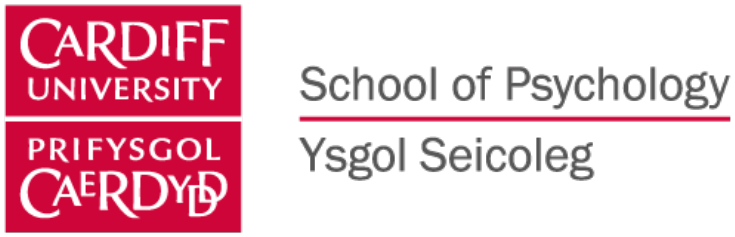

A Systematic Review of Body Image Dissatisfaction in Young Athletes and Non-Athletes, and an Empirical Study of The Link Between Disgust and Body Image in an Analogue Sample

Thesis submitted in partial fulfilment of the requirement for the degree of:

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Table of Contents

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Preface

Paper 1

Paper 1 presents a systematic review of the literature examining child and adolescent athletes and non-athletes on a measure of body image dissatisfaction (BID). BID is a key risk factor for the development of an eating disorder (ED) and commonly develops in childhood and adolescence. Child and adolescent athletes may be at a heightened risk of developing BID as a result of the unique weight, nutrition, and body composition pressures within the sporting environment. Despite this, the majority of research examining BID amongst athletes is conducted with adult or young adult samples. Therefore this review aimed to synthesise research within child and adolescent samples, to provide a snap shot of the literature in this field and offer insight into what additional research may be beneficial. This review also aimed to assess the methodological quality of the studies, and to explore how the quality of studies impacts the conclusions we can make from the review findings. To answer the review question literature searches were conducted across five electronic databases. Inclusion and exclusion criteria for paper eligibility was applied to potentially relevant papers. Eleven studies were eligible for review, and were quality assessed using the Newcastle -Ottawa Quality Assessment Scale. The quality assessment found that most studies were of 'fair' or 'poor' methodological quality. Two studies were deemed to be of 'good' methodological quality. The results of the studies reviewed were synthesised with the quality assessment. Results indicated that athletes (engaging in structured and competitive sports) may have some level of protection from BID, with non-athletes experiencing greater BID than their athlete peers. Results found that females experience greater BID than their male peers, regardless of athletic status. However, no firm conclusions could be made about the impact of age, sport

type or level of competition on BID. The findings of this review indicate that further, better quality research is needed within the field of BID amongst child and adolescent athletes and non-athletes, and a number of recommendations have been suggested. The findings that non-athletes appear to experience greater BID than their athletic peers have a number of implications for the identification, prevention, and reduction of BID amongst children and adolescents in non-sporting contexts such as educational settings. Therefore, there are implications for educational policy and curriculums for the inclusion of body image and its associated difficulties. Review findings also offer some implications for the role of physical activity as a intervention aimed at reducing BID amongst child and adolescents.

Paper 2

Paper 2 presents an experimental study of the link between disgust and body image in a sample of undergraduate students who have high eating disorder (ED) symptomatology and low ED symptomatology. Body image dissatisfaction (BID) is a key risk factor for the development and maintenance of an ED. A key factor in the development of BID is 'thin-ideal internalisation' (TII). TII refers to the extent to which an individual internalises socially defined ideals of attractiveness (e.g., being thin). Recent theory and research has begun to explore the role of the emotion disgust in the development and maintenance of BID. Therefore, this study aimed to examine the role of disgust on a key factor of BID, TII. To answer the research question, participants were experimentally induced in disgust using a film clip validated to induce disgust (mood induction; MI). To overcome the issues associated with self-reported measures (e.g., under or over-reporting) an implicit (not explicitly expressed) measure of TII was used; the Implicit Association Task (IAT). Based on a measure of ED symptomatology, 181 students were allocated into a 'high' or 'low' ED condition and were then induced in disgust or a neutral emotional state. Participants then

completed an implicit association task (IAT) to measure TII. Statistical analysis indicated that as expected, participants in the high ED group experienced greater implicit TII than those in the low ED group. Analyses revealed that those in the disgust MI experienced greater implicit TII than those in the neutral MI. Contrary to expectations, it was also found that MI and TII did not depend on ED condition. Findings suggest that experiencing disgust is associated with greater TII, regardless of whether an individual has symptoms of an ED or not. Given that this appears to be the first study to present such findings, the study requires replication and implications are tentative in nature. However, the novel study findings present a number of potential implications for clinical practice, including a greater role for disgust in assessment and intervention for BID and EDs. There are also potential implications for the theoretical understanding of the development of BID and the mechanisms of emotional processing (e.g., the implicit nature of emotions). A number of recommendations for future research have also been presented.

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Abstract

Body image dissatisfaction (BID) commonly develops in adolescence. Young athletes may be at a greater risk of developing BID than their non-athlete peers as a result of the unique pressures of sporting contexts. This paper presents a systematic review of the recent literature comparing athlete and non-athlete children and adolescents on a measure of BID, to explore the current status of BID in young male and female athletes. Literature searches were conducted across five electronic databases. Eleven studies were narratively synthesised, and quality assessed using the Newcastle-Ottawa Quality Assessment Scale (NOQA). Most studies were assessed to be of 'fair' or 'poor' quality, with two studies deemed to be of 'good' methodological quality. Results indicated that engaging in structured and competitive sports may provide some buffer from BID, and that females experience greater BID than their male peers regardless of athletic status. However, no clear pattern relating to the impact of age, sport type or competition on this buffer could be established. Further robust research within this field is warranted. Implications of the findings for BID in children and adolescents are discussed, along with future directions for research.

Keywords: Children and adolescents, body image, athletes, systematic review

1 Introduction

1.1 Body Image

Body image is described as a multifaceted construct that focuses on the body's function and appearance (Sabiston et al., 2019). Cash and Smolak (2011) described four main dimensions to body image: perception (how an individual sees their appearance and body's function), cognitive (how an individual thinks about their body appearance and function), affective (how an individual feels about their body appearance and function) and behavioural (resulting behaviours from the other three dimensions). One of the most empirically supported theoretical frameworks for understanding body image dissatisfaction (BID) is the sociocultural model (Cafri et al., 2005; Holland & Tiggemann, 2016; Tiggemann & Slater, 2013). This theory postulates that societal ideals of beauty exist within cultural norms which are then transmitted through various sociocultural channels and internalised by individuals. Thus, an individual's sense of body satisfaction or dissatisfaction is based on the extent to which the individual perceives themselves to meet or not meet the societal ideal (Cash & Smolak, 2011). Research has indicated that this theory can explain the emergence of BID at a cognitive level (awareness of thin-ideal standards and internalisation of standards), perceptual level (perceived pressures to be thin), affective level (feeling dissatisfied with one's body) and behavioural level (through dieting or other weight control behaviours) (Cafri et al., 2005).

Over the past 20 years, research examining BID has predominately focused on females and 'thin-ideal internalisation' (Ralph-Nearman & Filik, 2020). Thin-ideal internalisation (TII) refers to the extent to which an individual internalises socially defined ideals of attractiveness and engages in behaviour that aims to move them closer to the ideal

body (Thompson & Stice, 2001). Research has indicated that TII plays a central role in the development and maintenance of BID (Cafri et al., 2005).

1.2 Body Image and Eating Disorders

Research has evidenced BID to be a key predictor of eating disorders (EDs; Tolosa-Sola et al., 2019). This has been established across samples; including females and males, individuals who identify as transgender, and pregnant individuals (Dakanalis et al., 2015; Shloim et al., 2015; Witcomb et al., 2015). Despite this, BID remains for up to two thirds of individuals following cognitive behaviour therapy for EDs (CBT-E; Fairburn, 2008). Consequently, BID remains a priority for public health organisations due to the associated risks and potential link to developing an ED (Yager & O'Dea, 2010).

1.3 Body Image and Athletes

There has been an increase in empirical interest in the area of athletes and EDs in recent years (Rousselet et al., 2017). Anecdotally, there has also been an increased media interest (e.g., 'Freddie Flintoff: Living with Bulimia'; Mackenzie-Betty & Leach 2020). Given the body, weight, eating and performance pressures that athletes experience, they have been identified as an at-risk population for the development of BID and EDs (Petrie & Greenleaf, 2007). Athletes are also at risk of developing relative energy deficiency in sport (RED-S) as a result of restricted eating and overtraining (intentionally or unintentionally; Logue et al., 2018). RED-S is a condition of low energy availability of athletes which can have an adverse impact on bodily systems and long term health (Mountjoy et al., 2015).

Athletes are subject to pressures to lose weight or body fat in an attempt to enhance sport performance (Reel, 2011), and in certain sporting environments, are exposed to pre-

determined weight standards that they must adhere to (Petrie et al., 2007). Athletes may also be subjected to strict nutritional programmes, particularly in sports where restrictive diets are part of the strategy for aesthetic, body composition or weight category purposes such as gymnastics, swimming and wrestling (Sundgot-Borgen & Torstveit, 2010). Furthermore, athletes may be required to wear uniforms which are revealing or tight fitting (e.g. swimming costume) (DiPasquale & Petrie, 2013). Such uniforms may be a source increased self-consciousness, BID and unhealthy body comparisons (Reel, 2011; Thompson & Sherman, 2011). These factors may elicit BID and motivation for unhealthy weight loss practices such as losing weight too quickly, self-induced vomiting or the use of laxatives or diuretics in an attempt to enhance sporting performance.

Research indicates that athletes also experience weight and body image pressure within the sporting environment, both from coaches and teammates (Thompson & Sherman, 2011). The greater the pressure perceived from coaches, teammates, family members and fans, the greater the BID and increased engagement in weight-loss behaviours (Anderson et al., 2012). Although research has indicated that sport-specific risk factors have been more present for female athletes, males report experiencing such pressures too (Galli & Reel, 2009).

A previous systemic review conducted by Varnes et al. (2013) examined studies between 1997 and 2012 comparing body image concerns among college athletes and non-athletes. However, there are a number of limitations to this review. Although authors mention an evolving ‘new body ideal’, emerging evidence indicates that sociocultural body shape ideals have continued to change since 2012, with many women seeking a more muscular appearance, termed ‘thin-muscularity-ideal’ (Ralph-Nearman & Filik, 2020). Additionally, Varnes et al. (2013) did not include males in their sample. This is reflective of the literature within this field where a meta-analysis of BID and EDs in male athletes indicated that only

19.2% of included studies assessed males (Hausenblas & Downs, 2001). Despite this, research has evidenced that BID is prevalent among males (McCabe & Ricciardelli, 2004). More recently, there have been empirical and theoretical advances which has allowed for a more accurate understanding of BID amongst males (Bassett-Gunter et al., 2017). For example, examination of 'muscle dysmorphia', a condition characterised by an interpretation of one's body size as both small and weak, even though they may appear to be of normal weight or highly muscular (Pope et al., 2005). These emergences in the literature have led to the validation of new outcome measures assessing BID amongst men (Ralph-Nearman et al., 2018). Thus, a systematic review including male and female samples, synthesising any potential theoretical and empirical emergences is warranted.

1.4 The Importance of Focusing on Children and Adolescents

Within the field of BID and EDs, child and adolescent (CAA) athletes have been one of the least researched (Thompson & Sherman, 2014). Despite this, research indicates that most athletic participation and competition takes place during adolescence or early adulthood (Byrne & McLean, 2001). Many adult athletes at the highest level of competition have access to multiple professionals such as sports medicine physicians, nutritionists and psychologists. However, this is often not the case for CAA athletes. Thus, CAA athletes may have the same risk factors for BID development as adults, with less and poorer informed professional support (Thompson & Sherman, 2014). CAA athletes also carry a further risk to that of adult athletes as a result of biological and developmental changes. The onset of puberty occurs during adolescence and young athletes often experience changes in their body which contrast with expectations set in sports, where being as lean as possible is the ideal (Sundgot-Borgen et al., 2013). Such experiences may contribute to a discrepancy between perceived and ideal body weight, which may elicit BID. Additionally, CAA athletes are at a high risk age for

developing an ED when they first begin or become serious about a sport (Thompson & Sherman, 2014). Anorexia nervosa (AN) and bulimia nervosa (BN) (where BID is a key diagnostic criterion) commonly begin during adolescence (APA, 2013), increasing the risk of onset for those within this developmental stage. Furthermore, the onset of disordered eating amongst adult athletes is most commonly observed during their adolescence (Thompson et al., 2014). Thus, in order to prevent and intervene in reducing the impact of potential risk factors such as BID, research and reviews must focus on CAA.

This review asks the question: what are the differences on a measure of BID, if any, between athlete and non-athlete CAAs?

1.5 Rationale for Review Question

Research indicates that CAA athletes may be at a significant risk for the development of BID. This review will provide a snapshot of the literature surrounding BID amongst CAA athletes and non-athletes, and provide insight into what additional research is warranted to further our understanding of BID within this field. Furthermore, the literature discussed above indicates that there may be more nuance to how we understand BID across genders. Thus, a systematic review inclusive of gender is necessary to explore and report on any new emergences within the field. The implications of these findings may have a role in the development of evidence-based guidelines for educational institutions, coaches, and sports medical care teams in identifying and preventing BID and EDs.

1.6 Objectives

This systematic review aims to answer the review question stated above. A secondary aim is to assess the methodological quality of the studies included within the review, explore

how these impact on the conclusions we can draw from review findings and inform recommendations for future research and reviews.

2 Methods

The methods undertaken in this review adhered to the guidelines in the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) statement (Page et al., 2020). This review was not registered with PROSPERO.

2.1 Search Process

Searches were carried out and inclusion/exclusion criteria applied by the first author (see Table 1 and Table 2). Inclusion criteria were applied to the study search based on Population, Intervention, Comparison, Outcome, Study and Setting framework (PICOSS; Amir-Behghadami & Janati, 2020). In keeping with relevant literature in this area 'athlete' was defined as an individual participating in structured competitive physical activity that is governed by rules (Fox et al., 2000). Given there was no rationale to exclude papers based on publication date, all papers that met eligibility criteria were included. Studies that were not published as full reports were excluded given that it could not be determined whether they met inclusion criteria. In an attempt to reduce publication bias grey literature was included. The Open Access Theses and Dissertations (OATD) database was included as an accessible method of reaching grey literature.

Table 1

Inclusion Criteria Based on Population, Intervention, Comparator, Outcome, Study Design, Setting (PICOSS)

PICOSS	Inclusion criteria
Population(s)	Male and/or female athletes and non-athletes aged 18 years old or younger
Intervention(s)	Any
Comparator(s)	Non-athletes aged 18 years old or younger compared explicitly with athletes aged 18 years old or younger on a measure on body image
Outcomes	Any validated measure of body image
Study design	Any quantitative study
Setting	Any

Table 2

Exclusion Criteria

Criteria	Exclusion
Study design	Qualitative research
Type of publication	Not published as full reports (e.g. conference abstracts)
Language	Any language other than English
Publication date	None

Search terms were derived from systematic reviews within the area of body image and EDs (see Table 3).

Table 3

Body Image and Athlete Search Terms Entered into Electronic Databases

Search Terms
Body dissatisfaction
Body satisfaction
Body esteem
Muscle dysmorphia
Muscle dysphoria
Bigorexia
Muscle dissatisfaction
Fat dissatisfaction
Weight dissatisfaction
Athlete

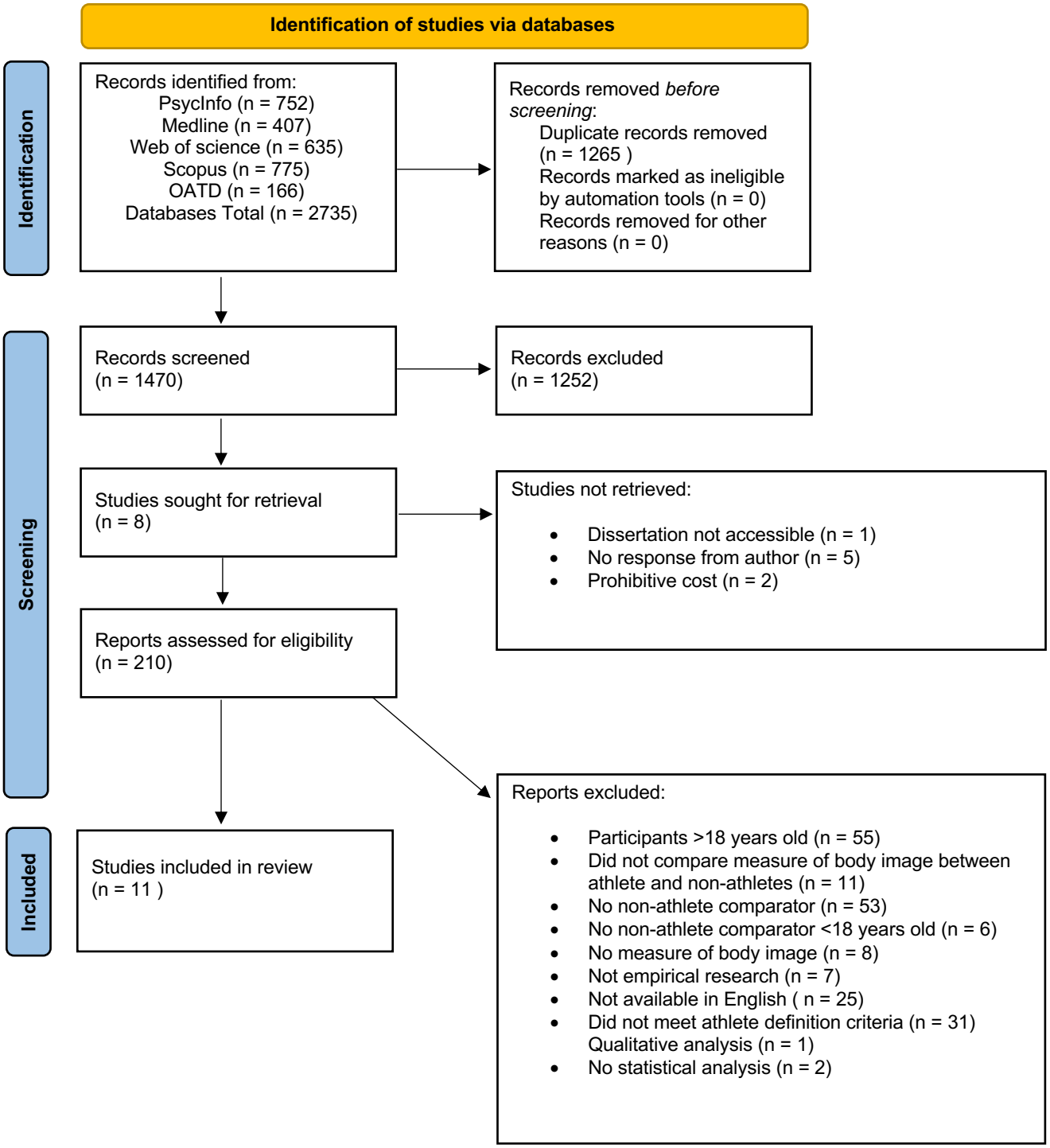
Note. Boolean operators "AND" and "OR", truncation symbol and proximity operators were utilised to improve search precision. Search terms were modified according to each database's unique search engine features.

Search terms were entered into five electronic databases; PsycInfo, Medline, Scopus, Web of Science and OATD, covering dates up to and including 2020 (see Appendix B for database syntax). Databases were searched in November 2020, and re-searched in May 2021 to ensure any new papers were identified. In total, 2735 records were identified. All titles and

abstracts were screened for study relevance and full texts of the relevant abstracts were then assessed for eligibility against the inclusion/exclusion criteria (see Figure 1). Overall, 11 studies were included for review.

Figure 1

PRISMA Flow Diagram of Review Search Process



2.2. Data Extraction

To reduce the possibility of researcher bias and to be blind to study quality, data extraction was conducted prior to quality assessment (QA; Boland et al., 2017). The first author extracted the data and a supervisory researcher checked the data extraction method and the extraction domains. Data was extracted from each paper with customised data extraction forms as recommended by Boland et al. (2017; see Appendix C).

2.3 Quality Assessment Tool

The Newcastle- Ottawa Quality Assessment Scale (NOQA) for cross-sectional studies (Modesti et al., 2016) was customised to assess risk of bias (see Appendix D). Scores were converted to Agency for Healthcare Research and Quality (AHRQ) standards (good, fair, and poor; see Appendix D for categorisations).

For each NOQA sub-category (e.g., 'comparability'), studies could score up to two stars if they fully met the criterion, one star if they partially met the criterion, or no stars if they did not meet the criterion. Given all studies used self-report measures for body image and the NOQA would have provided all studies with the same score, including this item would have reduced the variability in quality ratings. Thus, this item was adapted to ensure that psychometric properties of self-report measures were assessed. Furthermore, the NOQA was customised to include the following: the quality and comprehensiveness of athlete and non-athlete descriptors, whether the study controlled for age and/or gender of participants, and whether the study included an a priori hypothesis about the difference between athletes

and non-athletes on a measure of body image. These adaptations were conducted to specifically address items related to risk of bias within the study design and context of the present review, as recommended by AHRQ (Viswanathan et al., 2017).

2.4 Interrater reliability

A second reviewer quality assessed 25% of the included papers. The kappa calculation between raters was 0.58, indicating moderate agreement (McHugh, 2012). Rating variations were discussed until an agreement was reached.

3 Results

3. 1 Narrative Synthesis

The narrative synthesis presented throughout this review was conducted in line with guidance outlined by Popay et al. (2006). Key elements of the narrative synthesis included developing a preliminary synthesis, exploring relationships in the data and assessing the robustness of the synthesis product. As recommended by Popay, these elements were completed in an iterative manner.

For key characteristics of the included studies see Table 4.

Study Characteristics

Included studies were published between 1990 and 2018 and conducted in various countries, with the majority within Europe, and one in Brazil (Neves et al., 2015). All studies (except one which reported that all participants were Caucasian; Ferrand et al., 2009) failed to report the racial demographics of participants. All studies were quantitative, cross-sectional articles, published in peer-reviewed journals and utilised self-reported body image outcome measures. Two studies recruited participants through sport coaches/teachers (Francisco et al., 2013a; Salbach et al., 2007), four gained permission from a higher level

(e.g., sport officials or coordinators; Ferrand et al., 2009; Francisco et al., 2013; Monthuy-Blanc et al., 2010; Monthuy-Blanc et al., 2012) and five studies did not explicitly report the sampling methodology (Benson et al., 1990; Ferrand et al., 2005; Martinsen et al., 2010; Neves et al., 2015; Rosenvinge et al., 2018).

