School of Psychology
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Metacognition in eating disorders: An analogue sample

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

Doctorate of Clinical Psychology (DClinPsy)

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Supervised by: Dr Marc Williams, Dr John Fox

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Declarations

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This thesis is being submitted in partial fulfilment of the requirements for the degree of ... (*insert PhD, MD, MPhil, etc., as appropriate*)

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In fact, this whole journey has felt somewhat like a marathon… quite long, tough in parts, but a massive sense of achievement at the end. And definitely worth it.

Thesis Summary

The field of research in eating disorders is vast, with many studies looking at refining current theories and expanding treatment options.

Paper one presents a meta-review that amalgamates all systematic reviews conducted on attention biases within eating disorder populations. This paper aims to evaluate the quality of such reviews, as it is unclear which review produces the most reliable conclusions. Based on this, it aimed to provide an overview of the most reliable findings within this area.

Few studies have explored the role that metacognitions play in the maintenance of disordered eating. Paper two is a two-wave longitudinal mediation model study. This research looks at whether specific metacognitions predict disordered eating behaviour, and whether this relationship is mediated by worry as a thought control strategy. Both paper one and two are intended for publication.

Paper three is a critical reflection of the process of conducting the meta-review and empirical paper. The implications of the research to clinical practice is discussed as well as strengths and weakness of the research. Reflections on personal and professional development are also explored.

Table of Contents

1.Paper one: Meta-review of attentional biases in eating disorders

Systematic meta-review and quality assessment of research methodologies of attentional biases in those with eating disorders

This systematic review was prepared with the 'International journal of eating disorders' in mind. The guidelines of which can be found in Appendix 4.1.

Word count: 7,106 words excluding figures and tables

1.1 Abstract

Objective: The purpose of this meta-review was to assess the methodological quality of current published systematic reviews of studies evaluating attentional biases amongst eating disorder populations. The most reliable findings regarding attentional biases amongst eating disorder populations are discussed.

Method: PubMed, PsycInfo, Embase, and Scopus were systematically searched (last updated April 1, 2019). We identified 12 systematic reviews for the meta-review. The quality of each review was appraised using the AMSTAR-2 (A Measurement Tool to Assess Systematic Reviews).

Results: 80% of reviews were rated as low or critically low quality. The majority of reviews failed to include a risk of bias measurement, an assessment of publication bias and were unable to provide excluded studies with justifications.

Discussion: Whether attentional biases are detected, or to what extent, is impacted significantly by the particular type of stimuli used (e.g. weight, food, shape), and the experimental method employed (e.g. Stroop task, dot probe). A summary of conclusions for each stimulus is listed, alongside limitations and recommendations for future reviews.

Number of words in Abstract: 160

1.2 Keywords

Attentional bias, Eating Disorders, Systematic review

1.3 Introduction

One definition of attentional biases (AB) is the systematic favouring of processing one particular type of stimulus over another (Muris & Merckelbach, 1998). Research has highlighted the importance of attentional biases in the maintenance of specific eating disorders (Dondzilo, Rieger, Palermo, Byrne, & Bell, 2017; Shafran, Lee, Cooper, Palmer, & Fairburn, 2007). Understanding how attentional bias affects, and is affected by particular clinical presentations could broaden treatment targets and improve treatment effectiveness. There have been multiple systematic reviews and meta-analyses attempting to conclude the aetiology and maintenance factors of attentional biases within eating disorder (ED) populations (Dobson & Dozois, 2004; Stojek et al., 2018). This meta-review seeks to evaluate the methodological quality of the reviews, make suggestions for future systematic reviews and to summarise the most reliable findings regarding attentional biases in eating disorders.

1.3.1 Attentional bias

Early cognitive theories proposed that biases in information processing maintained emotional disorders such as generalised anxiety (e.g. Eyseneck, 1992). Research has systematically shown that anxious individuals have an attentional bias towards threating stimuli (Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & van IJzendoorn, 2007; Cisler & Koster, 2010), which is not present in non-anxious individuals (Karin Mogg & Bradley, 1998). Bias towards threatening stimuli may be an adaptive function that facilitates the detection of danger and aids in the protection of the individual (LeDoux, 2000; Tamietto & de Gelder, 2010). Directing attention away from threat (Bar-Haim et al., 2010; Wald et al., 2011) may minimise an individual's exposure to aversive situations that might otherwise have naturally dissipated. This is one explanation for how attentional biases can become fixed and automatic. Attentional

biases can arise due to threat competing with other stimuli or task-demands (Mathews & Mackintosh, 1998), or that a bias to threat is related to self-knowledge, with voluntary goals and beliefs of the individual guiding attention to threat (Wells & Matthews, 1996). Cisler & Koster, (2010) provide an integrative overview of the mechanisms that comprise and mediate attentional biases. Attention can be biased in numerous ways, including facilitated attention to a stimulus, or difficulty in disengaging from a stimulus (e.g. Amir, Elias, Klumpp, & Przeworski, 2003).

More recently, attentional biases have been detected in disordered eating populations (Starzomska, 2017). This population tend to show stronger attentional biases towards shape, food and weight stimuli when compared to healthy controls (Perpiñá, Hemsley, Treasure, & Padmal, 1993; Schmidt, Lüthold, Kittel, Tetzlaff, & Hilbert, 2016; Schneier et al., 2016).

Theoretical accounts of attentional bias could help us to understand the maintenance of these disorders. Vitousek & Hollon, (1990) provide a cognitive account of eating disorders, positing a role for weight-related schemata that give rise to automatic biases in information processing. Self-regulatory executive function theory (S-REF; Wells & Matthews, 1996), is a cognitive model that outlines how attentional biases arise through an interaction of automatic attentional capture and voluntary processes, which are guided by self-beliefs as well as metacognition. Combining these two theories, it could be that weight-related schemata in those with eating disorders are triggered by encountering certain stimuli in the environment (such as people of various body types). This leads to an interaction between automatic attentional capture, higher level beliefs and voluntary attentional strategies, resulting in unhelpful attentional biases to these stimuli. These attentional biases could manifest in many ways. For example by directing one's attention toward those with 'better' bodies than oneself and not paying attention to other

body types (a phenomenon known as an 'upward appearance comparison', thought to be a risk factor for developing an eating disorder; e.g.,(Arigo, Schumacher, & Martin, 2014).

1.3.2 Brief Overview of Major Findings within eating disorders

Below is an overview of the findings from different experimental paradigms, concerning their main conclusions within eating disorders.

1.3.3 Experimental measures

Researchers often study attentional bias using experimental methods, as cognitive self-report measures have proven to be unreliable (Vitousek & Orimoto, 1993). Attending to threatening stimuli can be automatic and involuntary (Cisler & Koster, 2010), and experimental methods aim to tap into these attentional processes (Yiend, Mackintosh, & Mathews, 2005). Experimental measures include the visual search task (Caglar-Nazali et al., 2014); spatial cueing task (Fox, Russo, Bowles, & Dutton, 2001; Koster, Crombez, Verschuere, Van Damme, & Wiersema, 2006) and eye tracking tasks. The most frequently used methods used to measure attentional bias within disordered eating populations are the emotional Stroop task and the dot-probe task.

The traditional Stroop task (Stroop, 1935) in its basic form, is a task that involves having to name the colour in which a word is printed, ignoring the word itself and calculating a participant's reaction time (RT). The emotional or 'modified' Stroop task (Williams, Mathews, & MacLeod, 1996) is a modification that involves measuring participants' reaction times (RTs) in naming the colours of emotionally salient words compared with the time taken to name the colours of neutral words. Delayed colour-naming latency for disorder-relevant words is referred to as the Stroop interference effect and indicates an attentional bias. Numerous studies have shown that when using the modified Stroop task with those with a diagnosis of Anorexia

Nervosa (AN) and Bulimia Nervosa (BN), participants tend to name the colour of disorder-related stimuli (e.g. food/weight/shape) more slowly than healthy controls, (e.g. Cooper & Fairburn, 1992; Dobson & Dozois, 2004; Faunce, 2002; Johansson, Ghaderi, & Andersson, 2005).

The dot-probe task (MacLeod, Mathews, & Tata, 1986) is also a popular method of measurement of attentional bias. Participants are asked to stare at a fixation cross on the centre of the screen. Two stimuli, one of which is neutral and one of which is threatening, appear simultaneously on either side of the screen for a predetermined amount of time (within eating disorders this might be a food-related word or picture). Since the original study, the dot-probe task has been modified slightly. On some trials, a probe (usually a dot) is presented in the location of one former stimulus and participants are instructed to press a button to indicate the location of the probe as quickly as possible, and the computer measures latency. Quicker reaction times to the probe is expected to occur when it appears in the previous location of a threatening stimulus they have attended to; often interpreted as an attentional bias to threat (Posner, Snyder, & Davidson, 1980).

Although frequently used, these methods have not been without criticism. Some have found that the dot-probe task was unsuitable for individual differences research due to its poor reliability estimates. An early review by Lee & Shafran (2004) noted that attentional biases were found outside of clinical groups, which may undermine particular methodologies or their findings. Other studies reported that Stroop interference for body shape words habituates throughout testing (Posner et al., 1980).

1.3.4 Stimuli used in experimental tasks

In the previous section, it was outlined that studies have used disorder-related stimuli such as weight/shape and food to measure attentional bias amongst ED participants (Posner et al., 1980). Recent research has expanded this to include stimuli such as faces, as social and emotional problems have been implicated in the development and maintenance of eating disorders (Caglar-Nazali et al., 2014). Those with EDs are more likely to exhibit attentional avoidance of accepting faces and a bias towards rejecting faces (Allen, Mason, Stout, & Rokke, 2018; Cardi, Matteo, Corfield, & Treasure, 2013). Allen et al., (2018) also found that sad emotions increase an individual's attentional bias to shape and weight stimuli. Not all research has found evidence of attentional bias in eating disorder populations (Schober et al., 2014; Shafran, Lee, Cooper, Palmer, & Fairburn, 2008). One study found delayed attentional disengagement from food stimuli in adolescents with BED compared to controls, but no initial orienting bias for food stimuli (Schmidt et al., 2016). Others have detected that attentional bias for food stimuli was conditional on the length of time for which these stimuli are presented in the tasks (Karin Mogg & Bradley, 1998).

1.3.5 Aims of the present review

As outlined above, the attentional bias literature involves very diverse methodologies, including different paradigms, different stimuli, and different lengths of stimulus presentation. Many systematic reviews have tried to amalgamate these findings and reach conclusions. Previous systematic reviews have tended to focus on a subset of paradigms, types of ED or types of stimuli. An overview of all of them would be beneficial. Considering the multiplicity of reviews in this area, it would be timely to assess their quality so that any issues can be recognised by researchers performing future reviews. Given the above, the present study is a meta-review of these papers and has the following aims:

1. To outline the quality of the current published systematic reviews around attentional biases in eating disorders
2. To provide an overview of the most reliable attentional bias findings in the disordered eating population

Suggestions will be made for future research.

1.4. Methods

1.4.1 Protocol

A systematic review protocol was registered at PROSPERO with the registration number CRD42018108030.

1.4.2 Search methods

A systematic search of the four following databases took place: PsycINFO, EMBASE, SCOPUS, and MEDLINE. A hand-search of reference sections included in articles ensured that all relevant studies were identified. The terms used in each search are found in Table 1. There were no restrictions on publication date or geographic regions. Additionally, to maximise the identification of relevant abstracts, the same search terms in Google Scholar using the Advanced Scholar Search function was utilised. The last search date was 01/04/2019.

Article titles and keywords were screened in a first step, and relevant articles were retrieved. The hits of all searches were entered into Zoetero©, duplicates were sifted out using this program, and the inclusion processes were executed after that.

Table 1: Search strategy

Attentional bias		Eating disorder		Review
Attention		Eating disorder*		Review
Attention* bias		Anorexia*		Systematic review
Cognition		Anorexic binge eating		Meta-analysis
Cognitive bias		disorder Restrained eating		Meta-anal*
Metacognition	AND	Dieting Disordered eating	AND	Quantitative* overview*
Cognitive		Compulsive eating		Systematic* overview*
Neuropsychology		Dietary restraint		Methodologic* review*
		Purging		Methodologic* overview*
		Binge eating		Literature review
		Bulimia*		Meta*-review
		Bulimic		

1.4.3 Eligibility criteria

For inclusion, reviews were required to:

1. Include at least one study focused on exploring attentional biases using an experimental paradigm
2. Include an experimental group of AN, BN, Binge eating disorder (BED) or Eating disorder not otherwise specified (EDNOS) or Other Specified Feeding and Eating Disorders (OSFED). Any reviews not meeting these criteria or otherwise subclinical will be excluded
3. Be systematic, including details of search strategy, or meta-analysis

Publications were excluded when:

1. Reviews were focused on modification of attentional bias as opposed to measurement
2. Studies included in the review did not include an experimental measure of attentional bias
3. Reviews that were not in English
4. Publications that were not peer-reviewed including dissertations/conference abstracts/books/letters (‘grey literature') [NB non-indexed journals can be missed]

5. Reviews were non-systematic reviews (e.g. narrative reviews)
6. Publications were a review of reviews
7. Studies included in the review focused on electrophysiological or neurobiological measures of attentional bias

1.4.4 Study selection

A 3-step inclusion process included: (1) screening based on titles and abstracts (2) screening based on full-text papers, (3) methodological assessment of reviews. All reviews remaining after the second stage were assessed with the AMSTAR 2 overview quality assessment tool. An initial screen of titles and abstracts of articles were identified using the search strategies and sifted according to whether they met the inclusion criteria. The author screened all the references and enlisted a co-reviewer to check a random sample of 20% of the titles. The author then reviewed the full texts and excluded articles that did not meet the inclusion criteria. Studies were excluded based on the predetermined criteria. Relevant data from the included reviews were extracted. Final screening and assessment for eligibility and criteria compliance were agreed at a consensus meeting between the reviewers.

1.4.5 Data analysis & synthesis

This meta-review was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (Liberati et al., 2009). Duplicate papers were removed, which left 39 publications of interest. After rigorously applying the exclusion criteria to the full-text reading of the documents, a set of 12 publications proved to fulfil the inclusion criteria for type and content of study (See appendix 4.2 for the full list of excluded texts with reasons). 60% of all included reviews were quality appraised by a co-reviewer independently from the author. Cohen's kappa suggested there was good agreement between the two, (κ=

.708, $p < .001$). Any disagreements were solved by consensus. Figure 1 outlines the PRISMA flow diagram. Data-analysis was conducted primarily by creating cross-tables for the different experimental methods, findings, population and stimuli used (See Table 2).

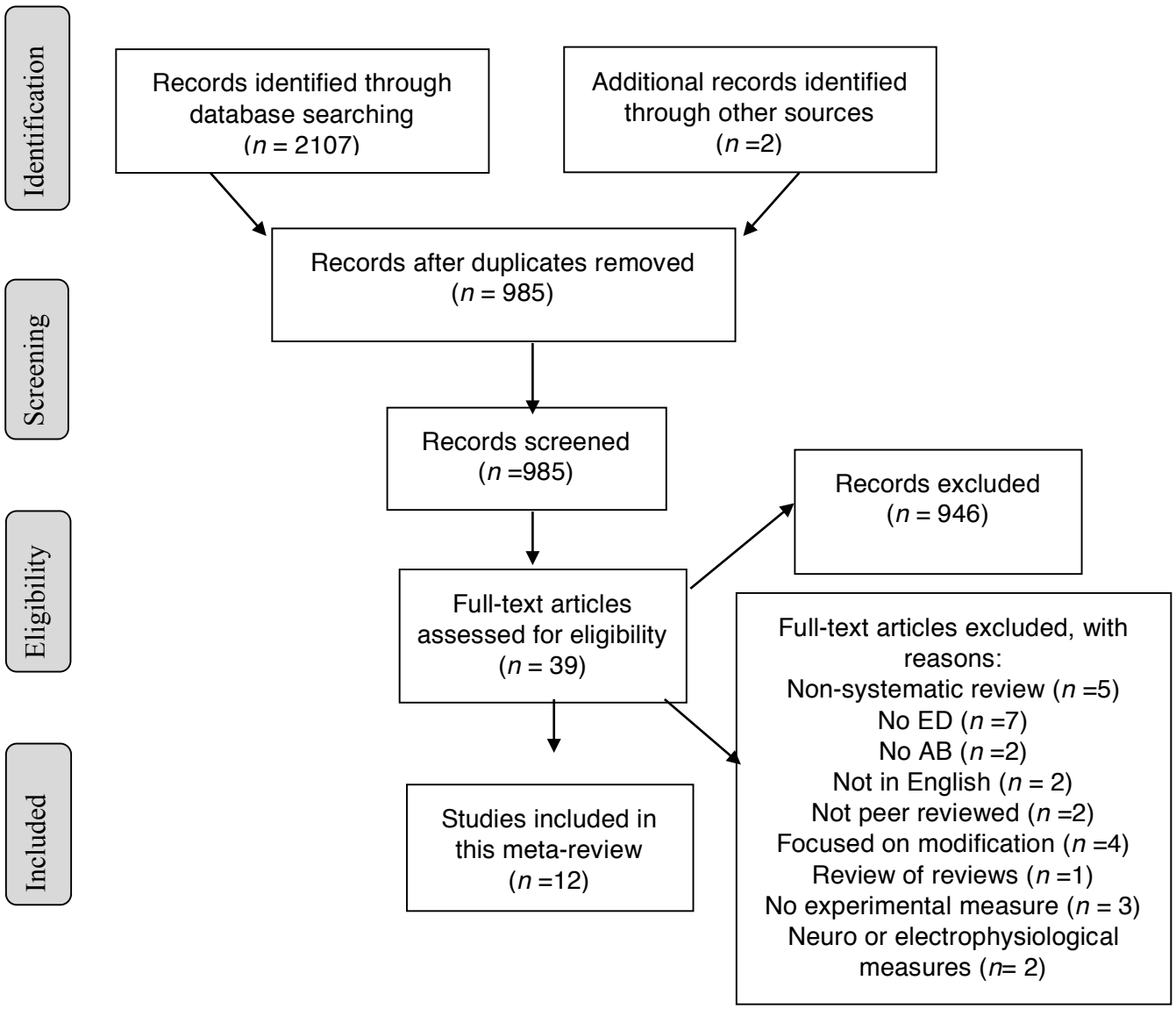

Figure 1 PRISMA flow diagram

Table 2: Characteristics of reviews included in the meta-review

Authors	Type of review	# studies	Population	Population Condition	Non-ED Comparison groups	Experimental methods	Stimuli
1. Aspen et al., (2013)	Systematic review & meta-analysis	4	Adults	AN, BN, BED, ENOS	HC	DP (*n*=4)	Photographs: Eating, body shape & weight. Words relating to a thin and large physique
2.Brooks et al., (2011)	Systematic review & meta-analysis	18	Adults	AN, BN, ED (not differentiated) Restrained eaters	HC, BN(REC), AN(REC)	Modified Stroop (*n*=16), DP (*n*=2),	Food words. High & low-calorie food images
3.DeJong et al., (2013)	Systematic review	1	Adults	BN	HC	Emotional Stroop task (*n*=1)	Neutral & Emotional Faces
4.Giel et al., (2011)	Systematic review	5	Adults	ED, AN, BN	HC	DP (*n*=3) Modified Stroop task, *(n*=1) VS (*n*=1)	Positive and negative eating, food, emotional, neutral stimuli
5.Giel et al., (2017)	Systematic review	4	Adults	BED, OB/BED	OBC, NWC, WMC	RSVP (*n*=1), spatial cueing (*n*=1), free viewing (*n*=2)	Food-specific and neutral
6.Jáuregui-Lobera (2013)	Systematic review	15	Adults	AN, BN, EDNOS-BN, R-AN, R-BN, AN-R	C	Traditional Stroop task (*n*=7), Modified Stroop task (*n*=6), DP (*n*=2), ET (*n*=1)	Thin/fat words. Body shape-related words,
7.Johansson et al., (2005)	Systematic review & meta-analysis	27	Adults & adolescents	AN, BN	NC, NED	Stroop task (*n*=27)	Food/eating. Body/weight. Body shape words & neutral
8.Kerr-Gaffney et al., (2019)	Systematic review	19	Adults & adolescents	AN-R, AN, AN-B/P, AN-W/R, BN, BED	HC, OWC	FV (*n*=18; 3 studies also used VS), DP (*n*=1)	Food, bodies, social,
9.Kittel et al., (2015)	Systematic review	5	Adults	BED	OB, OW	Traditional Stroop Task (*n*=2); ET (*n*=3)	Food & non-food stimuli. Images: Self & control body parts,
10.Reville et al., (2011)	Systematic review	6	Adults & adolescents	AN, BN, EDNOS	HC, Athletes, REC	ET (*n*=2), VP(*n*=2), DP (*n*=2)	Picture pairs, Food/weight shape images. Thin/fat body images, threat words, emotional faces

Table 2 continued

11.Stojek et al., (2018)	Systematic review	44	Adults and adolescents	BED,BN (Clinical and subclinical), AN-B/P	HC, Subclinical/recovered BN	Stroop task (*n*=27), ET(*n*=8) VP *(n*=3), SC (*n*=3), VS (*n*=3)	Weight/shape, food, threat
12.Van Den Eyde et al., (2013)	Systematic review	16	Adults & adolescents	BN, BED	HC	Stroop task (*n*=12), Traditional Stroop task (*n*=3), DP (*n*=1)	Body weight, shape, food & eating stimuli

Abbreviations: AN= Anorexia nervosa; AN (REC)= Anorexia nervosa recovered; R-AN=Recovered anorexia nervosa AN-R= Anorexia Nervosa Restricting subtype; AN-B/P= Anorexia nervosa Binge/purging subtype; AN-WR = weight-restored anorexia nervosa; BN= Bulimia nervosa; BED=Binge eating disorder; OB= Obese binge eating disorder; OBC= Obese controls; NWC= Normal weight controls; C=Controls; EDNOS= Eating disorder not otherwise specified; BN (REC)= Bulimia Nervosa recovered; VPDT= visual probe detection task; RSVP= rapid serial visual presentation; DP= Dot probe; VS= Visual search; SC= spatial cueing task; FV= Free viewing WMC=Weight matched controls;

1.4.6 Quality assessment measure

This meta-review used the AMSTAR 2 tool (A Measurement Tool to Assess Systematic Reviews), which is a validated measure and the most widely used tool in assessing the quality of systematic reviews (Shea et al., 2017). AMSTAR 2 is an update of the original AMSTAR tool (Shea et al., 2007). It uses a confidence rating instead of an overall score. Critical domains within the AMSTAR 2 are where errors or biases would seriously affect the validity of conclusions of the included reviews. Item number 2 was not included as a critical domain (as suggested in Shea et al., 2017), as doing so would have categorised the majority of the reviews within the same quality bracket.

