical care will not be affected in any way, currently or in the future.

**What will be involved if I take part in the study?**

If you decide to take part in the study, the researcher will arrange a time and a place that is convenient with you to meet in order to conduct a face to face interview. The interview will last between one and two hours and the researcher will ask you questions about your experiences of exercise during the course of your eating disorder and is interested in any aspects you consider to be important. The interview will be audio recorded and transcribed later on. This is to help the researcher recall what you have said. You will also be required to complete a short personal details questionnaire which will include information about: yourself, height, weight and your exercise behaviour.

**What are the possible advantages of taking part?**

The information that you share with us will help us to better understand the experience of exercise in those individuals with an eating disorder. Such evidence will support future service improvements and enable better support for patients. Although there are no guaranteed personal benefits, you may also find it helpful to have an opportunity to discuss your experiences.

**What are the possible disadvantages of taking part?**

It is unlikely that taking part in this study will cause a disadvantage or pose a risk to you. The interview itself may ask you to discuss some sensitive topics, personal feelings and thoughts relating to your exercise and eating disorder which you may find upsetting. As the questions will be related to your exercise and eating disorder it is likely that you have already spoken about these areas during your contact with the Eating Disorder service. You will not have to answer any questions or topics you do not wish to discuss and please remember you are free to withdraw from the study at any time. The researcher will be prepared to support you throughout the interview. The study has been designed to cause minimal inconvenience to you in relation to your time and travel.

**What if I am harmed by the study?**

It is very unlikely that you will be harmed by taking part in this research study. However, if you wish to complain or have any concerns about the way you have been approached or treated in connection with the study, you should ask to speak to Jack Roffe (Chief Investigator [REDACTED]) who will do their best to answer your questions.

In the event that something does go wrong and you are harmed during the research and this is due to someone's negligence then you may have grounds for a legal action for compensation against the [REDACTED] but you may have to pay your legal fees. Further, normal National Health Service complaint mechanisms will still be available to you (if appropriate).

**Will my taking part in the study be kept confidential?**

Yes. All information that you share will be handled in the strictest confidence and stored securely. Any information that you provide that could be used to identify you (obtained from the demographic information form, consent form and invitational letter) will be stored separate from your interview data. The demographic information collected will not be matched to your interview transcript or audio recording. Only members of the research team will have access to any of the personal information obtained. In the unlikely event that an external transcriber is used to transcribe the interviews, they will have access to the audio files, which might contain personally identifiable information. These individuals will be governed by the same confidentiality agreements as the Principal Researcher and will be required to sign a confidentiality agreement. Any data obtained from you, both personal and anonymised will be stored securely.

All interview transcripts will be anonymised, you will be assigned a pseudonym and any identifiable information (e.g. names, places, services) which may have been disclosed during the interview will be changed or removed to protect you from being identified. When the project is being written up, sections of your interview transcript might be quoted word for word, however, any potential identifiable information will be removed and you will always be referred to by your pseudonym. Following the completion of the



study your anonymised transcript and interview recording will be securely stored at the University of Leicester for 5 years before being destroyed.

If the research study is monitored or audited relevant sections of your personal data and medical notes might be looked at by authorised representatives from the University of Leicester, [REDACTED] or other regulatory authorities to verify the study data.

If you decide during the course of the interview to tell us information beyond what is being asked that could reasonably be considered to put your own or someone else's health at risk, we would not be able to guarantee complete anonymity. In such circumstances, we would need to pass on the information you disclosed, along with your personal details, to your named clinician or other agencies for safeguarding purposes. If this was the case, the researcher would inform you about this required action.

**What will happen to the results of the study?**

The results of the study will be written up as a thesis for the partial fulfilment of the Doctor in Clinical Psychology training program. It is anticipated that the findings will also be published in peer-reviewed academic journals, made available on relevant websites and presented at conferences. The findings will also be presented back to the [REDACTED] As explained above, no personally identifiable information will be included.

The researcher will give you an opportunity to request a summary of the findings which will be sent to you in the post or by email.

**What happens if I change my mind?**

You have the right to withdraw from the study at any time, without giving a reason. The standard of care you receive will not be affected in any way. If you decide to withdraw from the study, we will destroy any information that may identify you (i.e. your name, address, telephone number). However, we will use the anonymised data that we have collected up until the point of your withdrawal (i.e. interview). You will be able to withdraw up until the point at which the analysis has been completed and the findings are in written up.

