



An exploratory study investigating irritable bowel symptoms, associated unhelpful thoughts, adult attachment, emotional distress and disordered eating

By

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Dedication

I dedicate this thesis to two amazing people. Russell Bolger, you have been my rock whilst writing this thesis. Thank you for your care and support. I could not have done it without you. I love you.

Nanna, you are a wonderful woman! We all miss you.

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OVERVIEW

This thesis contains a systematic literature review, an empirical paper, and a concluding extended discussion.

The first chapter is a systematic literature review. The review reports on the overlap between irritable bowel syndrome (IBS) (and its associated gastrointestinal (GI) symptoms), eating disorders and disordered eating. The purpose of the systematic review was to identify the common psychological factors in the co-morbid experience of IBS, associated GI symptoms, eating disorders and disordered eating. Eight studies were identified, methodologically assessed and reviewed. An appraisal of the evidence demonstrated psychological factors to be present in this relationship. The findings are discussed in detail along with clinical implications.

The second chapter is an empirical study. Building on the findings from Chapter One, the aims of this study were; a) to explore the relationships between irritable bowel symptoms, attachment anxiety, attachment avoidance, IBS-related cognitions, depression, anxiety and disordered eating and; b) determine which of these psychological factors predicted disordered eating. The empirical study also discusses how these psychological factors may be related to 1) disordered eating in those experiencing primarily IBS symptoms and 2) IBS symptoms in those primarily affected by eating problems.

The final chapter of this thesis is the concluding discussion and has three sections. The first section is an extended discussion of Chapter One and Chapter Two. This discussion provides more detail as to the clinical implications of the conducted research. Incorporated into the extended discussion is section two, a discussion of future research and a proposal for a follow on study. Finally, in section 3, a lay summary of the results is provided. This is aimed at users of two charity websites, beat and The IBS Network, who kindly advertised the study.

Chapter 1: Systematic Literature Review

Psychological factors shared by irritable bowel symptoms and eating pathology: A systematic
review.

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(Appendix A)

CHAPTER 1: SYSTEMATIC LITERATURE REVIEW

Abstract

Irritable bowel syndrome (IBS) and gastrointestinal (GI) symptoms are related to disordered eating and eating disorders. These constructs have many commonalities, including a number of psychological factors. This review examines the psychological factors associated with IBS and its associated GI symptoms; and eating pathology. A systematic search of four databases was conducted and resulted in eight studies which were quality assessed and reviewed. Parental mental health; parental alcohol misuse; parental functional gastrointestinal disorders; parental separation; neuroticism; unhelpful cognitive processes; depression; anxiety; feeling sad and confused; and somatisation were found to be related to IBS, GI symptoms (associated with IBS) and eating pathology. These findings are critically discussed alongside the studies' methodological limitations. Clinical implications and ideas for future research are suggested.

Keywords: IBS, GI symptoms, eating disorder, disordered eating, psychological,

Introduction

Functional gastrointestinal disorders and irritable bowel syndrome

Functional gastrointestinal disorders (FGIDs) are symptom based only presentations and can affect any part of the gastrointestinal (GI) tract. By definition, they are disorders of function which are not explained by a structural or biochemical abnormality (Rey & Talley, 2009). Diagnosis is based entirely on functional symptoms such as, abdominal bloating, abdominal pain, constipation and diarrhoea (Agrawal & Whorwell, 2006) and the exclusion of other known structural bowel disorders and diseases (Camilleri & Spiller, 2002). Irritable bowel syndrome (IBS) is the most common of the FGIDs affecting between 1 to 33% of the world population (Quigley et al., 2009) with a huge cost to both the sufferer and society in terms of the associated occupational, social, recreational and emotional burden (Drossman et al., 2000; Hulisz, 2004). Although widespread, 'diagnosing' IBS is not straightforward, as individuals have idiosyncratic presentations with varying symptoms that are difficult to quantify (Spiegel, Farid, Esrailian, Talley, & Chang, 2010). Several attempts have been made to refine the diagnostic process with the introduction of classification systems; Manning criteria (Manning, Thompson, Heaton, & Morris, 1978) and Rome criteria (Drossman, 2006) (currently Rome III - see Appendix B for details of both criteria). Although useful for research the classification systems have proved to be limited and restrictive in clinical practice (Boyce, Koloski, & Talley, 2000). There is still a reliance on clinical judgement (Agrawal & Whorwell, 2006) resulting in the inconsistent use of these diagnostic tools. The current state of knowledge and practice regarding IBS is therefore still lacking in many areas. The cause of the disorder and diagnostic criteria are unclear (Quigley et al., 2012). Research samples may not reflect accurately those experiencing symptoms related to IBS in clinical and community populations. Thus there is still much to be learnt about IBS, in terms of research, practice and establishing clarity and accuracy of diagnosis.

Eating Disorders and disordered eating¹

It is not only individuals with IBS who present with idiosyncratic symptom patterns making clear diagnosis difficult. There are similar issues in the area of eating disorders. These present with a mixture of symptoms and behaviours related to eating, shape and weight not always captured by standard classifications (Mond et al., 2006; Strober, Freeman, & Morrell, 1999), which, at best, are likely to have limited validity. The majority of those presenting with an eating disorder are diagnosed with “Eating Disorder Not Otherwise Specified” (EDNOS) (Fairburn, 2008). EDNOS is a default category for those with a significant eating disorder which does not meet criteria for either anorexia nervosa or bulimia nervosa (Fairburn & Bohn, 2005). Furthermore, once diagnosed with an eating disorder individuals do not typically stay in one category (Milos, Spindler, Schnyder, & Fairburn, 2005) with diagnosis changing between anorexia nervosa and bulimia nervosa (Eddy et al., 2008) and then to EDNOS (Agras, Crow, Mitchell, Halmi, & Bryson, 2009). The fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM–V) (American Psychological Association [APA], 2013) has attempted to account for this by changing diagnostic criteria. Amenorrhea has been eliminated from the criteria of anorexia, the required frequency of binge and compensatory episodes has been reduced to once a week for bulimia and binge-eating disorder (BED) has been included. BED has been categorised as eating significantly more than the general population in a short time frame whilst feeling out of control (APA, 2013). Other eating behaviours, such as dieting do not meet criteria for an eating disorder (Becker, Eddy, & Perloe, 2009) but can develop into disordered eating (Hay, Fairburn, & Doll, 1996; Fayet, Petocz, & Samman, 2012). This means that many individuals with disordered eating who do not fall clearly into anorexia or bulimia categories may have been excluded from studies. It is important to include both individuals with eating disorders and with disordered eating as this is more representative of the general population and those who present for eating disorder treatment (Fisher, Schneider, Burns, Symons, & Mandel, 2001). Disordered eating should not be considered a less severe presentation as it has been shown that individuals with

¹ Disordered eating refers to a range of problem eating attitudes and behaviours along a continuum which ranges in severity; Shisslak, Crago, & Estes, 1995; Stice, Killen, Hayward, & Taylor, 1998)

disordered eating have similar levels of emotional distress and functional impairment (Fitzgibbon et al. 2003).

Issues of diagnosis have been discussed to highlight the importance of examining a sample that is truly representative of individuals who experience clinically significant symptoms and distress as a result of either their diagnosis of IBS; GI symptoms; eating disorder or disordered eating, independent of the exact combination of symptoms they present with. Terms used to refer to a collection of GI symptoms are used interchangeably in clinical and research practice. Therefore, to aid the reader, terminology used in the current review will be clarified here:

- “FGID” will be used when referring to all functional gastrointestinal disorders which come under this umbrella.
- “IBS” will be used when referring to individuals in research studies who have been given this diagnosis.
- “GI symptoms associated with IBS” will be used when referring to GI symptoms typically experienced by those with IBS who have not been diagnosed with IBS or given another FGID label.
- “Eating disorder” will be used when referring to a diagnosed eating disorder
- “Disordered eating” will be used when referring to problem eating attitudes and behaviours such as, feeling fat or dieting.
- “Eating pathology” will be used as a collective term for eating disorder and disordered eating.

When considering the implications of this review it is important to highlight that there is a significant gender bias in the investigation of these issues as both eating pathology and FGIDs are more prevalent in women than men (Harvey, Salih, & Read, 1983; Treasure, 2012). Due to this bias, the majority of studies discussed in this review will have a female sample and may have limited generalisability to the male population.

IBS, GI symptoms associated with IBS and psychological factors

As there is no consensus on the definition of IBS, research concerning its risk factors is limited (Drossman et al., 2011). Historically, cross-sectional research and case control studies have predominantly focused on biological, physiological and environmental risk factors (Drossman, Camilleri, Mayer, & Whitehead, 2002; Barbara, De Giorgio, Stanghellini, Cremon, & Corinaldesi, 2002; Hasler, & Schoenfeld, 2003). However, whether any of these factors have an impact on the development or maintenance of IBS remains elusive. More recently there has been a focus on the contribution of psychological factors and the use of a biopsychosocial framework to further the understanding of the development and maintenance of IBS (Tanaka, Kanazawa, Fukudo, & Drossman, 2011).

Psychological factors which have been found to have a relationship with IBS include neuroticism. Neuroticism is characterised by low mood, anxiety, guilt, worry and envy (Thompson, 2008) and has been linked to stress and illness (Grant, 2011). Neuroticism is consistently reported to be present in those with IBS (Levy, Olden, Nailboff et al., 2006; Zarpour & Ali Besharat, 2011). Somatisation, where emotion is expressed physically, (Nicholl et al., 2008), dissociation (Salmon, Skaife, & Rhodes, 2003) and childhood sexual abuse (Talley, Fett, & Zinsmeister, 1995; Reilly, Baker, Rhodes, & Salmon, 1999) have all been associated with IBS. However, research methodologies in the childhood sexual abuse literature have been criticised for the lack of control groups.

Emotional distress is common in those experiencing IBS. Depression has been diagnosed in 25 to 30% of individuals with IBS (Garakani, Win, Virk, Gupta, & Kaplan, 2003) in comparison to controls (2.5 to 10%). Those with anxiety have been found to have a high number of IBS symptoms (Palsson & Drossman, 2005). IBS is associated with specific types of anxiety namely panic disorder and generalized anxiety (Gros, Antony, McCabe, & Swinson, 2009). Those who have co-morbid anxiety and depression report a higher severity of GI symptoms associated with IBS (Drossman, Morris, Schneck et al., 2009). It is difficult to determine whether anxiety and depression precedes IBS and its associated symptoms, are a consequence of IBS or if they arise concurrently with IBS

symptoms. However, it is clear that anxiety and depression are common experiences in this clinical group.