Using the AMSTAR, one of four methodological quality ratings are assigned: 'high' (if reviews did not contain any of critical domains but could have up to three non-critical domains; 'moderate' (if reviews had more than three non-critical domains); 'low' (if reviews had one critical domain); 'critically low' (if reviews had more than one critical domains). See Appendix 4.3 for a full list of AMSTAR 2 items.

1.5 Results

1.5.1 Identification of systematic reviews

A total of 12 systematic reviews, three including meta-analyses, were included for data synthesis and quality assessment. The aims of each of the reviews are outlined (see appendix 4.4.). A summary of the characteristics of all 12 reviews is summarised in table 2. A summary of key findings is shown in appendix 4.5.

1.5.2 Participants included in the reviews

All reviews that included a meta-analysis included studies of participants with AN and BN. 8 of the reviews included studies of participants with AN (1,2,4, 6,7,8,10,11). All reviews included studies of participants with BN apart from 2 (5,9). 11 reviews included participants with BED (1,5,8,9,11,12). The majority of studies focused on comparisons of those with either AN, BN, BED to those with normal or healthy weight controls.

1.5.3 Search methods of included reviews

All papers searched at least two databases apart from one that only searched PubMed (1). PsychInfo and Pubmed was the most searched database (*n*= 9) followed by Medline (*n*=5) and Web of Science (*n*=4). Brooks et al., (2011) searched the most databases (*n*=8) and were the only paper to search the Cochrane library. The sum of studies included in the systematic reviews was 164. The total number of RCTs included within the reviews was not available.

1.5.4 Experimental methods

The majority of reviews included studies that used a form of the Stroop task (8/12).
Seven reviews included studies that used the dot-probe task. Other experimental methods used included: eye tracking, visual search task, spatial cueing task, free viewing paradigm and rapid serial visual presentation.

1.5.5 Methodological quality of included reviews

The methodological quality of included reviews was classified by the AMSTAR 2 method as ‘critically low' for 8 of the eleven reviews (1,10,3,7,9,6,8,5) ‘Low' for 2 reviews (4,11) and ‘moderate' for 2 (2,12). There were no reviews rated as ‘high'.

1.5.6 Non Critical Domains

Table 3 outlines the overall rating judgement and quality assessment of the individual AMSTAR 2 domains applied to each systematic review. All included reviews described their research questions according to PICO (item 1). The majority of studies did the following: described the inclusion studies in adequate detail (Item 8), discussed any heterogeneity in the results (Item 14), explained their selection of study design (Item 3), reported on funding (Item 10) or conflicts of interest (Item 16) and conducted study selection in duplicate (Item 5). Only one review (9) showed partial evidence of previous protocol registration (Item 2). The majority of the included studies failed to meet the following criteria: Performing data extraction in duplicate (Item 6), reporting on sources of funding (item 10). Of the 3 reviews to include meta-analysis, only 1 review assessed the potential impact of risk of bias (RoB) on their results.

1.5.7 Critical domains

All reviews conducted a comprehensive literature search (Item 4) apart from 1 (1). Only 4 reviews provided a detailed list of their excluded studies alongside justifications (Item 7). The majority of reviews did not report an assessment of the risk of bias (Item 9); 3 reviews scored a partial yes. However, the majority of reviewers attempted to account for the risk of bias in their interpretation of results (Item 13). The majority of reviews provided explanations for the causes of heterogeneity (Item 14). Of the 3 papers that included a meta-analysis 2 used appropriate methods for statistical combination of results (Item 11), only 1 performed an investigation into publication bias using funnel plots and statistical tests (Item 15).

Table 4: Quality rating results using AMSTAR 2

Study Name	1. Question & Inclusion	2. Protocol?	3. Study Design	4. Comprehensive search?	5. Study selection in	6. Data extraction in duplicate?	7. Excluded studies	8. Included studies?	9. Risk of bias (RoB)?	10. Funding sources?	11.: Statistical methods	12. RoB on meta-analysis?	13. RoB in individual studies?	14. Explanation for heterogeneity	15. Publication bias	16. Conflicts of interest	Overall Confidence in the review	Critical weaknesses	Non Critical weaknesses
1.Aspen et al (2013)†	Yes	No	Yes	No	No	No	yes	Partial Yes	No	No	Yes	No	No	No	No	No	Critically low	3	6
2.Brooks et al (2011)†	Yes	No	No	Yes	No	No	Yes	Partial yes	No	No	Yes	Yes	Yes	Yes	Yes	No	Moderate	0	6
3.DeJong et al (2011)	Yes	No	No	Partial yes	Yes	No	No	No	No	Yes	No MA	No MA	Yes	Yes	No MA	Yes	Critically low	2	4
4.Giel et al (2011)	Yes	No	No	Partial yes	No	No	No	Yes	No	No	No MA	No MA	Yes	Yes	No MA	No	Low	1	5
5. Giel et al. (2017)	Yes	No	Yes	Partial Yes	Yes	Yes	No	Yes	No	No	No MA	No MA	Yes	Yes	No MA	Yes	Critically low	2	2
6.Jáuregui-Lobera (2013)	Yes	No	No	Yes	No	No	No	Yes	No	No	No MA	No MA	No	No	No MA	Yes	Critically low	2	6
7.Johansson et al (2005)†	Yes	No	Yes	Yes	No	No	No	No	No	No	Yes	No	Yes	Yes	No	No	Critically low	3	7
8. Kerr-Gaffney (2019)	Yes	No	Yes	Partial Yes	Yes	No	No	Yes	Yes	No	No MA	No MA	No	Yes	No MA	Yes	Critically low	2	3
9.Kittel et al (2015)	Yes	No	No	Partial yes	No	No	No	Partial Yes	No	Yes	No MA	No MA	No	No	No MA	Yes	Critically low	3	3
10.Reville et al (2016)	Yes	No	no	Partial yes	No	No	No	Yes	Partial yes	No	No MA	No MA	No	No	No MA	Yes	Critically low	2	7
11.Stojek, et al (2018)	Yes	No	Yes	Yes	Yes	Yes	Partial Yes	Partial Yes	No	Yes	No MA	No MA	Yes	Yes	No MA	Yes	Low	1	1
12.Van den Eynde (2011)	Yes	No	No	Partial Yes	Yes	Yes	Partial Yes	Partial Yes	Partial yes	Yes	No MA	No MA	Yes	Yes	No MA	Yes	Moderate	0	2

† included a Meta-Analysis

1

1.5.8 Conclusions from the reviews

Overall, the results show that the modified Stroop task is the most frequently used experimental method to identify attentional bias in individuals with eating disorders. There are a small number of studies that used the traditional Stroop task to measure attentional bias in ED populations. Reviews by Jáuregui-Lobera (2013) and Kittel, Brauhardt, & Hilbert, (2015) found that overall, there were no significant differences between the level of Stroop interference between clinical populations and healthy controls (HC). Both of these reviews were rated as critically low in quality and only include a minimal number of studies. However, the review by Van Den Eynde et al., (2011), which was of moderate quality, drew the same conclusions. Overall, using the traditional Stroop task to measure attentional bias amongst disordered eating populations, is not informative. Many methods, including the emotional Stroop task, use disorder-relevant stimuli to measure attentional bias. The information included in reviews allows for an evaluation of different types of stimuli used in experimental paradigms; considered in the following section.

1.5.8.1 Food stimuli

Food/eating stimuli are the most widely used stimuli to assess attentional biases in those with eating disorders. This section first details the findings of the modified Stroop task when using food/eating stimuli before considering the findings of other experimental methods.

Modified Stroop task

The highest quality reviews that used food/eating stimuli (at moderate quality) were (Van den Eynde et al., 2011) and (Brooks, Prince, Stahl, Campbell, & Treasure, 2011). Van Den Eyde et al., (2011) found there was an overall stronger Stroop effect in those with BN in comparison to HC. However, they acknowledged that using food/eating stimuli had less consistent results

than shape/weight stimuli. Brooks et al., (2011) completed a meta-analysis of the findings from Stroop studies. They found a small effect size in those with BN (*d*=0.39). This effect size was not significantly different from the effect size of those with AN (*d*=0.38). Furthermore, an assessment of publication bias was non-significant, adding to the reliability of these conclusions. (Giel et al., 2011) only included 1 study, but concluded that those with ED had an attentional bias to positive eating stimuli in comparison to HC. Johansson et al., (2005) completed a meta-analysis, but their review was classified as critically low quality. However, it supported the above finding showing that both those with AN and BN had a larger effect size for food words than controls (both *d*=0.58). Jáuregui-Lobera (2013) found two studies showing that those with AN and BN had an attentional bias towards food stimuli. The review by Stojek et al., (2018) was found to be of low quality but includes the largest number of studies of all the reviews (*n*=44). They found that 9/15 studies using the Stroop task with food stimuli on those with BN found no attentional bias. However, they also found that 6/15 did show an attentional bias. Therefore although the majority of Stroop tasks indicate there is an attention bias to food/eating stimuli, this is not consistently found.

Other experimental methods

Stojek et al., (2018) identified 3 studies using the visual probe task with food stimuli, which had inconclusive findings. The dot-probe task with food stimuli is used in a large number of studies and has produced more consistent results. Kerr-Gaffney, Harrison, & Tchanturia, (2019) found that those with AN showed shorter gaze durations for food and control pictures than HC. Similarly, Jáuregui-Lobera (2013) concluded that in an eye tracking task, those with AN had more attentional disengagement to food pictures compared with control subjects. However, this review was of critically low quality, with a high number of non-critical weakness that might diminish confidence in its findings. However, other reviews have included studies

using the dot-probe task which have reached the same conclusion. Brooks et al., (2011) was a moderate quality review and conducted a meta-analysis on findings from the dot-probe task and food stimuli. They analysed two studies concluding that those with ED had an attentional bias away from food pictures. They conducted a meta-analysis to support their findings showing a medium effect size (d=0.50). Despite the critically low quality of the review by Aspen, Darcy, & Lock, (2013), they included the same two studies as Brooks et al., (2011) in their review. They conducted a meta-analysis of 4 studies, concluding that those with ED have an attentional bias away from positive eating stimuli (d=-0.83) These authors acknowledged the limitations of having a small number of studies and a large amount of heterogeneity. Giel et al., (2011) was a low-quality review. They also used the same two studies, but unlike the review by Aspen et al., (2013) or Brooks et al., (2011), they concluded that the study's author's reported that there was an attentional bias *towards* food items in patients with ED's. It is important that when specified, the nature of stimuli is clearly outlined (e.g. positive or negative food stimuli). Although the review by Giel et al., (2011) is of higher quality, the review by Aspen et al., (2013) is supported firstly by a meta-analysis, and secondly by a review of moderate quality, also with a meta-analysis. Therefore, we can have greater confidence in concluding that when using the dot-probe task and food stimuli, those with an eating disorder have an attentional bias *away* from food/eating stimuli.

There are fewer studies that include BED populations than those with AN or BN. However, conclusions surrounding attentional biases to food stimuli in this population are relatively consistent. Kittel et al., (2015) found that those with BED had more conscious attention allocation to food stimuli than obese and normal weight controls; they also found evidence of attentional bias in BED participants using the Stroop task. These findings complement those found by Stojek et al., (2018), who reported that when using the visual search task and food

stimuli, half of the studies of women with BED showed greater attentional bias towards food stimuli. This finding was also observed when using the visual search paradigm; those who binge eat consistently exhibit difficulties with attentional disengagement from food cues. While the review by Stojek et al., (2018) is low quality, it includes the least number of noncritical domains on the AMSTAR 2. They acknowledge that there is significant heterogeneity in study samples, grouping variables, and AB tasks. Kerr-Gaffney et al., (2019) found that those with BED had difficulty inhibiting their attention to both food and non-food stimuli in comparison to HC. Giel, Teufel, Junne, Zipfel, & Schag, (2017), found three studies in adults that revealed early attentional biases for food pictures in BED. They included the only study present on adolescent BED patients, showing an attentional bias for food pictures in later processing compared to obese participants.

1.5.8.2 Shape/Weight stimuli

Overall, studies that include shape and weight stimuli appear to have more consistent findings than those using food/eating stimuli. Stojek et al., (2018) found that those with BN had a greater attentional bias to weight/shape stimuli in comparison to other groups (using the modified Stroop task). They concluded that there is some evidence from eye tracking studies that those with BN have greater difficulty with disengaging from low-BMI images of others and that they intentionally avoid high-BMI images of other people. Van Den Eyde et al., (2011) was a moderate quality review. They report that in Stroop tasks, there is a consistent AB observed to shape/weight stimuli in those with BN compared to HC. Furthermore, they concluded that these stimuli have a negative effect on selective attention in those with BN. The review by Jáuregui-Lobera (2013) summarised that overall, those with BN showed attentional biases for weight and shape related words.

Studies using AN populations have consistently shown that this group tend to exhibit an attentional bias towards thin body shapes regardless of different experimental paradigms used (Jáuregui-Lobera, 2013; Reville, O'Connor, & Frampton, 2016). Similarly, Kerr-Gaffney et al., (2019) showed that those with AN showed a hierarchy of attention allocation, looking more at thin body shapes, followed by fat body shapes, as opposed to having a general bias towards body-related stimuli. Although these reviews were of low or critically low quality, the findings are consistent with one another.

Johansson et al., (2005) was a review of critically low quality, but they conducted a meta-analysis on findings using the Stroop task and body stimuli. They found that the Stroop inference score was significantly larger in women with ED than in non-ED women and controls. When separating ED into AN and BN, they found the effect sizes were higher for those with BN, although this difference was not significant. This is different from previous findings where those with BN were more concerned with body weight and those with AN were more concerned with eating (see Cooper & Fairburn, 1992).

Aspen et al., (2013) also completed a meta-analysis, but it was a review of critically low quality. They included 4 studies looking at shape stimuli using the dot-probe task. They acknowledged the significance of heterogeneity and interpreted their findings accordingly. Descriptively, half of the studies showed an AB *towards* positive shape stimuli in ED populations (with effect sizes ranging from d=.11 to d= .55). However, when conducting a meta-analysis, the pooled effect size was d=-.16. They concluded that an attentional bias *away* from positive shape stimuli exists. This review demonstrates how valuable a meta-analysis can be in enabling a researcher to interpret the significance of descriptive data. These results also

confirm those by reviews of moderate quality, e.g. Van Den Eyde et al., (2011) who concluded that shape stimuli have a negative impact on selective attention on those with BN.

Kerr-Gaffney et al., (2019) looked only at eye tracking measures of attentional bias. When using body stimuli, those with BED had a fixation on self-more than controls. They also found that participants with AN, BN and BED have a stronger attentional bias towards unattractive body parts, compared to obese or healthy controls. These findings complement those in the review by Kittel et al., (2015) who found 1 study which concluded that an attentional bias towards own body and ugly body parts was found to be stronger in individuals with BED than obese controls.

1.5.8.3 Nonspecific Threat Stimuli

Overall, results showed that nonspecific threat stimuli are used less frequently in comparison to disorder-specific stimuli (i.e., food and weight/shape cues). Using the Stroop task, Stojek et al., (2018) concluded that those with BN and BED have a greater attentional bias towards threat stimuli in comparison to HC. One study using the visual probe in participants with BED demonstrated an AB toward rejecting faces, but attentional avoidance of accepting faces. The opposite pattern is shown in healthy controls, and the magnitude of the group difference was small-to-medium.

Reville et al., (2016) reported a study that found the dot-probe task showed no differences in attentional bias to threat-related stimuli between those with AN and athletes. However, participants with AN had significantly slower reaction times. The review by (DeJong et al., 2013) was of critically low quality but showed that those with BN had a greater attentional bias for angry than neutral faces (d=0.80). A similar finding was observed in the Jáuregui-Lobera

(2013) review; they found a study that showed those with AN & BN showed an attentional bias towards rejecting faces. The review by Kerr-Gaffney et al., (2019) concluded that those with BN spent less time looking at attractive features of their own face than HC, and those with AN were more likely to misidentify their own face as showing sadness. More research needs to explore the area of nonspecific threat stimuli, specifically concerning social stimuli such as faces, as it is not possible to make broad generalisations using the current studies.

1.6 Discussion

1.6.1 Aim 1: Quality of systematic reviews around attentional biases in eating disorders

A high-quality systematic review is one of the most reliable sources of evidence to guide clinical practice (Clarke, 2011). The author's overarching goal was to provide an analysis of systematic reviews that focused on summarising the quality of these reviews. The main findings of this meta-review showed that of the twelve included reviews from the last twenty years of research, there are significant methodological limitations. Ten of twelve reviews were rated as 'critically low' or 'low' quality. Biases can be introduced at several stages in the design, planning, conduct, and analysis of a study (Shea et al., 2017). Significant areas of limitations included reviews not having developed a protocol before commencing the review. Conducting risk of bias (RoB) is a key step in conducting systematic reviews that informs many other steps (Shea et al., 2017). Many of these reviews neglected to assess this. Data selection and extraction was often not performed in duplicate, which can contribute to a higher prevalence of errors in systematic reviews (Gøtzsche, Hróbjartsson, Marić, & Tendal, 2007). Conducting systematic reviews within a team may mitigate this. There also was a lack of detail given regarding excluded studies, which do not enable the impact of their exclusion to be known (Shea et al., 2017).It is these discrepancies that have implications for the viability and reliability of the conclusions reached by authors. Guidance documents for AMSTAR 2 are

readily available, and researchers are encouraged to consider these when embarking on conducting a systematic review. Although this meta-review shows that the majority of the reviews are of critically low quality, it provides future researchers with valuable information of where the areas of low quality are most likely to be.

1.6.2 Aim 2: To provide an overview of the most reliable attentional bias findings in the disordered eating population

The two reviews rated highest (moderate quality) were Brooks et al., (2011) and Van Den Eyde et al., (2011). Although the review by Stojek et al., (2018) is considered to be low quality, it covers the largest number of studies. It has 1 non-critical weakness and 1 critical weakness, therefore, it is considered to be the most reliable of lower quality reviews. Stojek et al., (2018) evaluated the most studies and had the least number of non-critical weaknesses. Therefore, it is considered to be the most reliable lower quality review. Between these reviews, we can conclude the following regarding attentional bias in disordered eating populations. Using the Stroop task and food stimuli, there is evidence for those with BN having an attentional bias to food stimuli. This bias appears to be less consistent in those with AN. The dot-probe and eye tracking tasks showed that those with ED are more avoidant of food pictures than HC. The Stroop task has consistently shown how those with BN have an attentional bias to body stimuli in comparison to HC.