Participant Characteristics

Five studies included both males and females in their participant samples. The remaining six included females. Four of the studies compared one athlete group with a control non-athlete group, whilst seven compared two or more athlete groups with a non-athlete group. Athlete samples engaged in various sports, although all 11 studies included some description of dancers, gymnasts, or swimmers within their athlete samples. Descriptors of non-athlete participants varied across the 11 studies. Non-athlete controls were defined as high school students in eight studies. In one study the non-athlete condition included college students and in two studies non-athlete control conditions included students that attended physical education (P.E) classes but never organised sport. One study included patients with a diagnosis of anorexia nervosa (AN) as an additional non-athlete comparator, and one study included non-aesthetic sports as the non-athlete control group. Sample sizes across the studies ranged from 64-966 participants.

Athlete Competitive Level. In nine of the included studies the athlete sample consisted of individuals competing either nationally or internationally, fitting a description of ‘elite athlete’; an individual who trains and competes at the highest levels of their chosen sport (Sands et al., 2019). Two studies included non-elite athletes, competing at district or inter-district level.

Age. The mean age of participants ranged from 12.5 years old to 16.5 years old. Two studies provided an age range without reporting a mean or standard deviation. Seven studies utilised participants within 'late adolescence' (aged between 15 – 19 years old; Sawyer et al., 2012). Four studies included participants within 'early adolescence' (aged between 10-14 years old; Sawyer et al., 2012).

Outcomes of Included Review Studies

Four studies reported no significant difference between athlete and non-athlete adolescents on BID. Contrastingly, four studies reported significant differences in BID between athletes and non-athletes, and three studies reported mixed findings. Three of the studies that reported significant differences found that athletes had greater BID than non-athletes. Contrastingly, four studies reported that non-athletes had greater BID than athletes. A variety of BID measures were utilised across studies, with the EDI-BD subscale being the most frequently implemented.

Summary

The papers included within this review are heterogeneous in nature. The most homogenous factors across papers are the type of study presented and the publication status. The findings presented across papers produce inconclusive results in relation to the differences in BID between CAA athletes and non-athletes. To explore the inconsistencies amongst studies, studies will be quality assessed and results will be synthesised in the context of the QA findings.

Table 4

Key Study Characteristics, Participant Characteristics, Study Outcomes and Quality Assessment of Included Studies within the Review

Study	Country of origin	BI measure	Race	Mean age in years (SD)		Sex	Athlete sport (s)	Sample size	Outcome	Effect size	QA Rating
Rosenvinge et al. (2018)	Norway	EDI-2-BD	NR	Control	15-16 (NR)	F & M	Individual and team sports	966	Female: A (M = 6.9, SD = 6.8), NA (M = 10.6, SD = 8.0) $p < .05$	g = 0.524	Good
				Athlete (E)	15-16 (NR)				Male: A (M = 2.4, SD = 3.3), NA (M = 4.1, SD = 4.6) $p < .01$	g = 0.421	
Neves et al. (2015)	Brazil	BSQ	NR	Control	13.29 (1.61)	F & M	Artistic gymnasts	413	EA (M = 65.18, SD = 24.34), NEA (M = 66.16, SD = 25.81), NA (M = 68.63, SD = 27), p = .628, *ns*	NR	Poor
				Athlete (NE)	12.57 (1.84)						
				Athlete (E)	13.33 (1.86)						

Study	Country of origin	BI measure	Race	Mean age in years (SD)		Sex	Athlete sport (s)	Sample size	Outcome	Effect size	QA Rating
Francisco et al. (2013)	Portugal	CDRS	NR	Total	15.34 (2.12)	F & M	Gymnasts Dancers	725	Females: EA (*M* = -.88, *SD* = 1.12), NEA (*M* = -.51, *SD* = 1.19), NA (*M* = -.81, *SD* = 1.31) *p* < .05 Males: EA (*M* = -0.11, *SD* = 0.83), NEA(*M* = 0.27, *SD* = 0.96), NA (*M* = -.17, *SD* = 1.09), *ns* EA vs NEA (*U* = 3,768.50, *p* < .01)	NR	Fair
Francisco et al. (2013a)	Portugal	CDRS	NR	Control	14.58 (1.81)	F & M	Gymnasts Dancers	227	Females: A (*M* = -0.55, *SD* = 1.25), NA (*M* = -0.61, *SD* = 1.34) *U* = 2425.50, *ns*	*d* = .024	Fair
				Athlete (E)	15.35 (2.73)				Males: A (*M* = -0.21, *SD* = 0.89), NA (*M* = -0.07, *SD* = 1.17), *U* = 729, *ns*	*d* = .044	

Study	Country of origin	BI measure	Race	Mean age in years (SD)		Sex	Athlete sport (s)	Sample size	Outcome	Effect size	QA Rating
Monthuy-Blanc et al. (2012)	France	EDI-BD	NR	Control	14.60 (1.26)	F	Ballet dancers Basketball players	172	BA (M = 10.28, SD = 7.33), BB (M = 8.27, SD = 6.62), NA (M = 8.32, SD = 6.60), *ns*	η^2 = .02	Poor
				Ballet (NE)	13.59 (1.32)						
				Basketball (NE)	14.13 (1.28)						
Monthuy-Blanc et al. (2010)	France	EDI-BD >18	NR	Control	14.1 (1.3)	F	Ballet dancers Basketball players	180	A (n = 17), NA (n = 6), 95% CI[0.57,4.26], p = .38, *ns*	η^2 = .005	Fair
				Athlete (NE)	14.1 (1.4)				*B (n = 52), BB (n = 43),* 95% CI[0.42,3.55], p = .72, *ns*	η^2 = .002	

Study	Country of origin	BI measure	Race	Mean age in years (SD)		Sex	Athlete sport (s)	Sample size	Outcome	Effect size	QA Rating
Martinsen et al. (2010)	Norway	EDI-BD >14 for girls and >10 for boys	NR	Control	15-16 (NR)	F & M	50 different sports	961	Females: A (n = 36), NA (n = 50), p <.01 Males: A (n = 17), NA (n = 21), p < .01	NR	Good
				Athlete (E)	15-16 (NR)						
Ferrand et al. (2009)	France	BES	Caucasian	Control	16.3 (.86)	F	Rhythmic gymnasts Synchronized swimmers	152	NA (M = 47.3, SD = 12.6), RG (M = 49.4, SD = 14.3), SS (M = 38.8, SD = 13.2), p < .001	f = 0.321	Fair
				Rhythmic Gymnasts (E)	16.2 (1.5)						
				Synchronized swimmers (E)	15.8 (1.2)						

Study	Country of origin	BI measure	Race	Mean age in years (SD)		Sex	Athlete sport (s)	Sample size	Outcome	Effect size	QA Rating
Salbach et al. (2007)	Germany	EDI-BD	NR	Control	14.9 (1.7)	F	Rhythmic gymnasts	164	F*(2)*=11.7, p <.001 AN vs RG AN (M = *39.0, SD = 12.8),* RG (M = 27.9, SD = 10.7) p < .001 RG vs NA NA (M = 31.9, SD = 12.6), RG (M = 27.9, SD = 10.7), p = .240 *ns*	f = 0.374 NR NR	Fair
				Rhythmic Gymnasts (E)	14.8 (2.1)						
				AN	15.5 (1.5)						
Ferrand et al. (2005)	France	BES	NR	Control	16.3 (1.1)	F	Synchronized swimmers Sports where weight is not central	132	SS vs NA SS (M = 38.26, SD = 13.2), NA (M = 46.72, SD = 13.1), p < .001 WNC vs NA, *ns*	NR	Poor
				Synchronised Swimmers (E)	15.4 (1.2)						
				WNC (E)	16.5 (.93)						

Study	Country of origin	BI measure	Race	Mean age in years (SD)		Sex	Athlete sport (s)	Sample size	Outcome	Effect size	QA Rating
Benson et al. (1990)	Switzerland	EDI – BD	NR	Control	13.5 (1.2)	F	Gymnasts Swimmers	64	Significantly more swimmers reported a mean = or > AN cut off than NA or gymnasts, $p < .01$	NR	Poor
				Swimmers (E)	12.8 (.9)						
				Gymnasts	12.5 (1.1)						

Note. SD = standard deviation; NR = not reported; A = athlete; NE = non-elite athlete; E = elite athlete; RG = rhythmic gymnasts; SS = synchronised swimmers; WNC = weight not central sports; AN = Anorexia nervosa patients; BA = ballet dancer athletes; BB = basketball players; F = female; M = male; QA = quality assessment; BSQ = Body Shape Questionnaire; CDRS = Contour Drawing Rating Scale; BES = Body Esteem Scale (Canadian-French version); EDI-BD= Body dissatisfaction subscale of Eating Disorder Inventory; *ns* = non-significant

3.2 Quality Assessment Narrative Synthesis

The methodological quality of studies included in this review were varied (see Appendix E for QA scoring). Furthermore, three studies reported significant variability in methodological rigour within QA sections, further contributing to quality inconsistencies (Ferrand et al., 2005; Monthuy-Blanc et al., 2012; Neves et al., 2015). Overall, Neves et el. (2015) and Ferrand et al. (2005) were assessed to be of 'poor' quality as a result of scoring 0 in the 'comparability' subscale. However, in other areas of the QA, these papers reflected 'good' and 'fair' quality. Additionally, Monthuy-Blanc et al. (2012) scored 'good' in 'selection' quality, 'fair' in 'outcome' quality and 'poor' in comparability quality.

All studies included representative samples of the target population. Additionally, all but one study (Benson et al., 1990) reported the statistical test utilised to compare athlete and non-athlete groups on a measure of body image (mainly t-tests or non-parametric t-test equivalent). All studies included self-reported measures of body-image. The variety of these measures and potential issues with their use will be discussed later in this review. Nine studies (Ferrand et al., 2005; Ferrand et al., 2009; Francisco et al., 2013; Francisco et al., 2013a; Martinsen et al., 2010; Monthuy-Blanc et al., 2010; Neves et al., 2015; Rosenvinge et al., 2018; Salbach et al., 2007) described good psychometric properties of the tool and two described the tool sufficiently. The majority of studies, with the exception of two (Neves et al., 2015; Rosenvinge et al., 2018;), did not provide a justified and satisfactory sample size with estimated power. Ferrand et al. (2005) appeared to be the only study to include an a priori hypothesis about BID difference across athlete and non-athletes. The remaining studies were exploratory in nature. Three studies included within the review controlled for potential confounding factors of age and gender (Francisco et al., 2013a; Martinsen et al., 2010;

Rosenvinge et al., 2018). Four studies controlled for age or gender (Ferrand et al., 2009; Francisco et al., 2013; Monthuy-Blanc et al., 2010; Salbach et al., 2007) and four did not control for any relevant factors (Benson et al., 1990; Ferrand et al., 2005; Monthuy-Blanc et al., 2012; Neves et al., 2015).

Seven studies did not provide summary data of non-respondents (Benson et al., 1990; Ferrand et al., 2005; Ferrand et al., 2009; Francisco et al., 2013; Francisco et al., 2013a; Neves et al., 2015; Salbach et al., 2007). Four studies included a basic summary of non-respondent characteristics (Martinsen et al., 2010; Monthuy-Blanc et al., 2010; Monthuy-Blanc et al., 2012; Rosenvinge et al., 2018). Six studies included clearly specified and defined descriptions of athlete and non-athlete samples (Ferrand et al., 2009; Martinsen et al., 2010; Monthuy-Blanc et al., 2010; Monthuy-Blanc et al., 2012; Neves et al., 2015; Rosenvinge et al., 2018), whilst five provided clearly defined descriptors of the athlete sample but not for the non-athlete samples (Benson et al., 1990; Ferrand et al., 2005; Francisco et al., 2013; Francisco et al., 2013a; Salbach et al., 2007).

3.3 Biases

Sample Bias

Half of the included studies utilised non-random sampling methodology, indicating that some members of the athlete and non-athlete population are more or less likely to be included than others. This may result in biased samples and less accurate representation of the target population. Additionally, the remaining studies failed to report the sampling methodology resulting in an inability to scrutinise the sampling methodology.

The majority of studies did not provide summary data of non-respondents. Thus, it is unclear whether response bias was influencing study participation and outcomes. Of those studies which did provide non-respondent data, basic response rate information was described by Rosenvinge et al. (2018), reducing the ability to assess response bias. The remaining three studies all reported that a proportion of participants failed to provide completed parental consent forms, indicating potential bias in participant responses towards those who felt comfortable to request this from guardians or who had guardians who were happy for their child to partake.

There is disparity amongst non-athlete definitions included in this review. For example, some studies excluded participants in the non-athlete group who engage in any kind of physical activity outside of mandatory physical education classes, whereas one study utilised a control group of participants who engage in no aesthetic sports without exclusion criteria for non-aesthetic sports (Francisco et al., 2013). The heterogeneity of non-athlete definitions produces difficulties when synthesising and interpreting results as it is unclear whether findings are confounded by the differences in non-athlete group variables (e.g. amount of physical activity), reducing the reliability and validity of findings.

Measure Reliability and Validity

All BID measures were self-report, relying on the subjective experience of the CAA. Thus, responses are open to social desirability bias, leading to under or over-reporting of perceived undesirable attitudes (Latkin et al., 2017). This may reduce the validity of BID outcomes. Issues surrounding the validity and reliability of measures within CAA and male samples also limits the validity of review findings.

The majority of studies in this review utilised the EDI-2-BD subscale to measure BID. The EDI-2 has been widely used within CAA samples (Micali & House, 2011). However, the suitability of the EDI-2 for CAAs has been questioned due to the level of comprehension required to complete the questionnaire and the limited normative data available for this age group (Thurfjell et al., 2004). Thus, validity of findings from studies utilising this measure may be limited. Two of the studies utilising this measure included males and females within their samples (Martinsen et al., 2010; Rosenvinge et al., 2018). Research suggests that the underlying mechanisms driving BID in males and females may differ, with young males being more likely to be focused on both losing weight and increasing muscle size whilst females are more focused on losing weight (McCabe & Ricciardelli, 2003). Furthermore, the EDI-BD assesses dissatisfaction with the hips, buttocks, thighs and stomach, areas which research has shown to be more important in females than males (Watkins & Lask, 2002). Thus, those studies which include male and female samples and utilise the EDI-BD subscale may not be capturing valid responses of male BID across athlete and non-athlete samples. Supporting this hypothesis, Martinsen et al. (2010) reported that the BD subscale of the EDI-2 reported a lower reliability for athlete boys ($\alpha = 0.63$) and control boys ($\alpha = 0.75$) than athlete and non-athlete girls ($\alpha = 0.91$). Martinsen et al. (2010) edited two scale items for males (e.g., changed "I like the shape of my buttocks" to "I like the shape of my upper body") in an attempt to eliminate any reduction in item reliability and validity. However, psychometric properties of the edited items were not reported, therefore it remains unclear how valid or reliable these items are for the male sample.

Summary

The QA indicates that there is significant variability in methodological robustness of the included studies, with the majority of studies reflecting 'fair' or 'poor' quality. The high

variability in paper quality produces difficulties in drawing reliable conclusions about the methodological quality of the study. Consequently, conclusions drawn from the studies should be considered tentatively, particularly within papers of 'poor' quality. The QA findings implicate multiple recommendations for future research to enhance methodological quality which will be discussed later in this review. The findings of the included studies will now be synthesised in the context of the QA.

3.4 Results Synthesis

Athletes vs Non-athletes on Measure of Body Image

Both methodologically 'good' quality studies (Martinsen et al., 2010; Rosenvinge et al., 2018), found significant differences between male and female athletes and non-athletes on a measure of BID, with non-athletes reporting significantly greater BID. The significant difference reported by Rosenvinge et al. (2018) was found to be of a medium effect size.

The studies that scored 'fair' within the QA reported mixed findings. Three studies reported non-significant differences between athletes and non-athletes on a measure of BID (Francisco et al., 2013a; Monthuy-Blanc et al., 2010; Salbach et al., 2007). Contrastingly, Ferrand et al. (2009) reported a significant difference with a medium effect size between non-athletes, rhythmic gymnasts, and swimmers. Authors found that athlete swimmers experienced greater BID than rhythmic gymnasts and non-athlete peers. Furthermore, Francisco et al. (2013) found that there was a significant difference between elite athletes, non-elite athletes, and non-athletes. However, this difference was only found in females, not males.

Two methodologically 'poor' quality studies found no significant differences between athletes and non-athletes (Monthuy-Blanc et al., 2012; Neves et al., 2015). Contrastingly,

Benson et al. (1990) found a significant difference, with more athletes (swimmers) reporting a mean BID score equal to or greater than the clinical cut off (for AN patients) than non-athletes. Finally, Ferrand et al. (2005) found a significant difference between athletes (swimmers) and non-athletes, but not between athletes where weight is not central and non-athletes.

Gender

Of the methodologically 'good' quality studies, Martinsen et al. (2010) found significant differences between male and female athletes and non-athletes BID, with more females scoring above EDI-BD clinical cut off than males. Rosenvinge et al. (2018) did not statistically compare male and female samples, therefore differences between genders could not be determined.

Two 'fair' quality studies included males and females (Francisco et al., 2013; Francisco et al., 2013a), whist three samples consisted of females only (Ferrand et al., 2005; Monthuy-Blanc et al., 2010; Salbach et al., 2007). Although Francisco et al. (2013) and Francisco et al. (2013a) controlled for gender, neither statistically analysed BID differences between genders.

Three studies that were classified as 'poor' quality did not include male participants (Benson et al., 1990; Ferrand et al., 2005; Monthuy-Blanc et al., 2012). Thus, it is undetermined whether any differences would have been found between genders. Although Neves et al. (2015) included a sample of male and females, no analysis was conducted to determine whether there was any significant differences between genders.

Weight Sensitive Sports vs Non-Weight Sensitive Sports

Both methodologically ‘good’ quality papers (Martinsen et al., 2010; Rosenvinge et al., 2018) included athlete samples participating in a variety of weight sensitive (WS) sports (where success requires leanness or a particular body appearance; Rosenvinge et al., 2018) and less weight sensitive (LWS) sports and these were compared with non-athletes. However, WS and LWS sports were not compared with non-athletes separately. Thus, it is unclear whether there were differences between WS categories on BID. This remained the case when examining studies of ‘fair’ methodological quality as no studies compared BID between WS sports and LWS sports with non-athletes.

Two methodologically ‘poor’ studies directly compared WS and LWS sport athletes with non-athletes on BID (Ferrand et al., 2005; Monthuy-Blanc et al., 2012). Ferrand et al. (2005) found significant differences between synchronised swimmers (WS) and non-athletes, but not between athletes participating in LWS sports and non-athletes. Authors found that young athletes participating in WS sports experienced greater BID than those in LWS sports. Contrastingly, Monthuy-Blanc et al. (2012) found no significant differences in BID between ballet dancers (WS), basket-ball players (LWS) and non-athletes. The remaining three methodologically ‘poor’ studies did not compare WS sports, LWS sports and non-athletes. However, both athlete samples included within Benson et al. (1990) study would be considered WS (swimmers and gymnasts). Authors found that there was a significant difference in BID between swimmers, gymnasts, and non-athletes, with swimmers experiencing greater BID than gymnasts and non-athlete controls.

Age

Methodologically ‘good’ papers included participants in ‘late adolescence’. Four of the five ‘fair’ quality studies included participants in ‘late adolescence’ (Ferrand et al., 2009; Francisco et al., 2013a; Francisco et al., 2013; Salbach et al., 2007). Monthuy-Blanc et al.

(2010) examined participants in ‘early adolescence’ and reported no significant differences between athletes and non-athletes.

Finally, three of the methodologically ‘poor’ papers included participants in ‘early adolescence’ (Benson et al., 1990; Monthuy-Blanc et al., 2012; Neves et al., 2015), and one included participants in ‘late adolescents’ (Ferrand et al., 2005).

4 Discussion

The primary aim of this review was to synthesise the most up-to-date research comparing CAA athletes and non-athletes on a measure of BID. The majority of studies included within the review were deemed to be of ‘fair’ or ‘poor’ methodological quality, thus conclusions drawn from their findings should be made tentatively. Two papers were deemed to be of ‘good’ quality. The implications of these higher quality papers will be now be considered.

4.1 Athlete Versus Non-Athlete

The highest quality papers (Martisen et al., 2010; Rosenvinge et al., 2018) both reported significant differences between athletes and non-athletes, with non-athletes reporting greater BID than athletes. These findings appear consistent with a previous review comparing BID amongst college aged female athletes and non-athletes between 1997 and 2012 (Varnes et al., 2013). Moreover, the present findings are congruent with, and provide support for, a previous review exploring weight-concerns and weight-control behaviour amongst elite athlete adolescents (Werner et al., 2013). Werner found that the majority of studies indicated a lower risk of athletes than non-athletes for weight concerns.

Contrastingly, studies of ‘fair’ methodological quality produced variable outcomes. Several key factors may explain the differences in results found between ‘good’ and ‘fair’

quality papers. Firstly, both Rosenvinge et al. (2018) and Martinsen et al. (2010) included larger sample sizes than that of all methodologically 'fair' papers. This taken with the lack of power analysis could indicate that the non-significant findings reported by three of the 'fair' quality papers were a result of the study being underpowered, thus, type two error. Secondly, inconsistencies could be attributed to a difference in competition level between 'good' and 'fair' quality papers. For example, Monthuy-Blanc et al. (2010) utilised a non-elite athlete sample, in comparison to the elite samples utilised by Rosenvinge et al. (2018) and Martinsen et al. (2010). The potential importance of competition level will be discussed in greater detail below. Additionally, in contrast to findings within 'good' quality papers, Ferrand et al. (2009) reported more swimmers than non-athletes had greater BID. Along with the factors noted above, differences in outcomes may be related to measure construct disparities. Both Rosenvinge et al. (2018) and Martinsen et al. (2010) utilised the EDI-BD subscale, in comparison to Ferrand et al. (2009), which utilised the Canadian-French version of the body-esteem scale. Despite all measures reporting adequate measure reliability, it is unclear whether subtle differences in construct measurement (e.g., differences between body esteem and body dissatisfaction) may have contributed to these inconsistent findings.