Many cognitive processes have been found to be associated with IBS and its GI symptoms. One of these cognitive processes is pain catastrophising. Pain catastrophising is defined “as a set of exaggerated and ruminating negative cognitions and emotions during actual or perceived painful stimulation” (Leung, 2012, p. 204). Pain catastrophising is associated with predictions about the course, impact, duration and experience of pain. Pain catastrophising is also associated with strong symptoms of anxiety and the belief that the pain will be unbearable, will endure and be uncontrollable (Sullivan, Bishop & Pivik, 1995). Pain catastrophising has been related to heightened symptom severity (Lackner & Quigley, 2005) particularly increased abdominal pain. Catastrophising thoughts about pain are also associated with emotional distress (Lackner & Gurtman, 2004; Cano, Leonard, & Franz, 2005), and have been found to specifically mediate the relationship between pain and emotional distress (Lackner, Quigley, & Blanchard, 2004). In terms of cognitive appraisals about non-pain related symptoms and more specifically GI symptoms associated with IBS, those who experience IBS are more likely to self-report a higher level of catastrophising thoughts about the functional and social consequences of their symptoms (Hunt, Milonova, & Moshier, 2009). Poor coping responses to GI symptoms (e.g., catastrophic beliefs and a poor sense of control over symptoms) play a critical role in mediating the relationship between affective states such as depression, symptom severity and quality of life (Lackner, Quigley, & Blanchard, 2004). Quality of life is a broad notion, and encompasses how a person evaluates different aspects of their life. These aspects of life include physical and psychological health, independent living, a sense of personal fulfilment, and satisfaction with interpersonal relationships (Diener, Suh, Lucas & Smith, 1999; World Health Organisation, 1998). Another highlighted cognitive process is increased self-focused attention. Studies have demonstrated that heightened attention upon abdominal symptoms, hypervigilance to bodily sensations and an internal, somatosensory bias for threat in those with IBS significantly increases anxiety and the severity of IBS symptoms (Crane & Martin, 2003; Keough, Timpano, Zawilinski, & Schmidt, 2011; Keogh, Dillon, Gergiou, & Hunt, 2001).

An effective treatment for IBS is Cognitive Behavioural Therapy (CBT) (Blanchard, 2005). Cognitive Behaviour Therapy describes how events, cognitive processes (such as thoughts and appraisals), emotional distress, behavioural and physiological responses impact on each other. Thoughts and unhelpful interpretations of bodily sensations and external events are of particular interest and how these relate to the underlying beliefs and assumptions a person holds (Beck, 1976). The aim of CBT is to identify thoughts, patterns of thinking and behaviour which can be associated with negative emotions and in turn hinder quality of life. Consistent with CBT, the cognitive processes highlighted so far suggest that catastrophic appraisals, self-focused attention, threat bias and poor coping contribute to the maintenance and exacerbation of IBS. Altering these cognitive and behavioural processes through cognitive and behavioural interventions has been found to underlie the success of CBT for IBS (Reme et al., 2011). These findings confirm the role and impact that psychological factors have in the experience of IBS.

Eating pathology and psychological factors

Like IBS, there has been a significant body of research conducted into the risk factors associated with eating disorders and disordered eating. As in IBS, this has led to the identification of biological, psychological and social factors or a biopsychosocial model. A discussion of all of these issues is beyond the remit of this review which is focused on psychological factors alone. For a fuller review of the risk factors associated with eating disorders see Jacobi, Hayward, DeZwaan, Kraemer and Agras (2004); Polivy and Herman (2002); and Stice (2002).

Similar to IBS, personality traits seem to be associated with eating pathology. Perfectionism, characterised by extreme striving and critical self-evaluation for a perfect outcome, (Stoeber, Joachim, Childs, & Julian, 2010) has been observed to predict the onset of bulimia nervosa (Killen et al., 1994), anorexia nervosa (Fairburn, Cooper, Doll, & Welch, 1999) and the maintenance of eating disorders (Santonastaso, Friederici, & Favaro, 1999). Neuroticism combined with introversion has been related to greater disordered eating (bulimic type behaviours and drive for thinness) in undergraduate females (Miller, Schmidt, Vaillancourt, McDougall, & Laliberte, 2006). Thus, perfectionism, neuroticism and introversion may be risk factors for both eating disorder and disordered eating.

Comparable to IBS, early adverse experiences are more common in those with eating disorders compared to controls (Schmidt, Tiller, Blanchard, Andrews, & Treasures, 1997; Raffi, Rondini, Grandi, & Fava, 2000). Such events include loss (Fairburn, Cooper, Doll, & Welch, 1999) and childhood abuse (Wonderlich, Brewerton, Jolic, Dansky, & Abbott, 1997; Neumark-Sztainer, Story, Hannan, Beuhring, & Resnick, 2000). More recently, childhood emotional abuse has been suggested to be a significant adverse childhood experience which predicts eating disorders (Kent & Waller, 2000) by negatively impacting on self-esteem and the ability to regulate emotions (Groleau et al., 2012). In summary, childhood stressful life events seem to have an impact on eating pathology. However, how childhood stressful events impact upon eating behaviors remains unclear.

The association between eating disorders, anxiety and depression is well established (Fairburn & Harrison, 2003). This relationship also holds for disordered eating (Touchette et al., 2011). It is unclear which precedes or is consequent to the other. On the one hand, there is evidence that low mood and anxiety precede eating disorders (Godart et al. 2000; Swinbourne et al., 2012). Inducing negative affect can stimulate body dissatisfaction, which then precipitates disordered eating (Carter et al., 1996). On the other, there is evidence that eating disorder symptoms and dietary restraint predict depression consequently in those without a baseline diagnosis of depression (Stice et al., 2000). It is conceivable that there is a third possibility that depression and anxiety and eating pathology co-occur at one and the same time. Despite the lack of clarity around the sequence of eating pathology and emotional distress it is evident that depression and anxiety may play a role in the onset and the maintenance of eating pathology.

As in the IBS literature, unhelpful cognitive processes seem to play a significant role in eating disorders and disordered eating. Unhelpful cognitive processes have been described as being the core psychopathology of eating disorders (Fairburn, 2008). Unhelpful concerns about eating, food, shape and weight have been found to be present in those who suffer with anorexia and bulimia (Cooper, Cohen-Tovee, Todd, Wells, & Tovee, 1997). Anxiety about weight gain, weight and shape concern, and preoccupation with thoughts of weight and eating are examples of cognitive processes which are common among young people (Cooper et al. 1997; Fairburn, 2008; Fairburn, Cooper, & Shafran, 2003). These have been linked to disordered eating (Stice, Killen, Hayward, & Taylor, 1998) and

psychological distress (Masuda, Price, Anderson, & Wendell, 2010) in non-clinical populations. Rumination, another cognitive process, has been found to present in women with bulimia (Troop, Holbrey, & Treasure, 1998). In the spectrum of eating disturbances misperceptions and preoccupations with body size, shape and eating are common (Shisslak et al., 1995). These risk factors highlight the cognitive component of both eating disorders and disordered eating.

Due to the central role played by cognitive factors in eating pathology and the associated behaviours that people with an eating disorder or disordered eating engage in, CBT has been viewed to be the most appropriate treatment. A meta-analysis (National Institute for Health and Care Excellence [NICE], 2004) and other systematic reviews (Shapiro, Berkamn, & Brownly, 2007; Hay, Bacaltchuk, & Stefano, 2009) found CBT to be the most effective intervention for bulimia. There is less evidence for anorexia and EDNOS. Cognitive Behaviour Therapy aims to improve eating disorder symptoms through challenging unhelpful cognitive processes regarding body size, shape, and weight and other associated psychological factors.

IBS and eating pathology co-morbidity and shared characteristics

IBS and eating pathology share many characteristics. Both have limitations with diagnosis and methodology and both have comparable risk factors in terms of the development and maintenance of key clinical symptoms. More specifically, IBS and its associated GI symptoms have consistently been demonstrated to be experienced by those with an eating disorder. In one study, 98% of eating disorder outpatients were found to have at least one FGID (Boyd, Abraham, & Kellow, 2005). For 52% of this sample the FGID was IBS. For those with a current or past eating disorder and who were recruited from a volunteer register, 64% met Manning Criteria for IBS (Perkins, Keville, Schmidt, & Chalder, 2005). This relationship is complicated and illustrated through studies which have found:

1. Self-reported evidence of GI symptoms before diagnosis of eating disorders (Ogg, Millar, Puszati, & Thom, 1997; Winstead & Willard, 2006)
2. The appearance of GI symptoms ten years after an eating disorder is diagnosed (Perkins et al., 2005)
3. The persistence of FGIDs following the recovery of an eating disorder (Boyd, Abraham, & Kellow, 2010; Porcelli, Leandro, & De Carne, 1998).

There is also evidence of IBS and GI symptoms being associated with disordered eating in non-clinical populations (Lau & Alsaker, 2001; Quick, McWilliams, & Byrd-Bredbenner, 2012). From this brief synopsis it is clear that FGIDs, including IBS and its associated symptoms and eating pathology co-occur.

Despite IBS, associated GI symptoms, eating disorders and disordered eating being classified as separate disorders or collection of symptoms, it is evident from the literature that they share many common factors. These include a disproportionately high prevalence in women (Drossman et al., 1982; White, 1992) and a number of shared psychological factors as discussed above. The presence of common psychological factors indicate that these factors are “across disorder” and not “within disorder” or in other words, transdiagnostic (Harvey, Watkins, Mansell, & Shafran, 2008).

Aims of systematic review

The aim of this systematic review was to determine what psychological factors are related to the occurrence of both eating pathology (eating disorders and disordered eating) and IBS (including GI symptoms associated with IBS) in the identified studies. IBS (and associated GI symptoms) were chosen as the focus of the review as IBS is the most common FGID experienced in those with eating pathology.

Studies in this relatively new area used a variety of methodologies, research questions and measures in heterogeneous samples. Therefore, it was decided that a meta-analysis was not appropriate or feasible. Studies were critically appraised for setting, participants, study size, measurement, and statistical analysis.