**Who is funding the research?**

This research is sponsored by [REDACTED]

**Who has reviewed the study?**

To protect your rights and safety this research has been reviewed and approved by the University of Leicester and an independent group of individuals within the Research Ethics Committee which is part of the NHS.

**Who is the lead researcher/person responsible for the research?**

Jack Roffe (Trainee Clinical Psychologist, Doctorate Clinical Psychology Training Programme, University of Leicester).

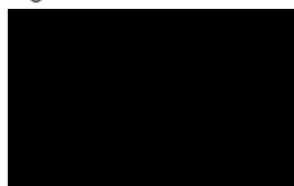
If you have any queries or concerns please contact Jack on:

Email: [jr321@le.ac.uk](mailto:jr321@le.ac.uk)

Phone: [REDACTED]

**Thank you for taking the time read this information**

## Appendix L – Consent form



### Consent Form

**Title of Study:** The Experience of Compulsive Exercise in Individuals with an Eating Disorder

**Principal Researcher:** Jack Roffe

**Centre Number:**

**Study Number:**

**Participant Identification Number for this study:**

**Please Initial Box**

1. I confirm that I have read and understand the Participant Information Leaflet dated 3<sup>rd</sup> June 2016 (Version 2.0) for the above study. I have had opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving reason and without my medical care or legal rights being affected. I understand that if I decide to withdraw after the results have been written up that the data obtained will still be included in the final report. ☐
3. I understand that all my data will be held securely and confidentially at the University of Leicester and that only Jack Roffe (Chief Investigator) [redacted] will have access to them. I understand that relevant sections of my medical notes and data collected during the study, may be looked at by authorised individuals from the University of Leicester, [redacted] and from regulatory authorities for monitoring and audit purposes. ☐
4. I understand that my interview will be audio recorded, transcribed and written up. ☐
5. I understand that if the researcher is concerned about my safety or the safety of others, that the researcher has a duty of care to break confidentiality. ☐
6. I understand that my interview will be included as part of a thesis, and that the results will be made available in the public domain, including academic journals and eating disorder services. ☐
7. **I agree to take part in the above study** ☐

\_\_\_\_\_  
Name of participant

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature

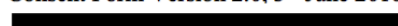
\_\_\_\_\_  
Name of person taking consent

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature

(original copy for participant, original copy for researcher)

Consent Form Version 2.0, 3<sup>rd</sup> June 2016



1

## ***Appendix M – Interview Topic Guide***

### **Interview Topic Guide**

#### **EATING DISORDER (History)**

- 1. Can you describe how you became aware of your eating difficulties?**
- 2. Can you tell me about how your difficulties with eating have progressed?**
- 3. What is the current state of your eating?**

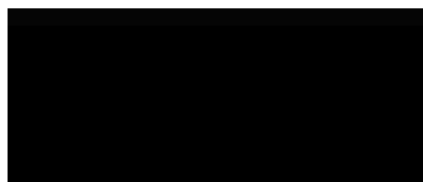
#### **EXERCISE**

- 4. Can you describe when you first got into exercise (history of exercise behaviour)?**
- 5. Can you describe your early experiences of exercise?**
  - Were you involved with exercise/sport before the onset of eating difficulties?
  - What led you to exercise?
  - What thoughts and feelings would you associate with exercise at this time?
- 6. Can you tell me what exercise means to you?**
  - What did it mean in the past? What does it mean now?
- 7. Can you describe when the difficulties with exercise began?**
  - Was anything going on at this time?
  - How did it feel to exercise?
  - What did exercise mean to you at this time?
  - What thoughts and feelings would you associate with exercise?
- 8. Can you tell me about your relationship with exercise?**
  - If difficult to start, can you tell me what today has been like? Or when you last exercised?
  - What usually leads you to exercise? Has this changed?
  - How did exercise make you feel on this occasion?
- 9. Has your relationship with exercise changed over time?**
  - Can you think of what led to these changes?
  - Can you think of any specific examples?
- 10. Can you describe your typical exercise pattern?**
  - During a day? A week?
  - How long would the session last? What would signal the end?
  - How do you feel afterwards?
- 11. Can you tell me about the thoughts and feelings you experience when you exercise?**
- 12. Can you think of a recent time you exercised/or when exercise was at its worst, what happened?**
  - What led you to go and exercise?
  - What were you thinking and feeling before, during and after/
  - When did you stop?
  - Was it a typical session? Is it ever different?