Only two of the studies which found a significant differences on BID between athletes and non-athletes reported effect sizes or provided the data to enable effect size calculation. Thus, understanding the magnitude of the differences reported is limited. However, Rosenvinge et al. (2018) reported that non-athletes experienced significantly greater BID than athlete peers with a medium effect size indicating that this difference is of moderate power. These findings increase the confidence in any clinical implications resulting from such findings.

Despite a minimal sample of ‘good’ quality papers, findings indicate that engaging in competitive and structured sports may provide some protection for BID amongst CAAs.

4.2 Gender

Of the four higher quality papers (‘fair’ or ‘good’ methodological quality) that included male and female samples, only one study statistically compared male and female athletes and non-athletes on BID (Martinsen et al., 2010). Consistent with previous literature (Joy et al., 2016), researchers found a significant difference on BID between male and female athletes and non-athletes, with females reporting significantly greater BID. However, it is important to acknowledge the potential validity issues of the BID measures utilised for male samples within this review. It may be that disparities within BID between male and female athletes and non-athletes may be explained by psychometrically poor and inappropriate BID measures being used within male samples. For example, research has started to identify the unique weight gain behaviours that are prevalent particularly among male adolescent athletes (Nagata et al., 2020). Thus, BID may be driven by body ideals that emphasise leanness and muscularity (Nagata et al., 2019). Findings from the current review indicate that these updates in the understanding of body image within adolescent male athletes samples have not yet filtered through to the literature or been applied through the use of psychometrically valid measures within research.

4.3 Weight Sensitive Sports vs Less-Weight Sensitive Sports

As there are often different demands associated with different sport types, authors explored the studies in relation to their categorisation of WS sports and LWS sports. This is a distinction that has been well established within the literature in relation to EDs within athletes, introduced by Sundgot-Borgen (1993).

Studies of ‘good’ methodological quality which included athletes involved in WS and LWS sports did not compare these groups with non-athletes on a measure of BID. Furthermore, no studies of ‘fair’ methodological quality explored the role of weight sensitivity when comparing athletes and non-athletes on a measure of BID. However, Martinsen et al. (2010) did find a non-significant relationship between sport type (leanness or non-leanness) and ED symptomology (including BID), although no comparisons between athlete and non-athlete samples were conducted. Martinsen et al. (2010) findings appear inconsistent with a recent review which concluded that there is strong evidence to suggest that athletes competing in lean sports are at higher risk for disordered eating (Mancine et al., 2020). It is unclear whether this would remain the case if the focus of the review was the impact on BID specifically. Additionally, tentative findings appear to be inconsistent with theoretical models of the development of ED symptomology within adult athletes (Stoyel et al., 2020). Researchers postulate that ED symptomatology varies across many factors, including sport-type. Thus, as noted by Werner et al. (2013), further research is required to establish whether WS sports are a key risk factor for the development of BID in CAA athletes.

4.4 Level of Competition

Both methodologically ‘good’ quality papers included athlete samples which met the criteria for ‘elite’ athlete. In comparison, studies which included ‘non-elite’ athlete samples were assessed to be of ‘poor’ or ‘fair’ methodological quality. Given the differences in methodological quality, it is difficult to disentangle the impact of the level of competition on BID between athletes and non-athletes, as disparities in results may be a reflection of poor methodological quality rather than competition level. Furthermore, to draw firm conclusions about any differences between athletes (at different levels of competition) and non-athletes

on BID, direct comparisons between elite athletes and non-athlete, and non-elite athletes and non-athletes would be required.

Two studies included both elite and non-elite athlete samples, although only one was assessed to be of ‘fair’ methodological quality. This study found that elite athletes had significantly more BID than non-elite athletes, experiencing similar BID to that of non-athlete controls (Francisco et al., 2013). Given that only one study can be reliably utilised to examine the role of competition level on BID within CAA athletes and non-athletes, conclusions cannot be established in this review. Further research examining the influence of athlete competition level on BID in comparison to non-athletes in CAA is warranted.

4.5 Age

Methodologically ‘good’ papers included participants in ‘late adolescence’, and both reported that non-athletes experienced greater BID than their athlete peers. Contrastingly, three of the four studies including participants in early adolescence found non-significant differences between athletes and non-athletes. However, these papers were of ‘poor’ or ‘fair' methodological quality producing difficulties when attempting to conduct comparisons, as differences in results may reflect biases and limitations noted within the QA.

Based on these findings alone, it is unclear how developmental processes impact on a CAAs perception and internalisation of BID.

4.6 Theoretical Considerations

A number of social, psychological, and cognitive factors may account for the findings that CAA athletes may experience lower levels of BID than their non-athlete peers, despite the unique and complex pressures that young athletes experience. Athletic clubs potentially offer CAAs a social environment where they may interact and connect with like-minded

peers. Therefore one factor that may reduce risk of BID may be access to enhanced social support. Qualitative research exploring the experiences of young elite athletes attending an Olympic competition supports this hypothesis, reporting that the athletes relied on different types of social support (e.g., peers, coach) to manage the competitive stressors (Kristiansen & Roberts, 2010). Furthermore, previous research has evidenced the mediating role that the number of friends or peer support has in CAAs participating in competitive sports on overall mental wellbeing. However, they did also find that associations between competitive sports and positive mental wellbeing remained when mediators (regular exercise, health diet and number of friends) were controlled for. Developmental theories of BID may help to contextualise the current review findings. It has been theorised that maturational status (such as timing of menarche), and early physical maturation in particular, is a central factor to the developmental of BID (Thompson, 1990). Research has supported the association between pubertal timing and aspects of BID (Williams & Currie, 2000). Athletic training has been implicated in the delayed onset of menarche, sexual maturation and skeletal maturation in female athletes (Klentrou, 2006; Thomis et al., 2005). Thus, differences in maturational status between adolescent athletes and non-athletes, with non-athletes reaching physical maturation earlier, may account for the review findings that non-athletes may experience greater BID than their athlete peers. One of the most empirically supported theories for understanding BID, the sociocultural model, appears to offer less insight into the current review. This theory posits that an individual's body image is based on the extent to which they perceive themselves to meet or not meet societal and cultural body ideals (Cash & Smolak, 2011). The studies of 'good' methodological quality included in this review reported no significant differences in BMI or height between athlete and non-athlete samples. Thus, it could be suggested that all individuals would be experiencing somewhat similar perceptions of the discrepancy between their perceived body weight or shape and the ideal. Thus, this would not

account for any differences in BID between athletes and non-athletes. It may be that changes in perception of an individual's body that occur when exercising (e.g., when engaging in strength training perceiving the body to feel leaner) may account for potential disparities in BID between athletes and non-athletes independent of objective body shape or weight differences. Further theoretical frameworks to understand the nuanced differences in BID within young athletes and non-athletes is warranted.

4.7 Limitations of included studies

In addition to the biases identified within the QA, a number of limitations require acknowledgement.

Representativeness of studies

Only five of the studies within this review included both males and females in their samples. The remaining six included females only resulting in a strong gender bias towards conducting research on females within this field. Furthermore, those studies that included males and females did not always have groups that were matched by gender. Neves et al. (2015) reported significant variation across athlete and non-athlete samples, with 46.88% of non-athletes being female in comparison to 92.5% of elite-athletes being female. This gender bias is likely to reduce the validity of the study and review results. Thus, great consideration should be given to how generalisable findings from the current review are to young male populations.

Almost all of the participant samples of the included studies originated within westernised cultures. Only Neves et al. (2015) examined participants not within this category (Brazil). This is pertinent given research has indicated that there may be cultural differences in BID experiences within and across genders (Maezono et al., 2018). Furthermore, all but

one study failed to report data relating to participant ethnicity or race, therefore it is unclear whether study findings are representative of societal diversity. Thus, the generalisability of study findings to individuals and cultures within non-westernised societies is questionable, with further research within non-westernised cultures warranted.

The majority of studies examined participants within late adolescence. This limits generalisability of the review findings to child or early adolescent athletes where sporting competitions and training sessions are encouraged from an early age. This is pertinent given research has indicated that athletes specialising in sports in early childhood is increasingly common (Jayanthi et al., 2013). The age of the sample is key for the interpretation of study results due to the physical, cognitive, social, and emotional differences between children, early adolescence, and late adolescence. The limited focus on such factors within the papers included in this current review reduces the ability to make reliable and valid interpretations of findings. Given the significance of developmental experiences on the formation of self-identify and perception (Williams et al., 2000), it is recommended that future research examines and discusses these factors and the potential implications on BID in young athletes and non-athletes.

A limited number of sports representing athlete samples were included, with the majority of studies examining individualistic athletes such as dancers, gymnasts, or swimmers. This is reflective of the literature indicating that disordered eating is frequently observed within sports that emphasise leanness and low body weight (Sundgot-Borgen & Torstveit, 2004). However, the limited focus of athlete sports without the inclusion of a variety of WS sports and LWS sports (and both individual and team) reduces the generalisability of findings to the population of CAA athletes. Two studies overcame this limitation by including 50 different sports (categorised into WS and LWS sports),

representing both individual and team sports, within their athlete sample (Martisen et al., 2010; Rosenvinge et al., 2018). Thus, findings from these studies offer greater generalisability to CAA athlete populations.

4.8 Strengths and Limitations of Review Process

Quality assessment

The NOQA (adapted for cross-sectional studies) was utilised for QA. No formal NOQA for cross-sectional studies currently exists, and further evaluation of its psychometric properties has been recommended (Moskalewicz & Oremus, 2020). Thus, it is unclear whether QA tool is limited by potential validity and reliability issues, opening up bias to the current review findings. The cross-sectional adaptation was modified further by the author to ensure it could identify and assess key factors relevant to the current review. Although adaptations aimed to increase validity of the tool to the current study, psychometric properties of the customised scale are unknown and therefore questionable. Furthermore, the modification process may increase the risk of author bias within the QA process.

Review Process

Non-English language studies were excluded. Although necessary due to the first authors language, this exclusion increases a risk of bias within the review results (Rasmussen & Montgomery, 2018). This review may not have captured all relevant studies due to the language restriction.

Application of the inclusion criteria to the results of initial searches identified 11 papers. This number is small given the substantial number records identified through database searching. However, the contribution of secondary reviewers within the process of examining inclusion/exclusion criteria allows confidence that all eligible research was

included within this review. The contribution of secondary reviewers at data extraction and quality assessment phases also increases the robustness of the current review. Although it is acknowledged that this would not eliminate all potential bias, additional reviewers allow greater confidence in the validity and reliability of methods undertaken within this review and the resulting outcomes and conclusions.

This review attempted to limit publication bias by including theses and dissertations within searches. However, it is acknowledged that this only accounts for a specific and minimal selection of grey literature, and it is likely that some publication bias remains within the current review.

4.9 Implications

Research

Future research should consider and address the methodological limitations of the literature highlighted in this review. In order to increase reliability and validity of study results several recommendations have been proposed. Future studies should include a mixed gender sample of participants and gain greater representation of the target population by including participants from diverse cultural, social, and sexual minority backgrounds.

It is recommended that validated measures within male samples, such as the Drive For Muscularity Scale, and the Somatomorphic Matrix (Sawyer et al., 2012), are utilised in future research. Future research may also benefit from the inclusion of athletes participating in a multitude of individual and team sports to increase the generalisability of findings. Appropriate use of power analysis or sample size calculation would also allow greater confidence in interpreting the magnitude and reliability of findings.

Given that there was insufficient data regarding the potential role of competition level on BID between athlete and non-athletes, it is recommended that future research allows direct examination of the influence of elite versus non-elite athletes on BID, in comparison to their non-athlete peers.

Finally, the review findings suggest that research surrounding theoretical models of the development of BID within athletes should consider of a multitude of factors, including level of competition, type of sport and developmental stage.

Clinical

Review findings potentially implicate the need for a greater role for the identification of BID in non-sporting contexts (e.g., educational settings). The present findings offer support for existing government policy to promote mental health and wellbeing, early identification and onward referral to specialist or appropriate services for presenting needs within educational settings (Department of Health, 2017). Review findings also support the proposals set out within this policy to support schools to train a designated senior lead for mental health. Findings indicate that this professional would benefit from having awareness of key identifying features of BID (across cognitive, perceptual, emotional, and behavioural dimensions). Findings also offer support for the second proposal within this green paper; to have mental health support teams to bridge the gap between education and mental health services. This may allow for early detection of BID, critical to the prevention of subclinical or clinical EDs

It may be beneficial to ensure that issues of body image and eating are included within the educational curriculum. This may help to counteract thin-ideal internalisation, a core mechanism of the development of BID according to the sociocultural model (Ralph-Nearman

& Filik, 2020). Targeting BID within this approach would fit in line with one of the four core purposes of the new national educational curriculum; to promote healthy and confident individuals (Welsh Government, 2020). It could be implicated from the present findings that CAAs would benefit from integrating issues of body image within the learning and experience area of Health and Wellbeing for CAA aged 3-16 years old. Support for the benefits of such an approach has been provided by research examining the effectiveness of a school based curriculum for developing healthy body image in male and female high school students (Kater et al., 2000). Furthermore, recent research has supported the effectiveness of such programs within both preadolescents and adolescents across males and females (McCabe et al., 2017; Sundgot-Borgen et al., 2019). Furthermore, integration of BID within the curriculum supports a 'whole school approach' in line with national framework guidance, where a holistic approach to supporting emotional health and wellbeing is the responsibility of all those within the educational system (Welsh Government, 2020).

Finally, given young athletes appear to have lower BID in comparison to their non-athlete peers, findings offer tentative support for the role of physical activity in preventing the development of, or reducing, BID. Such implications are supported by a meta-analysis examining the effectiveness of exercise interventions for BID. Researchers concluded that exercise represents an accessible and effective intervention for children and young people with poor body image (Campbell & Hausenblas, 2009). However, Campbell recommended that further research examining the effects of exercise on BID in youth is warranted.

4.1.1 Conclusion

Findings from higher quality papers within this review indicate that involvement in structured and competitive sport may offer some protection from the experience of BID. As expected, this review contributes to the body of evidence that young females experience

greater BID than their male counterparts. However, this review indicates that research continues to be limited by a lack of male samples, validated measures of BID in young boys, and in measures reflective of recent emergences in socio-cultural body ideals towards thin-muscularity. Given the small sample of methodological ‘good’ quality papers, further robust research surrounding BID amongst young athletes (both elite and non-elite) and non-athletes is warranted.

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Abstract

Individuals with an eating disorder (ED) often continue to experience body image dissatisfaction (BID) following treatment. Preliminary research and theoretical models of EDs suggest that disgust may play a role in the maintenance of BID. Thin-ideal internalisation (TII) is a core mechanism in the development of BID. This experimental study examined the role of disgust on an implicit measure of TII. Based on a measure of ED symptomatology, undergraduate students (n = 181) were allocated into a 'high' or 'low' ED condition and were then induced in disgust or a neutral emotional state. Participants completed an implicit association task (IAT) to measure TII. Analysis revealed a significant main effect of both ED and mood induction (MI) groups on implicit TII, with participants in the high ED group reporting greater TII than those in the low ED condition, and those induced in disgust reporting greater TII than participants in the neutral condition. No interaction between ED and MI condition was found. Results suggest that state disgust may play a key role in the development of implicit TII regardless of ED symptomatology. Implications of the findings for BID are discussed, as well as future directions for research into its treatment.

Keywords: body image, eating disorders, disgust, experimental research

1 Introduction

1.1 Eating Disorders

An eating disorder (ED) is a multifaced and complex mental health condition which can have a detrimental impact on an individual's physical and mental health related quality of life (Hay et al., 2017). Furthermore, EDs have a 6% mortality rate, one of the highest amongst any mental health presentation (Owens et al., 2021). The core diagnoses as stated by the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; APA, 2013) include anorexia nervosa (AN), bulimia nervosa (BN) and binge eating disorder (BED). Research argues that AN and BN share a core dissatisfaction, over-evaluation of, and preoccupation with, body weight and shape (Sharpe et al., 2018) and negative beliefs about eating and food (Alvarenga et al., 2014). The emergence of EDs is more common in females than males (APA, 2013), although prevalence estimates amongst males are likely to be underestimated (Gorrell & Murray, 2019). The aetiology of EDs remains poorly understood, however there is evidence to suggest that there is a complex interplay between genetic and environmental influences (Keski-Rahkonen & Mustelin, 2016). The age of ED onset can vary significantly, although EDs typically begin during adolescence or young adulthood (APA, 2013).

1.2 Body image

Body image is a multidimensional construct that depicts how an individual perceives their body and its functioning (including how an individual thinks, feels and behaves). Body image dissatisfaction (BID) has been established as a core factor in the development and maintenance of an ED (Fairburn et al., 2003; Pellizzer et al., 2018). One of the main

interventions for an ED (enhanced cognitive behaviour therapy; CBT-E; Fairburn, 2008) includes key BID targets. Despite this, BID frequently remains following intervention (Alleva et al., 2015) and is often linked to ED relapse (Glashouwer et al., 2019).

One of the most empirically established theoretical models for understanding the development of BID is the sociocultural model (Cafri et al., 2005; Holland & Tiggemann, 2016; Tiggemann & Slater, 2013). This theory postulates that influences from the environment (e.g., peers, media, toys) contribute to BID. It is theorised that individuals internalise societal body ideals and drive to attain these ideals by engaging in body or eating centred behaviours, known as thin-ideal internalisation (TII; Thompson & Stice, 2001). Research has supported the role of TII on an individual's body related attitudes (weight or shape dissatisfaction) and behaviours (dietary restraint; Cafri et al., 2005; Girard et al., 2018). Furthermore, research has indicated that TII may be a causal risk factor in the onset and maintenance of BID and eating disturbance (Cash, 2012; Thompson et al., 2001). Despite the majority of research focusing on females, recent research has evidenced that both muscularity and thinness internalisation are also associated with BID and disordered eating in males (Klimek et al., 2018).

Given that BID is a core feature of EDs and is often resistant to intervention, further understanding of the psychological mechanisms underlying BID is required.

1.3 Disgust

Disgust has been described as the "repulsion by the sight, smell, or taste of something; disgust may also be provoked by people whose actions are revolting or by ideas that are offensive" (Ekman & Cordaro, 2011, p. 365). Disgust has been evidenced as a 'basic' emotion (characterised by the ability to be discretely distinguished from other emotions, and to be evolutionary adaptive) that is experienced across cultures (Ekman et al., 2011). Rozin et

al. (2008) proposed four main categories of disgust: core disgust (real or perceived threat of offensiveness or consumption of something that may cause disease or sickness), animal-reminder disgust (reminders of human morality), interpersonal disgust (elicited by being with unknown or ill individuals) and socio-moral disgust (elicited by violations of moral rules or expectations).

Given that disgust is an emotion highly linked to food and eating, it is unsurprising that disgust may play a key role in the development of an ED (Troop & Baker, 2009). Emerging research has supported this hypothesis, indicating that aversive disgust-based learning may represent a risk factor for the development and maintenance of avoidance-based ED symptoms (such as food avoidance; Anderson et al., 2021). However, the link between disgust and BID remains unclear due to limited research. Recent research has shown that the disgust response is associated with body-focused difficulties (Neziroglu et al., 2010). Disgust propensity, sensitivity and self-disgust have been found to be significantly correlated with BID (Stasik-O'Brien & Schmidt, 2018). However, only self-disgust was associated with BID when other negative emotional states were accounted for. A study examining the positive correlation between self-disgust, disgust propensity and sensitivity and BID suggested that self-disgust partly accounted for the association between disgust proneness and BID (von Spreckelsen et al., 2018).

Information processing and mood-congruent bias theories hypothesise that individuals with EDs have an attentional bias to stimuli associated with weight, shape and food (Vitousek & Hollon, 1990; Williamson et al., 1999), which has been empirically demonstrated (see Stott et al., 2021, for a review). Stott et al. (2021) proposed that disgust may underlie attentional bias in ED groups. Furthermore, the Schematic Propositional Analogical Association Representation System (SPAARS) model applied to EDs (SPAARS-ED) argues that disgust is key within the development and maintenance of EDs (Fox & Power, 2009).

This theory hypothesises that those with EDs may direct disgust toward their own bodies as a means of inhibiting the experience or expression of other emotions, such as anger.

1.4 Experimental Methodologies

Despite preliminary research and theoretical frameworks indicating a role for disgust in the development and maintenance of BID, research remains limited. Furthermore, the majority of research within this field utilises qualitative or non-experimental methodologies (Fox et al., 2013). Therefore, further experimental research is warranted. To overcome the limitations associated with self-report methodologies and provide a more reliable assessment of constructs, the implicit association task (IAT) has been successfully implemented to measure implicit ED related beliefs and attitudes, including drive for thinness (Borgers et al., 2021; Izquierdo et al., 2019; Spring & Bulik, 2014). Research has also demonstrated that experimental methodologies can be successfully implemented to induce emotion (Fox et al., 2013; Wildes et al., 2012).

1.5 Current Study Aims & Hypotheses

To understand the nuances and underlying mechanisms involved in the development and maintenance of BID, it is necessary to build upon previous research and theory by experimentally examining the impact of disgust on implicit TII. To the best of the author's knowledge, these concepts have not been examined using mood induction (MI) and IAT paradigms. The current research aims to address the above empirical and theoretical gaps.

Research has indicated that those with greater ED symptomatology experience greater implicit TII (Schaefer et al., 2019), and that disgust may be correlated with BID (Stasik-

O'Brien & Schmidt, 2018). Furthermore, research has suggested that those with ED symptomatology may have an increased sensitivity and propensity to experiencing disgust (Stasik-O'Brien & Schmidt, 2018). Finally, the SPAARS- ED theoretical model proposes that disgust may develop implicitly and contribute to the development of BID (Fox et al., 2009). The research and theory outlined above underpin the present study's hypotheses.