Other significant findings shared across multiple reviews include that those with BN have a greater attentional bias towards weight/shape stimuli in comparison to other groups. There is also evidence that those with AN are more concerned with thin-body shapes. Finally, those with BED have been found to have an early attentional bias present for food pictures, and a greater attentional bias to threat stimuli.

1.6.3 Overview

The spatial cueing task and visual search paradigm, are both experimental methods that appear to have yielded consistent conclusions between researchers, amongst some populations (e.g. BED), when using similar stimuli (See Stojek et al., 2018; Kerr-Gaffney et al., 2019; Giel et al., 2017). However, some reviews use paradigms with so few studies that it becomes difficult to generalise the results (DeJong et al., 2013; Reville, O'Connor, & Frampton, 2016). Where reviews use a small number of studies, the opportunity for type 1 error increases. There is a risk that such findings will have a disproportionately large effect on the conclusions of the review. Where this is unavoidable (because there a so few studies in that particular area), meta-analysis is recommended to support the conclusions made (such as those conducted in Brooks et al., 2011). As outlined as part of the results, it is perhaps the variability in disorder-specific stimuli between studies which may account for inconsistent results in attentional bias. Alternatively, the strength of attentional bias may be due to the type of stimulus used; the size or nature of the stimulus. Therefore, standardisation of stimuli may mitigate variability in findings. For example, when using images or words, the same images or words should be used in all studies across different populations.

The majority of studies included in the reviews use the modified Stroop task or the dot-probe task. Both these methods rely on reaction times as a measure of attentional bias, which provides only a single snapshot of the attentional process. A core cognitive trait in eating disordered populations appears to be executive dysfunction (Fagundo et al., 2012; Van den Eynde et al., 2011; Van Elburg & Treasure, 2013). Therefore, it is possible that a delay in reaction time is due to these types of impairment, which is not often explored in studies.

Another consideration for the consistent variability in findings is that different eating disorders might be associated with different types of attentional bias. It is therefore crucial for researchers to distinguish between types of an eating disorder or their symptoms, as opposed to using ED as one broad category. For example, attentional bias to food cues might be associated with over-consumption, as observed in those with purging or binging behaviours (Hardman, Rogers, Etchells, Houstoun, & Munafò, 2013) which may not be as prevalent in those without such behaviours. Gilon Mann et al., (2018) conducted a study that found that patients with AN-Resistant type showed vigilance to both eating disorder and social threat words, whereas patients with AN-Binging purging type showed avoidance of both threat types. These results provide further support for categorising eating disorders by symptoms. Understanding the biases that arise as a result of specific symptoms might assist in the development of theories regarding the maintenance of such behaviours.

Although this paper has speculated about the inconsistencies in the findings, it is possible that the discrepancies are not due to methodological oversight. Measuring attentional bias is not straightforward, demonstrated by the vast methods and means of doing so, and researchers are not yet in agreement about a single best measurement. It is possible that mandating one way of doing so is an impossible task, given the complexity of eating disorders and their symptoms. Each experimental paradigm measures different aspects of attention; therefore variability in results is to be expected. The Stroop task does not differentiate between different attentional processes (e.g., attentional orientation, maintenance, disengagement), but measures selective attention. Dot-probe tasks can differentiate between vigilance toward, and avoidance of, specific stimuli (Koster, Crombez, Verschuere, & De Houwer, 2004). This is similar to the spatial cueing paradigm, which also measures attentional disengagement. Eye tracking paradigms are a continuous measure of an individual's attention allocation, guided by selective

attention (Kowler, Anderson, Dosher, & Blaser, 1995; Karen Mogg, Millar, & Bradley, 2001). The visual search task measures speeded detection and increased distraction (Smeets, Roefs, Van Furth, & Jansen, 2008). A detailed overview of experimental measures used in this field, alongside their strengths and limitations is provided by Jiang & Vartanian (2018). Their review is focused on body-related stimuli only, but the criticisms of these measures apply more broadly to other stimuli. They concluded that the best outcomes to target the particular attentional mechanism of interest are a combination of eye tracking technology and specific reaction time measures.

Few reviews discuss how attentional bias might be affected by alternative factors relevant to the population they are studing. Research has shown that individuals can experience low mood as a result of cycles of bingeing, purging and restriction (Keys, Brozek, Henschel, Mickelsen, & Taylor, 1950). Furthermore, negative mood has been shown to influence attentional bias, e.g. negative mood has resulted in an individual becoming hyper-attentive to food-related cues (Hepworth, Mogg, Brignell, & Bradley, 2010; Rofey, Corcoran, & Tran, 2004), or by mood influencing attention allocation (Allen et al., 2018; Donofry et al., 2019). The differences in attentional bias between EDs/subtypes could be somehow linked to different emotional processes which warrant further exploration.

1.6.4 Limitations of this meta-review

A meta-review method does not allow the in-depth examination that is possible when individual studies are considered. Therefore, the most recent literature on this topic might not have been included. However, an effort has been made to incorporate information from any recent studies into the introduction and discussion. We acknowledge that due to its recent

publication, there may be specific limitations of using the AMSTAR 2 that are yet to be uncovered. Gates et al., (2018) is currently undertaking an evaluation. We have not attempted any meta-analysis of the published systematic reviews. Because of the multiple aims of this review, this narrative synthesis offers a more appropriate way to synthesize results to compare and contrast their methods, quality and conclusions. A focus on electrophysiology and neurobiology were beyond the scope of this review but would have enabled greater confidence in an attempt to synthesise the most reliable findings of attentional bias. Smith, Mason, Johnson, Lavender, & Wonderlich (2018) is a meta-review focusing of neurocognitive functioning in eating disorders which covers some of the aspects of attentional bias that were not included here.

1.6.5 Conclusions

Overall, the current published systematic reviews on attentional bias in eating disorder populations have significant flaws in methodology and quality. 80% of reviews were rated as low or critically low, with no reviews scoring higher than moderate, which may undermine some of the conclusions made by researchers in this field. The most reliable findings from the included reviews indicate that those with BN have an attentional bias to food/eating stimuli. Using a paradigm that looks more specifically at attention disengagement, authors concluded that those with EDs tend to turn their attention away from food/eating stimuli. Furthermore, those with BN display a consistent attentional bias to weight/shape stimuli, and those with AN allocate attention first to thin-body shapes. Research into those with BED is limited but does indicate that an early attentional bias is present for food pictures and greater attentional bias to threat stimuli is present. Future systematic reviews would benefit from the implementation of risk of bias assessments as well as greater scrutiny on data extraction and synthesis. More recent on attentional biases in eating disorders, categorised by symptoms, is needed.

1.7 References

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2. Paper 2 Metacognition in eating disorders: An analogue sample

Words: 7,335 (excluding abstract & references)

This empirical paper was prepared with the 'Journal of social sciences and humanities' in mind. The guidelines of which can be found in Appendix 4.6.

2.1 ABSTRACT

It is well documented that anxiety and worry play a significant role in the maintenance of eating disorder pathology. Research has shown that underlying these cognitive processes are specific metacognitive beliefs. Beliefs about worries being uncontrollable and dangerous (BUD), and the need to control thoughts (NCT) are the most prevalent metacognitive beliefs related to the development of disordered eating. Some theories suggest that disordered eating serves as a means of an individual gaining a greater sense of control, however, there is a lack of clarity about other methods individuals may use to control their thoughts.

The aim of the present study was to examine whether metacognitive beliefs (BUD and NCT) were predictors of disordered eating over time and whether this relationship was mediated by worry as a thought control strategy. A convenience sample (*n*=153) completed measures of metacognition (MCQ-30), disordered eating behaviour (EDEQ), and thought control strategy (TCQ) at two-time points over a 6-month period. A two-wave longitudinal mediation analysis showed that the metacognitive belief BUD predicted disordered eating (accounting for 1.7% of the variance) and that the metacognitive belief NCT accounted for 2.4% of the variance. Metacognitive beliefs also predicted the use of worry as a thought control strategy. However, no interaction effect was found between worry as a thought control strategy and disordered eating. The results add to previous research that metacognitive beliefs play a prominent role in the development of disordered eating behaviour.

2.1.2 KEYWORDS:

Metacognition, Eating Disorder, Longitudinal Mediation

2.2. INTRODUCTION

Comorbidity is common amongst those with eating disorders (ED). Rates of anxiety and mood disorders in clinical samples of those with Anorexia Nervosa (AN) and Bulimia Nervosa (BN) range between 25%-75% (Godart et al., 2015; Keck et al., 1990; Swinbourne et al., 2012). Research shows that levels of anxiety are higher amongst those with eating disorders in comparison to the general population (Wilson, Loxton, O'Shannessy, Sheeran, & Morgan, 2019). Beyond comorbidity, there is evidence that anxiety increases the risk of developing AN (Meier et al., 2015), and that anxiety often precedes an eating disorder (Godart et al., 2015; Kaye, Bulik, Thornton, Barbarich, & Masters, 2004). Some have argued that eating disorders should be regarded as derivatives of anxiety problems (Pallister & Waller, 2008).

2.2.1 Metacognition

There is evidence that metacognition, ('an individual's knowledge about various aspects of their thinking' Moore, 1982) is instrumental in understanding anxiety. Worry is a cognitive process, widely studied as a feature of anxiety (Borkovec, Ray, & Stober, 1988; Hirsch & Mathews, 2012). Levels of both anxiety and worry are known to be predicted in part by one's level of both positive and negative beliefs about worry (e.g., worry is helpful / worry is dangerous (Sica, Steketee, Ghisi, Chiri, & Franceschini, 2007; Thielsch, Andor, & Ehring, 2015). Cognitive processes also play an important role in the maintenance of disordered eating pathology (Rawal, Park, & Williams, 2010); as do metacognitive beliefs (Hudson, Hiripi, Jr, & Kessler, 2007). However, cognitive processes underlying anxiety in eating disorders is poorly understood (Kesby, Maguire, Brownlow, & Grisham, 2017). While the relationship between anxiety and eating disorders is well established, there is a lack of studies looking at the role of worry in EDs. Research has indicated that there are higher levels of worry in ED subjects than controls (Kerkhof, Hermans, Figee, & Laeremans, 2000) and that in a stress situation worry is related to the Eating Disorders Inventory's subscales in nonclinical subjects

(Sandra Sassaroli & Ruggiero, 2005). In the following section, there will be consideration of a theory of the role of metacognition in worry, which could help shed light on the link between worry, metacognition, and eating disorders.

2.2.2 *Self-Regulatory Executive Functioning Model*

The self-regulatory executive functioning model (Wells & Matthews, 1996) conceptualises the role of metacognition in the aetiology and maintenance of psychological disturbance. The S-REF outlines a causal interplay between three levels of cognition: 1) automatic low-level processing; 2) controlled or voluntary processing involving conscious appraisal and regulation of action and 3) self-knowledge and strategies for self-regulation stored in long term memory. Where metacognitions are dysfunctional (e.g. "worrying will help me to cope" or "my thoughts are out of control"), maladaptive behaviours and coping strategies arise (e.g. focused attention, rumination, avoidance, thought suppression, and threat monitoring (Wells, 2000). This is known as Cognitive Attentional Syndrome (CAS; (Wells & Matthews, 1996), which effectively 'locks' people into repetitive disturbances (Wells, 2009). To illustrate this: an individual with an eating disorder may encounter an external trigger which they interpret as threatening (e.g. seeing a large plate of food). This begins a process of activating metacognitive beliefs that are automatic and unconscious (e.g. I need to control my thoughts). The individual then consciously evaluates how these beliefs might fit with their ideal reality (e.g. I am not controlling my thoughts, and therefore I am going to gain weight), thereby leading them to employ a strategy to manage any discrepancy observed (Wells & King, 2006). This traps a person in a processing cycle where these metacognitions become stronger, and ways of managing them are reinforced (e.g. I need to control my thoughts to not gain weight). Some researchers have shown evidence of those with eating disorders having disrupted neural processing related to self-referential processing (Kowalski, Wypych, Marchewka, & Dragan,

2019) which might help to explain the long-standing nature of these beliefs amongst eating disorder populations.

2.2.3 Evidence for Metacognition in eating disorders

The metacognitive model asserts that psychological distress arises from maladaptive coping strategies, which are a product of metacognitive processes (Wells & Carter, 2001). Metacognitions have been categorised into five broad domains using factor analysis (Wells & Cartwright-Hatton, 2004): 1) positive beliefs about worry; 2) Negative beliefs about worry; 3) confidence in one's own cognitive functions; 4) beliefs about the need to control thoughts; 5) cognitive self-consciousness. These domains of metacognition have been found to be predictive of a range of disorders, including generalised anxiety disorder (Wells & King, 2006; Wells et al., 2010), Post-traumatic stress disorder (PTSD, (Wells & Colbear, 2012); obsessive-compulsive disorder (Fisher & Wells, 2008), and idiosyncratic metacognitive models for these disorders have been proposed. There is evidence to suggest that metacognition is relevant to understanding Eating disorders (ED). Research has shown that metacognitions are more pronounced in ED patients than in non-clinical samples (Davenport, Rushford, Soon, & McDermott, 2015), and they are significantly correlated with eating disorder symptomatology (Olstad, Solem, Hjemdal, & Hagen, 2015). For example, the need to control thoughts and beliefs about worry being uncontrollable and dangerous have been shown to be predictors of disordered eating behaviour (McDermott & Rushford, 2011; Olstad et al., 2015; Safdari, Khoramdel, & Kamranian, 2013; Sun, Zhu, & So, 2017). Smaller studies have replicated these findings showing that beliefs about uncontrollability and danger were highest in those with anorexia, compared with dieters and non-dieters (Cooper, Grocutt, Deepak, & Bailey, 2007). Needing to control thoughts has also been shown to be a risk factor for binge eating in adolescents (Laghi, Bianchi, Pompili, Lonigro, & Baiocco, 2018). In one study, metacognition was found to explain 51% of the variance in eating disorder symptoms after controlling for age

and BMI (Olstad et al., 2015). Another study found that positive or negative beliefs about worry predicted the drive for thinness in those with typical and non-typical anorexia (Davenport et al., 2015). Applying the metacognitive model to this population may provide key insights into future treatment strategies.

To summarise, research has shown that individuals with ED's may hold two predominant meta-beliefs (needing to control thoughts; worries are uncontrollable and dangerous). Whether and how these meta-beliefs might interact with eating disordered thoughts and behaviours is not understood. Various models propose that ED symptoms are used to manage feelings (Fox, Federici, & Power, 2012). One possible interaction comes from a qualitative study by (Vann, Strodl, & Anderson, 2013). Participants with AN described using food restriction as a way of controlling perseverative negative thinking (PNT), using it as a distraction. PNT is a collective term of types of continuous negative thinking in the past or future, including worry (Devynck, Kornacka, Sgard, & Douilliez, 2017). Bingeing behaviours were also reported to result from feelings of being out of control. These findings suggest that metacognitions concerning worries being uncontrollable and dangerous, and the need to control thoughts might have a causal role in the development of disordered eating behaviour. Furthermore, they might predispose someone to seek strategies – such as restriction and bingeing – to control thoughts. There is another hypothetical connection between meta-beliefs and eating disordered thoughts and behaviours, which will now be considered.

2.2.4 Worry and thought control

Wells & Davies (1994) proposed that individuals develop specific strategies to control their thoughts, notably by re-appraisal, punishment, social control, distraction and worry and that these could be measured using the thought control questionnaire (TCQ). The TCQ has not yet

been used to look at relationships between thought control strategies and eating disorders. One study used a variation of the TCQ, called the Control of Intrusive Thoughts questionnaire (CITQ; Fehm & Hoyer, 2004) on those with AN and BN. They revealed that using worry as a thought control strategy was most prevalent amongst those with AN and BN than healthy controls (Kollei, Brunhoeber, Rauh, de Zwaan, & Martin, 2012). A qualitative study found that those who believed worry-related thought processes were uncontrollable and dangerous, often prompted engagement in thought control strategies such as thought suppression (Vann et al., 2013). A longitudinal exploration of the link between metacognitive beliefs and thought control strategies amongst individuals with eating disorders is needed. The present study hypothesises that worry is used as a thought control strategy in response to metacognitive beliefs about needing to control thoughts or about worries being uncontrollable and dangerous.

2.2 5 Worry and eating disorders

The propensity to worry and ruminate is well documented in those with EDs (Sassaroli et al., 2005; Startup et al., 2013; Sternheim et al., 2012); However, in accordance with metacognitive theory, it is the metacognitive beliefs about worry (e.g. worrying could make me go mad or worrying helps me to cope) that maintains a cycle of emotional disturbance (Reynolds & Wells, 1999). Regression analyses have indicated that worry and rumination are significant predictors of eating disorder symptomatology, over and above the effects of anxiety and depression (Startup et al., 2013). One study found that worry prospectively predicted symptoms of disordered eating, such as a drive for thinness (Sala & Levinson, 2016). Some have argued that a need for a sense of "control" amongst those with EDs, is displaced onto dietary self-control (Fairburn, Cooper, & Shafran, 2003; Fairburn, Shafran, & Cooper, 1999). Therefore, we hypothesised that using worry as a though control strategy would be predictive of disordered eating behaviour.

2.2.6 Loneliness

Other research into metacognition and eating disorders has shown that negative beliefs about worries being uncontrollable and dangerous are associated with personal alienation (Quattropani, Lenzo, Mucciardi, & Toffle, 2015). One study found that women with AN of the binge/purge subtype reported high levels of loneliness compared with non-eating disordered women (Troop & Bifulco, 2002). Similarly, feelings of loneliness are prevalent amongst binge eating populations, often with food being used to dampen such feelings (Hubert, Coker, & Birtchnell, 1986). Individuals with eating disorders report lower self-esteem and often do not believe others want to have relationships with them, consequently feeling more alone (Levine, 2012). Individuals with EDs have reported that social withdrawal is often used as a way of coping with their negative thoughts as it helps them to feel in control (Vann et al., 2013). Therefore, this study included an exploratory hypothesis that loneliness may be a mediator in the relationship between the beliefs about uncontrollability and danger and disordered eating behaviour.

2.2.7 Overview of the present study

The two wave mediation model examined in this study is depicted in Figure 1. On the basis of metacognitive and self-regulatory executive functioning theory, our hypotheses were: (1) metacognitive beliefs about worries being uncontrollable and dangerous would be predictive of disordered eating; (2) metacognitive beliefs about worries being uncontrollable and dangerous would be predictive of worry as a thought control strategy; (3) the relationship between beliefs about worries being uncontrollable and dangerous and disordered eating would be mediated by worry as a thought control strategy.

There were two exploratory hypotheses: 1) The metacognitive belief the need to control thoughts would predict worry and disordered eating, and that worry would mediate the relationship between metacognition and disordered eating. 2) Metacognitive beliefs about uncontrollability and danger would indirectly impact disordered eating behaviour through loneliness.

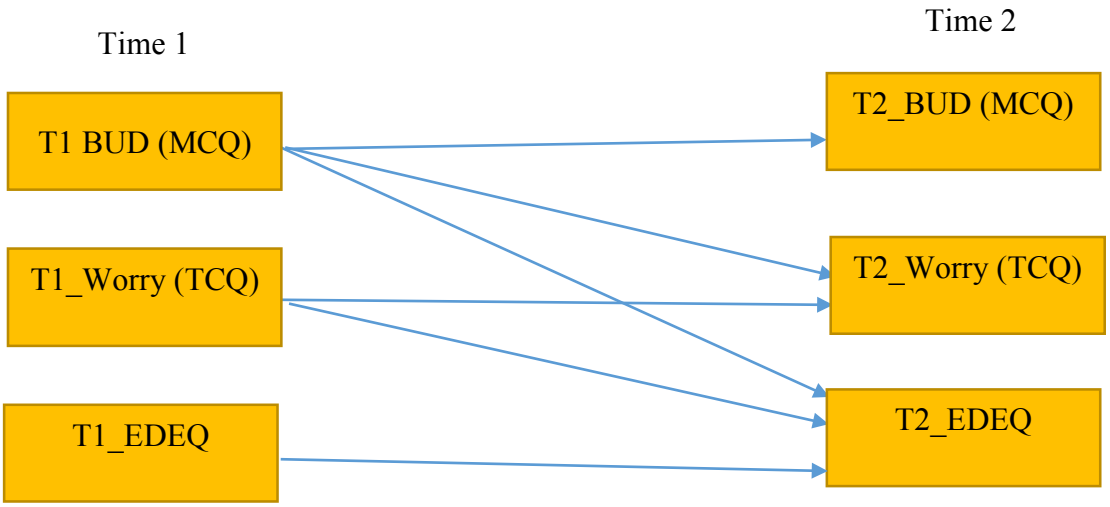

Figure 1: Two-wave mediation model

Abbreviations: T1= Time 1; T2= Time 2, EDEQ= Eating Disorder examination questionnaire, BUD= Beliefs about uncontrollability and danger (as measured by the metacognitions questionnaire), Worry (as measured by the thought control questionnaire).