Method

Search Methods

Four electronic databases (MEDLINE, Psychinfo and Science Direct accessed through Discover, a university database search engine and Scopus) were searched in November 2012 using the following search terms and Boolean operators; “IBS” OR “Irritable Bowel Syndrome” OR “Functional Gastro*” OR “Medically Unexplained” OR “Bloating” OR “Constipation” OR “Diarrhoea” OR “Diarrhea” OR “Distension” AND “Eating” OR “Disorder*” OR “Bulimia” OR “Anorexia” OR “Binge Eating” OR “ENDOS” OR “Dieting” AND “Psycho*”. These search terms

were developed through a general review of the literature and discussed with the second author². This search returned 579 articles with the majority of these focussing on biological variables. To narrow the search to more relevant articles in line with the search terms and research question the following related subjects were chosen within Discover; “Eating Disorder”, “Anorexia Nervosa”, “Bulimia”, “Irritable Bowel Syndrome”, “Anorexia”, “Abdominal Pain”, “Constipation”, “Diarrhea”, “Mental Disorder”, “Somatoform Disorder”, “Gastrointestinal Disorder” and “Psychotherapy”. The search was limited to the English language and to those published in peer reviewed academic journals. Titles were then screened for duplications and these were removed leaving 58 abstracts. Abstracts were then screened to see whether they met inclusion criteria. This resulted in eight studies. The reference lists of these studies and two relevant reviews which met the abstract inclusion criteria (Janssen, 2010; Mulvihill, 2005) were examined. This resulted in a further five potentially relevant papers however, after cross-checking they were confirmed to have already been examined. Authors of the selected studies were also emailed for unpublished work with no response. See Figure 1.1 for a flow chart of the selection of studies included in the review.

Inclusion and exclusion criteria

Studies were included if they mentioned search terms related to all of the following three areas; IBS (and associated GI symptom); eating disorder or disordered eating; and psychological factors and examined the co-occurrence of IBS (and associated GI symptoms) and eating pathology. This meant that other FGIDs such as functional dyspepsia (an FGID characterised by pain in the upper abdomen, feeling full and abdominal bloating) (Talley & Vakil, 2005) met criteria and were included due to sharing the same functional GI symptoms (abdominal pain and abdominal bloating). If an abstract included these relevant search terms but the focus of the study was biological, concerned the structure of the bowel or was part of a drug trial then the study was excluded. This left fifteen studies of which seven were reviews or editorials. These reviews and editorials were excluded. The full text of the remaining eight studies was obtained and reviewed using a data extraction sheet (see Appendix C). See Table 1.2 for a summary of the studies characteristics. Only outcomes that were relevant to the research question were extracted and reported.

² Second author refers to a supervisor EW

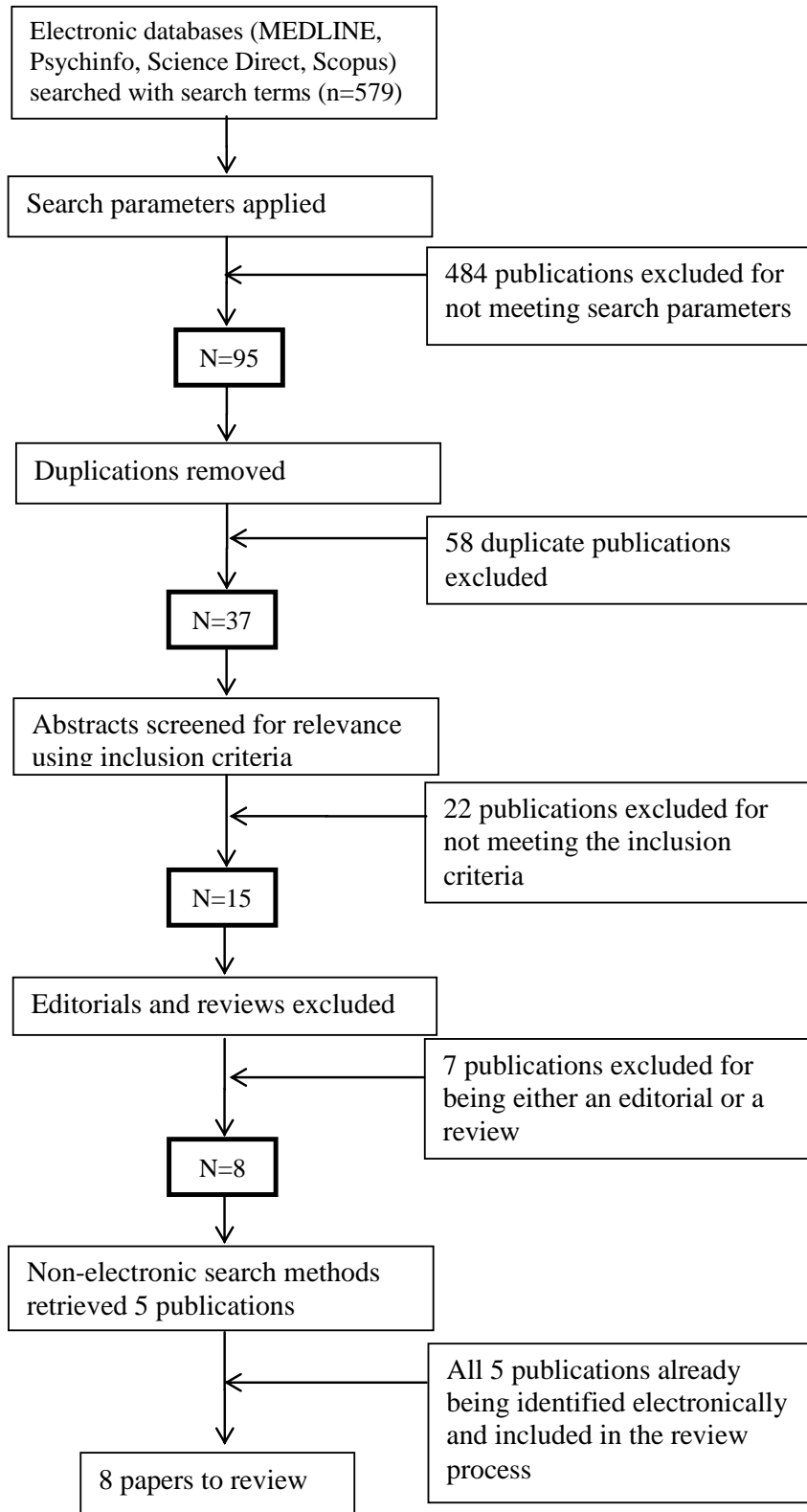


Figure 1.1: Flow diagram representing electronic and non-electronic search process

Quality Assessment

Each paper was quality assessed using criteria designed for this review (Table 1.1). To assist with the criteria selection two sources were consulted; the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) (von Elm, Altman, Egger, Pocock, Gøtzsche, & Vandenberg, 2007) and recommendations produced by a systematic review of quality assessment tools designed for observational studies in epidemiology (Sanderson, Tatt, & Higgins, 2007). STROBE is not a quality assessment tool in itself but provides guidelines for reporting observational studies. Items within these guidelines are classified into areas of potential sources of bias and have been recommended as a good starting point for the development of a quality assessment tool. Following the recommendations made by these two sources a quality assessment tool was designed. The quality assessment tool focused on the method domain and paid particular attention to the study design and statistical methods in a checklist format

Table 1.1

Quality assessment criteria

Method domains	Quality criteria
Setting	1. Location and dates given for period of data collection and follow up
Participants	2. Sources and methods of selecting participants are stated
	3. Inclusion and exclusion criteria are mentioned and discussed.
Study Size	4. Size of study stated
Measurement	5. Data sources and measures for variables are stated and described.
	6. Data sources and measures for variables are appropriate and mention reliability and validity.
Statistical methods	7. Methods for controlling confounding variables are mentioned and explained
	8. Chosen statistical methods are described and purpose explained.
	9. Chosen statistical methods are appropriate for the primary aims of the study.

Table 1.2

Study Characteristics (see Appendix D for fuller table including measures used in studies).

Study	Setting/Country	Design	Sample size (%)	Sample type	% female	Mean age	Measured ψ Variables	Attrition/missing data
<i>Cross-sectional</i>								
Abraham & Kellow (2011)	ED inpatient unit Australia	Self-reported Q on admission	160 AN 44.4% BN 18.1% EDNOS 37.5%	Consecutive inpatient	100	AN 24 BN 25 EDNOS 25	'eating disordered feelings' 'general Ψ feelings'	Non-response reported
Lobera et al. (2011)	ED & Psych outpatient & university Spain	Interview	245 ED 31.8% Psych 31.4% Student 36.7%	Clinic referral & Convenience	77	ED 23 Psych 41 Student 22	Thought-shape fusion Depression State-Trait anxiety	Not reported
Boyd et al. (2010)	ED inpatient unit Australia	Self-reported Q on admission & 12 month follow-up	73	Consecutive inpatient	100	20 \pm 5	Depression State-Trait anxiety Somatisation	Both reported & excluded
Boyd et al. (2005)	ED inpatient unit Australia	Self-reported Q on admission	108 AN 44.4% BN 18.1% EDNOS 37.5%	Consecutive inpatient	100	AN 21 BN 20 EDNOS 21	Neuroticism Depression State-Trait anxiety Somatisation	Both reported & excluded
Emmanuel et al. (2004)	GE centre & ED service England	Case records. Interview follow-up	60 GI & AN 33.3% AN 20 33.3% FC 20 33.3%	Clinic referral	92	GI 30 AN 22 FC 32	Psychiatric history Parental factors	Not reported
Lau & Alsaker (2001)	High schools Norway	Self-reported Q	1117	Convenience	49	13	Weight and eating concern Feeling fat question	Missing data reported & included Not reported
Porcelli et al. (1998)	GE outpatients Italy	Self-reported Q on referral	260 FGID 48.8% GD 62.7%	Consecutive clinic referral	67	FGID 39 GD 55	Depression Anxiety	Not reported
<i>Case-control</i>								
Quick et al. (2012)	Universities & DRCHCs websites USA	Self-report Q via internet Matched controls	2625 including 164 matched controls	Targeted & Convenience	Not reported	20	Body image attributes Depression Anxiety OCD Self-esteem Coping style 'black and white' thinking Emotion regulation	Not reported

Note. Bolded – total sample size. Abbreviations: FGID, functional gastrointestinal disorder; ED, eating disorder; GE, gastroenterology; DRCHC, diet-related chronic health conditions; Q, questionnaire; AN, anorexia nervosa; BN, bulimia nervosa; EDNOS, eating disorder not otherwise specified; GI, gastrointestinal; FC, functional constipation; Psych, psychiatric; GD, gallstone disease; Ψ , psychological; OCD, obsessive compulsive disorder

Results

What psychological variables are related to the occurrence of both IBS (including associated GI symptoms) and eating pathology?