Hypothesis 1

Individuals with high ED symptomatology will show higher implicit thin-ideal bias than those with low ED symptomatology.

Hypothesis 2

There will be no significant difference on implicit thin-ideal bias between individuals induced in disgust or a neutral emotion.

Hypothesis 3

There will be a significant interaction between MI condition (disgust/neutral) and ED condition (high/low-ED group) on implicit thin-ideal bias, in which the impact of the disgust induction on thin-ideal bias will depend on levels of ED symptomatology.

Exploratory Hypotheses

The following variables will be explored for their association with implicit thin-ideal bias (papers which have previously demonstrated an association with BID for each variable are included in parentheses).

1. Anxiety (Zanetti et al., 2013).
2. Depression (Paans et al., 2018).
3. Self-disgust (Stasik-O'Brien et al., 2018; von Spreckelsen et al., 2018).
4. Disgust propensity and sensitivity (von Spreckelsen et al., 2018).

5. Sociocultural attitudes towards appearance (Stojcic et al., 2020).

Difficulty identifying or describing emotions ('alexithymia') may impact on the MI methodology as this relies on subjective emotional experiences. Additionally, alexithymia is prevalent amongst ED samples (Westwood et al., 2017). Thus, alexithymia was included within exploratory hypotheses.

2 Method

2.1 Design

This is an experimental study, utilising a MI and IAT paradigm. The study includes two between-subject factors; MI and ED symptomatology.

2.2 Participants

A power analysis was conducted using G*power based on a 2 (neutral or disgust MI) X 2 (high or low ED) ANOVA. Due to the lack of comparable studies, it was not possible to calculate an expected effect size. A meta-analysis revealed that restrained eaters increased food intake in response to a negative MI with a medium effect size (Evers et al., 2018), therefore a medium effect size was selected, as a conservative estimate. For an alpha error probability of 0.05 and power of 0.80, it was estimated that a sample size of 125 would be required to establish a medium effect size.

The mean age of onset of disordered eating ranges between 18 years old and 25 years old, falling within the traditional university undergraduate years (Hudson et al., 2007). Consequently, research has concluded that undergraduate students should be considered a

population at heightened risk of developing an ED (Lipson & Sonneville, 2017). Thus, this population presented a clear target sample for the current research.

Undergraduate students aged 18 years old or older were invited to participate in the research. Students studying psychology at Cardiff University were recruited via the university research portal 'EMS'. Participants received one research credit for completing part one of the research and if eligible for part two, received a further three credits upon completion. Students who were not studying psychology at Cardiff University were recruited via social media advertisements (e.g., Twitter). Participants were recruited from across the United Kingdom. These participants were automatically entered into a prize draw to win a £50 amazon voucher for their completion of part one of the research. Participants were recruited in six samples across time points, between March 2020 and January 2021.

As an analogue sample, participants were split to represent comparable conditions to 'non-clinical' and 'clinical' ED samples using quartile splits. Participant Eating Disorder Examination-Questionnaire (EDEQ; Fairburn & Beglin, 1994) global scores were placed in ascending order and split into quartiles. Participants who scored within the top or bottom EDEQ quartile were placed into the high or low ED group, respectively, and then randomly assigned to either the disgust or neutral MI condition. These participants were invited to complete part two of the study. A total of 181 participants (26 males, 154 females, one identified as 'other') completed the entire study, aged between 18 years and 38 years old, with a mean age of 19.97 (*SD* = 2.79). Four conditions were analysed (see Tables 1 and 2 for descriptive data).

Table 1

Condition Sample Size

Condition	High ED	Low ED

Disgust	46	46
Neutral	49	40

Table 2

Participant Descriptive Data

Gender	Condition	N
Male	MI	
	Neutral	16
	Disgust	10
	ED	
	Low	21
	High	5
Female	MI	
	Neutral	72
	Disgust	82
	ED	
	Low	65
	High	89
Other	MI	
	Neutral	1
	Disgust	0
	ED	
	Low	0
	High	1

Note. MI = mood induction condition; ED = eating disorder group; N = sample size

2.3 Measures

For a copy of all measures, see Appendix F.

Eating Disorder Symptomatology

The EDEQ is a 33 item self-report questionnaire that measures ED symptomatology (Fairburn et al., 2008). The EDEQ provides scores of severities on key aspects of EDs which are measured across four subscales: restraint, eating concern, shape concern and weight concern. For subscale scores, items that relate to each subscale are added together and the sum is divided by the total number of items within that subscale. Higher EDEQ scores reflect greater ED symptomatology. The EDEQ is widely used in clinical and research settings world-wide. Its psychometric properties are well established, with research indicating good convergent validity (Anderson et al., 2021), concurrent validity, acceptable criterion validity (Mond et al., 2004) and sensitivity to change (Sysko et al., 2005). All EDEQ subscales demonstrate excellent internal consistency and test-retest reliability (restraint $\alpha = .81$; shape concern $\alpha = .94$; weight concern $\alpha = .92$; eating concern $\alpha = .87$; Luce & Crowther, 1999).

Depression

The Patient Health Questionniare-9 (PHQ-9) is a self-report measure that is derived from the depression module of the PRIME-MD, a diagnostic instrument for common mental health conditions (Kroenke et al., 2001a). The PHQ-9 consists of nine statement items that relate to depressive symptomatology over the past two weeks. Responses are rated on a Likert scale which corresponds to the frequency that the individual has been bothered by the symptom statements (0 = not at all, to 3 = nearly every day). The score for each item is

summed to provide a PHQ-9 total. Summed scores of 0-4 reflects 'minimal' depression severity, 5-9 reflects 'mild', 10-14 reflects 'moderate', 15-19 reflects 'moderately severe' and summed scores of 20-27 reflects 'severe' depression. The PHQ-9 has demonstrated high internal consistency and validity (α = .89; Kroenke et al., 2001b).

Anxiety

The Generalised Anxiety Disorder-7 (GAD-7) is a 7-item self-report scale that was developed to identify probable cases of generalised anxiety disorder (GAD; Spitzer et al., 2006). The scale consists of seven items that reflect GAD symptom severity. Responses are scored on a Likert scale that relate to the frequency that they have been bothered by the difficulties over the past two weeks (0 = not at all, to 3 = nearly every day). Total GAD-7 scores are calculated by summing the score for each item. Total scores of 0-5 reflects 'mild' anxiety severity, 6-10 reflects 'moderate', 11-15 reflects 'moderately severe' and 15-21 reflects 'severe' anxiety severity. The GAD-7 has shown good reliability (α = .89; Löwe et al., 2008), and good criterion, construct, factorial, and procedural validity (Spitzer et al., 2006).

Self-Disgust

The Self-Disgust Scale (Overton et al., 2008) is an 18-item self-report questionnaire that is based on three constructs: appearance, general self-concept, and behaviour/abilities. Each statement is rated on a 7-point Likert scale (1= strongly agree to 7 = strongly disagree). A total self-disgust score is calculated by summing scores to the 12 items related to self-disgust constructs, after reverse scoring items 1, 3, 4, 7, 10, 12, 15, 17, and 18. All other items ('filler' items) and are not included in the score as per instructions (Overton et al.,

2008). Higher scores indicate higher self-disgust, with a maximum score of 84 and a minimum score of 12. The scale has excellent internal consistency (α = .91).

Attitudes Towards Appearance

The Sociocultural Attitudes Towards Appearance Questionnaire (SATAQ-3) is a 30-item self-report questionnaire that aims to measure societal influences on body image and eating disturbances (Thompson et al., 2004). The questionnaire consists of four sub-scales: information, pressures, internalisation-general and internalisation-athlete. Participant responses are recorded on a 5-point Likert scale (1 = definitely disagree, to 5 = definitely agree). Higher scores indicate greater media internalisation. Internal reliability scores range from α = .96 (internalisation-general and information) to α = .89 (internalisation-athlete), and from α = .90 (internalisation-general) to α = .85 (internalisation-athlete and pressures) amongst non-clinical adult female samples (Wilksch & Wade, 2012). The SATAQ-3 also has high internal consistency in patients with EDs (Calogero et al., 2004).

Alexithymia

The Toronto Alexithymia Scale-20 (TAS-20) is a 20-item self-report questionnaire that measures alexithymia (Bagby et al., 1994). 'Alexithymia' refers to a difficulty in identifying and describing one's own emotions. The TAS-20 has three main subscales: difficulty describing feelings, difficulty identifying feelings and externally oriented thinking. Items are scored using a 5-point Likert scale (1= strongly disagree, to 5 = strongly agree). Five items on the scale are reversed scored. The scale is scored by summing responses of all items, with higher scores indicating greater alexithymia. A total score equal to or less than 51

indicates non-alexithymia, 52 to 60 indicates possible alexithymia, and a score equal to or greater than 61 indicates alexithymia. The measure is widely used within research and has demonstrated good internal consistency in student populations (α = .80), psychiatric outpatient samples (α =.83), and test-retest reliability and validity (Bagby et al., 2020).

Disgust

The Disgust Propensity and Sensitivity Scale-Revised (DPSS-R; Van Overveld et al., 2006) is a 16-item self-report questionnaire. Participants are instructed to read statements and mark the answer which is most appropriate to them. The statements relate to the frequency of experiencing certain bodily symptoms, and their emotional impact. Responses are recorded on a 5-point Likert scale (1 = never to 5 = always). To score each subscale (propensity and sensitivity) items relating to the subscale are summed. Propensity assesses the degree to which a person is likely to respond with disgust to a situation, and sensitivity refers to the unpleasantness of the emotion of disgust is. Higher scores indicate higher propensity or sensitivity, with a maximum score of 40 for both subscales. Research has found the DPSS-R to demonstrate acceptable reliability (α = .84) and validity (Olatunji, Cisler, et al., 2007).

Implicit Association Task

The Implicit Association Test (IAT) is a computer-based task that uses reaction time latencies to measure an individual's underlying associations between two constructs (Greenwald et al., 1998). This paradigm relies on the idea that concepts that are more strongly related to one another in an individual's memory will lead to faster pairings on the IAT than those that are less strongly related. The IAT utilised in the current study was adapted from the freely available online IAT 'OpenIAT' (*Demos / OpenIAT*, n.d.). The IAT follows the sequence of blocks outlined by Nosek et al. (2007; see Table 4).

Table 4

IAT Block and Trial Sequence

Block	Number of trials	Function	Items assigned to left-key response	Items assigned to right-key response
B1	20	Practice	Normal weight image	Underweight image
B2	20	Practice	Positive words	Negative words
B3	20	Practice	Normal weight image or positive words	Underweight image or negative words
B4	40	Test	Normal weight image or positive words	Underweight image or negative words
B5	40	Practice	Underweight image	Normal weight image
B6	20	Practice	Underweight image or positive words	Normal weight image or negative words
B7	40	Test	Underweight image or positive words	Normal weight image or negative words

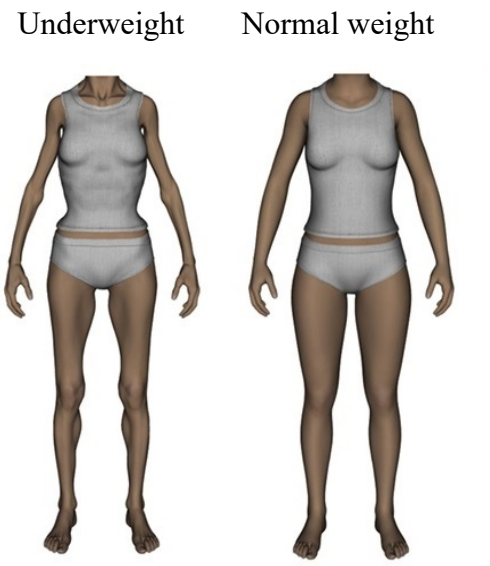
Note. Sorting rules in blocks B1, B3, B4 were automatically and randomly counterbalanced with B5, B6, B7 between subjects. A trial refers to the time from the onset of a stimulus to the correct categorisation of the stimulus. The participants were required to correct any errors they make in categorisation before they were able to continue with the next trial.

A picture based IAT was utilised (using images to represent concepts rather than words alone). Picture-based IAT measures of shape and weight allow various attitudes towards different body weights to be measured more accurately, including those differentiated by body mass index (BMI). Images representing ‘normal weight’ models range in BMI from 19 to 21.5, and the underweight models range in BMI from 14 to 16.5 (see

Figure 1 for example images; see Appendix G, Figure G.1 for all image stimuli). Both underweight and normal weight category images have a BMI range of 2.5. The computer-generated images of female bodies with different BMIs were generated by Moussally et al., (2017). The figures show the body from the neck-down, in order to overcome limitations associated with existing stimuli used in body image research (Moussally et al., 2017). Thus, the stimuli do not conflate the influence body shape/weight and head/facial features.

Figure 1

Representative Examples of Each BMI Class of Computer-Generated Women's Bodies Used in the Picture-IAT



Prior to the introduction of stimuli, participants were provided a written introduction to the IAT with thorough completion instructions (see Appendix G; Figure G.2). Participants were then presented with further instructions and word/image stimuli relating to each block (see Appendix H).

The IAT d-score (denoted as d') was used to represent implicit TII. The d' score was calculated using Greenwald et al. (2003) improved scoring algorithm (see Appendix I) and programmed using Microsoft Word macros. Scores closer to -2 reflect greater TII, and scores closer to +2 reflect less TII.

Visual Analogue Emotion Scales

Participants completed visual analogue emotion scales (VAS). Participants rated their current emotion along a single horizontal line corresponding to each of the emotions (happy, sad, angry, guilty, disgusted, surprised, neutral) on a scale from 0 (not at all) to 10 (extremely).

Mood Induction

Mood induction procedures have been substantially researched, and a number of techniques have been developed to induce positive and negative mood states experimentally. Results from these studies have contributed to the understanding of the relationship between emotion, cognition and behaviour (Thompson & Stice, 2001). The presentation of film clips with emotion focused content is one of the most effective and widely utilised MI procedures (Fernández-Aguilar et al., 2018). To induce a mood of disgust, an empirically validated clip from *Trainspotting* (from 1:44-3:53 minutes) was utilised. In research examining film clips for eliciting discrete emotional states via an online platform, *Trainspotting* was found to be effective in evoking physical disgust (rather than moral disgust) in the absence of an anger confound, and for evoking disgust more intensely than other disgust-inducing video clips (Gilman et al., 2017). These researchers also found this clip to be effective for eliciting disgust higher than all other emotions (e.g., fear). For the control group, an empirically validated film clip from *Lost in Translation* (from 6:17-8:09 minutes) was utilised to induce a

neutral mood (Jenkins & Andrewes, 2012). A film clip was considered neutral if it had a mean emotion rating of less than two points on a 10-point scale for each of the target emotions (Jenkins et al., 2012). Both film clips were validated on age-matched males and females with a wide age representation (Gilman et al., 2017; Jenkins et al., 2012).

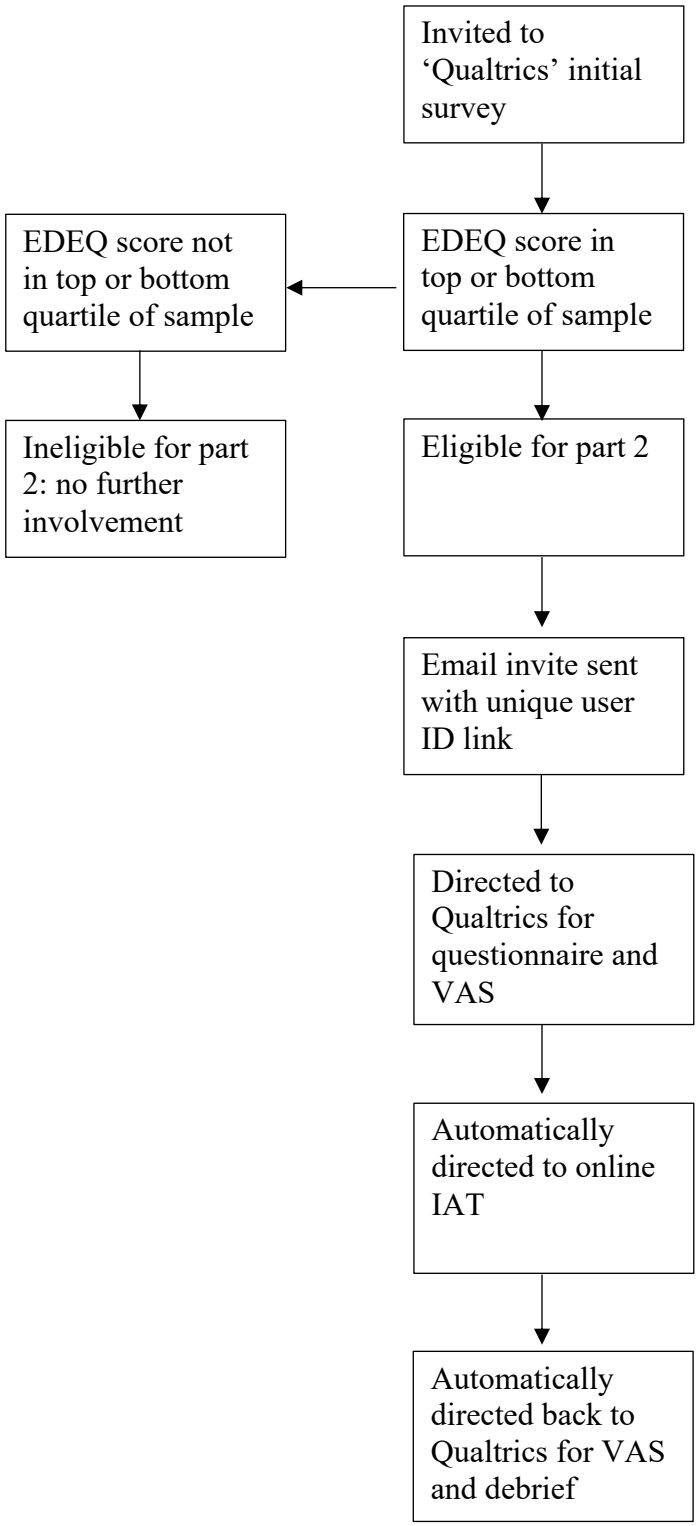
2.4 Procedure

All participants completed the study remotely. They were invited to access part one of the study via a URL link which directed them to the survey platform 'Qualtrics' (see Figure 2). Participants were provided with an information sheet about both parts of the study, followed by a consent declaration (see Appendix J). Participants were required to provide informed consent prior to study initiation. All participants completed demographic questionnaires, and questionnaires relating to eating, body image and emotions.

Following completion of the initial Qualtrics survey, those who were eligible (participants scoring within the top or bottom quartile of the sample on the EDEQ) were allocated into the high ED or low ED. A unique participant identification code was utilised to manually allocate participants into either the disgust or neutral MI condition via alternating 'A-B-A-B' process. Participants were then invited via email to participate in part two. The email contained an anonymised URL link (which contained a unique user ID embedded) which directed the participant to a second Qualtrics survey. Participants were provided with an information sheet about part two of the study and were required to provide consent prior to study initiation. Participants were asked to complete a VAS and then underwent a MI, consisting of a brief film clip (either neutral or disgust). Participants were immediately required to repeat the VAS and then automatically redirected to an online platform 'Pavlovia' (an online platform where researchers in the behavioural sciences can run and share experiments) to complete the IAT. On completion of the IAT, participants were automatically redirected back to Qualtrics for the study debrief information sheet (see Appendix J).

Figure 2

Flow Chart of Participant Procedure



2.5 Ethics

This study was approved by the School of Psychology Ethics Committee (approval code: EC.20.01.14.5944RA2)

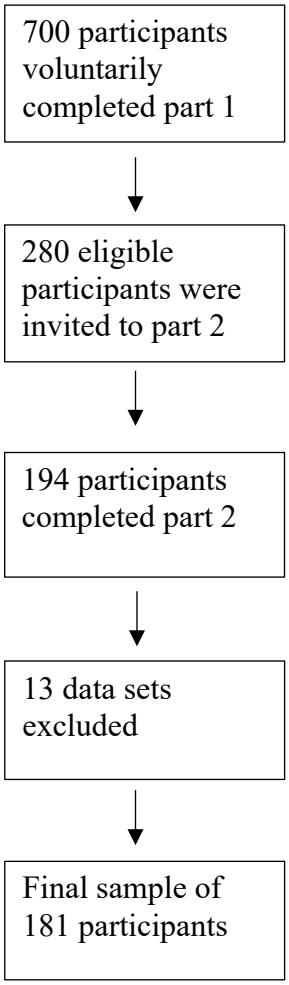
3 Results

3.1 Participant Flow

Overall, 181 participants completed the entire study (see Figure 3). Of the 13 participant data sets excluded due to data incompletion, six were from within the neutral MI condition, and seven were from within the disgust MI condition.

Figure 3

Flow Chart of Participant Sample



3.2 Preliminary Analyses

All analyses were conducted in SPSS.

Word Length

An independent samples t-test determined that there was no significant difference in the average positive (M = 6.8, SE = .73) and negative (M = 6.6, SE =.68) word length used within the IAT $t(8) = .200$, $p = .846$.

IAT Block Order

An independent samples t-test indicated that there was no significant difference in IAT d' scores between participants randomised into IAT block order one (n = 91, M = .38, SE = .04) or two (n = 90, M = .48, SE = .04), $t(179) = -1.508$, $p = .133$.

Gender

An independent samples t-test found no significant difference between males and females on IAT d' scores, $t(178) = .652$, $p = .516$. A 2 (MI) X 2 (ED) X 2 (gender) ANOVA reported no significant main effect of gender on IAT d' scores F (2, 172) = .235, $p = .791$, $h^2 = .003$. There was a non-significant interaction between gender, ED condition and MI condition on IAT d' scores, $F(1, 172) = 1.595$, $p = .208$, $h^2 = .009$. Thus, males, females and those identifying as neither female or male were not affected differently by MI or ED condition on IAT d' scores.

Manipulation Check

As VAS data did not meet parametric assumptions of normality, non-parametric statistical analysis was conducted. To determine whether the MI had been successful, a Mann-Whitney test was conducted on disgust rating scores both pre and post MI, for the neutral MI condition and disgust MI condition.