2.3 METHODS

The final sample of this study was composed of 153 adults (81.7 % female, 18.3% male) with a mean age of 35.2 years (SD= 12.37, Age range, 18-70). 64.1% of the sample had completed education to an undergraduate level or above. 7.2% were currently studying. 80.4% of the sample were from the United Kingdom, 2 % were from outside the UK, and 17.6 % did not report where they were from. The mean BMI was 24.11 kg/m2 (SD =4.87 BMI range = 12.60-37.50). 9.2 % of the sample fell within an underweight range (BMI <18) (*n*=14). 54.2 % of the sample fell within the normal weight range (BMI between 18-25) *(n*=83), 35.9% fell within the overweight range (BMI >35) (*n*=55). One case omitted this question.

2.3.1.0 Recruitment

Time One

Participants were recruited via open access online forums on social media, with a link to the study and a password attached to the online link which gave them access (This was to prevent the link to the study being shared too widely). The research aimed to target a wide range of potential participants of varying ages and educational backgrounds. During the recruitment phase, it was encouraging that lots of people were volunteering to complete the study. However not all of the participants were completing all of the questionnaires. I posted on social media forums at regular intervals to ensure there would be enough participants.

Time two

The 526 participants that completed time one were contacted through an online bulk SMS messaging platform six months after completion of time one. A total of 153 participants completed time 2, following removal of any cases with missing data, or who could not be matched to their unique identifier code from time one.

2.3.1.1 Procedure

The Ethics Committee of Cardiff University approved this study and its procedure. Recruitment and data collection were completed with a colleague who was completing a different study. Her study investigated the influence of shame and perfectionism on disordered eating. In both studies participants completed the same questionnaires, but I only conducted analyses on the questionnaires relevant to my hypotheses. The pool of participants included in my study's analyses were the same, except when participants had missing data for specific questionnaires relating only to my study. The questionnaires were transferred onto the commercial programme, Qualtrics (http://www.qualtrics.com/) along with information about the study and the researcher's contact details. The link to the information sheet and the questionnaires were distributed via online social media forums. Upon clicking the link to the questionnaires, participants were required to enter a password supplied to them in the advertisement of the study. Participants were presented with an information sheet describing the purpose and procedures of the study, study confidentiality and anonymity of responses and voluntary participation. Participants were told they would have the chance to receive one of two £40 Amazon vouchers, and the recipients were chosen at random. Participants were required to electronically sign an informed consent form before continuing, and they were required to respond to each questionnaire item. Participants were asked to give themselves a unique identifier code to match their results to time two data six months later. This code was suggested to be their initials followed by the year they were born (e.g. AA00). Participants were also asked to provide their mobile number as a means of being contacted via text message to invite them to complete part two.

A total of 906 individuals were recorded as having clicked the link to take part in the research at time one. These results were then screened to eliminate 15.1% who had not given consent

and 26.8% incomplete submissions, which left a total of 526 participants with complete data at time one. A power analysis was conducted using G*POWER (Faul, Buchner, Erdfelder, & Lang, 2008) to determine the number of participants required at time point 2 to detect an effect of 0.15 with a power of 0.95. This number was determined to be 107. Attrition rates in longitudinal research are expected, and can be as high as 60% (Hochheimer et al., 2016). It was determined that this number would be adequate to reach a sample size of 107 at time point 2. 493 participants from time one received a text message after approximately six months using an online bulk messaging service (33 participants did not provide a valid number), including a link to the questionnaires inviting them to complete the same questionnaire. They were provided with the information sheet for a second time and required to give informed consent to proceed. A total of 224 responses were gathered for time 2. This data was screened to eliminate a) 57 who did not complete the questionnaires in full, and b) 14 duplicate entries. Participants' data were matched by using the unique identifier code or mobile number (if there were duplicate identifier codes). There was 1 case where the data could not be matched, and this case was excluded from the analysis. There was a considerable attrition rate between time 1 and time 2 participants. Table 1 below details a comparison of descriptive statistics between time 1 and time 2 samples.

Table 1: Descriptive statistics for time 1 and time 2 participants

Variable	Time 1	Time 2
Age (Mean)	34.22 years	35.2 years
Gender Female	83.5%	81.7%
Male	16%.	18.3%
Other	0.6%	0%
BMI (mean)	24.77 kg/m2	24.11 kg/m2
Education level completed:		
Currently Studying	8.4%	7.2%
Did not complete secondary education	1.3%	0.7%
Secondary Education	5.6%	3.9%
Post-Secondary Education	15.4%	17.0%

Vocational Qualification	7.8%	7.2%
Undergraduate Degree	23.2%	20.3%
Post-graduate Degree	18.9%	15.0%
Doctorate	19.5%	28.8%
Country:		
United Kingdom	66.9%	80.4%
USA & Canada	8.5%	0%
Europe	1.1%	17.6%
Rest of the world	2.6%	0%
Missing	20.8%	0%

Note: BMI= Body mass index

Five independent samples T-tests were conducted to compare the participant's demographic data between time one and time two samples. T-tests carried out on age, gender, and education level revealed no significant differences between the samples. There was a significant difference in the scores that showed significantly fewer people in the Time 2 sample were outside Europe compared with Time 1, $t(678) = 4.04$, $p = 0.00$. BMI for the Time 2 sample was also significantly lower than Time 1, $t(676) = 1.19$, $p = 0.03$.

A total convenience sample of 153 participants was left to be included in the analysis. The power of the multiple regression (with three predictors) was analysed to ascertain the validity of the predictability of the independent variables upon the dependent variable. Post-hoc power analysis using G*POWER (Faul et al., 2008) indicated that the power to detect obtained effects at the .05 level was .98. Participants completed the following questionnaires in counterbalanced order to minimise order effects.

2.3.2 Measures

2.3.2.1 Individual data

A body mass index (BMI) score was computed for each participant using self-reported height and weight.

2.3.2.2 Metacognitive questionnaire (MCQ-30)

Metacognition was assessed with the Metacognition Questionnaire (Wells & Cartwright-Hatton, 2004), which is a self-report measure composed of 30 items ranged on a 4 point-Likert scale from 1 (disagree) to 4 (agree). It measures five factors consistent with the metacognitive model: positive beliefs (6 items; sample item: "I need to worry in order to work well") ; uncontrollability and danger (6 items; sample item: "When I start worrying I cannot stop"); cognitive competence (60 items; sample item: "I do not trust my memory"); Need to control thoughts (6 items; sample item: "If I could not control my thoughts I would go crazy"); cognitive self-consciousness (6 items; sample item: "I am constantly aware of my thinking";). Each subscale score is derived by an averaging of the total sum of each scale. Cronbach coefficient alphas for each subscale have been reported as: positive beliefs =.92, uncontrollability and danger =.91, cognitive confidence =.92, Need to control thoughts=.72, cognitive self-consciousness=.92 (Wells & Cartwright-Hatton, 2004). The MCQ-30 was developed and validated on a convenience sample of 182 students, university staff and health employees. Pearson re-test correlations were significant, ranging from 0.59 to 0.87 for the subscales and 0.75 for the total scale (Wells & Cartwright-Hatton, 2004).

2.3.2.3 Thought control questionnaire (TCQ)

Thought control strategies were assessed by the thought control questionnaire (TCQ; Wells & Davies, 1994). The TCQ is a 36 item, self-report measure that assesses the frequency of use of

thought control strategies. It measures 5 factorially derived and conceptually distinct categories: (1) worry (e.g. “I focus on different negative thoughts”); (2) punishment (e.g. “I punish myself for thinking the thought”); (3) re-appraisal (e.g. “I try to reinterpret the thought”); (4) distraction (e.g. “I do something that I enjoy”); and (5) social control (e.g. “I ask my friends if they have similar thoughts”). Each subscale consists of six items rated on a four-point Likert-type scale (1 = never; 2 = sometimes; 3 = often; 4 = almost always). A total TCQ score is obtained by summing the individual subscales. The TCQ has acceptable to good internal consistency (alpha = .64-.72), and test-retest coefficients indicate acceptable to very good standards of reliability (r = .67-.83) (Wells & Davies, 1994).

2.3.2.4 Eating Disorder Examination Questionnaire (EDEQ)

The Eating Disorder Examination Questionnaire (EDEQ) was developed as a self-report version of the investigator-based EDE (Fairburn & Beglin, 1994). Studies of the validity of the EDE-Q have demonstrated a high level of agreement between the EDE-Q and EDE in assessing the core attitudinal features of eating disorder psychopathology in the general population (C. Fairburn & Beglin, 1994; J.M. Mond, Hay, Rodgers, & Owen, 2006). The EDE-Q is made up of 28 questions that are designed to assess disordered eating attitudes and behaviours. There are four clinically derived subscales assessing disordered eating attitudes: Restraint (5 items), Eating Concern (5 items), Weight Concern (5 items), and Shape Concern (8 items). Ratings include the presence or absence and frequency of symptoms. A global score is generated as the average of the four subscales. Additional questions assessing behavioural symptoms (i.e., binge eating and compensatory behaviours) are used clinically but are not included in subscale or global scores. Acceptable levels of internal consistency have been reported for the EDEQ total score (.90) and subscales: Restraint (.90) Eating Concern (0.73), Shape Concern (0.83) and Weight Concern (0.72) subscales (Peterson et al., 2007).

2.3.2.5 Loneliness questionnaire

The 6 item loneliness scale was created by Gierveld & Tilburg, (2006), and derived from the original 11 item loneliness scale (De Jong Gierveld, 1987). The scale can be used as a one-dimensional measure or choose to use two subscales (social and emotional loneliness). The overall loneliness score ranges from 0 to 6, where 0 means no loneliness and 6 indicates severe loneliness. It is a reliable and valid measurement for overall, emotional (.88), and social loneliness (.88) that can be used in a broad age range (18-99 years).

2.3.3 Descriptive Statistics

Cronbach alphas were used to investigate the internal consistency of the subscales included in this study, while Pearson correlations were used to investigate their stability over time. These results are summarised in table 2. The Cronbach alphas scores exceed the level recommended by (Nunnally, 1978) except social control within the thought control questionnaire. The Pearson correlations were significant at p=0.05 level in all items except social control in the thought control questionnaire. Internal consistency (Cronbach's alpha) was good ($\alpha > 0.9$) for EDEQ and TCQ, and good ($\alpha > 0.8$) for the MCQ-30 subscales.

Table 2: *Internal consistency and test-retest reliability of all subscales*

Subscale	Cronbach Alpha		Pearson's r
	Time 1	Time 2	
EDEQ Global Score			.699**
Beliefs about uncontrollability and danger (MCQ)	.898	.892	.513**
Need to control thoughts (TCQ)	.843	.866	.542**
Worry (TCQ)	.818	.824	.469**
Loneliness Total subscale			.481**

** Significant at 0.05 level

Abbreviations: EDEQ= Eating Disorder examination questionnaire; MCQ= Metacognitions questionnaire; TCQ= Thought control questionnaire

2.3.4 Statistical analysis

Data were organised in an SPSS version (Statistical Package for Social Sciences v. 25 software for Mac, 2019) database. Analyses were performed with descriptive and inferential statistical analysis. Pearson correlation coefficients were used to examine the bivariate associations among study variables. The significance levels for the correlation coefficients were $p < 0.05$.

2.4. RESULTS

Table 3 presents descriptive statistics for the main study variables. 86.9% of this sample scored above the clinical cut off on the EDEQ questionnaire for both time 1 and time 2 points (>2.3; (Mond, Hay, Rodgers, Owen, & Beumont, 2004). The mean scores on the metacognition questionnaire BUD and NCT are also slightly higher than those conducted by the authors of the measure (9.30 and 8.34 respectively).

Table 3: *Descriptive Statistics for the Continuous Main Study Variables*

Variable	N	Min	Max	Range	Mean	SD
T1 Global EDEQ	153	.00	8.63	34.50	3.00	2.20
T2 Global EDEQ	152	.06	8.63	34.25	2.91	1.68
T1 Beliefs about uncontrollability and danger (MCQ)	153	6.00	24.00	18.00	12.04	4.88
T2 Beliefs about uncontrollability and danger (MCQ)	153	6.00	24.00	18.00	11.71	4.89
T1 Worry (TCQ)	153.	.000	18.00	18.00	9.07	2.95
T2 Worry (TCQ)	153	6.00	21.00	17.00	9.87	3.34
T1 Need to control thoughts (MCQ)	153	6.00	24.00	18.00	9.92	4.01
T2 Need to control thoughts (MCQ)	153	6.00	24.00	18.00	9.81	4.09

Abbreviations: EDEQ= Eating Disorder examination questionnaire; MCQ= Metacognitions questionnaire; TCQ= Thought control questionnaire; T1= Time 1; T2= Time 2

2.4.1 Missing Value Analysis

The data were screened for missing values prior to conducting the primary analyses. Analysis of missing value patterns indicated that there were no missing values except for the T2 EDEQ and BMI variables. For both variables, only 0.7% of the participants had missing responses. Little's Missing Completely At Random (MCAR) (Little & Rubin, 2014)(test indicated that missing data did not follow any clear patterns as indicated by a non-significant chi-square ($\chi 2 = 24.301$, df = 20, p = .229). This suggests that the missing data pattern is completely random and that missing data do not a present threat to the results.

Table 4: *Correlations among the study variables*

	1	2	3	4	5	6	7	8	9	10
1.T1 EDEQ		.699**	.514**	.319**	.549**	.240**	.357**	.317**	-.098	.206*
2.T2 EDEQ			.472**	.370**	.350**	.204**	.395**	.341**	-.071	.171*
3. T1 BUD (MCQ)				.513**	.525**	.433**	.514**	.438**	-.311**	-.004
4. T2 BUD (MCQ)					.317**	.403**	.370**	.708**	-.060	-.012
5. T1 Worry (TCQ)						.469**	.307**	.287**	-.069	-.009
6. T2 Worry (TCQ)							.240**	.336**	-.242**	-.018
7.T1 NCT (MCQ)								.542**	-.228**	-.037
8.T2 NCT (MCQ)									-.172*	-.023
9. Age										.174*
10.BMI										

Note: * $p < .05$; ** $p < .01$.
Abbreviations: T1= Time 1; T2= Time 2; EDEQ= Eating Disorder examination questionnaire; BUD= Beliefs about uncontrollability and danger; NCT= Need to control thoughts; TCQ= Thought Control Questionnaire; BMI= Body mass index; MCQ= Metacognitions questionnaire

2.4.2 Hierarchical Regression Analyses

The first hypothesis sought to determine whether metacognitive beliefs about uncontrollability and danger predicted T2 disordered eating behaviour, after controlling for previous T1 disordered eating behaviour. Prior to conducting a regression analysis, the data were analysed to test that the recommended assumptions were met (Field, 2017). The scatterplot of standardised predicted values verses standardised residuals, showed that the data met the assumptions of homogeneity of variance and linearity and the residuals were approximately normally distributed. There was independence of residuals, as assessed by a Durbin-Watson statistic of 1.705. There was homoscedasticity, as assessed by visual inspection of a plot of

studentized residuals versus unstandardized predicted values. There was no evidence of multicollinearity, as assessed by tolerance values greater than 0.1. The assumption of normality was met, as assessed by Q-Q Plot. It was hypothesised that the metacognitive beliefs about uncontrollability and danger would predict T2 disordered eating behaviour after accounting for T1 disordered eating behaviour. To test this hypothesis, hierarchical multiple regression analysis was performed between T2 disordered eating behaviour as the criterion variable and T1 disordered eating behaviour in the first block and metacognitive beliefs about uncontrollability and danger as a predictor variable in the second block. Table 5 displays effect size measure (R^2), change in R^2 (ΔR^2) and standardised regression coefficients (β) with their corresponding t-test values. The T1 disordered eating behaviour in the first block explained 48.9% of the variation in T2 disordered eating behaviour which was statistically significant (R^2=.489, F(1,150)=14.56, p=.0001) (see Table 5). Adding metacognitive beliefs about uncontrollability and danger in the second block explained an additional 1.7% of the variation in T2 disordered eating behaviour (ΔR^2 =.017, F (1,15)= 5.21, p =.024). The examination of individual predictors in the second block revealed that both metacognition beliefs about uncontrollability and danger and T1 disordered eating behaviour are statistically significant predictors of T2 disordered eating behaviour. This indicates that the first hypothesis was fully supported.

Table 5*: Summary of Hierarchical Multiple Regression Analyses Predicting T2 disordered eating behaviour (n= 153)*

Variable	β	T	R^2	ΔR^2
			.489	.489
T1 EDEQ	.699	11.98		
			.500	.017
T1 EDEQ	.620	9.25		
T1 BUD (MCQ)	.153	2.28		

***Abbreviations**:* T1= Time 1; EDEQ= Eating Disorder examination questionnaire, BUD= Beliefs about uncontrollability and danger, NCT= Need to control thoughts; TCQ= Thought Control Questionnaire; MCQ= Metacognitions questionnaire.

2.4.3 Longitudinal Mediation Analysis

The third hypothesis was focused on examining whether, and to what extent, worry as a thought control strategy mediates the relationship between metacognitive beliefs about uncontrollability and disordered eating behaviour. To test this, we conducted an autoregressive mediation model (Jose, 2016). According to Jose, (2016) mediation in a two-wave longitudinal study can be tested by running two regression equations[1]

1. $Y_2 = i_1 + c'_1X_1 + b_1M_1 + s_1Y_1 + e_1$
2. $M_2 = i_2 + a_1X_1 + s_2M_1 + e_2$

2.4.4 Main Hypothesis

Based on these two equations, two multiple linear regressions were run. Tables 6 and 7 present the multiple regression analyses summaries. As can be seen from Table 7, T1BUD predicted T2 Worry and was statistically significant; however, as shown in Table 6, T1 Worry did not significantly predict T2 EDEQ. Theoretically, there should be a statistically significant association between the mediator and the dependent variable to evaluate mediation. In the current study, since worry did not predict EDEQ, further analysis of mediation may not be

[1] [1] *Where Y_2 is the dependent variable at Time 2, c_1 represents the effect of the Time 1 independent variable, b_1 represents the effect of the Time 1 mediator variable and s_1 represents the stability effect of the dependent variable . In the second equation, M_2 is the mediator at Time 2; a_1 represents the effect of the Time 1 independent variable on Time 2 mediator variable s_2 represents the stability effect of the mediator variable. In both regression equation, the "i" represents the constant and the "e" represents the residuals in standard regression.*

informative. A diagram of the model with the regression coefficients can be seen in figure 2.0. To further demonstrate the non-significance, the Sobel test was conducted, and the results were as follows: Z= 1.88; *p* =.136

Table 6: *Summary of Multiple Linear Regression Predicting T2 EDEQ*

	B	Std. Error	Beta	T	Sig.
(Constant)	4.849	1.339		3.621	.000
T1 BUD (MCQ)	.263	.098	.191	2.700	.008
T1 Worry (TCQ)	-.266	.166	-.117	-1.600	.112
T1 EDEQ	.505	.055	.665	9.194	.000

Abbreviations: T1= Time 1; T2=Time 2; EDEQ= Eating Disorder examination questionnaire; BUD= Beliefs about uncontrollability and danger; MCQ= Metacognition questionnaire; TCQ= Thought Control Questionnaire

Table 7: *Summary of Multiple Linear Regression Predicting T2 worry*

	B	Std. Error	Beta	T	Sig.
Constant	4.702	.715		6.573	.000
T1 BUD (MCQ)	.160	.051	.259	3.152	.002
T1 Worry (TCQ)	.342	.084	.333	4.057	.000

Abbreviations: T1= Time 1; BUD= Beliefs about uncontrollability and danger; MCQ= Metacognition questionnaire; TCQ= Thought Control Questionnaire.