Early negative parental influences

Early negative parental influences were examined in one study out of the eight reviewed. Emmanuel et al. (2004) found those who had presented to a GI service complaining of GI symptoms, and were subsequently diagnosed with anorexia, were more likely to have experienced early life stress associated with their parents. In more detail, Emmanuel et al. (2004) conducted a mixed retrospective and prospective study in order to characterise the demographic, psychosocial and prognostic features of individuals diagnosed with anorexia after presenting to a GI service (group 1, $n=20$). This group was compared to individuals with anorexia at an eating disorder unit (group 2, $n=20$) and a functional constipation group (group 3, $n=20$). Those with a diagnosis of anorexia had parents who had experienced more mental health and physical health problems than those with functional constipation. This was especially the case for those in group one. Fifty-three per cent of parents in group one and 30% of parents in group two had a history of alcohol misuse, severe mental health problems or FGIDs. This was compared to only 13% in group three. A chi-squared analysis demonstrated that these differences were significant. A chi-squared analysis also revealed that parents of adults with anorexia were more likely to have separated (group 1, 70% and group 2, 65%). In addition, the age of the individual at the time of the parental separation was significantly younger for those in group one (10 years old) compared to the other two groups (16 and 17 years old). These results suggest that unfavourable parental factors are associated with the co-morbidity of GI symptoms and anorexia.

Personality characteristics

Two studies found personality characteristics to be associated to those who had a diagnosis of an eating disorder and a diagnosis of an FGID or GI symptoms. Boyd et al. (2005) conducted an exploratory study to describe FGIDs in eating disorders and investigated the relationships between psychological variables, eating disorder attitudes and behaviours, demographics and FGIDs in a sample of females admitted to an eating disorder unit ($n=108$, AN 44%, BN 22%, EDNOS 34%). Ninety-eight per cent of the sample met criteria for at least one FGID with IBS being the most

frequently reported (52%). Neuroticism predicted comorbidity for three or more FGIDs. It is unclear from the FGIDs studied which three individual FGIDs these were or whether they were a combination of any FGIDs. The R^2 for this model was 19.1% suggesting that the model did not explain a substantial portion of variance in predicting the occurrence of specific FGIDs in those with eating disorders. In the second study, Emmanuel et al. (2004) found that 75% of those who presented to a GI service and were subsequently diagnosed with anorexia had a co-existent mental health problem including personality disorder. Altogether, these findings suggest that those who have neuroticism as a personality trait or personality difficulties are more likely to experience co-occurring GI symptoms and eating disorders.

Unhelpful cognitive processes

Unhelpful cognitive processes were found to be present in those who experienced both IBS/GI symptoms and eating pathology in three studies. One study (Abraham & Kellow, 2011) aimed to examine the relationship between eating disorder quality of life (ED-QOL), IBS quality of life (IBS QOL) and IBS severity, in 160 women admitted to an eating disorder unit (AN 44.4%, BN 18.1%, EDNOS 37.5%). IBS was found to be associated to specific items on the ED-QOL measure. These questions were “preoccupied with thoughts of body weight and shape”; “fear loss of control of body”; “preoccupied with thoughts of food and eating” and “like things to be perfect”, demonstrating a link between these unhelpful cognitions and IBS in those with an eating disorder. In the second study, Lobera et al. (2011) investigated the quality of life of individuals with functional dyspepsia and the psychological process, thought-shape fusion, in three groups: eating disorders ($n=78$), individuals with a psychiatric diagnosis ($n=77$) and students ($n=90$). Thought-shape fusion was measured using the Thought-Shape Fusion Questionnaire (TSF-Q; Shafran & Robinson, 2004). This measures the fusion between thoughts and body shape and body image. It has two sub-scales; a conceptual sub-scale which measures the importance attached to thoughts related to eating and the body, and an interpretative sub-scale, which evaluates how these thoughts are understood by participants. Functional dyspepsia GI symptoms and the total and sub-scale scores for TSF-Q were all positively and significantly associated for all groups. However, these were only maintained for the eating disorder group after state and trait anxiety and depression were controlled for. In this group the

highest correlations were bloating ($r=0.36$, $p<0.01$), a diffuse painful feeling ($r=0.44$, $p<0.01$), nausea ($r=0.24$, $p<0.01$) and total dyspepsia score ($r=0.39$, $p<0.01$). Functional dyspepsia, TSF-Q total, TSF-Q interpretative and conceptual sub-scales and depression predicted poor quality of life in those with an eating disorder.

The third study (Lau & Alsaker, 2001) evaluated whether psychological concerns related to weight and eating concern and the perception of feeling fat predicted dieting behaviour in a sample of 1117 Norwegian adolescents (569 boys and 548 girls). The study was also interested in whether these psychological concerns operated differently in men and women and whether dieters were more at risk of developing an eating disorder. Hierarchical multiple regression revealed that girls and boys who scored highly in weight and eating concern and feeling fat were significantly more likely to diet. A one-way ANOVA revealed that dieting girls who rated themselves as having weight and eating concerns experienced more constipation and binge eating attacks. Constipation discriminated between risk dieters and non-risk dieters. Binge eating attacks were reported significantly higher by risk dieters. The authors argued that these physiological symptoms are associated with low calorie intake and therefore those dieting girls (who have psychological concerns and constipation/binge eating) were at greater risk of developing an eating disorder. None of the boys dieting groups differed on constipation or binge eating. In sum, these studies provide some evidence for an association between unhelpful cognitive processes and GI symptoms in individuals with eating pathology.

Emotional distress

Seven studies of the eight reviewed found emotional distress to be prevalent in those who experienced both eating pathology, IBS and associated GI symptoms. For five of these studies this was depression and anxiety. Boyd et al. (2005) found anxiety to predict IBS in females with an eating disorder. In a subsequent study, Boyd et al. (2010) sought to evaluate the relationship between the appearance and disappearance of FGIDs and changes in BMI, ED behaviours and psychological variables between two time points: being admitted to an eating disorder unit and 12 months later ($n=73$). Although FGIDs slightly improved and BMI, eating behaviours, depression and anxiety significantly improved, FGIDs were still common after 12 months. The study does not attribute any reason as to why these variables improved as the study was interested in whether these variables were

associated with the turnover of FGIDs from admission to 12 months follow up. No relationship was found between the turnover of FGIDs and psychological factors in this study. Porcelli et al. (1998) investigated the presence of lifetime eating disorder and emotional distress in 127 individuals referred to an FGID outpatient department. This group was compared to a control group of 163 individuals with gallstone disease. Prevalence of eating disorder, in FGIDs was 20 out of 127 (15.7%). Between group analyses revealed that FGID patients were significantly more emotionally distressed than gallstone patients. Those with a lifetime presence of eating disorder in the FGID sample were more likely to be female and to be affected by anxiety and depression. Lobera et al. (2011) found depression and unhelpful cognitive processes to be a predictor of poor quality of life related to functional dyspepsia in those with an eating disorder. Abraham and Kellow (2011) found IBS to be associated with poor quality of life, in particular with feeling emotionally distressed and unable to cope. Using partial correlations, IBS was the strongest associated FGID with QOL-ED global scores and was the only FGID score to be correlated to all sub scales including 'psychological feelings'. Specifically, IBS was related to the following items on the ED-QOL measure 'feeling confused' and 'feeling sad and less able to cope'. Emmanuel et al. (2004) found that 75% of those who had been classified as having anorexia following presentation at a GI service had a co-existent mental health problem, typically depression. This was compared to 35% in the anorexic group.

In relation to disordered eating and emotional distress, Quick et al. (2012) comprehensively investigated whether psychological factors (reported to be linked to disturbed eating behaviours in healthy young adults) differed in those with and without diet-related chronic health conditions (DRCHC). These included type 1 diabetes, coeliac disease, cystic fibrosis, inflammatory bowel diseases and IBS. Those with a DRCHC were matched with a university group on age, gender and BMI. Those with DRCHC were twice as likely to have been diagnosed with an eating disorder and to be experiencing depression and anxiety. In summary, these studies demonstrate a link between emotional distress, IBS, GI symptoms (associated with IBS), eating disorders and disordered eating.

Somatisation

Two out of the eight studies reviewed examined somatisation as a predictor of co-morbid eating disorders and IBS. Boyd et al. (2005) found somatisation to predict IBS in those with an eating

disorder. Along with anxiety this model explained 18 % of variance. This suggests that the model does not account for a significant amount of variance in terms of the association between IBS and eating disorders. In a subsequent study, somatisation improved 12 months after admission to an eating disorder unit despite little improvement in FGIDs (Boyd et al., 2010). Although a modest contributing factor, it is likely that somatisation alone does not account for the co-occurrence of IBS and eating disorders.

Methodological quality of included studies (Table 1.3)

The quality assessment was used as a guide to the methodological quality of the included studies. The aim was not to compare the studies in terms of ratings per se due to their heterogeneity (different aims, populations and variables) or to exclude studies. No studies were excluded based on the quality assessment. The included papers were quality assessed by the author and ratings were discussed with the fourth author³. Methodological limitations are considered in the following areas; setting, participants, study size, measurement and statistical methods.

Overall, the methodological quality of the reviewed studies was strong. All studies met quality criteria in relation to the location of the study, data collection period, how participants were selected, sample size, description of inclusion and exclusion criteria, control of confounding variables, description of the purpose of the statistical methods chosen, description of the statistical methods and the appropriate use of statistical methods for the aims of the study.

Although meeting quality criteria there are some methodological points worthy of note. Some studies were clearer on exclusion criteria and processes than others. Boyd et al. (2010) gave detail of those who were excluded but did not clarify what was considered a major medical or mental illness, an exclusion criterion for participation in the study. Lobera, Santed, & Rios (2011) proposed ruling out the current presence or history of an eating disorder or psychiatric disorder in a student sample but did not give detail on how this was done nor did the study discuss whether comorbidity was considered in the outpatient groups. This lack of clarity on the application of exclusion criteria makes these studies difficult to replicate.

³ The fourth author refers to one of the supervisors (WS).