No significant difference in disgust rating scores between pre and post VAS for those within the neutral MI condition was found, $U(N_{pre} = 125, N_{post} = 125) = 7033.00$, $z = -1.386$, p

= .166. There was a significant difference on disgust rating scores pre and post disgust MI condition, $U(N_{pre}= 145, N_{post}= 145) = 3133.50$, $z = -10.34$, $p < .001$. Participants reported significantly greater disgust post disgust MI (*Mdn* = 6.66) than pre disgust MI (*Mdn* = .94).

Exploratory Analyses Between ED Conditions

Histogram data and the presence of outliers indicated that exploratory variables did not meet parametric assumptions. Thus, a Mann-Whitney statistical test was conducted to determine whether there were differences on the exploratory variables between ED conditions (see Table 7). To adjust for the increased risk of a type one error associated with multiple comparisons, the probability level was reduced ($p < .01$)

Across all variables there was a significant difference between ED conditions, with those in the high ED condition scoring higher on all variables.

Table 7

Mann-Whitney U Statistical Analysis of Exploratory Variables Between ED Conditions

Variable measure	Mean rank		Mann-Whitney U	Z	Significance (*p*)
	High ED	Low ED			
GAD-7	110.13	66.14	1966.50	-5.715	.000*
PHQ-9	110.48	65.75	1934	-5.81	.000*
SDS	104.13	69.68	2283	-4.509	.000*
DPSS	102.42	74.48	2675.50	-3.63	.000*
TAS-20	100.48	74.48	2686	-3.39	.001*

SATAQ-3	106.49	67.96	2139	-5.03	.000*
EDEQ	118.03	58.28	1271.50	-7.75	.000*

Note. * = significant at the p < .01 level.

Exploratory Analyses Between MI Conditions

A Mann-Whitney test was conducted with the adjusted probability level ($p < .01$), to determine whether there were significant differences on the exploratory variables between MI conditions (see Table 8). Significant differences were found between MI conditions on TAS-20, SATAQ-3 and EDEQ, with participants in the disgust MI reporting significantly greater scores on these measures than participants in the neutral MI condition.

Table 8

Mann-Whitney U Statistical Analysis of Exploratory Variables Between MI Conditions

Variable measure	Mean rank		Mann-Whitney U	Z	Significance (*p*)
	Neutral MI	Disgust MI			
GAD-7	80.96	96.95	3208.500	-2.079	.038
PHQ-9	84.85	93.10	3551	-1.072	.284
SDS	85.76	89.24	3633.500	-.455	.649
DPSS	94.40	83.66	3441	-1.394	.163
TAS-20	68.60	106.75	2158.500	-4.982	.000*
SATAQ-3	70.03	106.18	2246.500	-4.720	.000*

EDEQ	78.82	98.84	3029.500	-2.598	.009*
Age	86.58	87.39	3703	-.110	.912

Note. * = significant at the p < .01 level.

Analysis was re-conducted with data utilised for the post-hoc ANOVA (discussed below). All findings were replicated except for EDEQ scores, where no significant difference was reported between MI conditions, $U(N_{=}137) = 1757.500$, $z = -2.530$, $p = .011$.

3.3 Correlational Analyses

Exploratory Hypotheses

To adjust for the increased risk of a type one error associated with multiple correlations without the potential pitfalls associated with Bonferroni correction (Nakagawa, 2004), the probability level was reduced ($p < .01$; Chen et al., 2017). Pearson's correlation coefficient was conducted to determine whether relationships existed between exploratory variables and IAT d' scores (see Table 7). All variables except DPSS and SATAQ were negatively correlated to IAT d' scores. No significant relationship was found between DPSS and SATAQ, or between DPSS and TAS.

Table 7

Pearson Correlation Coefficient between Self-Report Variables and IAT d' Scores

Measures	GAD7	PHQ9	SDS	TAS	SATAQ	DPSS	EDEQ	IAT d'
GAD7	1	.785*	-.286*	.570*	.439*	.271*	.683*	-.230*
PHQ9	.785*	1	-.296*	.501*	.330*	.348*	.649*	-.330*
SDS	.164	.211*	1	.089*	.155	.190	.304*	-.203*
TAS	.570*	.501*	-.310*	1	.466*	.181	.424*	-.263*
SATAQ	.439*	.330*	-.431*	.466*	1	-.046	.560*	-.164
DPSS	.271*	.348*	.268*	.181	-.046	1	.309*	-.138
EDEQ	.683*	.649*	-.198*	.424*	.560*	.309*	1	-.326*
IAT d'	-230*	-.330*	.101	-.263*	-.164	-.138	-.326*	1

Note. *= significant correlation at $p < .01$ level.

3.4 ANOVA

Parametric Assumptions

Data was explored to establish whether parametric assumptions were met. A histogram and P-P plot conducted with IAT d' scores indicated data normality with minimal negative skew (see Appendix F). Thus, normality was deemed adequate, especially in view of ANOVA's robustness to slight deviations from normality (Field, 2009). Variances were equal across ED conditions, $F(1,178) = .286$, $p = .594$, and across MI conditions, $F(1,179) = 3.589$, $p = .060$. Thus, homogeneity of variances was assumed. One outlier was identified via stem

and leaf plots which was within d' score parameters (-2 to +2). To ensure this outlier did not impact the data, statistical analysis was run both with and without the outlier removed. No differences were found when the outlier was removed. Therefore, the outlier remained within the data set.

Analysis

A 2(MI) x 2(ED) factorial ANOVA was conducted to compare the main effects of MI and ED, as well as their interaction effects on IAT d' scores.

Hypothesis 1

A significant main effect of ED condition was found, $F(2, 176) = 6.44$, $p < .001$, $w^2 = .06$. Participants within the low ED condition had significantly more positive IAT d' scores (responding more quickly to underweight and negative pairings and normal weight and positive pairings; $M = .53$, $SE = .04$) than participants within the high ED condition ($M = .34$, $SE = 0.4$).

Hypothesis 2

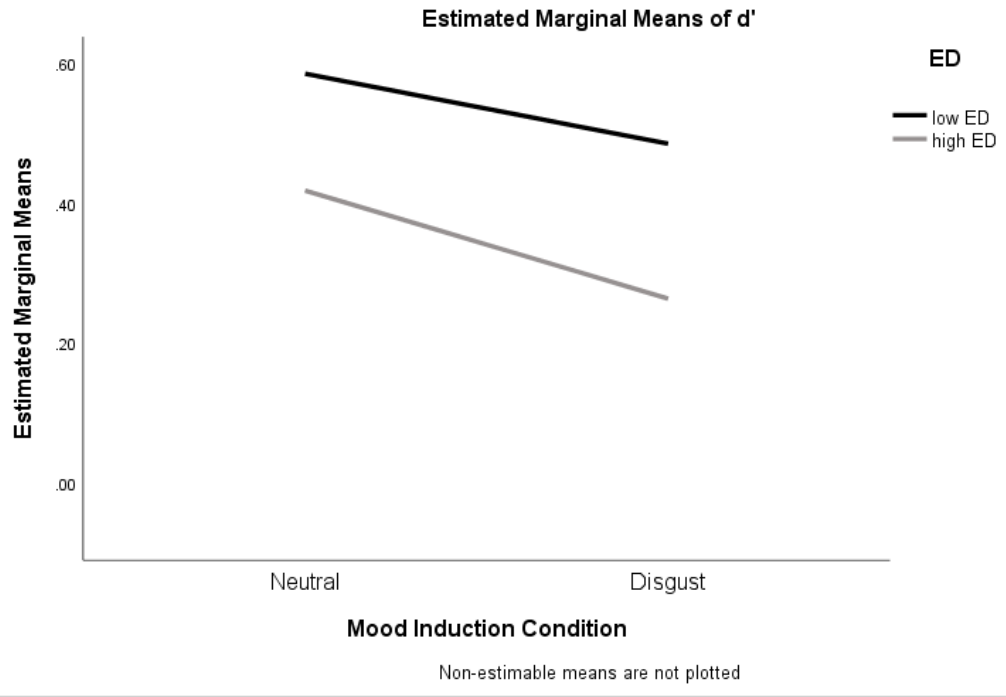
There was a significant main effect of the MI condition, $F(1, 176) = 4.66$, $p = .039$, $w^2 = .02$. Participants within the disgust MI ($M = .37$, $SE = .05$) had on average more negative IAT d' scores (responding more quickly to underweight and positive pairings and normal weight and negative pairings) than participants within the neutral MI ($M = .49$, $SE = .04$).

Hypothesis 3

The interaction effect was not significant $F(1, 176) = .211$, $p = .708$, $w^2 = -.004$, indicating that the relationship between MI and IAT d' scores did not depend on the level of the ED condition (see Figure 3).

Figure 3

Line Plot of Non-Significant Interaction Between ED and MI condition on IAT d' Scores



3.5 Post-Hoc Analysis

EDEQ Clinical Cut Off

As the disgust group was found to have higher EDEQ scores than the neutral group (and EDEQ score was found to be significantly associated with IAT d' score), a further 2 (MI) X 2 (ED) ANOVA was conducted using different EDEQ groupings. The high EDEQ

group comprised of individuals scoring four or above on the EDEQ (clinical cut off for an ED; Fairburn, 2008). The low EDEQ group comprised of individuals scoring below one on the EDEQ. No significant differences were found on EDEQ scores between the MI groups using these new EDEQ groupings. Bootstrapping was implemented to derive more robust estimates of standard errors and confidence intervals.

A significant main effect of MI condition remained $F(1, 136) = 4.796$, $p = .030$. Participants in the neutral MI condition reported more positive d' scores (responding quicker to normal weight and positive pairings and underweight and negative pairings; $M = .49$, $SD = .38$) than participants in the disgust MI condition ($M = .39$, $SD = .44$).

A significant main effect of ED condition remained $F(2, 136) = 6.260$, $p < .01$. Participants in the low ED condition had significantly more positive IAT d' scores (normal weight and positive pairings and underweight and negative pairings; $M = .53$, $SD = .38$) than high ED participants ($M = .34$, $SD = .41$).

A non-significant interaction between ED condition and MI condition remained $F(1, 136) = .997$, $p = .320$, indicating that there was no combined effect for MI and ED on IAT d' scores.

Partial Correlation Analysis

Given that EDEQ scores were significantly correlated with d' scores and with all other exploratory variables (see Table 7), a partial correlation (fifth-order) was conducted to explore whether this correlation still held when controlling for exploratory variables. When controlling for GAD-7, PHQ-9, TAS and SATAQ, the correlation between EDEQ and IAT d' remained significant, $r = -.159$, $p = .020$. However, the relationship between EDEQ and IAT d' diminished, dropping from 10.63% of the variance being accounted for by EDEQ to 2.53% when the above variables were controlled for.

4 Discussion

The overarching aim of this study was to examine the role of disgust on implicit TII. Hypothesis one was supported: individuals with higher ED symptomatology evidenced significantly greater implicit TII than those with lower ED symptoms, with a medium effect size. Hypothesis two was not supported: individuals in the disgust MI evidenced significantly greater implicit TII than those in the control group, with a small effect size. Hypothesis three was not supported: there was no significant interaction between MI and ED conditions on implicit TII. Findings indicate that individuals induced in disgust have a greater TII to those in the control MI condition, regardless of ED symptomatology. Potential explanations, limitations and implications of the main findings will be discussed below.

4.1 Reliability and Validity of Methodology

IAT d' scores significantly correlated with ED symptomatology, anxiety and depression. These findings are in line with research which indicates TII is associated with greater ED symptoms (Girard et al., 2018), anxiety, (Posavac & Posavac, 2020) and depression (Loeber et al., 2016). Findings support the construct validity of the implicit TII IAT utilised. Furthermore, statistical analysis found no significant differences in average word length between positive and negative word stimuli, or in d' scores between individuals completing IAT block order one or two indicating that IAT responses were not confounded by stimuli or block order variables. The manipulation check evidenced that the disgust induction had the intended effect, and the neutral induction did not have any effect on state emotion, as expected.

Findings indicate that the methodology utilised is reliable and valid in measuring implicit TII, inducing disgust, and in controlling for this experimentally.

4.2 Main Finding

The most intriuging and unexpected finding from this study is that when induced with disgust, participants experienced greater implicit TII, regardless of ED condition. These findings offer a novel contribution to the current literature.

Disgust conditioning may offer some understanding to the present findings. Emerging evidence indicates a role for disgust-conditioning in avoidance-based ED symptoms (Anderson et al., 2021). Hildebrandt et al. (2012) theorised that stimuli related to body image or food increases attentional bias towards threat. This bias then interacts with previously learned associations between food and weight gain. Authors proposed that this interaction increases threat appraisal and emotional responses (anxiety, disgust), resulting in food avoidance. This theory was tested using a food-based reversal learning paradigm to examine response flexibility in female adolescents with AN and controls (Hildebrandt et al., 2015). Reversal learning of threat/reward system tasks measure the ability to override past stimulus-reward/threat learned associations. Researchers found that adolescents with AN exhibited greater difficulty in extinguishing and updating food-based disgust learned associations than controls. It has also been theorised that disgust conditioning may play a role in the onset and maintenance of food avoidance and selective eating in avoidant restrictive food intake disorder (ARFID; Armstrong et al., 2019). A recent analogue study has supported this notion, indicating that individuals with higher ED symptoms have greater impairments in food-based disgust learning and extinction than those with lower ED symptoms (Olatunji, 2020). It could be hypothesised that such a process may also underpin the present findings. For example, the disgust response induced by MI may activate previously learned associations between disgust responses and body weight, resulting in an implicit bias towards under-weight bodies. This tentative theory requires further empirical exploration. Furthermore, the above studies all indicate disgust-conditioning impairments within ED samples. This is contrary to the present

findings which indicate that individuals experience greater implicit TII when induced in disgust regardless of ED symptomatology. Thus, the process of learned disgust must be examined more widely within non-clinical ED samples. This would enable greater understanding of potential nuances underpinning the process and impact of learned-disgust on TII in those without ED symptomatology.

One theory that may account for the findings that individuals induced in disgust experience greater TII regardless of ED symptomatology is that individuals within western societies are conditioned to view 'healthy weight' bodies to be 'disgusting' via systemic and societal influences. As posited by Fox et al. (2015) it is argued that young girls in particular are increasingly being subjected to higher expectations to be the providers of care (e.g. of children) and to be slim. Consequently, there may be an increased objectification of bodies (Fox et al., 2015). Objectification theory posits that individuals living in cultures which sexually objectify the body eventually internalise such views (Fredrickson & Roberts, 1997). Thus, an individual's body is mostly valued for its outward appearance and sexual functions. Although this theory has stemmed from research conducted with females, research has evidenced that objectification is also observed amongst males (Lanzieri & Hildebrandt, 2016). Along with research which indicates that BID and weight/shape related bias is prevalent within the general population (Mond & Hay, 2011; Puhl & Heuer, 2009; Sharpe et al., 2018) the objectification theory may support a tentative hypothesis that individuals are pre-disposed via internalised body objectification, to percieve healthy weight bodies as ngeaitive or disgusting.

Broadly speaking, the present findings are consistent with previous research indicating that the disgust repsonse is associated with body-focused difficulties (Neziroglu et al., 2010) and that BID is associated with an attentional bias towards disgusting images (Onden-Lim et al., 2012). Findings are also consistent with more recent research evidencing

the association between disgust propensity and sensitivity and BID (Stasik-O'Brien & Schmidt, 2018; von Spreckelsen et al., 2018). However, neither of these studies utilised experimental methodologies and are therefore not directly comparable with the present findings. On the contrary, the present findings are inconsistent with a recent experimental study examinining implicitly assessed weight/shape bias related to attractiveness and disgust using a customised Implicit Relational Assessment Procedure (IRAP) in a sample of undergraduates (Ritzert et al., 2016). Unlike the IAT, the IRAP directly asks participants to deny or confirm a attitude or belief by responding to the relation between two stimuli presented (Cullen et al., 2009). Ritzert et al. (2016) found that participants demonstrated a thin relational bias towards the self. However, participants responded to 'me being fat is disgusting' similarly when required to respond to 'true' and 'false'. Findings appear to imply that disgust may have a limited role in TII. Furthermore, there was no difference in the pattern of responding between implicit fear stimuli ('me being fat is scary') and implicit disgust stimuli ('me being fat is disgusting') suggesting that weight or shape bias may not behave differently across specific emotions. The emotion disgust was not induced within Ritzert et al. (2016) study, therefore no firm conclusions about the role of disgust can be made. Furthermore, the Ritzert et al. (2016) IRAP utilised self-orientated stimuli, unlike the non-self-orientated stimuli utilised in the present study. Thus, it could be argued that differences in findings may relate to stimuli and conceptual differences.

4.3 Exploratory Variables

Correlational analysis found significant relationships between implicit TII and self-reported anxiety, depression, self-disgust, and alexithymia. Self-reported disgust propensity and sensitivity was not correlated with implicit TII, despite induced disgust having a significant impact on implicit TII. Findings appear to support the role of the implicit pathway

of emotional processing as theorised by Fox et al. (2009). Furthermore, post-hoc partial correlation analysis revealed that when exploratory variables were accounted for (anxiety, depression, sociocultural attitudes towards appearance, self-disgust, disgust propensity and sensitivity and alexithymia), the variance in implicit TII explained by ED symptoms diminished. Findings offer empirical support for research implicating the role of depression (Pearl et al., 2014; Stice & Bearman, 2001), anxiety (Pidgeon & Harker, 2013) and socio-cultural attitudes towards appearance (Stojcic et al., 2020) within TII. Furthermore, findings indicate that these variables may be experienced and influence TII on an implicit level.

4.4 Limitations

Several limitations require acknowledgment. Participant randomisation into MI conditions appears to have not been entirely successful as there were some differences between groups. However, further analyses allowed for pinpointing the effects of some variables and this will be discussed below.

Participant randomisation was manually conducted by the author. Although all efforts were made to reduce researcher bias (e.g., participants allocated by unique user ID), potential biases may not have been eliminated. Participant conditions were also not matched and significant differences between MI conditions were found in sociocultural attitudes towards appearance, alexithymia, and ED symptoms. It could be argued that given higher ED scores were found in the disgust condition than the neutral condition, differences in implicit TII may be accounted for by ED symptoms. However, neither EDEQ means of those within the disgust and neutral conditions were above the EDEQ clinical cut off (>4; Fairburn & Beglin, 1994), indicating that differences were not of clinical significance. Furthermore, in a post-hoc analysis with a more ‘clinical’ sample (participants in the high ED condition had EDEQ scores above clinical cut-off), a main effect of disgust on implicit TII remained, and no

significant difference on ED symptoms between MI conditions was found. Consequently, differences in condition samples do not appear to have significantly impacted on study results. However, ideally, a true randomisation process (e.g., via a computer-generated randomiser) would have been utilised to minimise potential group differences and researcher bias (Schulz & Grimes, 2002).

Secondly, the IAT computer-generated images were of female bodies and validated amongst females only (Moussally et al., 2017). Thus, the validity of IAT responses from male participants is questionable, given it is unclear whether the IAT images measure TII within male samples. Consequently, generalisability of the current findings to the male population is limited. However, no significant differences were found between males and females on implicit TII scores, suggesting that the inclusion of male participants did not reduce the validity of study findings.

Thirdly, there are potential dangers of using reaction times as a measure of implicit attitudes (as utilised in the IAT). One potential source of bias is the complex nature of reaction time data cleaning and analysis techniques. It has been argued that there is potential for researcher bias as a result of authors using different analysis techniques in an attempt to confirm their hypothesis (Ellithorpe et al., 2015). Efforts were made to ensure that this bias was limited by using a structured data analysis guide (Greenwald et al., 2003). However, the complexity and frequency of steps involved in such analysis inflates the possibility of making errors that may influence the IAT findings and interpretation (Ellithorpe et al., 2015). Furthermore, several uncertainties about what mechanisms can explain the IAT effects remain (Goodall, 2011). Although overall, literature supports the utility of the IAT in evaluating implicit attitudes, it is important to consider its potential limitations when interpreting the present findings.

Finally, consideration must be given to the MI paradigm. Statistical analysis evidenced that the MI was successful in inducing disgust in the disgust condition and not the neutral condition. However, self-report VAS manipulation check responses are open to social desirability bias, potentially reducing the reliability and validity of findings. This has been recognised as a limitation within the field of MI validation (Gilman et al., 2017). The VAS is also reliant on participants being able to identify and report their emotional experience. This may be particularly relevant for a proportion of the participants within the present study, as research indicates that those with ED symptomatology may present with alexithymia (Nowakowski et al., 2013). Thus, although both MI film clips were empirically validated, it is difficult to determine the true success of MI. Furthermore, the manipulation check utilised six of the universal basic emotions (happiness, sadness, anger, disgust and surprise) with the addition of 'neutral' in order to validate the neutral MI. It is unclear whether different emotions would have been elicited if a wider range of emotions were utilised (e.g., fear).

Lastly, there are several extraneous variables that may have influenced the participant when completing a remote MI, including environmental factors, or choosing not to actively engage in the film clip. These could significantly influence the MI effectiveness, and the resulting experimental outcomes. Ideally, future research would employ an accuracy question following each MI film clip to assess the degree the participant engaged in the stimuli as conducted by Gilman et al. (2017).

4.5 Implications

Research

It is hoped that the present findings will generate further research and theory development, and a number of recommendations for this have been proposed below. Given the unexpected findings that a disgust induction leads to implicit TII regardless of scores on an ED measure, it would be important to attempt to replicate this finding in follow-up studies.

Any replication should also consider the robustness of findings when tested in participants from different cultural groups. Any comparable studies conducted with male participants should include psychometrically reliable and valid measures of implicit body-ideal internalisation for this population. The Visual Body Scale for Men (VBSM; Talbot et al., 2019) has been empirically validated and evidenced to have good psychometric properties. The images in the VBSM were measured in terms of fat free mass index and boy fat percentage rather than BMI as utilised within the current IAT. Consequently, these images would not have been entirely comparable for the current study but could be utilised in a male-only sample.