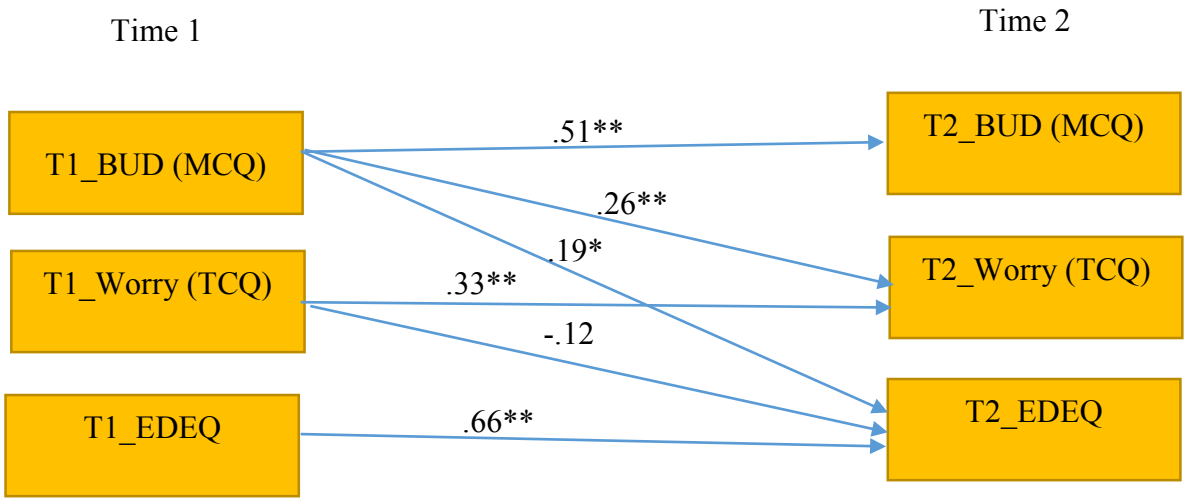

Figure 2.0 Longitudinal mediation path

*=p<0.01 **p=<0.05

Abbreviations: T1= Time 1; T2= Time 2, EDEQ= Eating Disorder examination questionnaire, BUD= Beliefs about uncontrollability and danger (as measured by the metacognitions questionnaire), Worry (as measured by the thought control questionnaire).

2.4.5 Exploratory hypotheses

2.4.5.1 Need to control thoughts

An exploratory hypothesis sought to determine whether the metacognition need to control thoughts (as measured by the metacognitions questionnaire) predicted T2 disordered eating behaviour, after controlling for previous T1 disordered eating behaviour. To test this hypothesis, hierarchical multiple regression analysis was performed between T2 disordered eating behaviour as the criterion variable, T1 disordered eating behaviour in the first block, and metacognition need to control thoughts as a predictor variable in the second block. Table 8 displays effect size measure (R^2), change in R^2 (ΔR^2) and standardized regression coefficients (β) with their corresponding *t*-test values. Adding the metacognition need to control thoughts in the second block explained an additional 2.4% of the variation in T2 disordered eating behaviour (ΔR^2 =.024, F (1,150) = 7.49, p =.007). The examination of individual predictors in the second block revealed that both metacognition need to control thoughts and T1 disordered eating behaviour are statistically significant predictors of T2 disordered eating behaviour. This indicates that the exploratory hypothesis is fully supported. However, Table 6 shows that T1 Worry did not significantly predict T2 EDEQ. Therefore, the analysis of worry as a mediator between the need to control thoughts and disordered eating was not considered.

Table 8*: Summary of Hierarchical Multiple Regression Analysis Predicting T2 disordered eating behaviour*

Variable	β	T	R^2	ΔR^2
			.489	.489
T1 EDEQ	.699	11.982		
			.507	.024
T1 EDEQ	.640	10.459		
T1 NCT (MCQ)	.167	2.738		

Abbreviations: T1= Time 1; EDEQ= Eating Disorder examination questionnaire; NCT= Need to Control Thoughts; MCQ= Metacognition questionnaire

2.4.5.2 Loneliness

The final exploratory hypothesis was focused on examining whether, and to what extent, loneliness mediates the relationship between metacognitive beliefs about uncontrollability and danger and disordered eating behaviour. Tables 9 and 10 present the multiple regression analyses summaries. As can be seen from Table 9, T1 loneliness predicted T2 EDEQ and was statistically significant; however, T1BUD did not significantly predict T2 EDEQ. As can be seen in Table 10, T1BUD predicting T2 loneliness was not statistically significant. In the current study, since T1 BUD did not predict EDEQ T2 or T2 loneliness, further analysis of mediation was not completed.

Table 9: *Summary of Multiple Linear Regression Predicting T2 EDEQ*

	B	Std. Error	Beta	T	Sig.
(Constant)	3.518	1.000		3.519	.001
T1 BUD (MCQ)	.088	.097	.064	.901	.369
T1 Lonely	.691	.215	.221	3.211	.002
T1 EDEQ	.428	.051	.563	8.341	.000

Abbreviations: T1= Time 1; EDEQ= Eating Disorder examination questionnaire; MCQ= Metacognition questionnaire BUD= Beliefs about uncontrollability and danger

Table 10: *Summary of Multiple Linear Regression Predicting T2 Loneliness*

	B	Std. Error	Beta	T	Sig.
Constant	1.441	.415		3.475	.001
T1 BUD (MCQ)	.001	.038	.002	.020	.984
T1 lonely	.486	.086	.480	5.650	.000

Abbreviations: T1= Time 1; EDEQ= Eating Disorder examination questionnaire, BUD= Beliefs about uncontrollability and danger

2.5. DISCUSSION

The present study aimed to examine whether specific metacognitions concerning beliefs about worries being uncontrollable and dangerous were predictive of disordered eating behaviour over time (6 months). Specifically, we were interested in examining if the thought control strategy worry predicted the development of disordered eating over time, above that explained by particular metacognitive beliefs. As expected, we found that metacognitive beliefs about worries being uncontrollable and dangerous were predictive of disordered eating behaviour. However, controlling thoughts using worry was not predictive of disordered eating behaviour, and therefore it was not possible to show that worry as a thought control strategy mediated the relationship between certain metacognitive beliefs and disordered eating. The first exploratory hypothesis revealed that metacognitive belief about the need to control thoughts was predictive of disordered eating behaviour over time. The second exploratory hypothesis showed that loneliness predicted disordered eating behaviour, but metacognitive beliefs did not predict loneliness. The second exploratory hypothesis revealed that while loneliness was predictive of disordered eating behaviour over time, it was not predicted by metacognitive beliefs about uncontrollability and danger.

2.5.1 Implications on assessment and intervention

Beliefs about worries being uncontrollable and dangerous were significantly predictive of scores on the EDEQ. This predicted an additional 1.7% of the variance in eating disorder

symptoms at time 2 in addition to the variance predicted by EDEQ score at time 1 (48.9%). Although this is very small, it was statistically significant over a six-month period. According to the metacognitive model (Wells, 1999), metacognitive beliefs directly impact whether someone experiences their worry as problematic or not. The belief that worries are uncontrollable and dangerous may, in some cases, drive an individual to engage in disordered eating behaviour as a form of managing worries, which would be consistent, for instance, with Vann et al.'s (2013) reports from patients with AN that dietary restriction is a way of controlling perseverative negative thinking. Furthermore, our exploratory hypothesis was also confirmed. The metacognition needing to control thoughts accounted for an extra 2.4% of the variance after controlling for EDEQ at time 1, when predicting EDEQ score at time 2. These results add to previous research findings that metacognitive beliefs about uncontrollability are a prominent antecedent for the development of disordered eating (McDermott & Rushford, 2011; Olstad et al., 2015; Sun et al., 2017), which has important theoretical and clinical implications. Should the importance of such metacognitive beliefs in the cause/maintenance of EDs receive further empirical support, assessing the presence of such beliefs for an individual with an ED might become useful for a clinician assessing and formulating an individual's ED. Targeting such beliefs in treatment would be useful if they are thought to contribute to the ED's maintenance.

This study sheds light on the metacognitive patterns that predict disordered eating behaviour. It identifies that metacognitions surrounding beliefs that worries are dangerous and uncontrollable, or that worrying thoughts need to be controlled, leads to using worry as a thought control strategy. Understanding metacognitive function in this population has implications for prevention, and even treatment. Understanding the specific metacognitive beliefs that predict disordered eating could lead to a greater exploration of an individual's thoughts when an individual is assessed for an eating disorder. Clinical and evidence-based

research should verify the possible effects of reducing the strength in metacognitive beliefs using metacognitive therapy (Van der Heiden, Muris, & Van der Molen, 2012).

2.5.2 Implications for theory

Metacognitive theory assumes that metacognitive beliefs are at the core of an individual's emotional disturbance (Wells, 2009). These findings confirm that metacognitive theory may be useful in understanding the development of eating disorders. Metacognitive therapy (MCT) is the application of this theory amongst clinical populations (Wells, 2009). MCT focuses on teaching an individual to use strategies to manage threat, while also encouraging them to focus on their attentional bias and the ways they use worry as a strategy for dealing with a threat. MCT acts as an alternative treatment option, which has been applied to populations of individuals with anxiety and depression (Normann, van Emmerik, & Morina, (2014), PTSD (Wells & Sembi, 2004) & OCD (Fisher & Wells, 2008). While research has shown that there is a theoretical basis for applying this model to this population, to date, there have been no clinical trials exploring the effects of metacognitive therapy (MCT) for eating disorders. This study provides further support that the exploration of this would be beneficial.

This study did not find worry as a thought control strategy to be predictive of disordered eating. However, this may be due to the measurement of worry as a thought control strategy. Previous studies have found that worry is predictive of disordered eating (Startup et al., 2013). However, these studies have measured trait worry using the Penn State Worry Questionnaire (Meyer, Miller, Metzger, & Borkovec, 1990). This study was focused on the behaviour of worry as opposed to trait worry, which may explain why only a small correlation was found. Furthermore, research has shown that the relationship between worry and disordered eating was more closely related to dimensions of extreme restriction in the absence of binge-purge

cycles, which is more characteristic of those with AN than of BN (Sala & Levinson, 2016). This study did not distinguish between sub-types or symptoms of eating disorders (e.g. BN, AN, BED), but instead used the global score on the EDEQ. Future research on this population could explore whether such mediation is observed, e.g., in a more restrictive subgroup of respondents without binge-purge cycles.

Another possible explanation for the lack of an observed association between worry as a thought control strategy and disordered eating is because worry (TCQ) measures a behavioural tendency, whereas metacognitions are beliefs. These results shown that amongst this sample, using worry as a thought control strategy was not used to cope with metacognitive beliefs. It is possible that those who have these specific beliefs about their worries utilise specific strategies like restriction or bingeing to manage these. An additional explanation of the findings might be that individuals that hold beliefs about needing to control thoughts, and worries being uncontrollable and dangerous, may feel a sense of responsibility to prevent adverse outcomes. It might be this feeling, elicited by metacognitions, that drives them to engage in disordered eating behaviours (e.g. restricting, purging). These behaviours may serve as a means of altering an individual's emotional state (Mond et al., 2004; Wildes, Ringham, & Marcus, 2010). A recent paper showed that individuals use their eating disorder to manage negative emotions (Henderson, Fox, Trayner, & Wittkowski, 2019). Exploring the relationship between metacognition and emotional state warrants further exploration.

2.5.3 Limitations of the study

This study has limitations that need to be acknowledged. Time 2 data shows a lack of representation from outside of Europe, which is significantly different to the spread of data accumulated at time 1. This suggests a possible error in the invitation process on the online SMS platform during time 2. It is likely that reminder text messages to mobile numbers outside

of the United Kingdom and Europe were not received by participants. This affects the generalisability of the sample, which is considered as part of the study's limitations. This was a convenience sample, which appears to have led to an overrepresentation of people with significantly disordered eating: over 85% of this sample scored above the clinical cut off for their scores on the EDEQ. This is likely reflective of sampling bias in which the forums from which the sample was drawn, attracting people who have higher levels of disordered eating. Furthermore, the majority of participants were based in the UK educated to at least an undergraduate level. While this suggests that the results obtained from this sample cannot be generalised to the normal population, the advantage is that it increases the credibility of the results in terms of understanding the role of metacognitive beliefs in clinical eating disorders. A deeper understanding of metacognitive beliefs in eating disorders will only be achieved; however, when these issues are investigated with people who have a formal diagnosis. Previous studies have shown that self-report measures of disordered eating behaviour can be unreliable, as those with BN tend to overestimate their scores on the EDEQ in comparison to face to face interviews (Black & Wilson, 1996; Mond et al., 2004). Research has shown that exposure to stress can increase levels of worry, which can have an impact on the endorsement of beliefs concerning mental control (Wells, Cart-wright 2002). It would, therefore, be useful for future research to include other correlates such as current levels of stress or mental well-being.

During the recruitment process, online forums relating to weight and diet concerned groups were targeted, which may offer an explanation of why an overrepresentation of individuals with eating concerns is observed in this study. Furthermore, a number of disordered eating relating organizations promoted the current research on twitter, inviting individuals to take part. Again, this may have drawn a greater amount of interest from those who have disordered eating behaviours.

The chosen method of recruitment for this study may introduces selection bias by potentially

over-representing those individuals who spend the most amount of time on social media communities such as Facebook and twitter. Furthermore, it automatically excludes individuals that do not have social media and therefore is not truly representative of the whole population. Research has shown that higher use of facebook has been associated with lower self-esteem (Kalpidou, Costin, & Morris, 2011) and greater levels of loneliness (Song et al., 2014). Research shows that low self-esteem and levels of loneliness are correlated with disordered eating behaviour (Dykens & Gerrard, 1986) The above factors might account for the overrepresentation of high-scorers on the EDEQ.

The TCQ scale used in this study does not measure trait worry, which is a potential correlate that was not explored here. Therefore, we cannot conclude that worry is not significantly related to disordered eating, but shows that using the worry as a thought control strategy is not necessarily linked to disordered eating behaviour. The correlations of TCQ worry between the two-time points were the lowest of all the variables from this study. This shows that this particular construct may not stable over time and has implications for the measures' test-retest reliability. Other authors have found the reliability of the TCQ to be unsatisfactory (Fehm & Hoyer, 2004). Future research would need to employ a valid and reliable measure of worry to assess whether it mediates the relationship between metacognition and disordered eating. Finally, the use of a concurrent mediation model has provided limited information about the directionality of temporal influences among variables over time (Jose, 2013). Suggestions for future research would be to conduct a focused longitudinal mediation, requiring three-time points (Jose, 2013) to reach firmer conclusions about the longitudinal relationships.

2.5.4 Conclusions

In conclusion, the present study indicates that metacognitive beliefs about uncontrollability and danger and the need to control thoughts predict the development of disordered eating over time, but this interaction is not mediated by the thought control strategy worry as initially hypothesised. The findings of this present study are consistent with the existing literature showing that metacognitions are predictive of disordered eating behaviour. This study also provides evidence that levels of loneliness are linked to disordered eating behaviour but that metacognitive beliefs do not predict this.

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3.Paper: Critical and Reflective evaluation

Words: 4,458

This paper aims to discuss and evaluate the process and experience of conducting the Large Scale Research Project (LSRP). The context for the LSRP will be outlined, followed by a description and appraisal of the research process for both the systematic review and empirical papers. The implications for future research, clinical practice and methods for dissemination are considered. The paper will conclude with the author's reflections regarding personal and professional development from undertaking the project.

3.1 LSRP Context

The development of eating disorders (including anorexia nervosa, bulimia nervosa, binge eating disorder, and atypical eating disorders) affect many men and women are complex and varied. Eating disorders are associated with low rates of recovery (Berkman, Lohr, & Bulik, 2007), and have the highest mortality of all psychiatric disorders (Arcelus, 2011). There is evidence of biological, psychological, developmental, and sociocultural effects on the development of eating disorders, but these are not conclusive. Research into metacognition has been applied to many different types of emotional disturbances but is sparse in the field of eating disorders.

3.1.2 Choice of Research Project

I was initially interested in developing a research project in this area as I had worked clinically with several clients with eating disorders. I came to understand the difficulty many individuals face when trying to recover from an eating disorder, and the invisible pull they often feel in trying to change what seems to be an automatic behavioural pattern. I was intrigued by other therapeutic approaches used with this client group and I read about Metacognitive therapy (Wells, 1999). Metacognitive therapy is as equally effective as disorder-specific CBT for comorbid anxiety disorders (Johnson, Williamson, & Wade, 2018). I became aware of some literature that had applied metacognitive therapy to those with eating disorders (Cooper, Todd, & Wells, 2008), and I was interested in the theory behind this. The LSRP aimed to focus on contributing to the theoretical basis behind the role of metacognition in eating disorders and to contribute to the broader understanding of what maintains eating disorders. Paper one explores attention biases in the field of eating disorders. Paper two looks at the role of metacognition in disordered eating behaviour.

3.2 Paper 1: Systematic Literature Review

3.2.1 Identifying the Question

The systematic review aimed to complement the empirical paper by exploring the role that attention biases play in the maintenance of disordered eating. Cognitive biases play an essential role in the theory and treatment of eating disorders (Williamson, Muller, Reas, & Thaw, 1999). Attentional biases have also been widely studied, as contributing to the maintenance of these cognitive biases and behavioural patterns (Fairburn, Cooper, & Shafran, 2003). Through

reading relevant literature in this field, I realised that there were a large number of systematic reviews, completed in the last ten years, that have amalgamated such studies and attempted to draw broad conclusions surrounding attentional biases within eating disorders. I observed that many of these reviews appeared to have inconsistencies between their findings. Upon discussing this with my supervisors, it became a challenge to know which review was most reliable, and which reviews were of the highest quality. A meta-review (a review of reviews) felt like it occupied an appropriate space to answer some of these questions. Meta-reviews improve access to targeted information and inform healthcare decision-making (Smith, Devane, Begley, & Clarke, 2011). As a trainee of the South Wales Doctoral training programme, I was aware of my inexperience in conducting this type of review. However, my decision to do so was influenced by the opportunities this investigation may bring, and the chance it would give me to develop in my research skills. The review is registered with PROSPERO under the number CRD42018108030.

3.2.2 Search Terms, Inclusion and Exclusion Criteria

A systematic search of the four following databases was carried out (PsycINFO, EMBASE, SCOPUS, and MEDLINE). Email alerts from each database ensured I was notified of any additional relevant papers. After I had begun this meta-review, I was notified of a relevant systematic review of reviews, published in August 2018. This paper aimed to synthesise the literature found in neurocognitive function in eating disorders, and included attentional bias (Smith, Mason, Johnson, Lavender, & Wonderlich, 2018). I discussed the overlap in topic with my supervisors, concerned that my review would be redundant. However, the paper I was conducting was different in four main ways 1) my review was solely focused on attentional bias 2) I had a more focused search criteria. 3) I was reviewing 12 papers in comparison to 8.

4) I was using the AMSTAR 2 tool, of which the Smith et al,.(2018) review had used an older version.

Inclusion and exclusion criteria were devised with oversight from my supervisors and applied for selecting relevant reviews. There were a significant number of reviews that were relevant but were not systematic (e.g. Jiang & Vartanian, 2018; Starzomska, 2017). These papers provided valuable insights into attentional bias and included an overview of the methodology used, which initially was part of the aims of the meta-review. It was difficult to know how to proceed. To meet the objective of appraising the quality of current reviews, it felt essential to select studies that were only systematic. Systematic reviews are unique in their attempt to minimize bias in locating, selecting, coding, and amalgamating individual studies (Cook, Sackett, & Spitzer, 1995). Therefore, I decided to make non-systematic reviews part of the exclusion criteria. Relevant reviews would be used to inform the introduction and discussion.

3.2.3 Study selection

I completed data selection in duplicate. I first identified reviews that had met the search criteria and excluded a list of papers, including an outline of why they had been excluded. I gave half of the reviews to a co-trainee who verified these papers independently and reasons for exclusions. These were matched up to check there was full agreement.

3.2.4 Quality Appraisal assessment

There are a limited number of tools for reviewing and appraising systematic reviews. However, it was challenging to try and select one. There are considerably fewer meta-reviews than systematic reviews, and it was essential to choose a tool that would evaluate the specific

elements of a good quality systematic review. Several quality assessment frameworks for systematic reviews were considered. Including:

- The CEBM critical appraisal tool (*Centre for Evidence-Based Medicine Systematic Review Critical Appraisal Sheet Oxford: Systematic Review*,)
- The systematic review sheet from the 'Critical Appraisal Skills Programme (CASP)', 2018)

The most widely cited tool for reviewing the quality of systematic reviews is the AMSTAR (A Measurement Tool to Assess Systematic Reviews; (Shea et al., 2007). A revision of this in 2017 led to the development of the AMSTAR 2, which includes giving each review an overall confidence rating, and enables a more detailed assessment of systematic reviews (Shea et al., 2017). Furthermore, AMSTAR 2 is a validated and reliable measure.