All studies met statistical method criteria; however, some were limited in the extent of their analyses and perhaps could have further explored the data (e.g. Boyd et al., 2010; Boyd et al. 2005; Porcelli et al., 1998). In the study conducted by Boyd et al. (2010) the data analysis was confusing. It was difficult to follow the ANOVAs as information regarding these was limited. Also, psychological variables were not included in the analysis description, although they were included as an aim of the study. In Boyd et al. (2005) the statistical analysis was limited. This was an exploratory study but further analyses could have begun to explain some of the relationships found.

The areas in which all studies did not meet quality criteria were; a) the description of the measures lacked sufficient detail and b) appropriate discussion of the reliability and validity of measures used. Three studies (Abraham & Kellow, 2011; Boyd et al., 2010; Boyd et al., 2005) did not describe all the measures used. Sub-scales from these measures were used in isolation without any discussion around the validity or reliability of the sub-scale when used in this manner. Furthermore, Boyd et al. (2010), Boyd et al. (2005) and Porcelli et al. (1998) did not report the validity and reliability of all the measures used. Lau and Alsaker (2001) designed two scales specifically for the study, which were administered and then collapsed for analysis without the assessment of reliability or validity. These scales aimed to measure whether participants felt fat in comparison to others and their current dieting status. It is difficult to determine whether these questions were valid measurements of these variables. One study (Emmanuel, Stern, Treasure, Forbes, & Kamm, 2004) did not administer measures and collected information from diagnostic interviews, case notes and a service database. No inter-rater reliability evaluation was conducted. The results from these studies should be interpreted with caution due to the lack of description of measures used and reporting of reliability and validity.

Outside of the quality assessment, six out of the eight studies samples were predominantly women samples, with three studies having only women participants (Abraham & Kellow, 2011; Boyd et al., 2010; Boyd et al., 2005). One study (Quick et al., 2012) did not report gender. Seven studies were cross-sectional and one was a case-control study.

Table 1.3

Quality assessment of the included studies

Study	Study design	Setting	P selection	Inc/Exc criteria	Study size	Measure of IV/DV described	Measure of IV/DV appropriate	Controlling confounding	Statistical analysis described	Statistical analysis appropriate
Abraham & Kellow (2011)	CS	✓	✓	✓	✓	X	✓	✓	✓	✓
Lobera et al. (2011)	CS	✓	✓	✓	✓	✓	✓	✓	✓	✓
Boyd et al. (2010)	CS	✓	✓	✓	✓	X	X	✓	✓	✓
Boyd et al. (2005)	CS	✓	✓	✓	✓	X	X	✓	✓	✓
Emmanuel et al. (2004)	CS	✓	✓	✓	✓	✓	X	✓	✓	✓
Lau & Alsaker (2001)	CS	✓	✓	✓	✓	✓	X	✓	✓	✓
Porcelli et al. (1998)	CS	✓	✓	✓	✓	✓	X	✓	✓	✓
Quick et al. (2012)	CC	✓	✓	✓	✓	✓	✓	✓	✓	✓

Note. Please refer to table 1 when interpreting this table. Abbreviations; P, participant; Inc, inclusion; Exc, exclusion; CS, cross-sectional; CC, case-control. Key; ✓ met quality criteria; X, did not meet quality criteria; IV, independent variable; DV, dependent variable.

Table 1.4

Aims and results of included studies

Study	Study aims relevant to review question	Key findings relevant to aims of review
Abraham & Kellow (2011)	To explore the relationship between the QOL in ED individuals and FGIDs	IBS significantly correlated to ED QOL items; "preoccupied with thoughts of food and eating", "preoccupied with thoughts of body weight and shape", "fear of loss of control over body/eating/feelings" and "feeling confused/sad and less able to cope".
Lobera et al. (2011)	To study the quality of life and psychological features which underlie FD in those with an ED, psychiatric diagnosis and students.	In ED patients total FD score, abdominal bloating, abdominal pain and nausea were correlated with TSF-Q, controlling for anxiety and depression. Depression and TSF were predictors of poor QOL in those with FD and ED.
Boyd et al. (2010)	To evaluate the relationship between the appearance and disappearance of FGIDs and changes in ED behaviours and psychological variables after 12 months.	Depression, anxiety and somatization improved at 12 month follow up in those with an FGID and ED.
Boyd et al. (2005)	To investigate the relationship between psychological features, ED attitudes and behaviours, FGIDs and the number of FGIDs present.	Somatization and anxiety predicted IBS and neuroticism predicted 3 or more coexistent FGIDs in those with an ED.
Emmanuel et al. (2004)	To characterise the psychological features of patients with AN presenting to a GE service (GI&AN group) and patients with AN presenting to an ED unit compared to those with FC.	GI&AN group and AN group had parental history of alcohol misuse, mental health, FGID and parental separation. AN&GI group were significantly younger when parents separated. AN&GI group were associated with a diagnosis of personality disorder and depression.
Lau & Alsaker (2001)	To examine the importance of feeling fat and concerns about weight and eating as predictors of dieting behaviour and to find a group of dieters who were at risk of developing an ED.	Feeling fat and weight and eating concerns predicted constipation and binge eating. Constipation and binge eating heightened ED risk.
Porcelli et al. (1998)	To investigate the presence of lifetime ED in patients referred for FGID.	FGID patients with a past ED were found to have higher levels of anxiety and depression
Quick et al. (2012)	To investigate whether psychological characteristics reported to be linked to problem eating behaviours in healthy young adults differ in presence and severity in those with DRCHCs.	DRCHC predicted depression and anxiety. Those with DRCHCs were twice as likely to have been diagnosed with an ED.

Note. Key: ED, eating disorder; FGIDs, functional gastrointestinal disorder; QOL, quality of life; IBS, irritable bowel syndrome; AN, anorexia nervosa; GE, gastroenterology; GI, gastrointestinal; FC, functional constipation; TSF-Q, thought-shape fusion questionnaire; FD, functional dyspepsia; DRCHC, diet-related health condition

Discussion

IBS (as a diagnostic category), GI symptoms (associated with IBS), eating disorders and disordered eating (together termed “eating pathology”) have been found to co-occur (Ogg et al., 1997; Boyd et al., 2010; Porcelli et al., 1998; Quick et al., 2012). Both have a high prevalence in women, both have common developmental and maintaining risk factors and both have limitations with regards to diagnosis. Given these commonalities, the present systematic review aimed to discover which psychological factors were linked to the occurrence of both IBS (including its associated GI symptoms) and eating pathology. Eight observational studies investigating this co-occurrence were systematically reviewed for psychological factors. The studies were quality assessed according to inclusion and exclusion criteria, setting, participants, measurement and statistical analysis. No studies were excluded according to their assessed quality. In the eight studies that examined psychological variables, early negative parental influences, personality characteristics, unhelpful cognitive processes and emotional distress were found to be associated with the experience of IBS, its associated GI symptoms and eating pathology.

Methodological limitations of reviewed studies

The overall methodological quality of the reviewed studies was good. All eight studies met criteria for giving the location of the study, the data collection period, how participants were selected, sample size and the description of inclusion and exclusion criteria. Also, all studies were deemed to have selected appropriate statistical methods and to have described the purpose of the chosen statistical methods. One study (Boyd et al., 2010) failed to describe how the study controlled for confounding variables. Three studies (Abraham & Kellow, 2011; Boyd et al., 2005; Boyd et al., 2010) did not give sufficient detail for the measures that were used and five studies (Boyd et al., 2005; Boyd et al., 2010; Emmanuel et al. 2004; Lau & Alsaker, 2001; Porcelli et al., 1998) did not give clear information regarding the reliability and validity of the measures used.

Although the methods of the studies were good there were a number of methodological limitations that need to be considered alongside the findings from this systematic review. Boyd et al. (2010) and Lobera et al. (2011) were unclear regarding the exclusion criteria used. This lack of clarity on the application of exclusion criteria makes these studies difficult to replicate and the lack of detail

(on whether the same exclusion criteria were considered for control groups) may make interpretation difficult due to potential confounding variables. Although the majority of the studies used well-validated measures it was left for the reader to seek details out elsewhere. For five studies the reliability and validity of the measures were not reported and some made amendments to the subscales or designed measures used without reporting internal consistency (Boyd et al., 2005; Boyd et al., 2010; Porcelli et al., 1998; Abraham & Kellow, 2011; Lau & Alasker, 2001). For example, in one study there was no indication of the inter-rater reliability for the diagnosis and extraction of data (Emmanuel et al., 2004). In six out of eight of the studies, the sample was predominantly female, which runs the risk of reduced generalizability of the findings. The majority of studies were cross-sectional. It is difficult to determine from cross-sectional studies cause and effect therefore causality cannot be assumed.

Psychological factors

Early negative parental influences (e.g. a parent with mental health issues, alcohol misuse, and parental separation) were found to be associated with presenting at a GI service and successively being diagnosed with anorexia in one study. This group was in comparison to those with anorexia in an eating disorder unit and a functional constipation group (Emmanuel et al., 2004). Specifically, the age in which parents separated was significantly younger in the GI anorexia group. Negative parental influences are known to be experienced by those with an eating disorder (Polivy & Herman, 2002). Conversely, there is little research into the negative parental factors associated with the development of IBS or GI symptoms (associated to IBS) making Emmanuel's study (2004) significant.

It may be that those individuals who had a parent with mental health difficulties or alcohol issues had a stressful and disrupted early life. Research has found that due to the experience of mental health and adversity, parents may become preoccupied and less able to respond sensitively and care for their child (Gopfert, Webster & Seeman, 2004). This has been suggested to have an impact on attachment formation (Manning & Gregoire, 2009) and resulting in an insecure attachment (Bowlby, 1988). Insecure attachment has been associated with the later development of psychological and physical difficulties (Beardslee, Versage, & Gladstone, 1998). As a result of feeling insecure within relationships and the environment, these children may have employed strategies such as increased

focus, vigilance and preoccupation in order to feel secure and safe within their environment. This early increased attention may be associated with the development of psychological and physical difficulties such as eating pathology or GI symptoms in later life. Attachment insecurity has been correlated with all eating disorders (Abbate-Daga et al., 2010), chronic illness (McWilliams & Bailey, 2010) and medically unexplained symptoms (Taylor, Mann, White, & Goldberg, 2000). Although IBS is classified as a chronic illness, there is no research which explores the relationship between attachment and IBS. A finding consistent with the potential influence of attachment insecurity on the development of eating pathology, IBS and GI symptom is that those in the GI anorexia group were younger when their parents separated. Research from longitudinal studies has found that children who were younger at the time of the separation had a less secure attachment (Woodward, Fergusson & Belsky, 2000). This suggests that the timing of parental separation impacts on attachment formation.