Given the significant relationship between anxiety, depression and implicit TII, and in particular the conceptual similarities that disgust and anxiety may share (Davey & Chapman, 2009), future research could benefit from experimentally inducing emotions of fear or sadness in a replication study to explore whether this would have a similar impact on an implicit measure of TII. This would provide greater insight into the specific role and relative importance of disgust and other basic emotions within TII. The current findings would also be strengthened by replication with a clinical ED sample to explore whether the lack of interaction between MI and ED condition on implicit TII would remain. Finally, research exploring the processes underpinning the acquisition of disgust-based learning would help to guide disgust-based interventions. This may have implications for the intervention of TII, BID and EDs, and also for the treatment of psychological presentations where research indicates that disgust plays a critical role in its onset and maintenance such as obsessive compulsive disorder (Bhikram et al., 2017) and post-traumatic stress following sexual trauma (Badour & Feldner, 2016).

Clinical

The present findings offer a number of potential clinical implications. However, given the novel nature of the findings (which would need replication), further research is warranted and the implications postulated are tentative.

The present findings imply that disgust may represent a key target within TII, BID and ED prevention and intervention. Disgust is not typically a core feature of such interventions, with the focus being placed on anxiety reduction. For example, commonly implemented therapeutic models addressing TII within BID interventions such as CBT target anxiety associated with the body and weight (e.g., body avoidance) through exposure (Fairburn, 2008). Disgust elicits similar avoidant behavioural patterns (Taboas et al., 2015), yet activates different physiological responses (van Hooff et al., 2013). Thus, if the motivating emotion driving the avoidance behaviour is disgust rather than fear, clinical gains from treatment may be limited. Research has indicated that disgust is less effectively reduced through exposure than fear (Mason & Richardson., 2012) and that disgust reduction is typically slower than that of fear (Olatunji, Smits, et al., 2007). Researchers suggested that there may be different mechanisms involved in disgust learning compared with fear, and that disgust requires a more intensive treatment. Furthermore, research had indicated that visual exposure alone to the conditioned stimulus (e.g., body weight/shape) or exposure without physical contact is likely to be ineffective in providing the relevant information that the stimulus is free from threatening (whether visual or perceived) contamination (Bosman et al., 2016). As a result of such differences, clinicians may benefit from exploring the role of disgust within assessment and formulation, and obtaining regular assessments of disgust within and between treatment sessions to guide therapeutic work.

Secondly, if disgust is working at an implicit level to increase TII the effectiveness of interventions such as CBT, which works at the conscious verbal level (such as challenging unhelpful automatic thoughts) when addressing disgust-driven psychopathology is

questionable. Clinicians may benefit from making the implicit underlying disgust more explicit within the therapy room. A therapeutic intervention that may offer promise for achieving this alongside traditional therapeutic approaches such as CBT is emotion focused therapy (EFT). EFT is underpinned by the viewpoint that ED symptoms are a result of a limited ability to access, identify and be guided by helpful or adaptive emotions (Ivanova & Watson, 2014). Thus, interventions such as EFT that aim to enhance emotional processing and regulation, including the experience of disgust, may be of benefit for addressing TII and BID. Initial preliminary research indicates that EFT may be an effective treatment for EDs (Dolhanty & Greenberg, 2009; Glisenti et al., 2018; Hibbs et al., 2020) where TII is prevalent.

4.6 Conclusion

This study investigated the impact of disgust on implicit TII. The findings suggest that regardless of ED symptomatology, inducing disgust in an analogue sample of undergraduate students increases TII. Further research exploring disgust-based learning, disgust, self-disgust, and other basic emotions is warranted to strengthen the current findings and guide prevention and intervention for TII, BID and EDs.

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Appendix A

Journal of Body Image Author Guidelines

Article structure

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State the objectives of the work and provide an adequate background, avoiding a detailed literature survey or a summary of the results.

Material and methods
Provide sufficient details to allow the work to be reproduced by an independent researcher. Methods that are already published should be summarized, and indicated by a reference. If quoting directly from a previously published method, use quotation marks and also cite the source. Any modifications to existing methods should also be described.

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Results should be clear and concise, describing the findings and their associated statistical basis. Consider the use of tables and figures for statistical details.

Discussion

This section should present the theoretical, empirical, and applied implications of the results, not simply repeat the findings. The study's limitations should be explicitly recognized. A combined Results and Discussion section may be appropriate.

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The main conclusions of the study may be presented in a short Conclusions section, which may stand alone or form a subsection of a Discussion or Results and Discussion section.

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If there is more than one appendix, they should be identified as A, B, etc. Formulae and equations in appendices should be given separate numbering: Eq. (A.1), Eq. (A.2), etc.; in a subsequent appendix, Eq. (B.1) and so on. Similarly for tables and figures: Table A.1; Fig. A.1, etc.

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Data statement
To foster transparency, we encourage you to state the availability of your data in your submission. This may be a requirement of your funding body or institution. If your data is unavailable to access or unsuitable to post, you will have the opportunity to indicate why during the submission process, for example by stating that the research data is confidential. The statement will appear with your published article on ScienceDirect. For more information, visit the Data Statement page.

Appendix B

Database Search Syntax

PsycInfo Search Strategy

Search | Journals | Books | Multimedia | My Workspace | EBP Tools | What's New

▼ Search History (16) — View Saved

	# ▲	Searches	Results	Type	Actions	Annotations
	1	exp Body Image/	13524	Advanced	Display Results | More	
	2	(body adj2 dissatisf*).mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	4780	Advanced	Display Results | More	
	3	body image.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	21744	Advanced	Display Results | More	
	4	(body adj1 esteem).mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	1193	Advanced	Display Results | More	
	5	(body adj2 satisf*).mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	2014	Advanced	Display Results | More	
	6	muscle dysmorph*.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	259	Advanced	Display Results | More	
	7	muscle dysphori*.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	2	Advanced	Display Results | More	
	8	bigorex*.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	19	Advanced	Display Results | More	
	9	musc* dissatisf*.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	55	Advanced	Display Results | More	
	10	(fat adj2 dissatisf*).mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	35	Advanced	Display Results | More	
	11	(weight adj2 dissatisf*).mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	324	Advanced	Display Results | More	
	12	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11	23857	Advanced	Display Results | More	
	13	athlet*.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	29303	Advanced	Display Results | More	
	14	exp Athletes/	15376	Advanced	Display Results | More	
	15	13 or 14	29303	Advanced	Display Results | More	
	16	12 and 15	752	Advanced	Display Results | More	

Contract

Save | Remove | Combine with: AND | OR

Medline Search Strategy

# ▲	Searches	Resu
2	(body adj2 dissatisf*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	35
3	body image.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	234
4	(body adj1 esteem).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	6
5	(body adj2 satisf*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	14
6	muscle dysmorph*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	1
7	muscle dysphori*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	
8	bigorex*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	
9	musc* dissatisf*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	
10	(fat adj2 dissatisf*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary	
11	(weight adj2 dissatisf*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	
12	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11	
13	athlet*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	
14	exp Athletes/	
15	13 or 14	
16	12 and 15	

Scopus Search Strategy

(((TITLE-ABS-KEY("body image")) OR (TITLE-ABS-KEY(body W/1 esteem)) OR (TITLE-ABS-KEY(body W/2 dissatisf*)) OR (TITLE-ABS-KEY(body W/2 satisf*)) OR (TITLE-ABS-KEY("muscle dysmorph*")) OR (TITLE-ABS-KEY("muscle dysphori*")) OR (TITLE-ABS-KEY("musc*dissatisfaction")) OR (TITLE-ABS-KEY(fat W/2 dissatisf*)) OR (TITLE-ABS-KEY(weight W/2 dissatisf*)) OR (TITLE-ABS-KEY(bigorex*)))) AND ((TITLE-ABS-KEY(athlet*)))

Web of Science Search Strategy

TS=("body image" OR body NEAR/1 esteem OR body NEAR/2 dissatisf* OR body NEAR/2 satisf* OR "muscle dysmorph*" OR bigorex* OR "musc* dissatisf*" OR weight NEAR/2 dissatisf* OR fat NEAR/2 dissatisf* OR "musc* satisf*" OR weight NEAR/2 satisf* OR fat NEAR/2 satisf*) AND TS=(athlet*)
Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years

Appendix C

Data Extraction Form

Author	Design	Location	Inclusion criteria	Sample size	Athlete definition	Non-athlete definition	Age (*M*)	Sex	Race	Measure	Results
Rosenvinge et al. (2018)	Cross-sectional	Norway	Born in 1992 First year at elite sport school or at randomly selected high school	966	Elite sport high school student	Students attending high school	15-16	F&M	NR	EDI-2-BD	Female: A (*M* = 6.9, *SD* = 6.8), NA (*M* = 10.6, *SD* = 8.0) $p < .05$ Male: A (*M* = 2.4, *SD* = 3.3), NA (*M* = 4.1, *SD* = 4.6) $p < .01$
Neves et al. (2015)	Cross-sectional	Brazil	Athletes: enrolled and regularly attending in artistic gymnastics training centre	413	Elite and non-elite artistic gymnasts	Public school students who do not exercise	13.29	F&M	NR	BSQ	EA (*M* = 65.18, *SD* = 24.34), NEA *(M* = 66.16, *SD* = 25.81), NA (*M* = 68.63, *SD* = 27), $p = .628$, *ns*

Author	Design	Location	Inclusion criteria	Sample size	Athlete definition	Non-athlete definition	Age (*M*)	Sex	Race	Measure	Results
Francisco et al. (2013)	Cross-sectional	Portugal		725	E: Gymnasts competing international competitions and professional dancers NE: recreational dancers and gymnasts from lower levels of competition	Do not do aesthetic sports	15.34	F&M	NR	CDRS	Females: EA (*M* = -.88, *SD* = 1.12), NEA (*M* = -.51, *SD* = 1.19), NA (*M* = -.81, *SD* = 1.31) *p* < .05 Males: EA (*M* = -0.11, *SD* = 0.83), NEA(*M* = 0.27, *SD* = 0.96), NA (*M* = -.17, *SD* = 1.09), *ns* EA vs NEA (*U* = 3,768.50, *p* < .01*)*

Author	Design	Location	Inclusion criteria	Sample size	Athlete definition	Non-athlete definition	Age (*M*)	Sex	Race	Measure	Results
Francisco et al. (2013a)	Cross-sectional	Portugal		227	Gymnasts competing in international competitions and professional dance students	Controls	14.58 (NA) 15.35 (A)	F&M	NR	CDRS	Females: A (*M* = -0.55, *SD* = 1.25), NA (*M* = -0.61, *SD* = 1.34) *U* = 2425.50, *ns* Males: A (*M* = -0.21, *SD* = 0.89), NA (*M* = -0.07, *SD* = 1.17), *U* = 729, *ns*
Monthuy-Blanc et al. (2012)	Cross-sectional	France		172	Ballet dancers and basketball players competing at district or inter-district level	Students involved in physical education classes but never organised sport	14.60 (NA) 13.59 (ballet) 14.13 (basketball)	F	NR	EDI-BD	BA (*M* = 10.28, *SD* = 7.33), BB (*M* = 8.27, *SD* = 6.62), NA (*M* = 8.32, *SD* = 6.60), *ns*

Author	Design	Location	Inclusion criteria	Sample size	Athlete definition	Non-athlete definition	Age (*M*)	Sex	Race	Measure	Results
Monthuy-Blanc et al.(2010)	Cross-sectional	France	Athletes practicing sport from 3 to 6 hours a week and competing at district of inter-district level	180	Ballet dancers and basketball players competing at district or inter-district level	Students involved in physical education classes but never organised sport	14.1	F	NR	EDI-BD >18	A (n = 17), NA (n = 6), 95% CI[0.57,4.26], p = .38, *ns*
Martinsen et al. (2010)	Cross-sectional	Norway	Born in 1992 Enrolment as first year student at one of Norwegian elite sport schools or one of randomly selected high schools	961	Attending elite sport school Representing 50 different sports	Age matched high school students	15-16	F&M	NR	EDI-2-BD >14 for girls and >10 for boys	Females: A (n = 36), NA (n = 50), p <.01 Males: A (n = 17), NA (n = 21), p < .01

Author	Design	Location	Inclusion criteria	Sample size	Athlete definition	Non-athlete definition	Age (*M*)	Sex	Race	Measure	Results
Ferrand et al. (2009)	Cross-sectional	France		152	Rhythmic gymnasts and synchronised swimmers competing in national championships	College students performing 2 hours of physical activity per week on average	16.3 (NA) 16.2 (gymnasts) 15.8 (swimmers)	F	Caucasian	BES	NA (*M* = 47.3, *SD* = 12.6), RG (*M* = 49.4, *SD* = 14.3), SS (*M* = 38.8, *SD* = 13.2), $p < .001$

Author	Design	Location	Inclusion criteria	Sample size	Athlete definition	Non-athlete definition	Age (*M*)	Sex	Race	Measure	Results
Salbach et al. (2007)	Cross-sectional	Germany	Participants had to be aged between 12-18	164	Rhythmic gymnasts competing at national/international level and exercise at least 8hrs per week	High school students and inpatients with AN	14.9 (NA) 14.8 (gymnasts) 15.5 (AN)	F	NR	EDI-BD	F*(2)*=11.7, *p* <.001 AN vs RG AN (*M* = *39.0, SD* = *12.8),* RG (*M* = 27.9, *SD* = 10.7) *p* < .001 RG vs NA NA (*M* = 31.9, *SD* = 12.6), RG (*M* = 27.9, *SD* = 10.7), *p* = .240 *ns*

Author	Design	Location	Inclusion criteria	Sample size	Athlete definition	Non-athlete definition	Age (*M*)	Sex	Race	Measure	Results
Ferrand et al. (2005)	Cross-sectional	France		132	Synchronised swimmers competing in national divisions 1 & 2 Athletes in sports where weight is not a central issue	Nonathlete college students	16.3 (NA) 15.4 (swimmers) 16.5 (WNC)	F	NR	BES	SS vs NA SS (*M* = 38.26, *SD* = 13.2), NA (*M* = 46.72, *SD* = 13.1), *p* < .001 WNC vs NA, *ns*
Benson et al. (1990)	Cross-sectional	Switzerland		64	Gymnasts in Swiss national team and competitive swimmers	Non-athletic public school girls	13.5 (NA) 12.8 (swimmers) 12.5 (gymnasts)	F	NR	EDI-BD	Significantly more swimmers reported a mean = or > AN cut off than NA or gymnasts, *p* < .01

Note. NR = not reported; A = athlete; NE = non-elite athlete; E = elite athlete; WNC = weight not central sports; AN = Anorexia nervosa patients; F = female; M = male; QA = quality assessment; BSQ = Body Shape Questionnaire; CDRS = Contour Drawing Rating Scale; BES = Body Esteem Scale (Canadian-French version); EDI-BD= Body dissatisfaction subscale of Eating Disorder Inventory; *ns* = non-significant

Appendix D

Newcastle-Ottawa Scale adapted for cross-sectional studies (customized for current review)
Selection:

1. Representativeness of the sample:
    a. Truly representative of the average in the target population. ** (all subjects or random sampling)
    b. Somewhat representative of the average in the target group. * (non-random sampling)
    c. Selected group of users/convenience sample.
    d. No description of the derivation of the included subjects.

2. Sample size:
    a. Justified and satisfactory (use of power analysis/including sample size calculation or justified). *
    b. Not justified.
    c. No information provided

3. Non-respondents:
    a. Proportion of target sample recruited attains pre-specified target or basic summary of non-respondent characteristics in sampling frame recorded. *
    b. Unsatisfactory recruitment rate, no summary data on non-respondents.
    c. No information provided

4. Ascertainment of athletic status:
    a. Athlete and non-athlete status was clearly specified and defined. **
    b. Athlete status was clearly specified and defined but not non-athlete. *
    c. Non-athlete was clearly specified and defined but not athlete.
    d. Athlete and non-athlete status was poorly defined and operationalised

Comparability: (Maximum 2 stars)

1. Comparability of subjects in different outcome groups on the basis of design or analysis. Confounding factors controlled.
    a. The study controls for gender and age (and other relevant factors e.g. BMI)**
    b. The study controls for gender or age *
    c. The study does not control for any relevant factors

Outcome:

1. Assessment of outcome:
    a. Study describes good psychometric properties of the tool**

   b. Study describes the tool well*
   c. No description of the tool or the tool reports poor validity/reliability
2. A priori hypothesis:
   a. The study includes a priori hypothesis about the difference between athletes and non-athletes on a measure of body image *
   b. No a priori hypothesis is stated (findings were part of exploratory analysis)

3. Statistical test:
   a. Statistical test used to analyse the data clearly described, appropriate and measures of association presented including confidence intervals and probability level (p value). *
   b. Statistical test not appropriate, not described or incomplete.

Thresholds for converting the customised Newcastle-Ottawa scales to AHRQ standards (good, fair, and poor):

Good quality: 5 or 6 stars in selection domain AND 1 or 2 stars in comparability domain AND 3 or 4 stars in outcome/exposure domain

Fair quality: 2, 3 or 4 stars in selection domain AND 1 or 2 stars in comparability domain AND 2 or 3 stars in outcome/exposure domain

Poor quality: 0 or 1 star in selection domain OR 0 stars in comparability domain OR 0 or 1 stars in outcome/exposure domain

Appendix E

Adapted Newcastle-Ottawa Quality Assessment Form For Cross Sectional Studies

Study	Selection				Comparability	Outcome			Quality
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	
Rosenvinge (2018)	**	*	*	**	**	**		*	Good
Monthuy-Blanc (2012)	*		*	**		*		*	Poor
Monthuy-Blanc (2010)	*		*	**	*	**		*	Fair
Francisco (2013)	*			*	*	**		*	Fair
Francisco (2013a)	*			*	**	**		*	Fair
Martinsen (2010)	**		*	**	**	**		*	Good
Neves (2015)	*	*		**		**		*	Poor
Salbach (2007)	*			*	*	**		*	Fair
Benson (1990)	*			*		*			Poor
Ferrand (2009)	*			**	*	**		*	Fair
Ferrand (2005)	*			*		**	*	*	Poor

Note. * = one star as marked by the Newcastle-Ottawa Quality Assessment Form criteria; ** = two stars as marked by the Newcastle-Ottawa Quality Assessment Form criteria; empty cells represent a 'no star' recording on the Newcastle-Ottawa Quality Assessment Form. Q1 = representativeness of sample; Q2 = sample size justification; Q3 = non-respondents; Q4 = ascertainment of athletic status; Q5 = comparability; Q6 = assessment of outcome; Q7 = a priori hypothesis; Q8 = statistical test appropriateness and description.

Appendix F

Questionnaire Measures

Generalised Anxiety Disorder -7 Questionnaire

Generalized Anxiety Disorder 7-item (GAD-7) scale

Over the last 2 weeks, how often have you been bothered by the following problems?	Not at all sure	Several days	Over half the days	Nearly every day
1. Feeling nervous, anxious, or on edge	0	1	2	3
2. Not being able to stop or control worrying	0	1	2	3
3. Worrying too much about different things	0	1	2	3
4. Trouble relaxing	0	1	2	3
5. Being so restless that it's hard to sit still	0	1	2	3
6. Becoming easily annoyed or irritable	0	1	2	3
7. Feeling afraid as if something awful might happen	0	1	2	3
Add the score for each column	+	+	+	
Total Score *(add your column scores)* =				

If you checked off any problems, how difficult have these made it for you to do your work, take care of things at home, or get along with other people?

Not difficult at all _____
Somewhat difficult _____
Very difficult _____
Extremely difficult _____

Source: Spitzer RL, Kroenke K, Williams JBW, Lowe B. A brief measure for assessing generalized anxiety disorder. *Arch Inern Med.* 2006;166:1092-1097.

Patient Health Questionnaire-9

Over the last 2 weeks, how often have you been bothered by any of the following problems?
(Use "✓" to indicate your answer"

	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things.....……	0	1	2	3
2. Feeling down, depressed, or hopeless.……..……	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much.....……..……..	0	1	2	3
4. Feeling tired or having little energy.....……..……	0	1	2	3
5. Poor appetite or overeating.....……	0	1	2	3
6. Feeling bad about yourself — or that you are a failure or have let yourself or your family down……..	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television……..	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed? Or the opposite — being so fidgety or restless that you have been moving .around a lot more than usual.....……..	0	1	2	3
9. Thoughts that you would be better off dead or of hurting yourself in some way.....……	0	1	2	3

The Self-disgust Scale (SDS)

This questionnaire is concerned with how you feel about yourself. When responding to the statements below, please circle the appropriate number according to the following definitions: 1 = Strongly agree; 2 = Very much agree; 3 = Slightly agree; 4 = Neither agree nor disagree; 5 = Slightly disagree; 6 = Very much disagree; 7 = Strongly disagree.

	Strongly agree						*Strongly disagree*
1. I find myself repulsive.	1	2	3	4	5	6	7
2. I am proud of who I am.	1	2	3	4	5	6	7
3. The way I behave makes me despise myself.	1	2	3	4	5	6	7
4. I hate being me.	1	2	3	4	5	6	7
5. I enjoy the company of others.	1	2	3	4	5	6	7
6. I like the way I look.	1	2	3	4	5	6	7
7. Overall, people dislike me.	1	2	3	4	5	6	7
8. I enjoy being outdoors.	1	2	3	4	5	6	7

9. I feel good about the way I behave.	1	2	3	4	5	6	7
10. I do not want to be seen.	1	2	3	4	5	6	7
11. I am a sociable person.	1	2	3	4	5	6	7
12. I often do things I find revolting.	1	2	3	4	5	6	7
13. Sometimes I feel happy.	1	2	3	4	5	6	7
14. I am an optimistic person.	1	2	3	4	5	6	7
15. It bothers me to look at myself.	1	2	3	4	5	6	7
16. Sometimes I feel sad.	1	2	3	4	5	6	7
17. I detest aspects of my personality.	1	2	3	4	5	6	7
18. My behaviour repels people.	1	2	3	4	5	6	7

Sociocultural Attitudes Towards Appearance Questionnaire-3

Please read each of the following items carefully and indicate the number that best reflects your agreement with the statement.

Definitely Disagree 1
Mostly Disagree 2
Neither Agree Nor Disagree 3
Mostly Agree 4
Definitely Agree 5

TV programs are an important source of information about fashion and "being attractive."

_____

I've felt pressure from TV or magazines to lose weight.