The AMSTAR 2 is intended to be used for reviews of healthcare interventions, and has been adapted to included studies from randomised and non-randomised control trials. I chose it for the following reasons:

- It was important that confidence ratings replace an overall score, as an overall score can disguise critical weaknesses
- It is a specific quantitative assessment tool that is well-established in the literature
- It includes a measure of the risk of bias, including some overlap with the ROBIS instrument (Whiting et al., 2016).
- Its detailed guidance and prompts were considered as beneficial while rating the quality of a review and reduced ambiguity for peer inter-rating.

3.2.5 Quality Analysis

A co-reviewer was given 60% of the reviews to complete a quality appraisal. I was pleasantly surprised to see that we had agreed on most items, and it increased my confidence in my ability to conduct a thorough quality assessment. Talking about our points of disagreement enabled me to see how valuable it is to have two pairs of eyes, and reduce the risk of missing crucial pieces of evidence. One critique I have of the AMSTAR 2 is its sensitivity to error. Any critical domain that is marked as not being present in the study is enough to re-categorise the quality of the study. If one area is mismarked by the appraiser, the quality category might be affected, which has implications for how the review is interpreted. This further emphasises the need for quality appraisal to be done in duplicate.

3.2.6 Implications and Future Research

This meta-review shows that significant advances need to be made when undertaking systematic reviews to produce higher quality reviews. Very few authors provided a full list of excluded studies with reasons, and even fewer used a satisfactory risk of bias technique or carried out an investigation of publication bias. Ensuring these three domains are met would dramatically increase the quality of future reviews.

This meta-review highlighted the current difficulty researchers face in selecting the most appropriate experimental method to measure an individual's attention bias. Although methods vary, there are some patterns which could be explored further. For example, across all methodologies, BED populations showed an attentional bias to food stimuli. Stroop tasks using food stimuli does appear to indicate attention biases in eating disorders; however, this is not as consistent. The subtypes and symptoms of eating disorders are hugely varied, which may be reflected in the variability of the results of these studies. Future research would benefit from

categorising individuals by disordered eating symptoms to see whether specific attention patterns arise.

Only three of the 12 reviews included a meta-analysis. The review by Aspen, Darcy, & Lock, (2013) is an example of how important a meta-analysis can be when interpreting findings. Systematic reviews provide valuable descriptive information, but a meta-analysis can change the way that findings are interpreted. Inclusion of meta-analyses amongst current reviews would enable researchers to feel a greater sense of confidence when attempting to explain them.

3.2.7 Reflections on undertaking a meta-review

Once a systematic review is published, the quality of that paper is often overlooked. Therefore, I feel it is essential that systematic reviews are assessed for their quality so that the results can be deemed reliable. Although it has been a very time consuming and a complicated process to conduct, I am pleased I took on the challenge. It has enabled me to think more critically when reading through papers and given me confidence in knowing the areas to look for to determine a paper's quality.

3.3 Paper 2: Empirical study on metacognition in eating disorders

3.3.1 Research Objectives

The empirical paper aimed to identify the role that metacognitions play amongst those who engage in disordered eating behaviour. It aimed to determine how individuals respond to having metacognitive beliefs, and whether this relationship mediates the relationship between metacognition and disordered eating.

3.3.2 The decision for mediation analysis

In initial discussions with my supervisors, time was spent drawing out the metacognitive theory and its applications to eating disorder populations. We discussed how worry about worrying (metacognition) might be linked to the development of an eating disorder. We also each drew upon our individual clinical experiences, in working with this population. While the role of metacognition and eating disorders is relatively well established, we were interested in exploring the specifics of whether the means an individual tries to control their thoughts indirectly impacts this relationship. Following lengthy discussions, a mediation analysis suited best to identify the links between the various variables we had identified (metacognition, disordered eating and worry as a thought control strategy). A moderation analysis was dismissed as we aimed to try and explain the relationship between the IV and DV as opposed to understanding the strength of the relationship. To make predictions, we decided upon a longitudinal model using two-time points.

3.3.3 Ethical Considerations

Ethical issues were considered throughout the process to show a duty of care (British Psychological Society, 2014). This study was submitted to Cardiff University's ethics committee and approval was given prior to commencing the research (see appendix 4.7). To ensure we had a participant's informed consent, participants were required to tick boxes to confirm they were consenting to take part (See Appendix 4.8), and had read the information sheet (Appendix 4.9). I was concerned that by inviting participants to disclose their height, weight and eating behaviours (using the EDEQ), we might face a dilemma should someone fall within a clinical range. To ensure that this was addressed we provided direction towards relevant websites and encouraged individuals to visit their GP in the debrief sheet (See appendix 4.10). Participant's offered their phone number, which potentially may have made

them identifiable. However, this was overcome by removing the unique identifier code and coding each participant numerically.

3.3.4 Recruitment

Time One

Participants were recruited via open access online forums on social media, with a link to the study and a password attached to the online link which gave them access (This was to prevent the link to the study being shared too widely). The research aimed to target a wide range of potential participants of varying ages and educational backgrounds. During the recruitment phase, it was encouraging that lots of people were volunteering to complete the study. However not all of the participants were completing all of the questionnaires. I posted on social media forums at regular intervals to ensure there would be enough participants.

Time two

The 526 participants that completed time one were contacted through an online bulk SMS messaging platform six months after completion of time one. A total of 153 participants completed time 2, following removal of any cases with missing data, or who could not be matched to their unique identifier code from time one.

3.3.5 Questionnaires

Table 1 outlines a comparison of norms for each questionnaire used in this study. The Eating disorder examination questionnaire (EDEQ) was chosen because of its reliable and valid psychometric properties. It has been widely used in clinical and community samples. Of all the scales used in this questionnaire, it has the highest rate of internal consistency and has the strongest correlation between the two-time points (See Table 3). The Metacognitive

questionnaire (MCQ) also has good psychometric properties and is the main scale used in research to ascertain an individual's metacognitive beliefs.

Table 1: comparison of norms for each questionnaire

Scale	Community sample	Sample of the current study
Uncontrollability and danger	9.30 (4.00) §	12.04 (4.88)
Need to control thoughts	8.34 (2.62) ‡	9.92(4.01)
EDEQ global T1	1.42 (1.24) †	3.00 (2.20)
EDEQ global T2	1.42 (1.24) †	2.91 (1.68)

‡ As found in Fairburn, Cooper, & Shafran, (2003)
§ As found in Wells & Cartwright-Hatton (2004)
†As found in Mond, Hay, Rodgers, & Owen, (2006) (based on women aged between 33-37)
EDEQ= Eating disorder examination questionnaire

The thought control questionnaire (TCQ) has been used to establish relationships between thought control strategies and various mental health conditions (e.g. Reynolds & Wells, 1999; Tolin et al., 2007; Watkins & Moulds, 2009). The TCQ has not been used in studies with those with eating disorders. It is reported to have valid and reliable properties; however, it has faced fierce criticism. One paper has shown that both use with clinical and non-clinical populations has produced unsatisfactory reliability (Fehm & Hoyer, 2004). In this study, the TCQ had the lowest rate of internal consistency of all measures used. The correlations between time points ranges from weak to moderate (See Table 2). Alternative scales such as the control of intrusive thoughts questionnaire (CITQ; Fehm & Hoyer, 2004), or the Penn State Worry Questionnaire (Meyer, Miller, Metzger, & Borkovec, 1990), may have improved the reliability of current finding and been a better measure of testing the hypotheses.

Table 2 Internal consistency and test-retest reliability of all subscales

EDEQ Subscale	**Cronbach Alpha**		
	Time 1	**Time 2**	**Pearson's r**
Restraint	.84	.85	.76**
Eating Concern	.89	.88	.80**
Shape Concern	.92	.92	.81**
Weight Concern	.88	.87	.83**
Global Score			.70**
Positive Beliefs about worry'	.87	.88	.53**
Beliefs uncontrollable & dangerous	.90	.89	.51**
Cognitive confidence	.88	.91	.50**
Need to control thoughts	.84	.87	.54**
Cognitive self-consciousness	.88	.84	.42**
Distraction	.68	.69	.49**
Social Control	.33	.87	-.11
Worry	.82	.82	.470**
Punishment	.82	.79	.32**
Reappraisal	.82	.81	.45**
Total subscale			.42**
Emotional	.75	.70	.30**
Social	.82	.84	.27**
Total subscale			.48**

** Significant at 0.05 level

Loneliness was included as a measure as part of our exploratory hypothesis. The short version was used for ease of administration, and to reduce the overload of scales for participants to complete. In this study, the correlations between time 1 and 2 suggest that loneliness may not be stable over time. However, perhaps this is to be expected, given a portion of the sample were students. Time 1 was completed between May-September. This would have been during when the university term had ended (providing they were UK undergraduate students), and therefore feelings of loneliness may fluctuate significantly due to the change in location and social environment.

3.3.6 Reflections on Data Analysis

In my research proposal, I had planned on conducting a longitudinal mediation, which included two-time points. Upon reading about longitudinal mediation (See Jose, 2016), I realised that three-time points were necessary to conduct a focused mediation approach. This is one of the main flaws of this research. While a cross-sectional mediation (see Baron & Kenny, 1986) could have been included in the analysis, it would have failed to demonstrate its viability with longitudinal data empirically. Figure 2 is an example of the cross-sectional approach (using time 2 data only).

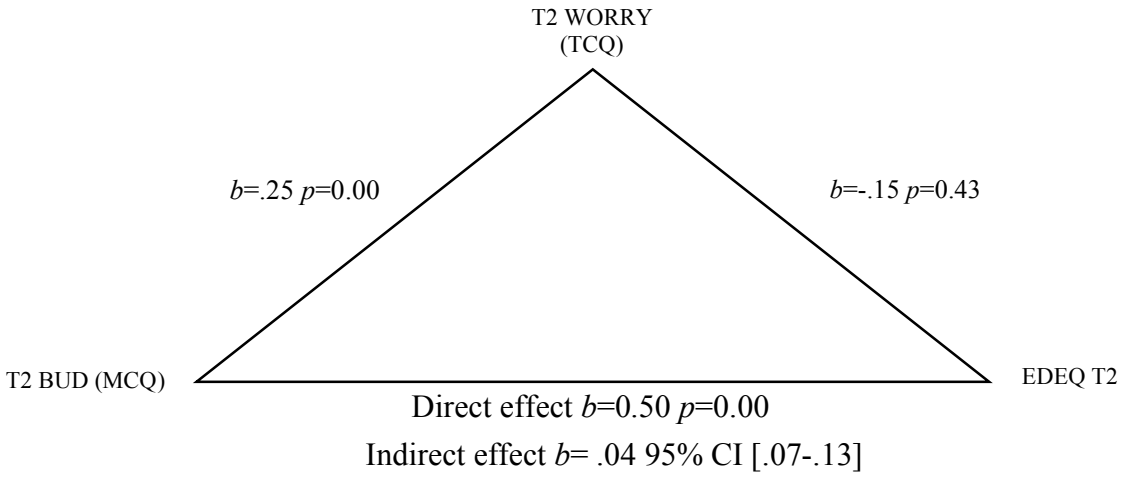

Figure 2: Model of metacognition as a predictor of disordered mediated by worry as a thought control strategy

The confidence interval for the indirect effect is a bias-corrected and accelerated (BCa) bootstrap based on 5000 samples. The total effect of MCQ BUD explains 22.3% of the variance of EDEQ (when worry is not present in the model).

Theoretically, there should be a statistically significant association between the independent variables and the dependent variables to evaluate mediation. In the current study, since Worry

(TCQ) did not predict EDEQ, conducting a mediation analysis is of no benefit. An alternative analysis strategy might have been to conduct multiple cross-sectional mediations using time 1 and time 2 data. However, this would not have been of benefit. Three time points are necessary in order to conduct the above model which we did not have.

3.3.7 Evaluation

The results from the empirical paper did not support the hypothesised indirect effect of worry (TCQ) on the relationship between metacognition (MCQ) and disordered eating behaviour (EDEQ). The high scores on the EDEQ in this sample indicate that although this study was a community sample, the ranges were far more representative of a clinical population (according to Mond, Hay, Rodgers, Owen, & Beumont, 2004). This was surprising and unexpected. It is possible that this is due do a flaw in the recruitment process, or the biases that are more likely to arise from collecting a sample online.

Methodological weaknesses of the study design (as outlined in the previous section) may explain the lack of effect of worry as a thought control strategy on disordered eating behaviour. The inclusion of further time points in future research could clarify whether these variables might predict disordered eating over time. Limitations in the measurement of TCQ worry may have precluded detection of subtle aspects of worry which is discussed in the next section.

One area that could have been explored further in this study is the theory of thought–shape fusion (TSF; Shafran, Teachman, Kerry, & Beglin, 1999) which is a cognitive distortion associated with eating disorders. This theory explains how eating disordered populations experience thoughts which affect their perception of themselves and how they feel. For example: an awareness of a thought about becoming fatter leads to beliefs that they have become fatter, which leads to them feeling fatter (Shafran, Fairburn, Robinson, & Lask, 2004).

If this theory is applied to this study, the act of worrying about being out of control may lead individuals to think and feel that they are out of control, thus evoking a response to remedy this. This study showed how using worry as thought control strategy might have been an attempt to manage their metacognitive beliefs. It is possible that similar cognitive processes are at play here. TSF shows how a thought can lead to an altered perception of self, which affects feelings and emotions. The research indicates that maladaptive coping strategies arise from worrying about worrying (Wells, 1995). One further avenue of exploration could be looking at how the nature of holding specific metacognitions might lead to an altered perception of self, which may affect feelings and behaviours.

A methodological limitation of the current research includes its external validity. Demographics of the sample in the current research were not considered, for example, ethnicity and educational level, which prevents the generalisability of the findings to different populations. Future research could consider possible cultural differences to a more diverse sample. Future research, conducted online, may study the use of such a method of selection; the possible impact of selection bias. To mitigate this, I could have investigated the effects of normalising information of participants with scores within one standard deviation above the mean of previous non-clinical scores.

Finally, this study included a significant number of non-responders. One reflection is that questionnaire measures used may have been too long (the EDEQ and TCQ were the longest measures, with 28 and 30 items each). Future studies could make use of brief but valid measures. Alternatively, existing measures could be developed to be shorter, or idiosyncratic measures could be designed to capture the variable of interest.

3.4 Dissemination

Dissemination of findings is an important but often overlooked part of the research process (Kerner, Rimer, & Emmons, 2005). I have considered dissemination at a range of levels. The empirical paper will be submitted to the Journal of social science and humanities, due to the relevant subject matter and the journal's previous interest in articles on metacognition (See appendix 4.6). This paper will also be submitted to the ICMCA 2020: International Conference on Metacognition and Cognitive Appliances which is the premier interdisciplinary platform for the presentation of new advances and research results in the fields of Metacognition and Cognitive Appliances. The European Association for Research on Learning and Instruction (EARLI) has a special interest group on metacognition. It is an international networking organisation for junior and senior researchers in education. An abstract from the empirical paper will be submitted to their next conference (dates released summer 2019). The meta-review will be submitted to the International Journal of Eating Disorders (See Appendix 4.1).

3.5 Professional and Personal Development

I wanted to conduct research that would make an impact amongst the current literature and develop the current understanding in the field of eating disorders. Having finished the study, I can reflect on the ways I have grown as an individual, and the benefits I have gained as a researcher. Early on, I realised the importance of time management and learnt what was necessary to prioritise. Looking back, I feel pleased with the way I have managed my time. I disciplined myself to follow the Gantt chart I made during my LSRP proposal, which enabled me to work a consistent pace throughout the past 18 months.

Conducting a piece of research from the inception of an idea to publication has developed many skills. During the early phases, I learnt how important it was to consider the impact my aims

may have on clinical practice and the patience required in recruitment. Although I was initially disappointed that my results did not produce a mediation effect, I have learnt to critically evaluate the methodology, which I feel will benefit me when I conduct future research. I have significantly developed in my knowledge of the cognitive factors relating to metacognition and eating disorders. I have since been able to apply some of this learning to my clinical practice.

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4.0 Appendices

4.1: Relevant author guidelines for 'International Journal for eating disorders'

International Journal of
EATING DISORDERS
Edited By: Ruth Striegel Weissman
Impact factor: 3.897
ISI Journal Citation Reports © Ranking: 2017: 21/83 (Nutrition & Dietetics)
ISI Journal Citation Reports © Ranking: 2017: 34/142 (Psychiatry)
ISI Journal Citation Reports © Ranking: 2017: 24/142 (Psychiatry (Social Science))
ISI Journal Citation Reports © Ranking: 2017: 9/78 (Psychology)
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1. SUBMISSION

Authors should kindly note that submission implies that the content has not been published or submitted for publication elsewhere except as a brief abstract in the proceedings of a scientific meeting or symposium. If there is a related paper under consideration at another journal, a copy of that paper should be submitted with the primary manuscript as supporting information.

International Journal of Eating Disorders will consider submissions that have previously been made available online, either on a preprint server like arXiv, bioRxiv, or PeerJ PrePrints, or on the authors' own website. However, any such submissions must not have been published in a scientific journal, book or other venue that could be considered formal publication. Authors must inform the editorial office at submission if their paper has been made available as a preprint.

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- Given that the measurable impact of the article is diminished when citations are split between the preprint and the published article, authors are required to:
    - Update the entry on the preprint server so that it links to and cites the DOI for the published version
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Authors should follow the guidelines carefully; failure to do so will delay the processing of the manuscript. **Once the submission has been prepared in accordance with the Author Guidelines, manuscripts should be submitted online at mc.manuscriptcentral.com/ijed**. Authors unfamiliar with ScholarOne can find details on how to use the system here: **www.wileyauthors.com/scholarone**.

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2. AIMS AND SCOPE

The *International Journal of Eating Disorders*—A leading peer-reviewed journal in the fields of psychology, psychiatry, public health, and nutrition & dietetics.

Mission: With a mission to advance the scientific knowledge needed for understanding, treating, and preventing eating disorders, the *International Journal of Eating Disorders* publishes rigorously evaluated, high-quality contributions to an international readership of health professionals, clinicians, and scientists. The journal also draws the interest of patient groups and advocates focused on eating disorders, and many of the articles draw attention from mainstream media outlets.

Scope: Articles featured in the journal describe state-of-the-art scientific research on theory, methodology, etiology, clinical practice, and policy related to eating disorders, as well as contributions that facilitate scholarly critique and discussion of science and practice in the field. Theoretical and empirical work on obesity or healthy eating falls within the journal's scope inasmuch as it facilitates the advancement of efforts to describe and understand, prevent, or treat eating disorders. The *International Journal of Eating Disorders* welcomes submissions from all regions of the world and representing all levels of inquiry (including basic science, clinical trials, implementation research, and dissemination studies), and across a full range of scientific methods, disciplines, and approaches.

A complete **overview** of the journal is given elsewhere on the journal's homepage.

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3. MANUSCRIPT CATEGORIES AND REQUIREMENTS

The *International Journal of Eating Disorders* publishes the following contribution types:

1. Original Articles
2. Brief Reports
3. Clinical Case Reports
4. Reviews
5. An Idea Worth Researching
6. Commentaries

When uploading their manuscript, authors will be asked to complete a checklist indicating that they have followed the Author Guidelines pertaining to the appropriate article type. All word limits relate to the body of the text (i.e., not including abstract, references, tables and figures) and represent maximum lengths. Authors are encouraged to keep their manuscript as short as possible while communicating clearly.

4) Reviews

These articles critically review the status of a given research area and propose new directions for research and/or practice. Both systematic and meta-analytic review papers are welcomed if they review a literature that is advanced and/or developed to the point of warranting a review and synthesis of existing studies. Reviews of topics with a limited number of studies are unlikely to be deemed as substantive enough for a Review paper. The journal does not accept papers that merely describe or compile a list of previous studies without a critical synthesis of the literature that moves the field the forward.

- Word Limit: 7,500 (excluding abstract, references, tables or figures).
- Abstract: 250 words.
- References: 100.
- Figures/Tables: no maximum, but should be appropriate to the material covered.

All Review articles must follow the PRISMA Guidelines (**www.prisma-statement.org**), summarized in a 2009 *J. Clin. Epidemiol.* article by Moher et al. entitled *"Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement"* (DOI: **10.1016/j.jclinepi.2009.06.005**), freely available for download in both English and Spanish.