Another possible explanation as to why those who experience early stress associated with their parents, and then GI symptoms and eating pathology, is that they may have learnt to focus on the somatic aspects of their distress rather than the cognitive-affective components of distress. This has been defined as Alexithymia, representing an inability to name, describe and label emotions (Lundh & Simonsson-Sarnecki, 2001). Research has found a link between stressful events and somatic complaints. For example, Walker, Garber and Greene (1994) found higher level of negative life events predicted higher levels of somatic complaints, including abdominal pain. This study also found that the participants had parents with high levels of somatic complaints suggesting that this expression of distress may have been modelled by parents. Supporting this assumption, Emmanuel et al. (2004) found that parents of those in the GI anorexia group were more likely to have had an FGID. This study did not mention whether parental eating pathology was examined. A recent study (Buonavolonta et al., 2010) revealed that parents of children with FGIDs had a higher prevalence of FGIDs themselves compared to parents of children without FGIDs. Altogether, these findings indicate that parental FGIDS are associated to an individual's GI symptoms and eating pathology.

Another psychological factor identified in those who experience both GI symptoms and eating disorders was the personality trait, neuroticism. Boyd et al., (2005) discovered that neuroticism predicted the co-occurrence of three or more FGIDs in those with anorexia, bulimia and EDNOS. As

neuroticism is linked to prolonged stress and anxiety, (Grant, 2011), eating disorders and IBS may potentially be an individual's response to chronic stress. Neuroticism has been consistently reported to be present in those with IBS (Levy, Olden, Nailboff et al, 2006; Zarpour & Ali Besharat, 2011) and when combined with introversion has been related to greater disordered eating (Miller et al., 2006). Bennett, Tennant, Piesse, Badcock, & Kellow (1998) showed that neuroticism is linked to greater symptom severity in both populations. Emmanuel et al. (2004) found that those who presented at a GI service and were diagnosed with anorexia were more likely to have a diagnosis of personality disorder than those with anorexia in an eating disorder unit. There is a body of research which indicates that personality disorders are extreme variants of the five-factor model of personality traits (McCrae & Costa, 2003) which includes neuroticism (Widiger, 2013). These findings suggest that neuroticism is associated with higher symptom severity in both FGIDs and eating disorders and that this severity may make them more likely to co-occur.

Unhelpful cognitive processes such as attentional, interpretation and appraisal/reasoning processes were common psychological factors in the studies reviewed. More specifically, these were self-focused attention, hypervigilance, rumination and catastrophic misinterpretations of bodily changes, shape and eating, elevated threat and thought-shape fusion. These findings were discovered in eating disorder samples receiving either inpatient or outpatient treatment (Abraham & Kellow, 2011; Lobera et al., 2011) and in dieters at high school (Lau & Alsaker, 2001). All samples were experiencing either IBS, functional dyspepsia and constipation. For the high school population, the study found associations between dieting, constipation and unhelpful cognitive processes about eating, weight and shape. The authors proposed that these individuals were at risk of developing an eating disorder. Developmental pathways are unclear. Considering the cognitive processes discovered in this review, one suggestion is that those who were constipated and concerned with their weight may interpret the sensations that come with constipation as fullness, fatness and heaviness. This is opposite to the experience of diarrhea which has been linked with feeling slim (Lu, Chen, Chen, & Ou, 2009) and one can postulate that this is associated with the feeling of having an empty and flat stomach. It is feasible that these interpretations of feeling fat and full maintain the concern about weight and shape and further increase dieting behaviour which, based on the body dissatisfaction and eating disorder

literature, may result in an eating disorder. Body dissatisfaction has been found to be associated with dietary restraint (Dunkley, Wertheim, & Paxton, 2001). Elevated dietary restraint has been found to increase the risk for onset of any eating disorder (Fairburn, Cooper, Doll, & Davies, 2005). Those with high body dissatisfaction are four times more likely to develop an eating disorder (Stice, Marti, & Durant, 2011).

Abraham & Kellow, (2011) and Lobera et al., (2011) found cognitive processes such as hypervigilance, catastrophic misinterpretations of bodily changes, elevated threat and thought-shape fusion to be present in those who experienced both GI symptoms and eating disorders. Based on these findings, it is possible that these identified unhelpful cognitive processes may play a role in the maintenance of an existing eating disorder when GI symptoms are experienced. It is hypothesised that this may happen as a consequence of the person focusing on their GI symptoms, attaching importance to thoughts about these symptoms and catastrophically misinterpreting the impact of the GI symptoms. This may further encourage them to engage in disordered eating behaviours to manage the GI symptoms.

Another common psychological factor reported by those who have both IBS, associated GI symptoms and eating pathology was emotional distress. This was present in seven out of the eight studies reviewed. Six of these studies were with clinical populations including those with an eating disorder in an inpatient setting (Abraham & Kellow, 2011; Boyd et al., 2010; Boyd et al., 2005); outpatient setting (Lobera et al., 2011) and those in a gastroenterology service with either a current (Emmanuel et al., 2004) or past eating disorder (Porcelli et al., 1998). One study was a university population matched to individuals with a diet-related chronic health condition (DRCHC) including IBS. For most studies, the emotional distress experienced was either depression or anxiety. For one study (Abraham & Kellow, 2011) emotional distress was determined using an eating disorder quality of life measure where feeling sad and confused were disclosed. Current emotional distress is common in both IBS and eating disorders so this is not a surprising finding (Garakani et al., 2003; Gros et al., 2009; Fairburn & Harrison, 2003). Many conclusions can be drawn from this. It may be that emotional distress increases in those who have an existing eating disorder and subsequently develop IBS. The distress associated with IBS may then encourage them to further engage in eating disordered

behaviours to manage the distress. Alternatively, those who experience GI symptoms and become emotionally distressed about these GI symptoms may engage in disordered eating to manage their distress and GI symptoms. It is possible to see how the identified unhelpful cognitive processes in the previous section are associated with emotional distress in those with IBS, GI symptoms associated with IBS and eating pathology. It is also feasible to see how individuals then go on to engage in behaviours such as disordered eating to alleviate this distress.

Emotional distress may also be demonstrated through somatic physical symptoms such as IBS, GI symptoms associated with IBS and eating pathology. In Boyd et al. (2005, 2010) somatisation was found to predict IBS in those with an eating disorder. This finding may be deceiving. There is a wealth of literature linking IBS to somatisation including IBS being labelled a somatoform disorder or medically unexplained (Miller et al., 2001; Riedl et al., 2008). In comparison, there is little research which suggests that somatisation is associated with eating disorders. Due to this, the review concludes that the finding that somatisation predicts IBS in eating disorders is related solely to the IBS and not the eating disorder. More research needs to be carried out with regards to the association between somatisation and eating disorder for clarification on how somatisation might account for the co-occurrence of IBS and eating disorders.

Considering the findings it is appropriate to conclude that psychological factors are associated with the co-occurrence of IBS, its GI symptoms and eating pathology. Conclusions concerning causation cannot however be made. Does IBS and its GI symptoms cause eating pathology? Does eating pathology cause IBS and its GI symptoms? Or is there a third process? Considering whether IBS causes eating pathology, it has been argued that IBS and GI symptoms are a common reason for self-starvation (Lee, Ho & Hsu, 1993). Individuals with an eating disorder have been found to consult their GP with gastrointestinal complaints for a five year period before diagnosis (Ogg et al, 1997). In a non-clinical population, severity of dieting was found to be positively associated with the frequency of bloating and constipation (Krahn et al., 1996). It is possible that these bodily sensations may cause sufferers to engage in disordered eating behaviours to manage GI symptoms. It is also possible that these sensations are a result of disordered eating. This review has found a number of psychological factors that could be investigated in order to further understand the nature of this relationship.

Considering the relationship the other way round, there is more evidence to suggest that eating disorders increase the risk of developing IBS. Perkins et al. (2005) found that IBS in those with an eating disorder developed on average 10 years after onset of the eating disorder. Altered GI physiology has been associated with disordered eating and is a possible explanation for the development of IBS after the onset of an eating disorder. However, the exact pathophysiological mechanisms still remain unclear. Zipfel et al., (2006) examined a number of studies (with relatively small sample sizes) which investigated the physiological reasons for the presence of GI symptoms in those with anorexia and bulimia. In those with anorexia, delayed gastric emptying and constipation were found to be common. These GI symptoms were considered to be worse for those who restricted and vomited. Suggested possible physiological reasons were gastric dilation or perforation, distorted esophageal motility (Stacher et al., 1986) and gastric antral dysrhythmias (Ravelli et al., 1993). However, the review stated that it still remained unclear whether GI symptoms were a result of restricting or vomiting, a manifestation of the eating disorder or a cause of the eating disorder.

Cremonini et al. (2009) sought to discover whether GI symptoms were associated with binge eating. They found that those who binged experienced more GI symptoms, independent of their BMI. The authors hypothesised that receiving a large amount of food in the stomach may surpass the gastric capacity and trigger gastric reflex adaptive relaxation (Tack, Piessevaux, Coulie, Caenepeel & Janssens, 1998). This has been proposed to cause higher wall tension (Tack, Caenepeel, Corsetti & Janssens, 2004) which can give the perception of bloating and abdominal pain. Bloating and fullness (which are generally associated with FGID's such as IBS) have also been found to be common symptoms of eating disorders (Hadley & Walsh, 2003). They have also been found to be the same as the GI symptoms experienced by those without an eating disorder (Abraham & Kellow, 2013). Again, these findings highlight the difficulties associated with determining whether IBS and GI symptoms cause eating pathology or whether eating pathology causes IBS and GI symptoms. These findings also highlight that the physiological mechanisms involved remain unclear.

Questions concerning causation are further challenged when psychological factors are considered. Those who experience disordered eating commonly experience other mental health difficulties (Lewinsohn, Hops, Roberts & Seeley, 1993). Depression and anxiety have been found to

occur before or at the same time as IBS and GI symptoms (Walker, Roy-Byrne & Katon, 1990).

Binge eating has been associated with depression and anxiety and this combination has been found to attenuate GI symptoms (Cremonini et al., 2009). It is possible that altered GI physiology together with psychological disturbances increase vulnerability to developing IBS and associated GI symptoms in those with an eating disorder.