_____

I do not care if my body looks like the body of people who are on TV.

_____

I compare my body to the bodies of people who are on TV.

_____

TV commercials are an important source of information fashion and "being attractive."

_____

I do not feel pressure from TV or magazines to look pretty.

_____

I would like my body to look like the models who appear in magazines.

_____

I compare my appearance to the appearance of TV and movie stars.

_____

Music videos on TV are not an important source of information about fashion and "being

_____

attractive."

I've felt pressure from TV and magazines to be thin.

_____

I would like my body to look like the people who are in movies.

_____

I do not compare my body to the bodies of people who appear in magazines.

_____

Magazine articles are not an important source of information about fashion and "being attractive."

_____

I've felt pressure from TV or magazines to have a perfect body.

_____

I wish I looked like the models in music videos.

_____

I compare my appearance to the appearance of people in magazines.

_____

Magazine advertisements are an important source of information about fashion and "being attractive."

_____

I've felt pressure from TV or magazines to diet.

_____

I do not wish to look as athletic as the people in magazines.

_____

I compare my body to that of people in "good shape."

_____

Pictures in magazines are an important source of information about fashion and "being Attractive."

_____

I've felt pressure from TV or magazines to exercise.

_____

I wish I looked as athletic as sports stars.

_____

I compare my body to that of people who are athletic.

_____

Movies are an important source of information about fashion and "being attractive."

_____

I've felt pressure from TV or magazines to change my appearance.

_____

I do not try to look like the people on TV.

_____

Movie starts are not an important source of information about fashion and "being attractive."

_____

Famous people are an important source of information about fashion and "being attractive."

_____

I try to look like sports athletes.

_____

Disgust Propensity and Sensitivity Scale

Disgust is an emotion experienced in relation to objects and acts that one appraises as offensive or repulsive. Some individuals, however, have been shown to be more easily disgusted than others. This questionnaire consists of 16 statements about disgust. Please read each statement and think how often it is true for you.

Never	Rarely	Sometimes	Often	Always
1	2	3	4	5

I avoid disgusting things.
When I feel disgusted, I worry I might pass out.
It scares me when I feel nauseous.
I think disgusting items could cause me illness/infection.
I feel repulsed.
Disgusting things make my stomach turn.
I screw up my face in disgust.
When I notice that I feel nauseous, I worry about vomiting.
When I experience disgust, it is an intense feeling.
I experience disgust.
It scares me when I feel faint.
I become disgusted more easily than other people.
I worry that I might swallow a disgusting thing.
I find something disgusting.
It embarrasses me when I feel disgusted.
I think feeling disgusting is bad for me.

Van Overveld, W. J. M., de Jong, P. D., Peters, M. L., Cavanagh, K., & Davey, G. C. L. (2006). Disgust propensity and disgust sensitivity: Separate constructs that are differentially related to specific fears. *Personality and Individual Differences*, *41*(7), 1241-1252

TAS-20

Using the scale provided as a guide, indicate how much you agree or disagree with each of the following statements by circling the corresponding number. Give only one answer for each statement.

Circle 1 if you STRONGLY DISAGREE
Circle 2 if you MODERATELY DISAGREE
Circle 3 if you NEITHER DISAGREE NOR AGREE Circle 4 if you MODERATELY AGREE
Circle 5 if you STRONGLY AGREE

	Strongly Disagree	Moderately Disagree	Neither Disagree Nor Agree	Moderately Agree	Strongly Agree
	1	2	3	4	5
I am often confused about what emotion I am feeling.					
It is difficult for me to find the right words for my feelings.					
I have physical sensations that even doctors don't understand.					
I am able to describe my feelings easily.					
I prefer to analyse problems rather than just describe them.					
When I am upset, I don't know if I am sad, frightened, or angry.					
I am often puzzled by sensations in my body.					
I prefer to just let things happen rather than to understand why they turned out that way.					
I have feelings that I can't quite identify.					
Being in touch with emotions is essential.					
I find it hard to describe how I feel about people.					
People tell me to describe my feelings more.					
I don't know what's going on inside me.					
I often don't know why I am angry.					
I prefer talking to people about their					

daily activities rather than their feelings.					
I prefer to watch "light" entertainment shows rather than psychological dramas.					
It is difficult for me to reveal my innermost feelings, even to close friends.					
I can feel close to someone, even in moments of silence.					
I find examination of my feelings useful in solving personal problems.					
Looking for hidden meanings in movies or plays distracts from their enjoyment.					
When I am upset, I don't know if I am sad, frightened, or angry.					
When I am upset, I don't know if I am sad, frightened, or angry.					
When I am upset, I don't know if I am sad, frightened, or angry.					
When I am upset, I don't know if I am sad, frightened, or angry.					
When I am upset, I don't know if I am sad, frightened, or angry.					
When I am upset, I don't know if I am sad, frightened, or angry.					

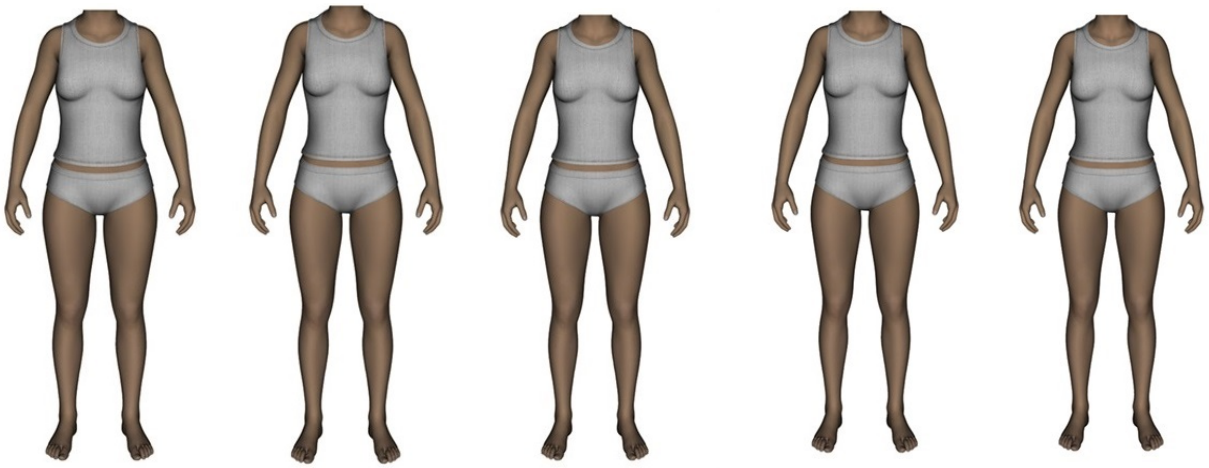
Appendix G

IAT Stimuli

Figure G.1

Normal Weight and Underweight Computer Generated Images Utilised in the IAT

Normal weight



Underweight

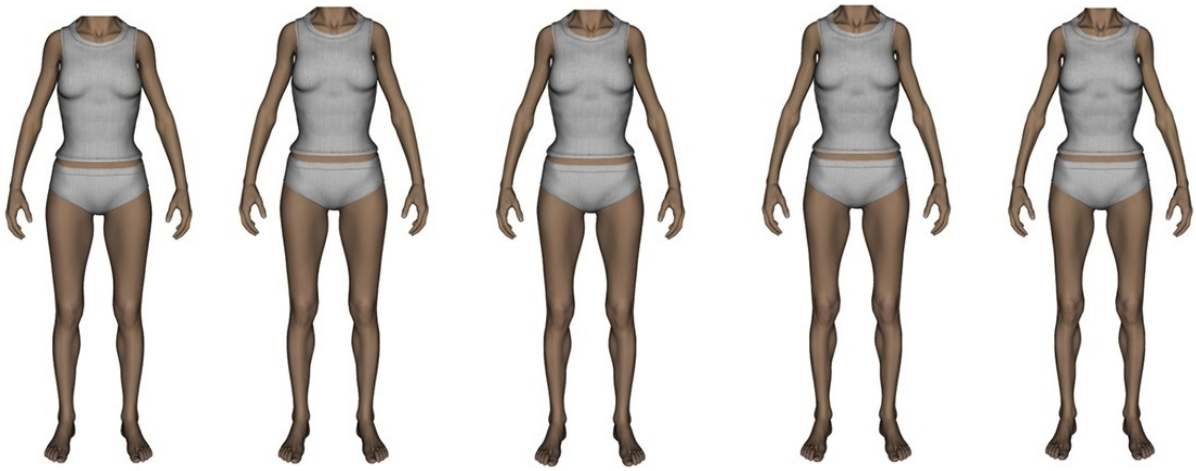
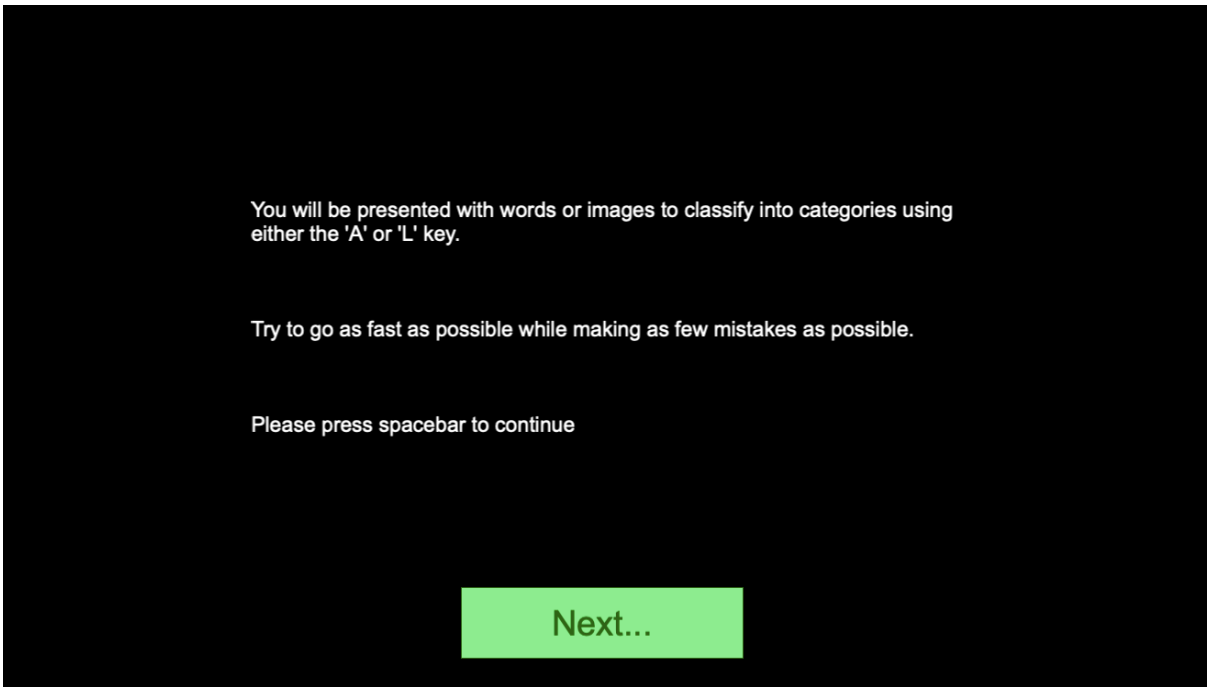
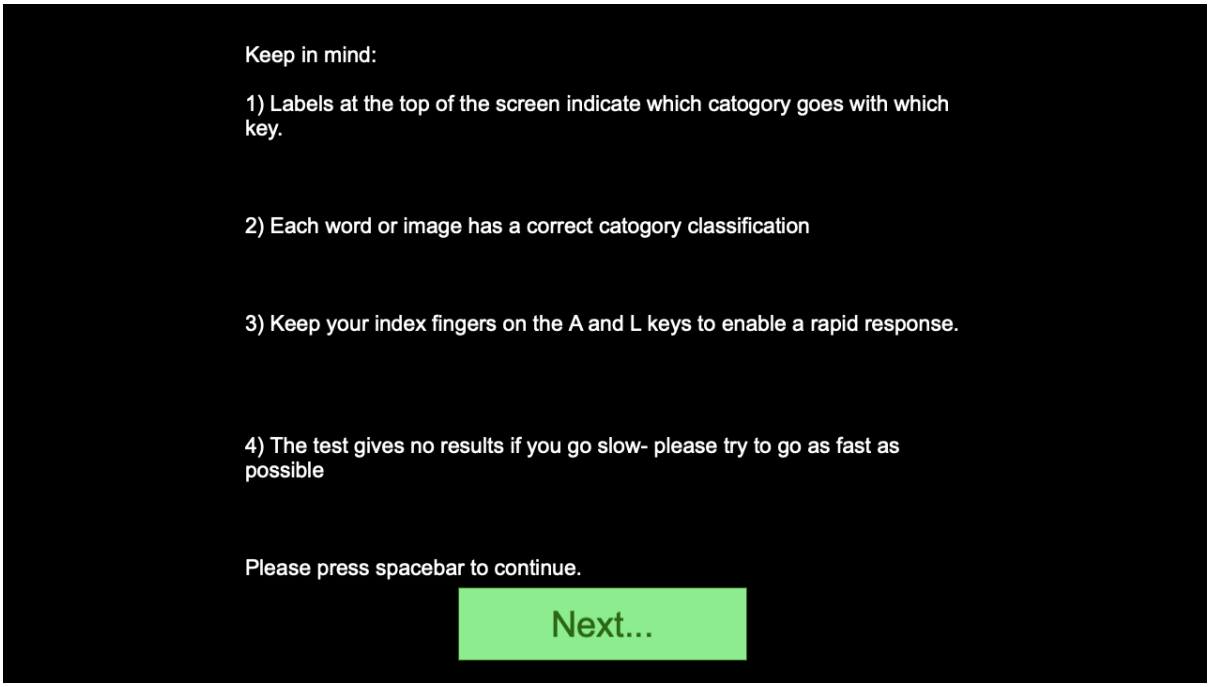
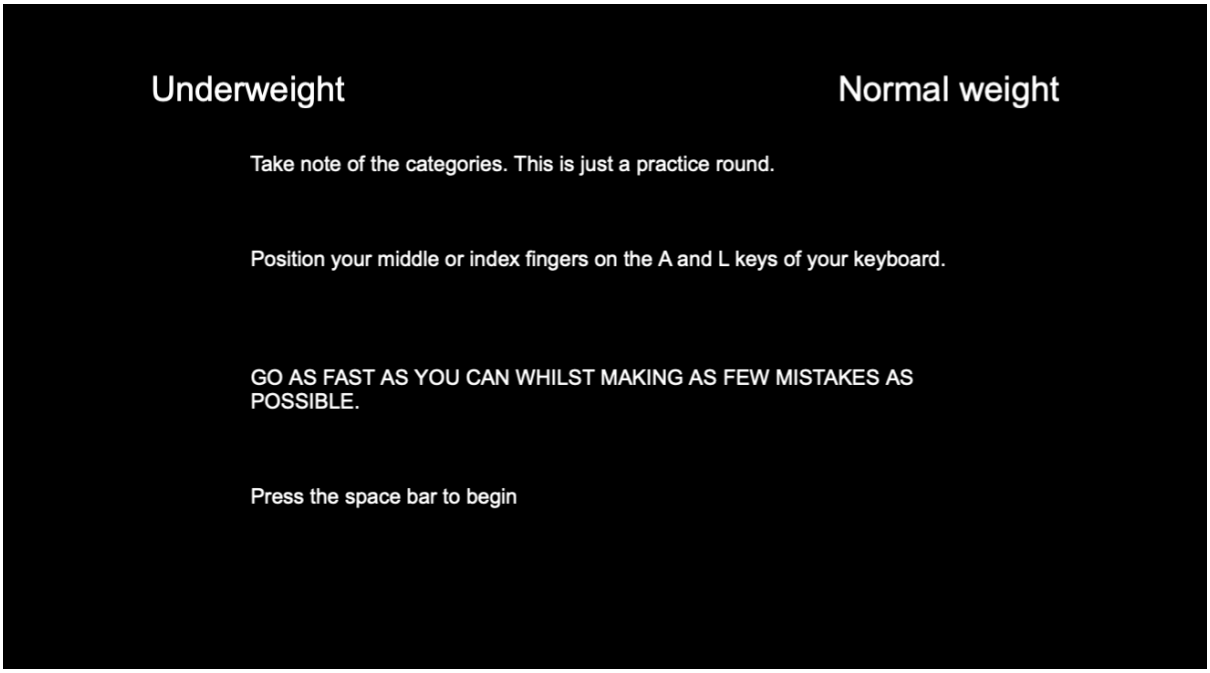


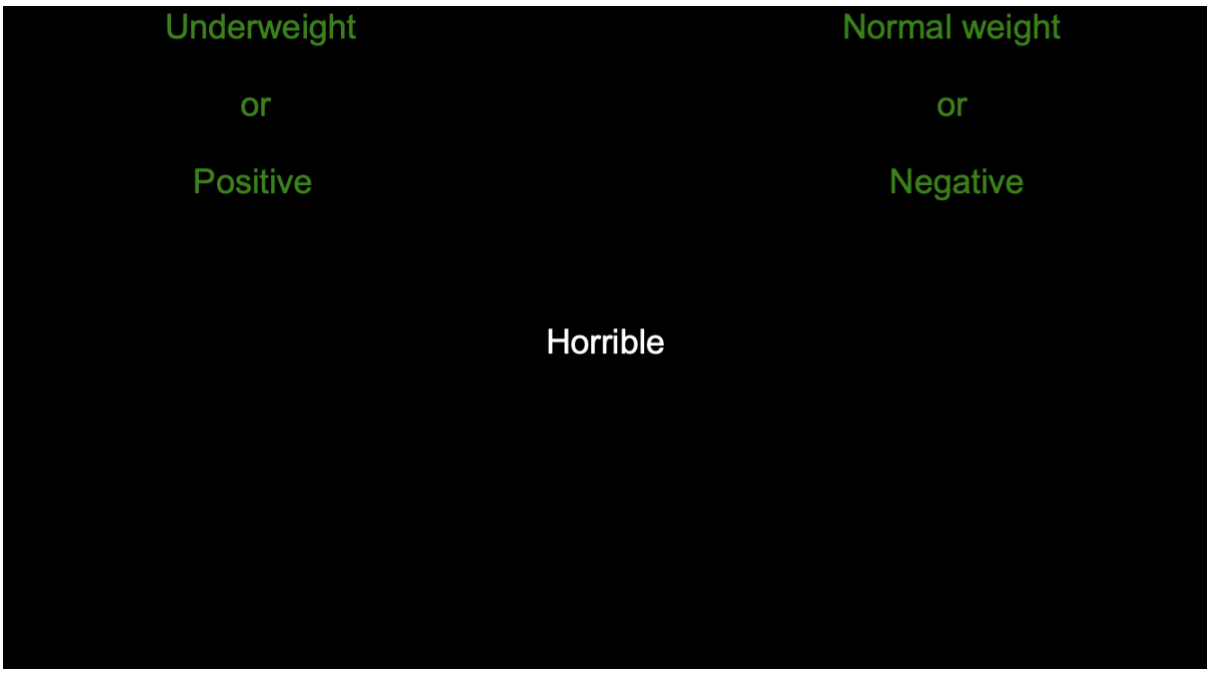
Figure G.2

Examples of IAT Instructions, Stimuli and Error Notification



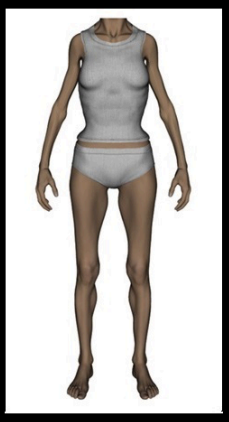



Underweight
Normal weight
Take note of the categories. This is just a practice round.
Position your middle or index fingers on the A and L keys of your keyboard.
GO AS FAST AS YOU CAN WHILST MAKING AS FEW MISTAKES AS POSSIBLE.
Press the space bar to begin


Underweight
or
Positive
Normal weight
or
Negative
Horrible

Underweight

Normal weight



Normal weight

Underweight

Take note, there are only two categories and they have switched positions. The concept that was on the left is now on the right, and the concept that was on the right is now on the left. Practice this new configuration.

Position your middle or index figure on A and L to categorize items into the four groups left and right, and correct errors by hitting the other key.

GO AS FAST AS YOU CAN WHILST MAKING AS FEW MISTAKES AS POSSIBLE.

Press the space bar to begin

Underweight

or

Positive

Normal weight

or

Negative

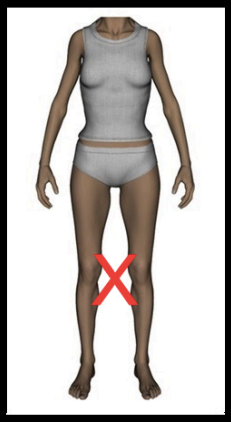
Take note, the four categories now appear together in a new configuration.

Position your middle or index fingers on A and L to categorize items into the four groups left and right, and correct errors by hitting the other key.

Press the space bar to begin

Underweight

Normal weight



Appendix H

Participants were presented with the category labels ‘normal weight’ and ‘underweight’ on the left and right of the screen with the following instructions: “Take note of the categories. This is just a practice round. Position your middle or index fingers on the A and L keys of your keyboard. Go as fast as you can whilst making as few mistakes as possible. Press the space bar to begin”. The participants then categorised images (normal weight or underweight) or words (see Table C1) that appeared in the centre of the screen into the categories labels on the left or right of screen as described in the block order (see Table 4). Participants were required to correct their errors (indicated by a red ‘X’ appearing on the stimuli) by pressing the alternate key in order to proceed.