Authors who choose this contribution type must complete the Review Checklist upon submission of the manuscript, an example of which can be found **here**). This example is for informational purposes only. During the submission process, authors will be prompted to complete the Review Checklist directly in ScholarOne. The rationale for any unchecked items on the Review Checklist must be explicitly described in the accompanying Cover Letter.

4. PREPARING THE SUBMISSION

The submission should be uploaded in separate files: 1) **manuscript file**; 2) **figures**; 3) **Supporting Information file(s)**.

1. Manuscript File

The text file should contain all of the manuscript text, including the tables and figure legends. The text should be presented in the following order, with items i-v appearing on the **Title Page**:

1. Title
2. A short running title of less than 40 characters
3. The full names of all authors
4. The authors' institutional affiliations where the work was conducted, with a footnote for an author's present address if different to where the work was carried out
5. Word counts (abstract and main text, excl. tables and references)
6. Acknowledgements
7. Abstract and Keywords
8. Main text

9. References
10. Tables (each table complete with title and footnotes)
11. Figure legends

Title Page

On the title page, authors should list the **title**, the short running title, the full names of all **authors**, and their affiliations. Authors should also state the **number of words** contained in the abstract and the number of words of the manuscript (excluding tables and references).

Title

The title should be short and informative, containing major keywords related to the content. The title should not contain abbreviations (see **Wiley's best practice SEO tips**).

Authorship

For details on eligibility for author listing, please refer to the journal's **Authorship policy** outlined in Section 5 of these Author Guidelines.

Acknowledgments

Contributions from individuals who do not meet the criteria for authorship should be listed, with permission from the contributor, in an Acknowledgments section. Financial and material support should also be mentioned. Thanks to anonymous reviewers are not appropriate.

Conflict of Interest Statement

Authors will be asked to provide a conflict of interest statement during the submission process. See the journal's policy on **Conflict of Interest** outlined in Section 5 of these Author Guidelines. Authors should ensure they liaise with all co-authors to confirm agreement with the final statement.

Abstract

The word maximum and abstract format varies by contribution type (see above). When an abstract is required, the abstract should be typed as a single paragraph. The journal requires **structured abstracts** with three exceptions: the journal will continue to use unstructured abstracts for Clinical Case Reports, Commentaries and "An Idea Worth Researching".

Structured abstracts should be organized as follows: **Objective**: briefly indicate the primary purpose of the article, or major question addressed in the study. **Method**: indicate the sources of data, give brief overview of methodology, or, if review article, how the literature was searched and articles selected for discussion. For research based articles, this section should briefly note study design, how participants were selected, and major study measures. **Results**: summarize the key findings. **Discussion**: indicate main clinical, theoretical, or research applications/implications.

Keywords

Please provide five to seven keywords. Keywords should be taken from those recommended by the US National Library of Medicine's Medical Subject Headings (MeSH) browser list at **www.nlm.nih.gov/mesh**.

Main Text

- Authors should refrain from using terms that are stigmatizing or terms that are ambiguous. For further explanation and examples, see the 2016 IJED article by Weissman et al. entitled "*Speaking of that: Terms to avoid or reconsider in the eating disorders field*" (DOI: 10.1002/eat.22528.)
- The text should be divided as outlined in Section 3 "Manuscript Categories and Requirements".
- Manuscripts reporting original research should follow the **IMRaD guidelines** (***I***ntroduction, (***M***ethods, ***R***esults, ***a***nd ***D***iscussion), which are recommended by the International Committee of Medical Journal Editors (ICMJE) (J. Pharmacol. Pharmacother. 2010, 1, 42–58).
- To facilitate evaluation by the Editors and Reviewers, each manuscript page should be numbered; the text should be double-spaced; and line numbers should be applied (restarting from 1 on each page). Instructions on how to implement this feature in Microsoft Word are givenhere.
- The journal uses US spelling. Authors may submit using any form of English as the spelling of accepted papers is converted to US English during the production process.
- Footnotes to the text are not allowed and any such material should be incorporated into the text as parenthetical matter.
- It is the primary responsibility of the authors to proofread thoroughly and ensure correct spelling and punctuation, completeness and accuracy of references, clarity of expression, thoughtful construction of sentences, and legible appearance prior to the manuscript's submission.
- Authors for whom English is not their first language are encouraged to seek assistance from a native or fluent English speaker to proof read the manuscript prior to submission. Wiley offers a paid service that provides expert help in English language editing—further details are given below.
- Articles reporting data taken from or deposited elsewhere should refer to the journal policy on Data Storage and Documentation in Section 5 (below).

References

References in all manuscripts should follow the style of the American Psychological Association (6th edition), except in regards to spelling. The APA website includes **a range of resources for authors learning to write in APA style**, including **An overview of the Publication Manual of the American Psychological Association, Sixth Edition**; includes **free tutorials on APA Style basics** and an **APA Style Blog**. Please note APA referencing style requires that a Digital Object Identifier (DOI) be provided for all references where available.

Tables

Each table must be numbered in order of appearance in the text with Arabic numerals and be cited at an appropriate point in the text. Tables should be self-contained and complement, not duplicate, information contained in the text. They should be editable (i.e., created in Microsoft Word or similar), not pasted as images. Legends should be concise but comprehensive—the table, legend, and footnotes must be understandable without reference to the text. All abbreviations must be defined in footnotes. Footnote symbols: †, ‡, §, ¶, should be used (in that order) and *, **, *** should be reserved for P-values. Statistical measures such as standard deviation (SD) or standard error of the mean (SEM) should be identified in the headings. The journal's **Editorial Policy on Sample Size and Statistics** is given in Section 5.

Figure Legends/Captions

Each figure caption should have a brief title that describes the entire figure without citing specific panels, followed by a description of each panel. Captions should be concise but comprehensive—the figure and its

caption must be understandable without reference to the text. Be sure to explain abbreviations in figures even if they have already been explained in-text. Axes for figures must be labeled with appropriate units of measurement and description. Include definitions of any symbols used and units of measurement.

2. Figures

Although authors are encouraged to send the highest quality figures possible, for peer-review purposes, a wide variety of formats, sizes, and resolutions are accepted. **Click here** for the basic figure requirements for figures submitted with manuscripts for initial peer review, as well as the more detailed post-acceptance figure requirements.

Helvetica typeface is preferred for lettering within figures. All letters, numbers and symbols must be at least 2 mm in height. Courier typeface should be used for sequence figures. Figures should be numbered consecutively with Arabic numerals, and they should be numbered in the order in which they appear in the text.

Figures should be submitted as electronic images to fit either one (55 mm, 2 3/16", 13 picas), two (115 mm, 4 1/2", 27 picas), or three (175 mm, 6 7/8", 41 picas) columns. The length of an illustration cannot exceed 227 mm (9"). Journal quality reproduction requires grey scale and color files at resolutions of 300 dpi. Bitmapped line art should be submitted at resolutions of 600–1200 dpi.

Figures submitted in color will be reproduced in color online free of charge. Authors wishing to have figures printed in color in hard copies of the journal will be charged a fee by the Publisher; further details are given **elsewhere** in these Author Guidelines. Authors should note however, that it is preferable that line figures (e.g., graphs) are supplied in black and white so that they are legible if printed by a reader in black and white.

3. Supporting Information Files(s)

Supporting Information is information that is supplementary and not essential to the article, but provides greater depth and background. Examples of such information include more detailed descriptions of therapeutic protocols, results related to exploratory or post-hoc analyses, and elements otherwise not suitable for inclusion in the main article, such as video clips, large sections of tabular data, program code, or large graphical files. It is *not* appropriate to include, in the Supporting Information, text that would normally go into a discussion section; all discussion-related material should be presented in the main article.

Because the Supporting Information is separate from the paper and supplementary in nature, the main article should be able to be read as a stand-alone document by readers. Reference to the Supporting Information should be made in the text of the main article to provide context for the reader and highlight where and how the supplemental material contributes to the article.

Should authors wish to provide supplementary file(s) along with their article, these materials *must* be included upon submission to the journal. If such materials are added to the submission as a result of peer review, i.e., during a revision, then the authors should bring this to the attention of the editor in their

response letter. If accepted for publication, Supporting Information is hosted online together with the article and appears without editing or typesetting.

Wiley's FAQs on Supporting Information are available on the Wiley Author Services site: **www.wileyauthors.com**.

Note: Authors are encouraged to utilize publicly available data repository for data, scripts, or other artefacts used to generate the analyses presented in the paper; in such cases, authors should include a reference to the location of the material within their paper.

General Style Points

The following points provide general advice on formatting and style.

- **Terminology**: Terms such as "anorexics" or "bulimics" as personal pronouns, referring to groups of individuals by their common diagnosis, should be avoided. Terms like "individuals with anorexia nervosa", "people with bulimia nervosa", or "participants with eating disorders" should be used instead. Note, "participants" should be used in place of "subjects".
- **Abbreviations**: In general, terms should not be abbreviated unless they are used repeatedly and the abbreviation is helpful to the reader. Initially, use the word in full, followed by the abbreviation in parentheses. Thereafter use the abbreviation only.
- **Units of measurement**: Measurements should be given in SI or SI-derived units. Visit the Bureau International des Poids et Mesures (BIPM) website at www.bipm.fr for more information about SI units.
- **Numbers** under 10 should be spelt out, except for: measurements with a unit (8 mmol/L); age (6 weeks old), or lists with other numbers (11 dogs, 9 cats, 4 gerbils).
- **The word "data"** is plural; therefore, text should follow accordingly (for example, "The data show…the data are … the data were…").
- **Sex/Gender & Age**: When referring to sex/gender, "males" and "females" should be used only in cases where the study samples include both children (below age 18) and adults and only if word limit precludes using terms such as "male participants/female participants," "female patients/male patients"; when the participants comprise adults only, the terms "men" and "women" should be used. In articles that refer to children, "boys" and "girls" should be used.
- **Trade Names**: Chemical substances should be referred to by the generic name only. Trade names should not be used. Drugs should be referred to by their generic names. If proprietary drugs have been used in the study, refer to these by their generic name, mentioning the proprietary name and the name and location of the manufacturer in parentheses.
- **Statistics**: Authors should adhere to the journal's policy on Sample Size and Statistics when reporting studies. For information on how to present p values and other standard measurements see IJED Statistical Formatting Requirements.
- **Wiley Author Resources**

Manuscript Preparation Tips: Wiley has a range of resources for authors preparing manuscripts for submission available **here**. In particular, authors may benefit from referring to Wiley's best practice tips on **Writing for Search Engine Optimization**.

Editing, Translation, and Formatting Support: **Wiley Editing Services** can greatly improve the chances of a manuscript being accepted. Offering expert help in English language editing, translation, manuscript formatting, and figure preparation, Wiley Editing Services ensures that the manuscript is ready for submission.

4.2 List of excluded studies with justifications

#	Author	Year	Title	Reason
1	Faunce (2002)	2002	Eating disorders and attentional bias: A review	Non-systematic review
2	Duchesne et al., (2004)	2004	Neuropsychology of eating disorders: A systematic review of the literature.	Not in English
3	Dobsona & Dozois (2004)	2004	Attentional biases in eating disorders: A meta-analytic review of Stroop performance	Non-systematic review
4	Lopez.,et al (2008)	2008	Central coherence in eating disorders: A systematic review	No measure of AB
5	Wang., et al (2012)	2012	Processing of food, body and emotional stimuli in anorexia nervosa: a systematic review and meta-analysis of functional magnetic resonance imaging studies. [Review]	No experimental measure of AB
6	Crombez., et al (2013)	2013	Attentional bias to pain-related information: A meta-analysis	NO ED
7	Renwick B et al.,(2013)	2013	Review of attentional bias modification: A brain-directed treatment for eating disorders	Focused on modification
9	Cordes & Bauer (2015)	2015	Body-related attentional bias in women and men: Potential risk factor for the development and maintenance of a distorted body image.	Not written in English
10	Schuck (2015)	2015	Cognitive biases in response to visual body-related stimuli in eating disorders: Study protocol for a systematic review and meta-analysis	Not peer reviewed
11	Wolz (2015)	2015	The processing of food stimuli in abnormal eating: A systematic review of electrophysiology	Electrophysiology focus
12	Werthmann & Jansen (2015)	2015	Worry or craving? A selective review of evidence for food-related attention biases in obese individuals, eating-disorder patients, restrained eaters and healthy samples	NO ED
13	Turton & Bruidegom (2016)	2016	Novel methods to help develop healthier eating habits for eating and weight disorders: A systematic review and meta-analysis. [Review	Focused on modification
14	Jiang & Vartanian (2017)	2017	A review of existing measures of attentional biases in body image and eating disorders research	Non-systematic review
15	Schoth & Liossi, (2017)	2017	A systematic review of experimental paradigms for exploring biased interpretation of ambiguous information with emotional and neutral associations	No ED
16	Fodor & Cosmoiu, (2017)	2017	Cognitive bias modification for attention to and approach of appetitive food stimuli: A meta analysis	Focused on modification
17	Starzomska, (2017)	2017	Applications of the dot probe task in attentional bias research in eating disorders: A review	Non-systematic review
18	Johnson, williamson, & wade (2018)	2018	A systematic review and meta-analysis of cognitive processing deficits associated with body dysmorphic disorder	No ED
19	Forcano & Mata, (2018)	2018	Cognitive and neuromodulation strategies for unhealthy eating and obesity: Systematic review and discussion of neurocognitive mechanisms	Focused on modification
20	Lau & Heathcote (2018)	2018	Cognitive Biases in Children and Adolescents With Chronic Pain: A Review of Findings and a Call for Developmental Research	No ED
21	Donnelly et al., (2018)	2018	Neuroimaging in bulimia nervosa and binge eating disorder: A systematic review	No measure of AB
22	Fico., et al (2018)	2018,	Interpersonal reactivity in eating disorders: A systematic review and meta-analysis of literature studies	Not peer-reviewed
23	Giel et a.l, (2018)	2018	Oxytocin and eating disorders: A narrative review on emerging findings and perspectives	Non-systematic review
24	Leppanen (2018)	2018	Meta-analytic review of the effects of a single dose of intranasal oxytocin on threat processing in humans	No ED
25	Smith,.et al (2018)	2018	systematic review of reviews of neurocognitive functioning in eating disorders: The state-of-the-literature and future directions	A review of reviews
26	Kakoschke ., et al (2019)	2019	The cognitive drivers of compulsive eating behavior.	NO ED
27	Blume.,et al (2019)	2019	Abnormalities in the EEG power spectrum in bulimia nervosa, binge-eating disorder, and obesity: A systematic review.	Electrophysiology focus

4.3 AMSTAR 2 items

Critical domains	
Item 4	Did the review authors use a comprehensive literature search strategy?
Item 7	Did the review authors provide a list of excluded studies and justify the exclusions?
Item 9	Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?
Item 11	If meta-analysis was performed, did the review authors use appropriate methods for statistical combination of results?
Item 13	Did the review authors account for RoB in primary studies when interpreting/discussing the results of the review?
Item 15	If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?
Non Critical domains	
Item 1	Did the research questions and inclusion criteria for the review include the components of PICO?
Item 2	Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol?
Item 3	Did the review authors explain their selection of the study designs for inclusion in the review?
Item 5	Did the review authors perform study selection in duplicate?
Item 6	Did the review authors perform data extraction in duplicate?
Item 8	Did the review authors describe the included studies in adequate detail?
Item 10	Did the review authors report on the sources of funding for the studies included in the review?
Item 12	If meta-analysis was performed, did the review did the authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?
Item 14	Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?
Item 16	Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?

4.4 List of aims of included reviews

Author	Aim of review (paraphrased)
1. Aspen et al., (2013)	to integrate the existing literature on Attention biases in eating disorders and other related psychiatric disorders to better understand its potential role in the development and maintenance of an Eating disorder
2.Brooks et al., (2011)	to review information processing of food stimuli (words, pictures) in people with eating disorders
3.DeJong et al., (2011)	to systematically review studies of social cognition, and to evaluate whether social cognition deficits exist within bulimia nervosa
4.Giel et al., (2011)	to outline current evidence from pictorial food stimuli studies and the processing of food cues in eating-disordered patients has recently been increasingly investigated
5.Giel et al., (2017)	to provide a systematic update on the food related impulsivity in obese individuals, with and without BED and normal weight individuals
6.Jáuregui-Lobera (2013)	to review the current state of neuropsychological studies focused on eating disorders
7.Johansson et al., (2005)	to conduct a quantitative meta-analytic review on Stroop studies to investigate interference for food- and body-related words that had been conducted independently of the meta-analysis by Dobson and Dozois (2004)
8.Kerr-Gaffney et al., (2019)	to provide a qualitative synthesis of studies that have utilized eye tracking in ED samples
9.Kittel et al., (2015)	to critically summarize the current state of research on Cognitive functioning and Emotional functioning (including ER and EA) in individuals with Binge eating disorder in comparison to (1) healthy controls (HC) and individuals with Anorexia nervosa or Bing eating disorder and (2) normal-weight (NW) and overweight/obese individuals without an eating disorder diagnosis (OW/OB).
10.Reville et al., (2016)	to critically evaluate more recent studies (published between the beginning of 2013 and May 2015) that reported on neuropsychological differences between patients with AN, and controls.
11.Stojek et al., (2018)	To summarize, critique, and integrate data on AB gathered using varied and novel experimental methods in those with binge eating behaviors, including binge eating, loss of control eating, and bulimia nervosa.
12.Van den Eyde., et al (2011)	to review the literature on neuro-cognition comparing people with a bulimic eating disorder in the acute phase of the illness with healthy controls

4.5 Summary of findings from each systematic review

Study	# studies included	Findings/effect sizes
1.Aspen et al (2013) Meta-analysis	4	• 2 studies found AB towards negative shape stimuli with medium effect sizes (d=.63; d=.61). The same studies also found AB towards positive shape stimuli although the effect size ranged from very small (d=.11) to medium (d=.55). When pooled together effect size showed those with ED have an AB away from positive shape stimuli (d=-.16) • Those with ED had an attention bias away from positive eating stimuli (d= -.83) and towards negative eating stimuli. • Those with ED had a differential biases in relation to self (AN bias) vs. other (BN bias) photographs Significant amount of heterogeneity so results to be interpreted with caution
2.Brooks et al (2011) Meta-analysis	18	• Attention bias to food stimuli is comparable in people with AN and RE but greatest in those with BN. • No significant difference in effect size for Stroop response times with food stimuli in AN d=0.38 and BN d=0.39 • 2/2 studies using the dot probe task found those with ED were avoidant of food pictures with a medium effect size (d=0.50). Negative, high calorie images caused avoidance in ED with a large effect size (d=0.72) • 1/2 studies using a visual distraction task found those with ED were distracted when looking at hi-calorie images (d=1.86).
3.DeJong et al., (2013)	1	• Those with BN had an AB towards social stimuli and a greater AB for angry than neutral faces (effect size large d=0.8)
4.Giel et al., (2011)	5	• Stroop: 1 study showed those with ED had an AB to positive eating stimuli compared to HC •DP: 3/3 studies showed those with ED greater response times to food stimuli than healthy controls (1 study used AN and BN groups separately). •They concluded that patients with EDs consistently showed an attentional bias towards food items.
5.Giel et al., (2017)	4	• All 3 studies in adults found early attentional biases for food pictures in BED participants • 1 study on adolescent BED patients showed an attentional bias for food pictures in later processing to OB participants.