The present review did not set out to determine whether IBS and GI symptoms caused disordered eating or vice versa. The focus was on the role and contribution of psychological factors in this complex relationship.

In conclusion, the co-occurrence of eating pathology, IBS and associated GI symptoms is complex and it is not possible to determine causality. What is most likely is that this co-morbid relationship is a result of biological, psychological and social factors. It is clear that there are a number of psychological factors that play a part in the co-occurrence of eating pathology and IBS/GI symptoms. It is important to explore these further in order to better help those who experience this comorbid relationship.

Clinical implications

The clinical implications of this review relate to how the findings can be used to help identify, understand and intervene when an individual presents with a combination of IBS and/or associated GI symptoms and eating pathology (eating disorder or disordered eating). It is hoped the findings will help to contribute to;

1. Engagement, assessment and formulation.
2. Treatment.
3. Creating an awareness of this co-occurring relationship amongst professionals such as general practitioners, gastroenterologists, clinical psychologists and psychiatric staff.

In terms of engaging those with existing eating pathology, acknowledging the experience of GI symptoms and associated cognitions and distress may improve the treatment of the eating disorder and the individual's treatment experience. First, acknowledging the GI symptoms (for those experiencing them) could be validating and may aid engagement in an otherwise difficult to engage

clinical group. It is quite possible that IBS and its associated GI symptoms may have served as a barrier to change in the treatment of eating pathology. This review has provided evidence that IBS and GI symptoms have common psychological factors that have been hypothesised to further encourage disordered eating behaviours. If not recognised, these processes may become enduring and prevent or limit the effectiveness of treatment for eating pathology and therefore an individual's recovery. This point highlights the importance for a comprehensive assessment. Questions about IBS and its associated GI symptoms, unhelpful cognitive processes and emotional distress should be included in assessments for those presenting with eating pathology. The clinician could also further explore these difficulties through asking the individual to keep diaries of GI symptoms and associated thoughts, behaviours and emotions. These findings could be incorporated into the individual's formulation for a more thorough understanding of the eating pathology for that individual. Importantly, if it were the case that some individuals' GI symptoms were linked to disordered eating through the identified psychological factors, screening for these would potentially identify targets for intervention. In terms of treatment, a process focused approach is suggested (Harvey et al., 2008). In this context 'process' is defined as an aspect of cognition (e.g. attention, memory, thought, reasoning) or behaviour (e.g. overt or subtle avoidance) that may contribute to the maintenance of a psychological disorder (Mansell, Harvey, Watkins, & Shafran, 2008, p. 182). The psychological factors indicated to be associated with comorbidity of IBS and eating pathology could be targeted in interventions. However, instead of focusing on the disordered eating per se, the clinician (informed by assessment and formulation and in collaboration with the individual) may choose to focus on; attentional processes, such as self-focused attention or hypervigilance; thought processes, such as rumination; emotional distress, such as low mood or anxiety or behavioural processes, such as avoidance. It is postulated that understanding and treating eating pathology using a process focused approach could increase the effectiveness of treatment in those experiencing GI symptoms. This hypothesis is consistent with the success of Fairburn et al. (2003) transdiagnostic model of eating disorders and other disorders such as anxiety (McManus, Shafran, & Cooper, 2010)

Those who work with people affected by both IBS and eating pathology should be cognisant of the common psychological factors. In terms of prevention, gastroenterologists could be asking

questions about disturbed eating attitudes and behaviours in those seeking consultation about GI symptoms or receiving a diagnosis of IBS. Likewise, those who come to the GP regarding their weight, shape and eating concerns could be asked questions about their experience of GI symptoms and how this impacts on their weight, shape and eating concerns and eating behaviours. It is possible that these conversations could help to identify those individuals at risk of developing an eating disorder and prevent this. It would also highlight those individuals who need additional support around their GI symptoms and eating pathology to prevent an increase of severity or maintenance of their eating disorder. This awareness amongst professionals is also important in secondary and tertiary care. Gastroenterologists, clinical psychologists and psychiatric staff maybe more successful at engaging, understanding and treating IBS and its associated GI symptoms, eating pathology and their common psychological factors if these are recognised with the individual. This will be validating for the client, help to develop an effective treatment plan and also may help in preventing an eating disorder.

Limitations

There are a number of limitations with this review. First, even though the search strategy was carefully developed it is possible that relevant studies were not included. For example, unpublished studies which may be biased to non-significant results. Second, the findings may be too restrictive as the focus was IBS and its associated GI symptoms. Restricting the search of this review to IBS may have excluded other psychological factors associated to other FGIDs. Nevertheless, FGIDs share many of the same GI symptoms and these were accounted for in the study. Third, this review did not explicitly look at the identified psychological factors in relation to the different eating disorder categories (anorexia, bulimia and EDNOS). However, these were not consistently specified throughout each study. Fourth, only eight studies were identified and they do not all examine each of the psychological factors found. A general limitation of this review is that there was only a focus on psychological factors.

Future research

This new and alternative understanding of the co-experience of IBS, its associated GI symptoms and eating pathology provides a framework for future research. The studies reviewed

should be replicated with larger samples and designs which address the methodological limitations in clinical and non-clinical populations (those with a diagnosis of IBS, those with GI symptoms, those with an eating disorder and those with disordered eating). It is important to examine non-clinical populations as the prevalence of both IBS and associated GI symptoms and eating pathology in the community are high. Investigating non-clinical populations will also capture the psychological factors involved for those at risk of developing eating disorders. The results of these studies could inform key preventative strategies and interventions. There is also a need for longer term follow-up studies on cohorts of people in the early stages of IBS and eating disorders which explore the associated psychological factors. These investigations could help to determine the validity and reliability of the psychological factors found to be present in the experience of IBS, GI symptoms (associated with IBS) and eating pathology. Second, other psychological factors should be tested for potential relationships. The current review is only based on eight studies. Potential psychological factors should be drawn from the existing eating pathology and FGID literature (as briefly reviewed in the introduction) as well psychological factors that have not been well researched. Examples include other early experiences, such as CSA, loss and other maintenance factors, such as experiential or behavioural avoidance. These should be examined in exploratory study designs and rigorous designed studies such as longitudinal prospective studies in clinical and non-clinical population.

Future research should aim to test the relationships identified in this review in both clinical populations and non-clinical populations. Further investigations should take a biopsychosocial approach and review the biological and environmental factors present in the co-occurrence of IBS, associated GI symptoms and eating pathology.

Conclusion

The reviewed research literature confirms that IBS, its associated GI symptoms, eating disorders and disordered eating co-occur. The current systematic review aimed to discover what psychological variables are related to the occurrence of both eating pathology (eating disorders and disordered eating) and IBS (including GI symptoms associated with IBS). The eight studies reviewed were deemed to be methodologically sound. Early negative parental influences, neuroticism,

unhelpful cognitive processes and emotional distress were found to be associated with the co-occurrence of IBS and/or associated GI symptoms and eating pathology (disordered eating and eating disorders). Due to the cross-sectional correlational designs of the studies reviewed it is difficult to determine the full influence of these psychological factors. Future research should address the methodological limitations highlighted in this review. These findings may have important clinical implications for the treatment of eating disorders.

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Chapter 2: Empirical paper

Irritable bowel symptoms and disordered eating: the role of IBS-related cognitions, adult attachment and distress.

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CHAPTER 2: EMPIRICAL PAPER

Abstract

Irritable bowel syndrome (IBS) and eating disorders are associated. IBS and disordered eating combined may be a risk factor for developing an eating disorder. The purpose of this study was to further understand this overlap including relevant psychological factors. The relationships between IBS symptoms, attachment anxiety, attachment avoidance, IBS-related cognitions, anxiety, depression and disordered eating in three community samples (406 university staff and students; 109 users of an eating disorder charity; and 41 users of an IBS charity) were evaluated. Key findings were; IBS symptoms were positively correlated with disordered eating in the university and disordered eating groups. Attachment anxiety was positively correlated with IBS symptoms, IBS-related cognitions and disordered eating in the university group. In all three groups, IBS symptoms were positively correlated to IBS-related cognitions. IBS-related cognitions were positively correlated to anxiety and depression in the university group and disordered eating group. Anxiety and depression were positively correlated with disordered eating and IBS symptoms in the university group and disordered eating group. IBS symptoms, attachment anxiety and depression predicted disordered eating in the university group. The IBS symptom group was the smallest; therefore the correlational analyses were underpowered and difficult to interpret. Clinical and research implications are discussed. Limitations of the study are considered.

Keywords: Irritable bowel symptoms, disordered eating, eating disorders, attachment insecurity, IBS-related cognitions, emotional distress

Introduction

Irritable bowel syndrome (IBS) is the most common of the functional gastrointestinal disorders (FGIDs) and is characterised by constipation and diarrhea usually associated with abdominal pain and bloating (Agrawal & Whorwell, 2005). Diagnosis is based entirely on functional symptoms and is not straightforward (Spiegel, Farid, Esrailian, Talley, & Chang, 2010; Foxx, 2006). Similarly, individuals with disordered eating present with fluctuating idiosyncratic patterns of symptoms and behaviour related to eating, shape and weight, making specific diagnoses difficult (Fairburn, 2008; Milos, Spindler, Schnyder, & Fairburn, 2005). Furthermore, eating behaviours, such as dieting do not meet criteria for an eating disorder (Becker, Eddy, & Perloe, 2009) but can develop into ‘disordered eating’⁴ (Hay, Fairburn, & Doll, 1996; Fayet, Petocz, & Samman, 2012). This means that many individuals with disordered eating may have been excluded from clinical and research populations.

Up to 52% of individuals with eating disorders may be affected by IBS (Boyd, Abraham, & Kellow, 2005). The relationship between IBS, its gastrointestinal (GI) symptoms, eating disorders and disordered eating is complex. The occurrence of GI symptoms before diagnosis of an eating disorder has been reported by participants (Ogg, Millar, Puszati, & Thom, 1997; Winstead & Willard, 2006) and FGIDs have been found to persist following the recovery of an eating disorder (Porcelli, Leandro, & De Carne, 1998; Perkins, Keville, Schmidt, & Chalder, 2005; Boyd, Abraham, & Kellow, 2010). Psychological factors appear to play a role here. A recent systematic review (Chapter 1) found that early negative parental influences, unhelpful cognitive processes, depression and anxiety to be related to both IBS symptoms and eating pathology when studied together.