- What would have been different if you hadn't exercised?
- 13. Can you tell me how exercise fits into your daily life and with your eating?**
  - Historical and Current
- 14. Does your exercise influence any other aspects of your life?**
  - Work, social etc.
- 15. Have you had any experiences where your exercise has been stopped?**
  - Or has it ever been interrupted?
  - How did this make you feel? What did you do?
  - How did you manage this?
- 16. Can you tell me about any positives of your exercise in relation to your eating disorder?**
- 17. Can you tell me about any support you have received for managing your exercise?**
- 18. Does your exercise bring anything to your treatment (positive/negative)?**
- 19. How do you see your relationship to exercise in the future?**
- 20. Is there else about your experience you'd like to add?**
- 21. What has it been like to talk about your experiences today?**

**PROMPT: Focus on affect → how has it made you feel? How do you make sense of that?  
Can you tell me more about...?**

*Appendix N – REC Approval Letter\**

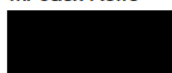


HSC REC A

**Please note:** This is the favourable opinion of the REC only and does not allow you to start your study at NHS sites in England until you receive HRA Approval

25 April 2016

Mr Jack Roffe



Dear Mr Roffe

**Study title:** The Experience of Compulsive Exercise in Individuals with an Eating Disorder - An Interpretative Phenomenological Analysis

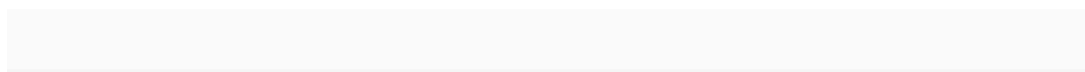
**REC reference:**  
**IRAS project ID:**



The Proportionate Review Sub-committee of the [REDACTED] reviewed the above application on [REDACTED]

We plan to publish your research summary wording for the above study on the HRA website, together with your contact details. Publication will be no earlier than three months from the date of this favourable opinion letter. The expectation is that this information will be published for all studies that receive an ethical opinion but should you wish to provide a substitute contact point wish to make a request to defer, or require further information, please contact the REC Manager [REDACTED]

[REDACTED] Under very limited circumstances (e.g. for student research which has received an unfavourable opinion), it may be possible to grant an exemption to the publication of the study.



## Appendix O – HRA Approval Letter\*



Health Research Authority

Mr Jack Roffe

22 June 2016

Dear Mr Roffe

### Letter of HRA Approval

**Study title:** The Experience of Compulsive Exercise in Individuals with an Eating Disorder - An Interpretative Phenomenological Analysis

**IRAS project ID:**

**REC reference:**

**Sponsor**

I am pleased to confirm that HRA Approval has been given for the above referenced study, on the basis described in the application form, protocol, supporting documentation and any clarifications noted in this letter.

### Participation of NHS Organisations in England

The sponsor should now provide a copy of this letter to all participating NHS organisations in England.

*Appendix B* provides important information for sponsors and participating NHS organisations in England for arranging and confirming capacity and capability. **Please read *Appendix B* carefully**, in particular the following sections:

- *Participating NHS organisations in England* – this clarifies the types of participating organisations in the study and whether or not all organisations will be undertaking the same activities
- *Confirmation of capacity and capability* - this confirms whether or not each type of participating NHS organisation in England is expected to give formal confirmation of capacity and capability. Where formal confirmation is not expected, the section also provides details on the time limit given to participating organisations to opt out of the study, or request additional time, before their participation is assumed.
- *Allocation of responsibilities and rights are agreed and documented (4.1 of HRA assessment criteria)* - this provides detail on the form of agreement to be used in the study to confirm capacity and capability, where applicable.

Further information on funding, HR processes, and compliance with HRA criteria and standards is also provided.