6.Jáuregui-Lobera (2013)	15	• Traditional Stroop: 6/7 studies of those with BN & AN found no significant AB. • Stroop & VPDT= • Those with AN had an attention bias towards 'thin' and 'fat' words •2 studies found those with AN and BN had AB towards food stimuli (using Stroop). 1 eye tracking showed AN patients have more attentional disengagement to food pictures compared with control subjects. Stroop: 1 study found AB for eating and weight stimuli in AN and BN & another study found those with BN were more distracted by shape compared to HC • DP=1 study showed those with AN & BN showed an attention bias towards rejecting faces????
Johansson et al., (2005) Meta-analysis	27	• Findings showed Stroop inference for eating disordered females using food & body stimuli was of medium effect size (Cohen's d=0.48). • AN displayed a larger effect size to food words (d= 0.58) than for body words (d=0.49) whereas BN had similar effect sizes for both food (d=0.58) and body words (d=0.57). There were no significant differences between food and body words for AN and BN separately (p >0.5) • These results were inconsistent with results from a previous meta-analysis (Dobson & Dozois,2004) who found no differences between ED words and neural words between all groups. This is suggested to be due to different studies being used and effect sizes calculated differently.
8.Kerr-Gaffney et al.,(2019)	19	• Looking at overall gaze duration- AN showed shorted gaze durations for food and control pictures. • Those with BED had difficulty inhibiting their attention to both food and non-food stimuli in comparison to HC • Studies looking at body stimuli in those with AN, BN & BED showed a greater attention bias towards self than controls. 2 studies showed there were no group differences in attention to self-versus other bodies •Those with BN looked for less time looking at attractive features of their own face than HC. Those with AN more likely to misidentify their own face showing sadness
9.Kittel et al., (2015)	5	• ET: 1 study found more initial fixation on food stimuli compared with non-food stimuli in BED. • Those with AN had an AB towards thin bodies, eating stimuli, body shape and active stimuli 1 study found an AB for food-related stimuli in BED compared to OB & NW •1 study found a bias towards the own body and towards ugly body parts was found to be stronger in individuals with BED than in obese controls • 2 studies using the traditional Stroop task found no significant difference between BED and OB/NW group

10.Reville et al., (2016)	6	• 1 study showed that recovered participants with AN and BN showed AB for rejecting faces and attentional avoidance of accepting faces. •DP: 2 studies used threat related stimuli on AN and found no AB
11.Stojek et al., (2018)	44	• 9/15 studies found no AB towards food stimuli in women with BN in comparison to HC. 6/15 showed an AB • 11/15 studies found BN had a greater AB towards weight/shape stimuli in comparison to other groups. • 7/8 studies found those with BED/BN behaviours found greater AB to threat stimuli. • ET: 4/8 studies used food stimuli found showed women with BED had greater AB towards food stimuli. 4/8 studies used shape/weight related stimuli. 1 found no group differences, 3 found AB present when using self-body images. • Those with BN have greater difficulty with disengaging from low-BMI images of others and that they intentionally avoid high-BMI images of other people. • VP, SC, VS: Each of these paradigms were used in 3 studies. The majority found AB for food stimuli in ED but many included only non-clinical samples • All studies that used the traditional Stroop task found no significant differences in reaction times between those with BN and HC.
12.Van den Eyde (2011) Meta-analysis	16	• Traditional Stroop task= No difference in Stroop Interference between BN, BED and HC • Overall studies reported a stronger Stroop effect to food/eating stimuli in people with BN but not all studies show this • Overall, Stroop paradigms using body weight and shape stimuli have a negative impact on selection attention in BN. • 2 studies using emotional word stimuli found an impact on Stroop performance in people with BN than in HC DP: 1 study using body related stimuli found no significant differences between BN and HC

Abbreviations: AB= Attentional bias AN= Anorexia; BN= Bulimia; BED= Binge eating disorder; NW= Normal weight; OB= Obese; VP= Visual Probe; SC= Spatial cueing; VS= Visual Search; ET= Eye tracking; VPDT= Visual Probe Dot-probe; DP= Dot-probe; HC=Healthy Controls; BMI=Body Mass Index

4.6 Guidelines for the Journal of Studies in Social Sciences and Humanities (***JSSSH)***

The Journal of Studies in Social Sciences and Humanities ***(JSSSH)*** is an international quarterly online research journal which aims to disseminate quality research in all the significant fields of social sciences and humanities world over. The JSSSH is **listed and included** in popular databases in the world such as Electronic Journal WZB (Social Science Research Center Berlin); EZB (Electronic Journals Library); AcademicKeys; Scientific Indexing Service, SIS; Academia.edu; Universty of Hamburg Library System; ResearchBib, Academic Resource Index; Google Scholar; JournalSeek, Genamics; WorldCat and waiting to be indexed with other databases. The journal adheres to the acceptance of research which is related to a significant aspect of social sciences and humanities.

Social sciences and humanities include; psychology, sociology, communication, criminology, environmental studies, human geography, international relations, law, political science, economics, rural and urban studies, anthropology, history, Asian studies, philosophy and philosophy of science, language and linguistics, literature, arts and design, media studies, social psychology, cultural studies, educational psychology, social work, rehabilitation, special education, management studies, nursing education, theater and performing studies, women and gender studies and any other such discipline to be considered by the editor.

Guidelines for Authors

Authors should follow the guidelines given in the sixth edition of Publication Manual of American Psychological Association (APA), except where prescribed below. For convenience, some of the basic features of the manual are given here. A few modifications in basic format have been made to meet the specific requirements of this journal.

General requirements

1. The article should be submitted in MS Word document.
2. Single space the entire article including references.
3. Page number on each page in the bottom right corner.
4. Use standard-sized page A4 (8.27" × 11.69") with standard margin one inch all around.
5. Font of the text should be 11-point with times new roman writing style (except

where prescribed).

6. Each paragraph should begin indented ½-inch (one tab space). This also applies to the paragraphs under headings of level 1 and level 2.

7. No extra line space between the paragraphs, the entire text of the article should be justified (aligned on both sides).

8. Enter space between the main sections of the article such as abstract, key words, main body of the manuscript, acknowledgment (if any), and reference list.

9. The article should range between 4500 to 7000 words on the whole (including title, abstract, keywords, and main body of the article, acknowledgment and references). However, the outstanding articles may be exempted from this restriction.

Title page

1. The title of your article centered, innovative and appealing
2. It should be sentence case starting with a capital letter.
3. If the title is more than one line, 1.15 space between the lines
4. Font of title 14-points, bold and with times new roman writing style
5. Your name centered and institutional affiliation should be given under it. Corresponding author should also give email address.
6. Abstract should contain 150-250 words with at least five key words.
7. Abstract and Key words subheadings in 11-points font, bold, time new roman at the beginning of the paragraph.

Organization of manuscript

1. The authors should adhere to the rules given in the relevant pages of APA manual 6th edition regarding journal article reporting standards (focus on elements of manuscripts), writing clearly and concisely (particularly organizing text in an appropriate length, level of headings and seriation), the mechanism of style (e.g., punctuation, numbers, and statistical and mathematical symbols), displaying results (especially, general guidelines on tables and figures), crediting sources (for instance, quoting and paraphrasing, citing references in the text, and different types and variations in references having specific components) and other rules required particularly in your article. For more details you may visit:**https://owl.english.purdue.edu/owl/resource/560/01/** or any other related website.

2. APA describes the following levels of heading, subheadings and sub-headings as levels 1, 2, 3, 4. or 5. All the headings should be of 12-points font with times new

roman style. A slight modification is made in each heading for the specific purpose of the journal. Short detail is given below.

Level 1: Centered, Bold, Uppercase and Lowercase

Paragraph text begins a single-spaced line below the heading (also single-spaced with Auto spacing before and 0 after), with ½-inch indentation at the start of each paragraph.

Level 2: Flush Left, Bold, Uppercase and Lowercase

Paragraph text begins a single-spaced line below the heading (also single-spaced with Auto spacing before and 0 after), with ½-inch indentation at the start of each paragraph.

Level 3: Indented, bold, lowercase, and ending with a period. Paragraph text begins two spaces after the period at the end of the heading. (Also single-spaced with Auto spacing before and 0 after the subheading).

Level 4: Indented, bold, italicized, lowercase, and ending with a period. Paragraph text begins two spaces after the period at the end of the heading. (also single-spaced with Auto spacing before and 0 after the subheading).

Level 5: *Indented, italicized, lowercase, and ending with a period.* Paragraph text begins two spaces after the period at the end of the heading. (Also single-spaced with Auto spacing before and 0 after the sub-heading).

Reference section

1. References should be given as recommended in APA manual 6th edition. Different types of references should follow the specific styles as given in the manual (for details you may visit: **https://owl.english.purdue.edu/owl/resource/560/05/**or any other website).
2. The heading of Reference should be flushed left and bold with 11-point font. Each reference should be left-indented ¼-inch after the first line. The reference list should be justified and no extra space between the references should be given.
3. Reference list should start at the end of manuscript (not from the new page).

Important note

1. The journal recommends authors to maintain originality and quality of research and to follow accurately the prescribed format and style before submitting an article. *The liability for content, scientific accuracy and originality of the manuscript (or plagiarism) lie solely with the author(s) of the article.* The authors need to

check for the plagiarism before submitting a paper to the journal.

2. The articles which do not meet these basic criteria would be regretted at an initial stage before sending for the review.

3. For further information, please refer to your APA manual. A short guide to APA publication manual is given below. As a sample for your paper, the template in Word format can also be downloaded below. Please follow the instructions given at this page of the journal where you find contradiction with the APA publication manual.

4. Figures, graphs, tables, pictures and other illustrations should be in accordance with the APA manual.

5. The controversial issues related to religion and ethics are beyond the scope of the journal.

6. The paper submitted to the JSSSH must NOT be submitted to any other journal for its publication before a decision is made by the journal.

For quick process of your research paper, please make sure that your manuscript is documented according to the criteria laid down in the 'guidelines for the authors' and specified in the template such as: page size; margin; line space, style, font and position of the headings; font and style of manuscript writing; font, line space and writing style of the title; author's name and affiliation and tables and figures. **For in-text citation please refer to pp. 8-12 of the guide.**

Sample-paper-JSSSH

Download Brief APA Guide (for in-text citation please refer to pp. 8-12 of the guide)

*** Papers NOT appropriately formatted would be sent back to the authors.*

Submission of article

Article complete in all respect should be submitted to the editorial office at:

editor.jsssh@gmail.com

4.7 Ethical approval

Reply all | Delete Junk | •••

Ethics Feedback - EC.18.01.09.5206R

P psychethics
Fri 16/02/2018, 15:22
Natalie Stott; Elinor MacCormac; John Fox

Reply all |

Inbox

Dear Natalie & Elinor,

The Ethics Committee has considered your revised project proposal: Does perfectionism continue to predict disordered eating when shame is controlled for? Does worry predict disordered eating when shame is controlled for? (EC.18.01.09.5206R).

The project has now been approved.

Please note that if any changes are made to the above project then you must notify the Ethics Committee.

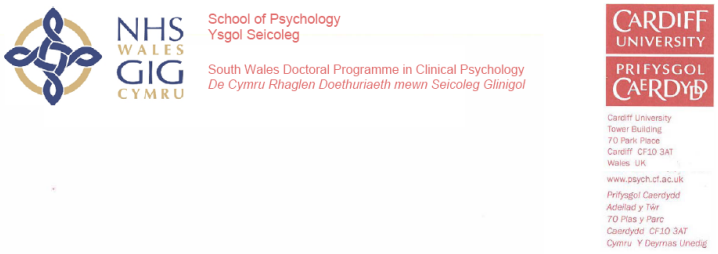
Best wishes,
Mark Jones

School of Psychology Research Ethics Committee
Cardiff University
Tower Building
70 Park Place
Cardiff
CF10 3AT

Tel: +44(0)29 208 70360
Email: psychethics@cardiff.ac.uk
http://psych.cf.ac.uk/aboutus/ethics.html
Prifysgol Caerdydd
Adeilad y Tŵr
70 Plas y Parc
Caerdydd
CF10 3AT

Ffôn: +44(0)29 208 70360
E-bost: psychethics@caerdydd.ac.uk

4.8: Consent form



Study Title: Metacognition in disordered eating and the relationship between shame and perfectionism in disordered eating.

Researcher: Natalie Stott (Trainee Clinical Psychologist) & Elinor MacCormac (Trainee Clinical Psychologist)

Participant ID (please write mobile phone number):_____

	Please Initial
If you consent to participating in the study and have read the information sheet, please read the statements below. If you agree with each statement please initial each box and sign in the space provided at the bottom of the sheet.	☐
1. I confirm that I have read and understood the participant information sheet dated XXth January 2018. I have had the opportunity to consider the information provided, ask questions and have had these answered satisfactorily.	☐
2. 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.	☐

_____

Name of participant Signature Date

4.9 Participant information sheet

PARTICIPANT INFORMATION SHEET

Study 1: Metacognition in disordered eating

Study 2: The relationship between perfectionism and shame in disordered eating

Researchers: Natalie Stott & Elinor MacCormac

You are being invited to take part in a joint research project that is being undertaken as part of a Doctorate in Clinical Psychology. Please read the information below carefully before deciding whether to take part. If you have any questions, please contact the researcher.

Why is the study being done?

One study (Study 1) will look at the relationship between people's worries and the effect of these worries of their eating behaviour. The findings of the study will be used to further our understanding of how our worries can affect eating behaviour.

The other study (Study 2) will look at the relationship between traits of perfectionism and feelings of shame in the context of disordered eating. This will help inform the most effective form of therapy for disordered eating in the future.

Background Research

Study 1

Anxiety is understood to be a core and debilitating clinical feature present in those with eating disordered behaviour. However, cognitive processes underlying anxiety in eating disorders are poorly understood (Kesby et al., 2017). Research has suggested that worry and rumination is a key feature of those with eating disorders; Sternheim and colleagues (2012) found a positive correlation between level of worry and level of eating disorder symptoms. Research has also indicated that disordered eating behaviour is correlated to loneliness and greater social impairment (Spoor et al, 2007).

Metacognition is defined as 'knowledge about one's own thoughts' and the factors that influence one's thinking. Over the past decade, researchers have begun to investigate the role of metacognitions within the eating disorder population. Although research is extremely limited, metacognition has been significantly correlated with eating disorder symptomatology (Olstad, et al 2015) and findings have shown that cognitive processes play an important role in the maintenance of eating pathology (Rawal.,et al 2010). A metacognitive model was developed by Wells (2009) to show how individuals can get stuck in a cycle of worry and it also suggests that people develop thought controlling strategies to manage their worry.

The metacognitive model has been applied to many disorders including generalized anxiety disorder (Wells & King, 2006;; Wells et al., 2010) and posttraumatic stress disorder (Wells & Colbear, 2012;; Wells et al., 2008). However there is a lack of research using this model with eating disordered behaviour. Investigating the role metacognitions have upon eating disordered behavior will help shape understanding of what may predict such behaviour, and also assist in the future treatment of disordered eating behaviour.

Study 2

Perfectionism has long been linked to disordered eating (Moor, Vartanian, Touyz & Beumont, 2004) and is viewed and treated as a maintaining factor in the transdiagnostic model of eating disorders (Fairburn, Cooper & Shafran, 2003a). The method of intervention based on this transdiagnostic model (Enhanced Cognitive Behavioural Therapy) has been found to significantly reduce perfectionism and eating disorders, and is widely used (Fairburn et al., 2011).

Research suggests that shame also plays a critical role in disordered eating (Markham, Thompson, & Bowling, 2005), and those with disordered eating have been found to have higher levels of shame than other clinical groups (Cook, 1994). Compassion Focussed Therapy for Eating Disorders was designed to specifically target shame and self-criticism in the context of disordered eating, and has shown promising results in the treatment of eating disorders (Gale, Gilbert, Read, and Goss (2012).

Both perfectionism and shame have been found to independently predict levels of disordered eating, with perfectionism being the strongest predictive factor (Cella, Cipriano, Iannaccone & Cotrufo, 2017). However, the literature is unclear whether this perfectionism/disordered eating relationship is mediated by shame, and whether it would continue to exist if shame were controlled for. Fully understanding the roles of perfectionism and shame and their interaction in relation to disordered eating is critical to provide the most effective treatment for disordered eating.

Do I have to take part?

No, it is your choice whether to participate or not. If you do decide to take part you are free to change your mind and withdraw from the study at any time. Please keep a note of your ID number in case you wish to do this at a later date.

What I will happen if I decide to take part?

If you want to participate in this study, you will be invited to ask the researcher any questions you may have and will be asked to electronically sign a consent form.

Methodology

Firstly, we will ask you to provide some background information about you that will be non-identifiable. We will ask you to include your phone number as your personal ID. (This will be the number you use should you wish to withdraw from this study at any time).

You will then be asked to fill in a total of 7 questionnaires. Information about each questionnaire is below:

1) A questionnaire about your beliefs about your thoughts
2) A questionnaire about eating behaviour
3) A questionnaire about how we control thoughts
4) A questionnaire about loneliness
5) Two questionnaires about feelings of shame
6) A questionnaire about traits of perfectionism

The total time taken to complete the study will be approximately 45 minutes-1 hour.

Once you have completed the questionnaires you will be given a debrief sheet and an opportunity to email the researcher with any questions you may have.

You will then be contacted in 6 months' time to invite you to take part in an identical follow up questionnaire This will allow us to see whether there are any changes over time.

What are the possible disadvantages of taking part?
There are minimal anticipated disadvantages to participating in the study. You will be asked to give an hour of your time. You are free to withdraw from the study and/or speak to the secretary of the ethics committee (see details below).
What are the possible benefits of taking part?
If you are part of Cardiff University you will be awarded with EMS credits. If you are outside of Cardiff university you will be entered into a prize draw with a chance to receive £40 Amazon vouchers. Although you may not benefit personally from the study, your participation will contribute to a study that may improve our understanding of how our thoughts and feelings contribute to our eating behaviour and to understanding what the best way to therapeutically support someone with disordered eating.
What will happen to the information I provide?
All information collected about you during the research is strictly confidential and your phone number will be used by us instead of your name to link your responses. Only the consent form will contain identifiable information; which will be solely accessible to the researchers and will be stored separately from your other data, in a locked filing cabinet. All other information you provide will be completely anonymous and stored in a separate locked filing cabinet. The information will be kept for 5 years. You will only be contacted following your participation by text if you win the £40 Amazon voucher prize draw.

What will happen when the study ends?
The results of the study will be written up and submitted to Cardiff University in order to fulfil the requirements for a Doctorate in Clinical Psychology. A report will also be sent to a peer-reviewed journal for publication. You will not be identified in any report or publication that follows this study.
Who has reviewed the study?
The study has been reviewed and approved by an ethics committee panel at Cardiff University.
Contact for further information?
If you feel affected by any of the issues raised in this study, the following may be able to provide help and advice:

- Your General Practitioner
- Secretary of the ethics committee: psychethics@cardiff.ac.uk
- BEAT website:

  https://www.beateatingdisorders.org.uk/

Thank you for taking the time to read this information sheet

4.10: Debrief Sheet

DEBRIEF SHEET

Study 1: Metacognition in disordered eating
Study 2: The relationship between perfectionism and shame in disordered eating

Researchers: Natalie Stott & Elinor MacCormac
Thank you for taking part in this joint study. This debriefing sheet will give you an overview of the purpose of the studies. Please take time to read this information and ask the researcher any questions you may have.

What are the aims of the study?

One study examined the relationship between people's worries and the effect of these worries of their eating behaviour. The findings of the study will be used to further our understanding of how our worries can affect eating behaviour.
The other study examined the relationship between traits of perfectionism and feelings of shame in the context of disordered eating. High traits of both perfectionism and shame are associated with disordered eating, but we are examining whether one is more influential than the other. This will help inform the most effective form of therapy for disordered eating in the future.

What are the details about the tasks I completed?

7) The Meta Cognitions Questionnaire measuring beliefs about thoughts
8) The Eating Disorder Examination Questionnaire measuring eating behaviour
9) The thought control questionnaire measuring how often thoughts are controlled
10) The loneliness scale measuring feelings of loneliness
11) The Other as a Shamer questionnaire measures external shame
12) The Personal Feelings Questionnaire-2 measures experience of internal shame
13) The Multi-Dimension Perfectionism Scale measures traits of perfectionism

We asked for some background information so we can examine whether there are any links between different groups of participants and their experiences (for example differences between genders).

What are the research hypotheses?

Study 1 hypothesised that there will be a relationship between different types of worries we have and disordered eating behaviour, and that needing to control thoughts will have an effect on this relationship.

Study 2 hypothesised that shame will predict disordered eating more than perfectionism, and that when we control for shame, the relationship between perfectionism and disordered eating will no longer exist.

Data Protection

All information collected about you during the course of the research is strictly confidential. Only the consent form and your mobile phone number (collected in order to contact you should you win the £40 Amazon voucher prize draw) will contain

identifiable information. These will be solely accessible to the researcher and will be stored for 5 years, in a locked filing cabinet at Cardiff University's School of Psychology Clinical Doctorate Programme. The data you provide on the questionnaires will have no identifiable information on it, will be completely anonymous and stored in a separate locked filing cabinet at Cardiff University School of Psychology Clinical Doctorate Programme.

Contact for further information?

If you feel affected by any of the issues raised in this study, the following may be able to provide help and advice:

- Your General Practitioner
- Secretary of the ethics committee: psychethics@cardiff.ac.uk
- BEAT website:

  https://www.beateatingdisorders.org.uk/

Thank you for taking the time to read this debrief sheet and to take part in the study.