Positive and Negative Word Stimuli used in the IAT

Positive	Negative
Happy	Awful
Pleasure	Terrible
Laughter	Nasty
Glorious	Horrible
Peace	Failure

Appendix I

Improved Scoring Algorithm Utilised to Calculate IAT d' Score as Proposed by Green, Nosek and Banaji (2003)

Step	Improved Algorithm
1	Use data from B3, B4, B6 & B7
2	Eliminate trials with latencies > 10,000 ms; eliminate subjects for whom more than 10% of trials have latency less than 300 ms
3	Use all trials
4	No extreme-value treatment
5	Compute mean of correct latencies for each block
6	Compute one pooled *SD* for all trials in B3 & B6, and another for trials B4 & B7
7	Replace each error latency with block mean + 600ms *
8	No transformation
9	Average the resulting values for each of the four blocks
10	Compute two differences: B6-B3 and B7-B4
11	Divide each difference by its associated pooled trials *SD* from step 6
12	Average the two quotients from step 11

Note. ms = millisecond; *SD* = standard deviation; block numbers (e.g. B1) correspond to block sequence described in Table 4 ; * = this step was adapted in the current study as an accurate measure of the error latency was calculated, therefore this latency was utilised rather than an estimation.

IAT d' scores lie between -2 and +2, with negative d' scores reflecting quicker responses to underweight images that are paired with positive words and normal weight

images that are paired to negative words (indicating greater implicit TII). Positive d' scores reflect quicker responses to underweight images that are paired with negative words and normal weight images that are paired to positive words.

Appendix J

Participant Information Sheet, Consent Forms and Debrief Forms

Version 1 (participants recruited from Cardiff University)

Participant Information Sheet
School of Psychology, Cardiff University

Participant Information Sheet

We would like to invite you to take part in a research study to help us learn more about body image. There are two parts to this study, the details of which are explained below.

Please read this leaflet carefully. It is important that you understand why the study is being done and what the study will involve before you decide to take part.

The purpose of this study
Body image dissatisfaction has been linked to the emergence of an eating disorder and to relapse in those with a diagnosed eating disorder. Therefore, it is clear that this is an important area for intervention for those at risk of developing eating difficulties. Despite this, common interventions addressing these difficulties are only mildly helpful. This study aims to understand the link between emotions and body image. It is hoped that this study will help us to understand how we can effectively prevent or treat these difficulties.

Why have I been invited to take part?
You have been invited to take part because you are a 1st or 2nd year undergraduate Psychology student at the University of Cardiff and may or may not have some eating difficulties.

Who can take part?
If you are over the age of 18 years old and currently a 1st or 2nd year undergraduate Psychology student at the University of Cardiff you are invited to take part.

Part 1- ONLINE

What will happen?
If you consent to participate in the study, part 1 will involve completing a number of questionnaires online. You will first be asked to complete some demographic information and will then complete a series of questionnaires about eating, body image and emotions. The questionnaires are 'tick box' and will take around 15-30 minutes to complete in total.

What will happen next?
You will automatically receive 2 research credits on completion of the online questionnaires for your participation. You will then exit the online survey. It is important to be aware that you then may or may not be contacted by the researcher in the near future to be invited to part 2 of the study.

If you are eligible to participate in part 2 (ONLINE) of the study, you will be contacted via the email address you provided to invite you to take part in the second part on the study. You will be sent a link via this email address. After clicking this link, you will be asked to consent to participate in the study. You will be asked to complete a short questionnaire and then watch a brief video clip. You will then complete a short questionnaire again and complete a computerised task. Following this task, you will be asked to complete a short questionnaire for a final time and be debriefed from the experiment. The experiment will last between 30 and 45 minutes. If you complete part 2 of the study, you will receive 2 research credits.

Do I have to take part?
Your participation in this study is entirely voluntary and you have a right to withdraw at any point, for any reason. You will be asked to sign a consent form prior to taking part.

Will my taking part remain confidential?
All information will be kept confidential via the online survey portal 'Qualtrics'. This will only be accessible to the researcher on a password protected portal. We will not ask for your name. However, we will ask for your email address as a means of contacting you if you are eligible for part 2 of the study.

What will happen to my data?
Your questionnaire responses will be kept securely on a password protected portal ('Qualtrics'). If you complete part 2 your data will be kept on a password protected programme. Your data will then be downloaded onto a data management system, on a password protected computer for data analysis. Data will not be identifiable unless you have access to two separate data bases which will be password protected. Only the named researchers will have access to these data bases. Your personal data will be deleted on completion of part 2 data collection. Research data will be kept for 7 years in a secure location before being destroyed.

If you have any questions or would like further information regarding the study please contact the researcher, research supervisor(s) or School of Psychology Research Ethics Committee on the following:

Name: Harriet Davies
Role: Lead Researcher
Email: daviesh101@cardiff.ac.uk

Name: Dr Marc Williams
Role: Research Supervisor
Email: WilliamsM93@cardiff.ac.uk

Name: Dr John Fox
Role: Research Supervisor
Email: FoxJ10@cardiff.ac.uk

School of Psychology Research Ethics Committee

Secretary to the Research Ethics Committee School of Psychology
Tower Building
70 Park Place , Cardiff, CF10 3AT
Email: psychethics@cardiff.ac.uk

Privacy Notice:

The information provided will be held in compliance with GDPR regulations. Cardiff University is the data controller and Matt Cooper is the data protection officer (inforequest@cardiff.ac.uk). The lawful basis for processing this information is public interest. This information is being collected by Harriet Davies.

The information on the consent form will be held securely and separately from the research information. Only the researcher will have access to this form and it will be destroyed after 7 years.

The research information you provide will be used for the purposes of research only and will be stored securely. Only the researcher and their supervisor(s) will have access to this information. After the completion of data collection for part 2 of the study (approximately 1 year) the data will be anonymised (any identifying elements removed) and this anonymous information may be kept indefinitely or published.

Version 1

Consent Form
School of Psychology, Cardiff University

Study Title: The Link Between Emotions and Body Image in Eating Disorders

Researcher: Harriet Davies

If you have read the participant information sheet 1 and consent to participating in the study, please read the statements below.

I confirm that I have read and understood the participant information sheet.

I have had the opportunity to consider the information provided, ask questions and have had these answered satisfactorily.

I understand that my participation in this study is entirely voluntary and that I am free to withdraw from the study at any time without giving reason. If I choose to withdraw from the study there will be no adverse consequences.

I understand that I can withdraw my data from the study up until the point the data is anonymised by contacting the researcher.

I understand that my email address will be collected and kept confidential for the purpose of inviting me to participate in part 2 of the study if I am eligible. I understand that my personal identifiable information will only be accessible to the researcher(s) and will be destroyed on the completion of data collection for part 2 of the study (2021).

I understand that my questionnaire responses will be stored on a password protected data base accessible to the researcher(s) only and will be destroyed after 7 years.

I understand that the personal data will be processed in accordance with GDPR regulations (see privacy statement below).

*I understand that if I consent to participate in this study, I **may or may not** be contacted by the researcher to participate in part 2 of the study via the email I provide.*

I consent to participate in the study conducted by Harriet Davies, School of Psychology, under the supervision of Dr John Fox and Dr Marc Williams.

Privacy Notice:

The information provided will be held in compliance with GDPR regulations. Cardiff University is the data controller and Matt Cooper is the data protection officer (inforequest@cardiff.ac.uk). The lawful basis for processing this information is public interest. This information is being collected by Harriet Davies.

The information on the consent form will be held securely and separately from the research information. Only the researcher will have access to this form and it will be destroyed after 7 years.

The research information you provide will be used for the purposes of research only and will be stored securely. Only the researcher and their supervisor(s) will have access to this information. After the completion of data collection for part 2 of the study (approximately 1 year) the data will be anonymised (any identifying elements removed) and this anonymous information may be kept indefinitely or published.

Version 2 (participants recruited from social media)

Participant Information Sheet
School of Psychology, Cardiff University

Participant Information Sheet

We would like to invite you to take part in a research study to help us learn more about body image. There are two parts to this study, the details of which are explained below.

Please read this leaflet carefully. It is important that you understand why the study is being done and what the study will involve before you decide to take part.

The purpose of this study
Body image dissatisfaction has been linked to the emergence of an eating disorder and to relapse in those with a diagnosed eating disorder. Therefore, it is clear that this is an important area for intervention for those at risk of developing eating difficulties. Despite this, common interventions addressing these difficulties are only mildly helpful. This study aims to understand the link between emotions and body image. It is hoped that this study will help us to understand how we can effectively prevent or treat these difficulties.

Why have I been invited to take part?
You have been invited to take part because you are an undergraduate student and you may or may not have some eating difficulties.

Who can take part?
If you are over the age of 18 years old and currently an undergraduate student you are invited to take part.

Part 1- ONLINE

What will happen?
If you consent to participate in the study, part 1 will involve completing a number of questionnaires online by following the survey link. You will first be asked to complete some demographic information and will then complete a series of questionnaires about eating, body image and emotions. The questionnaires are mostly 'tick box' and will take around 15-30 minutes to complete in total.

What will happen next?
You will automatically be placed into a £50 Amazon voucher prize draw on completion of the online questionnaires for your participation. You will then exit the online survey. It is important to be aware that you then may or may not be contacted by the researcher in the near future using the email address you provide to be invited to part 2 of the study or if you win the prize draw.

If you are eligible to participate in part 2 (ONLINE) of the study, you will be contacted via the email address you provided to invite you to take part in the second part on the study. You will be sent a link via this email address. After clicking this link, you will be asked to consent to participate in the study. You will be asked to complete a short questionnaire and then watch a brief video clip. You will then complete a short questionnaire again and complete a computerised task. Following this task, you will be asked to complete a short questionnaire for a final time and be debriefed from the experiment. The experiment will last between 30 and 45 minutes.

Do I have to take part?
Your participation in this study is entirely voluntary and you have a right to withdraw at any point, for any reason. You will be asked to sign a consent form prior to taking part.

Will my taking part remain confidential?
All information will be kept confidential via the online survey portal 'Qualtrics'. This will only be accessible to the researcher on a password protected portal. We will not ask for your name. However, we will ask for your email address as a means of contacting you if you are

eligible for part 2 of the study and so that you can be entered into a prize draw for your participation.

What will happen to my data?
Your questionnaire responses will be kept securely on a password protected portal ('Qualtrics'). If you complete part 2 your data will be kept on a password protected programme. Your data will then be downloaded onto a data management system, on a password protected computer for data analysis. Data will not be identifiable unless you have access to two separate data bases which will be password protected. Only the named researchers will have access to these data bases. Your personal data will be deleted on completion of part 2 data collection. Research data will be kept for 7 years in a secure location before being destroyed.

If you have any questions or would like further information regarding the study please contact the researcher, research supervisor(s) or School of Psychology Research Ethics Committee on the following:

Name: Harriet Davies
Role: Lead Researcher
Email: daviesh101@cardiff.ac.uk

Name: Dr Marc Williams
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Name: Dr John Fox
Role: Research Supervisor
Email: FoxJ10@cardiff.ac.uk

School of Psychology Research Ethics Committee
Secretary to the Research Ethics Committee School of Psychology
Tower Building
70 Park Place , Cardiff, CF10 3AT
Email: psychethics@cardiff.ac.uk

Privacy Notice:

The information provided will be held in compliance with GDPR regulations. Cardiff University is the data controller and Matt Cooper is the data protection officer (inforequest@cardiff.ac.uk). The lawful basis for processing this information is public interest. This information is being collected by Harriet Davies.

The information on the consent form will be held securely and separately from the research information. Only the researcher will have access to this form and it will be destroyed after 7 years.

The research information you provide will be used for the purposes of research only and will be stored securely. Only the researcher and their supervisor(s) will have access to this

information. After the completion of data collection for part 2 of the study (approximately 1 year) the data will be anonymised (any identifying elements removed) and this anonymous information may be kept indefinitely or published.

Consent Form
School of Psychology, Cardiff University

Study Title: The Link Between Emotions and Body Image in Eating Disorders

Researcher: Harriet Davies

If you have read the participant information sheet and consent to participating in the study, please read the statements below.

I confirm that I have read and understood the participant information sheet.

I have had the opportunity to consider the information provided, ask questions and have had these answered satisfactorily.

I understand that my participation in this study is entirely voluntary and that I am free to withdraw from the study at any time without giving reason. If I choose to withdraw from the study there will be no adverse consequences.

I understand that I can withdraw my data from the study up until the point the data is anonymised by contacting the researcher.

I understand that my email address will be collected and kept confidential for the purpose of inviting me to participate in part 2 of the study if I am eligible. I understand that my personal identifiable information will only be accessible to the researcher(s) and will be destroyed on the completion of data collection for part 2 of the study (2021).

I understand that my questionnaire responses will be stored on a password protected data base accessible to the researcher(s) only and will be destroyed after 7 years.

I understand that the personal data will be processed in accordance with GDPR regulations (see privacy statement below).

I understand that if I consent to participate in this study, I **may or may not** be contacted by the researcher to participate in part 2 of the study via the email I provide.

I consent to participate in the study conducted by Harriet Davies, School of Psychology, under the supervision of Dr John Fox and Dr Marc Williams.

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(inforequest@cardiff.ac.uk). The lawful basis for processing this information is public interest. This information is being collected by Harriet Davies.

The information on the consent form will be held securely and separately from the research information. Only the researcher will have access to this form and it will be destroyed after 7 years.

The research information you provide will be used for the purposes of research only and will be stored securely. Only the researcher and their supervisor(s) will have access to this information. After the completion of data collection for part 2 of the study (approximately 1 year) the data will be anonymised (any identifying elements removed) and this anonymous information may be kept indefinitely or published.

Debrief Form (part one of the study)

We thank you for your time spent taking this survey. PLEASE SCROLL TO THE BOTTOM OF THE PAGE AND CLICK THE ARROW TO SUBMIT YOUR RESPONSES.

Debriefing Information Sheet

Study Title: The Link Between Emotions and Body Image in Eating Disorders
Researcher: Harriet Davies

Thank you for taking participating in part 1 of this study. This debriefing sheet will give you an overview of the purpose of the study. Given that some participants will be eligible for part 2 of this study, we cannot provide any information that may bias our responses on part 2 of the experiment. Please take time to read this information and ask the researcher any questions you may have.

Aims of the study
Body image dissatisfaction is highly prominent within individuals with eating disorders and/or eating difficulties. Despite this, research indicates that the most common intervention addressing body image dissatisfaction only produces small improvements. There has been limited research into the role of the emotions and body image. However, the literature that is available indicates that there is a link between these concepts. This study aimed to enrich the current literature regarding the relationship between emotions and body image.

What happens next?
You **may or may not be** contacted by the researcher to invite you to participate in part 2 of the research study. If you are eligible, you will be invited using the email address that you have provided.

Further Support
Responding to questionnaires relating to eating, body image and emotions during your participation of this study may have been difficult. If you feel the study has had a negative impact on your wellbeing, here are some suggested sources of support you may want to consider contacting:

- Your friends and family may be able to offer you with immediate support

- Your GP may be able to provide you with support or signpost you to relevant sources of support if you feel this study has highlighted some difficulties that you would like to address

Beat Eating Disorders (https://www.beateatingdisorders.org.uk)

Beat is the UK's eating disorder charity. The Beat website offers a variety of information and online support services for those who may be affected by or who may know someone who is affected by an eating disorder.

Beat helpline: 0808 801 0677
Lines are open 365 days a year, 12pm-8pm on week days and 4pm-8pm on weekends.

The Samaritans(www.samaritans.org)

The Samaritans is a national charity which aims to help alleviate emotional distress. The Samaritans have a free helpline which is open 24 hours a day, 365 days a year, for anyone in need.

Samaritans helpline: 116 123

The Samaritans also has a Welsh Language Line: 0808 164 0123 (limited opening hours which can be found on https://www.samaritans.org/wales/how-we-can-help/contact-samaritan/welsh-language-phone-line/)

Mind Cymru (https://www.mind.org.uk/about-us/mind-cymru/)

Mind Cymru is the mental health charity in Wales that aims to improve mental health across the country. Mind Cymru has a total of 20 local branches across Wales.

Mind helpline: 0300 123 3393 (or text 86463)
Email: info@mind.org.uk

Telephone lines are open 9am-6pm, Monday to Friday (except for bank holidays).

If you have any further questions in relation to this study please contact the researcher, their supervisor(s) or the School of Psychology Research Ethics Committee on the details below.

Contact details
Name: Harriet Davies
Role: Lead Researcher
Email: daviesh101@cardiff.ac.uk

Name: Dr Marc Williams
Role: Research Supervisor
Email: WilliamsM93@cardiff.ac.uk

Name: Dr John Fox

Role: Research Supervisor
Email: FoxJ10@cardiff.ac.uk

School of Psychology Research Ethics Committee
Secretary to the Research Ethics Committee School of Psychology
Tower Building
70 Park Place , Cardiff, CF10 3AT
Email: psychethics@cardiff.ac.uk

Thank you again for taking the time to participate in this study.

Privacy Notice:

The information provided will be held in compliance with GDPR regulations. Cardiff University is the data controller and Matt Cooper is the data protection officer (inforequest@cardiff.ac.uk). The lawful basis for processing this information is public interest. This information is being collected by Harriet Davies.

The information on the consent form will be held securely and separately from the research information. Only the researcher will have access to this form and it will be destroyed after 7 years.

The research information you provide will be used for the purposes of research only and will be stored securely. Only the researcher and their supervisor(s) will have access to this information. After the completion of data collection for part 2 of the study (approximately 1 year) the data will be anonymised (any identifying elements removed) and this anonymous information may be kept indefinitely or published.

Debrief (part 2 of the study)

Study Title: The Link Between Emotions and Body Image in Eating Disorders
Researcher: Harriet Davies

Thank you for taking part in this study. This debriefing sheet will give you an overview of the purpose of the study. Please take time to read this information and ask the researcher any questions you may have.

Aims of the study
Body image dissatisfaction is highly prominent within individuals with eating disorders and/or eating difficulties. Despite this, research indicates that the most common intervention addressing body image dissatisfaction only produces small improvements. There has been limited research into the role of the emotion ‘disgust’ and body image. However, the literature that is available indicates that there is a link between these concepts. This study

aimed to enrich the current literature regarding the relationship between disgust and body image by investigating experimentally how disgust and body image are linked.

Mood Induction

In this study we aimed to create an emotion (either neutral or disgust) within an individual prior to the completion of the computerised task. We did this by showing participants a film clip of either something 'neutral' or something 'disgusting'. Whether the participant viewed a neutral or disgusting film was randomly allocated. The aim of the mood induction was to explore whether feeling disgusted impacted on how participants completing the computerised test categorised positive and negative words with pictures of body size.

Implicit Association Test

The Implicit Association Test (IAT), the computer-based measure that you completed, uses reaction times to detect an individual's underlying beliefs about two concepts. This test is based on the idea that concepts that are more strongly related to one another in an individual's memory will lead to faster pairings on the IAT than those that are less strongly related. For instance, is this study, participants that believed underweight body size was preferable, their response times to the positive words when categorising the underweight body size would be quicker than when categorising the positive words with the normal weight body size. By using this methodology in the current study we hoped to understand implicit (something that is believed or suggested but not directly expressed) processes involved in preferences for body size which may not be explicitly verbalised.

Further Support

Responding to stimuli and questionnaires relating to eating, body image and disgust during your participation of this study may have been difficult. If you feel the study has had a negative impact on your wellbeing, here are some suggested sources of support you may want to consider contacting:

- Your friends and family may be able to offer you with immediate support

- Your GP may be able to provide you with support or signpost you to relevant sources of support if you feel this study has highlighted some difficulties that you would like to address

Beat Eating Disorders (https://www.beateatingdisorders.org.uk)

Beat is the UK's eating disorder charity. The Beat website offers a variety of information and online support services for those who may be affected by or who may know someone who is affected by an eating disorder.

Beat helpline: 0808 801 0677
Lines are open 365 days a year, 12pm-8pm on week days and 4pm-8pm on weekends.

The Samaritans (www.samaritans.org)

The Samaritans is a national charity which aims to help alleviate emotional distress. The Samaritans have a free helpline which is open 24 hours a day, 365 days a year, for anyone in need.

Samaritans helpline: 116 123

The Samaritans also has a Welsh Language Line: 0808 164 0123 (limited opening hours which can be found on https://www.samaritans.org/wales/how-we-can-help/contact-samaritan/welsh-language-phone-line/)

Mind Cymru (https://www.mind.org.uk/about-us/mind-cymru/)

Mind Cymru is the mental health charity in Wales that aims to improve mental health across the country. Mind Cymru has a total of 20 local branches across Wales.

Mind helpline: 0300 123 3393 (or text 86463)
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Telephone lines are open 9am-6pm, Monday to Friday (except for bank holidays).

If you have any further questions in relation to this study please contact the researcher, their supervisor(s) or the School of Psychology Research Ethics Committee on the details below.

Contact details
Name: Harriet Davies
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Email: daviesh101@cardiff.ac.uk

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Appendix K

Tests of Data Normality

Figure K.1

Normal P-P Plot of d' Bias Scores

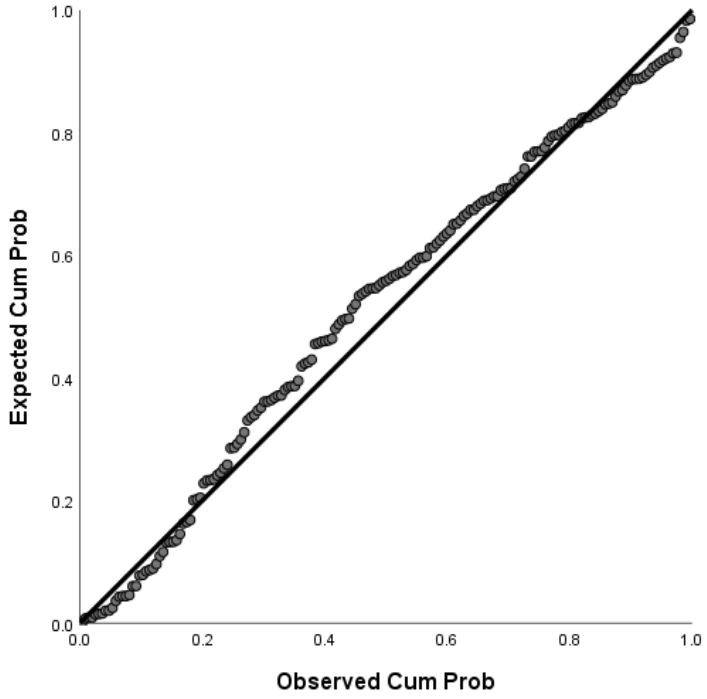

Figure K.2

Histogram of d' Bias Scores