It is critical that you involve both the research management function (e.g. R&D office) supporting each organisation and the local research team (where there is one) in setting up your study. Contact details

*Appendix P – Chronology of research process\**

<i>Activity</i>	<i>Timeline</i>
Consultation with research supervisor	October 2014
Development of initial research proposal	October 2014 to March 2015
Internal panel review of initial research proposal at the University of Leicester	June 2015
Refinement of research proposal Development of research documents	June 2015 to October 2015
Obtaining study sponsorship	November 2015 to January 2016
Service User Reference Group (SURG) review	January 2016
Peer review at the University of Leicester	
Refinement of research proposal	January 2016 to March 2016
Submission of IRAS form for proportional REC review and HRA Approval	April 2016
Favourable Opinion from REC	
HRA Approval	June 2016
Recruitment and interviewing participants Interview transcription	July 2016 to February 2017
Analysis	November 2016 to March 2017
Write up period	March 2017 to May 2017
Thesis submission to the University of Leicester	May 2017
Preparation for viva	June 2017 to July 2017
Dissemination of findings Poster presentation preparation	July 2017 to September 2017

## ***Appendix Q – Outline of the IPA Research Process***

The process of the analysis followed the recommendations outlined by Smith et al. (2009). They acknowledge that these stages should be applied flexibly by the researcher in accordance with the analytic task. Therefore, the stages are not prescribed and helped guide the in-depth analysis process.

### ***Reading and re-reading***

After each transcription had been completed the researcher spent time reading and re-reading each transcript to become familiar with the data. To facilitate immersion in the data this stage also involved listening back to the audio recordings.

### ***Initial noting/coding***

Following this, each transcript underwent a line by line analysis examining both semantic content and the language of the participant. The researcher took a ‘free-association’ stance where comments and thoughts in response to the data were noted down. Three different types of codes were commented on: descriptive, linguistic and conceptual. Descriptive comments focused on describing the content of the data. Linguistic comments focused on the explicit language of the data and the conceptual comments focused on engaging with the data at a more interpretative and exploratory level. To aid this process, the audio recordings were listened back to and notes were made in relation to the participant’s speech. Appendix S contains a transcript excerpt which demonstrates the initial coding process.

### ***Developing emergent themes***

Once the coding had been completed for each transcript, the researcher attempted to transform the initial codes into ‘emerging themes’. This was done by capturing the main qualities of discrete chunks of the data and concisely stating what seemed to be important about it. This primarily achieved by focusing on the initial codes that had been generated. See Appendix T for a theme map that captured some of the emergent themes for one participant.



### ***Looking for patterns across emergent themes***

Once ‘emerging themes’ had been established the researcher looked for patterns and connections between these within individual transcripts. This process involved thinking and mapping out how the emerging themes might fit together and developing ‘super ordinate themes’ where like for like ‘emergent themes’ were clustered together. This was aided using visual methods.

### ***Repeat above steps for individual transcripts***

The above steps were completed for each individual transcript before moving to the next transcript. The researcher made every attempt to remain impartial and not let previous transcripts influence the content of the codes and themes in order to treat each participant within their own individuality.

### ***Look for patterns across cases***

Once all the cases had been through the above process the next stage involved looking for patterns across the cases. This included exploring the similarities and differences between the participants’ experiences. Any themes that appeared to relate to one another were clustered together and if required were re-labelled to best capture idiosyncratic experiences within a single high-order concept. To assist this, several creative methods were employed which included printing out emerging themes from the cases on separately coloured card so the researcher could visually manipulate, order and re-configure themes. A frequency table was also created which allowed the researcher to note which themes captured collective and diverging experiences between the participants.

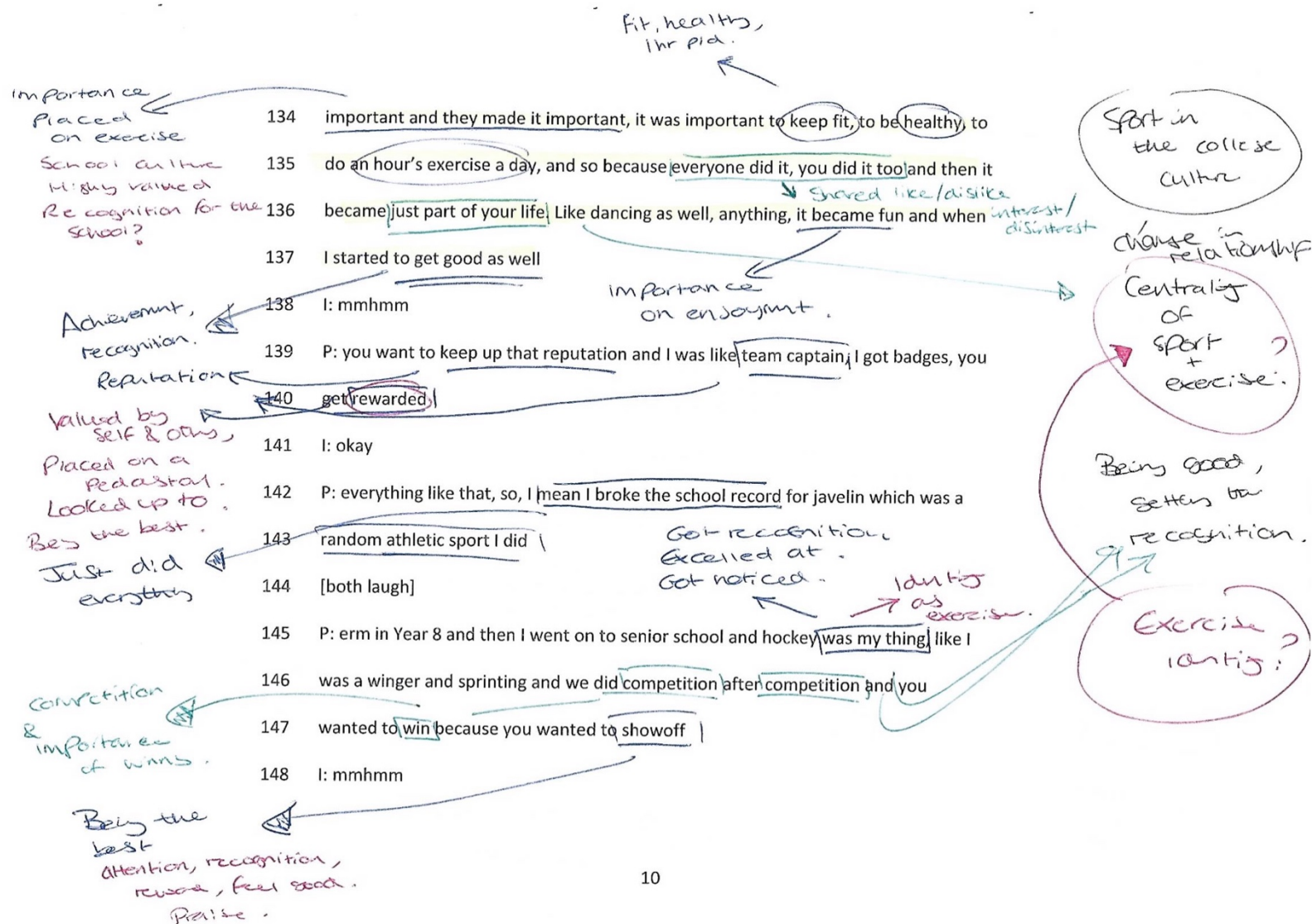
### ***Translating themes into a narrative account***

Following these processes and after much comparing, contrasting and re-organising clusters of themes and cross-checking back to the original data, the final analysis consisted of four super-ordinate themes with between two and five sub-themes in each. A narrative account was presented within the results which was facilitated by further interpretation of the themes.

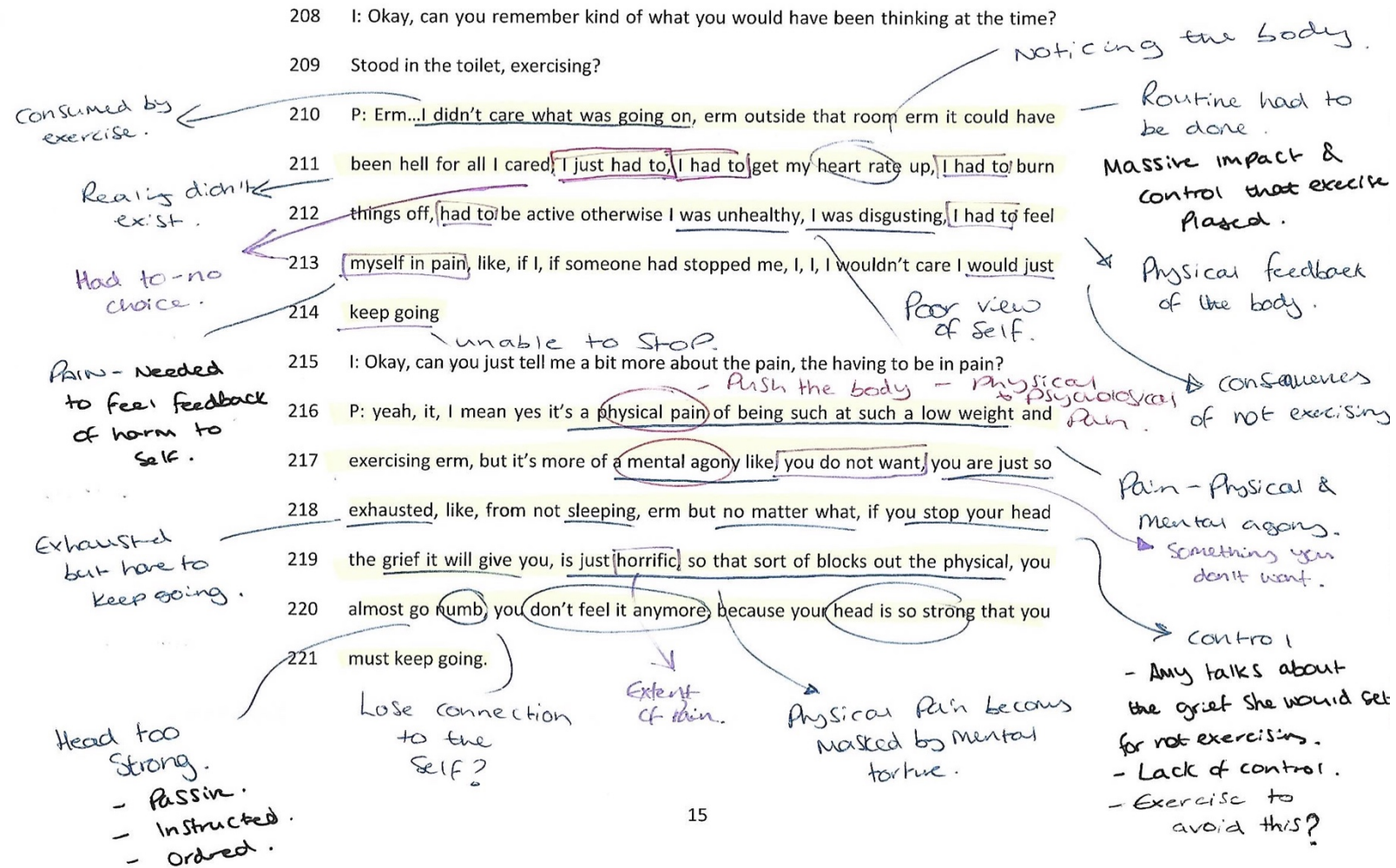
**Appendix R – Frequency table of themes**

Themes	Respondents						
	Amy	Lucy	Kate	Jessica	Olivia	Nicola	Rachel
<b>Becoming lost in a world of exercise</b>	✓	✓	✓	✓	✓	✓	✓
Powerless to stop exercising	✓	✓	✓	✓	✓	✓	✓
A life consumed by exercise	✓	✓	✗	✓	✓	✓	✓
Battling to maintain a social life	✓	✓	✗	✓	✓	✓	✓
<b>Exercise Identity</b>	✓	✓	✓	✓	✓	✓	✓
“I’ve been active my whole life”	✓	✓	✓	✓	✓	✗	✓
Ambivalence towards an exercise identity	✓	✓	✓	✗	✗	✓	✓
<b>Capturing self-worth through exercise</b>	✓	✓	✓	✓	✓	✓	✓
Feeling worthy or worthless	✓	✓	✗	✓	✓	✓	✓
Experiencing pain for a psychological gain	✓	✓	✓	✓	✓	✗	✓
Taking pride in fitness and health	✓	✓	✓	✓	✓	✓	✓
Unhealthy competition with others	✗	✓	✓	✓	✓	✓	✓
Pride in private rebellion	✓	✓	✗	✓	✓	✗	✓
<b>Multi-functionality of exercise</b>	✓	✓	✓	✓	✓	✓	✓
Earning and burning	✓	✓	✓	✓	✓	✓	✓
A way of coping: A release, escape, distraction	✓	✓	✓	✓	✓	✓	✓
Avoiding the mental torture	✓	✓	✓	✓	✓	✓	✓

## Appendix S – Initial Coding Example – Jessica



## Initial Coding Example – Amy



*Appendix T – Developing emergent themes (one page example from one participant)*