The terms ‘IBS symptoms’ (includes both a diagnosis of IBS and GI symptoms associated with IBS) and ‘disordered eating’ (includes both a diagnosis of an eating disorder and disordered eating) will be used throughout.

⁴ disordered eating refers to a range of problem eating attitudes and behaviours along a continuum ranging in severity; Shisslak, Crago, & Estes, 1995; Stice, Killen, Hayward, & Taylor, 1998)

Interventions based on cognitive behavioural principles have been found to be effective in the management and treatment of eating disorders (National Institute of Health and Care Excellence [NICE], 2004) and IBS (Mahvi-Shirazi, Fathi-Ashtian, Rasoolzade-Tabatabaei, & Amini, 2012). However, less than half of those with bulimia who complete cognitive behavioural therapy (CBT) make a full recovery (Wilson, Grilo, & Vitousek, 2007). Model specific treatments have been criticised for having a narrow focus and for not accounting for those individuals who experience multiple difficulties. Rarely, do individuals present with a ‘pure disorder.’ Due to comorbidity exclusion criteria in randomised control trials, model specific psychological treatment may not be generalisable (Hotopf, 2002). The newer, enhanced CBT (CBT-E) (Fairburn, 2008) has shown to be more effective and is based on a transdiagnostic understanding of eating disorders (Fairburn, Cooper, & Doll, 2009). Fairburn, Cooper, and Shafran (2003) attribute this improvement in effectiveness to targeting common psychological processes involved in the maintenance of all eating disorders. It can be seen from Chapter One that certain psychological factors and processes occur in both IBS and disordered eating.

Based on the findings in Chapter One, the present study focused on attachment insecurity, IBS-related cognitions and emotional distress. The present study was interested in understanding how these common psychological factors may be related to 1) disordered eating in those experiencing primarily IBS symptoms and 2) IBS symptoms in those primarily affected by eating problems. Chapter One concluded that early negative parental influences may affect the development of a secure attachment. Based on evidence which suggests that attachment insecurity is associated with eating disorders and physical health problems (Abbate-Daga, Gramaglia, Amianto, Marzola, & Fassino, 2010; Puig, Englund, Simpson, & Collins, 2013), it is feasible that attachment insecurity may be a common psychological factor in the overlap between IBS symptoms and disordered eating.

Attachment insecurity

The early caregiver-infant relationship is central to the development of coping when faced with stress (Bowlby, 1988). Infants whose caregivers respond consistently and sensitively to their needs develop a secure attachment and internal working model of their self and others. In contrast, infants whose caregivers are inconsistent and unresponsive develop an insecure internal working

model of self and others (Ainsworth, Blehar, Waters, & Wall, 1978; Brennan et al., 1998). In attachment theory, a key developmental hypothesis is that early caregiver-infant relationships are templates for adult attachments (Crowell & Treboux, 1995). These “templates” or internal working models are hypothesised to continue into adulthood and reflect adult attachment. For example, Waters, Crowell, Treboux, Merrick & Albersheim (2000) assessed the relationship between attachment security in infants and 20 years later, via the Adult Attachment Interview (George, Kaplan & Main, 1985). For both attachment security and attachment insecurity there was a 70% correspondence between infant and adult reports. This finding is supported by a review of attachment measures. This review found, from a range of different adult attachment measure studies, an association between infant attachment/infant parenting experiences and adult attachment (Crowell & Treboux, 1995).

Adult attachment has been conceptualised into two continuous dimensions of attachment anxiety and attachment avoidance (Brennan, Clark, & Shaver, 1998; Fraley & Waller, 1998). Those who are securely attached have effective coping abilities. In contrast, attachment anxiety and attachment avoidance have been associated with ineffective coping skills (Bowlby, 1988).

As mentioned, attachment insecurity is associated with all eating disorders (Abbate-Daga et al., 2010). There is no research which explores the relationship between attachment and IBS. However, attachment insecurity has been found to predict poor physical health (McWilliams & Bailey, 2010) and medically unexplained symptoms (Taylor, Mann, White, & Goldberg, 2000). Attachment insecurity is related to pain catastrophising (Meredith, Strong, & Feeney, 2005), which those with IBS symptoms can experience as well as increased symptoms of anxiety (Sugaya, Nomura, & Shimada, 2011) and depression (Hankin, Kassel, & Abela, 2005). Given that insecure attachment is associated with psychosomatic complaints and is implicated in eating disorders, it seems reasonable to suppose that this will also be an issue for those affected by IBS.

Cognitions

Unhelpful cognitive processes have been found to be significant in both eating disorders (Fairburn, 2008) and IBS (Greene & Blanchard, 1994). Such thinking processes have also been implicated in the co-occurrence of IBS symptoms and disordered eating (Abraham & Kellow, 2011;

Lobera, Santed, & Rios, 2011; Lau & Alsaker, 2001). This indicates that these cognitive processes are trans-diagnostic. Specifically, there is evidence that individuals with both IBS symptoms and disordered eating engage in self-focused attention, hypervigilance to symptoms, rumination, catastrophic misinterpretations of bodily changes, shape and eating, elevated threat and thought-shape fusion (Chapter 1). There is currently a lack of measures which capture these specific cognitive processes for those experiencing IBS symptoms. The Cognitive Scale for Functional Bowel Disorders (CS-FBD) (Toner, Stuckless, Ali, Downie, & Emmott, 1998) was designed to capture the thoughts specific to those with IBS symptoms. IBS-related cognitions identified were anxious predictions regarding bowel symptoms, pain concern and perfectionism. These IBS-related cognitions were associated with high IBS symptom severity, poor quality of life and emotional distress and were found to be responsive to cognitive therapy (Gonsalkorale, Toner, & Whorwell, 2004). In those with IBS symptoms and disordered eating, the IBS-related cognitions and associated emotional distress may be risk factors to further engagement of disordered eating as a way of coping.

Emotional distress

Depression and anxiety are prevalent in both those who experience IBS symptoms and those who experience disordered eating (Fairburn & Harrison, 2003; Palsson & Drossman, 2005; Garakani et al., 2003). They have also been found to be prominent in the co-occurrence of IBS symptoms and disordered eating in clinical samples (Abraham & Kellow, 2011; Boyd et al., 2005; Boyd et al., 2010; Lobera et al., 2011; Emmanuel, Stern, Treasure, Forbes, & Kamm, 2004; Porcelli et al., 1998) and non-clinical samples (Quick, McWilliams & Bredbenner, 2012). Emotional distress, such as stress and negative affect has been found to be an antecedent for disordered eating (Ball & Lee, 2000). Considering these associations, it is feasible to suggest that heightened emotional distress associated to IBS and GI symptoms in an individual with an existing eating disorder may put them at risk of engaging in further disordered eating behaviours to manage their distress. For individuals attempting to manage their IBS symptoms without a diagnosis of an eating disorder, it is possible that they may go on to develop an eating disorder as a result of disordered eating. It has been suggested that those with a diet-related chronic health condition such as IBS are twice as likely to be diagnosed with an

eating disorder (Quick et al., 2013) and those with GI symptoms, concerns about their weight and disordered eating are at increased risk of developing an eating disorder (Lau & Alsaker, 2001).

Aims

This study has two aims;

1. To explore the relationships between IBS symptoms, attachment anxiety, attachment avoidance, IBS-related cognitions, anxiety, depression and disordered eating in community samples, which are hypothesised to be significantly positively correlated (see below).
2. To discover which of these psychological factors and IBS symptoms independently predict disordered eating using multiple regression.

More specifically that in each group (see below) the hypotheses for study aim one are;

- a) IBS symptoms will be positively correlated with disordered eating.
- b) Attachment anxiety and attachment avoidance will be positively correlated with IBS symptoms
- c) Attachment anxiety and attachment avoidance will be positively correlated with disordered eating.
- d) Attachment anxiety and attachment avoidance will be positively correlated with IBS-related cognitions
- e) IBS symptoms will be positively correlated with IBS-related cognitions
- f) IBS-related cognitions will be positively correlated with depression and anxiety.
- g) Depression and anxiety will be positively correlated with disordered eating
- h) Depression and anxiety will be positively correlated with IBS symptoms

Given the issues with diagnosis and the breadth of problems observed in the co-occurrence of IBS symptoms and disordered eating individuals who experience IBS symptoms and individuals who are on the continuum of eating disorders and disordered eating were included in the present study. To cover such a range this exploratory study examined possible associations between the study variables within three separate groups: (1) a non-clinical sample of staff and students at a university, (2)

individuals who identified themselves to be experiencing IBS symptoms and (3) individuals who identified themselves to have an eating disorder/disordered eating. This study did not compare groups.

Method

Study design

The study employed a cross-sectional design to examine the associations between IBS symptoms, attachment anxiety, attachment avoidance, IBS-related cognitions, anxiety, depression and disordered eating. Data were collected via online surveys. This study was approved by the University of Liverpool ethics committee.

Participants and sampling

Three groups were recruited; a university sample (staff and students), users of a leading IBS charity website (ibs network; <http://www.theibsnetwork.org>) and users of a leading eating disorder charity website (beat; <http://www.b-eat.co.uk>). There were no exclusion criteria and the only inclusion criterion for the study was that participants needed to be aged 18 years and above. The advertisement and participant information sheet for the study stated that participants did not need a specific diagnosis of an eating disorder or IBS to take part. However, it was made clear that the study was interested in IBS symptoms and disordered eating (Appendix F). The university sample was recruited through an advertisement placed on the university's announcement service and departmental emails. The same advertisement was placed on the charities' websites and their related Facebook® and Twitter® pages. Prior to accessing the online questionnaire, participants were presented with a participant information sheet and an informed consent page. Participants implicitly consented to take part by continuing on to complete the survey. Basic demographic information was obtained. As an incentive, participants were offered the opportunity to be entered into a prize draw to win either 1 x £50 or 4 x £25 high street vouchers. The online surveys took no more than 25 minutes to complete.

Measures⁵

The Gastrointestinal Symptom Rating Scale – IBS version (GSRS-IBS; Wiklund et al., 2003) consists of 13 self-report questions which cover severity of GI symptoms associated with IBS. Items are scored on a seven-point Likert scale where each item is scored between 1 (no discomfort at all)

⁵ All measures are publicly available apart from the CS-FBD. Please see Appendix G for this measure.

and 7 (very severe discomfort). The GSRS-IBS is short, user friendly and is divided into five scales; abdominal pain, bloating, satiety, constipation and diarrhoea. These scales have good internal consistency (ranging from .74 and .85) and good convergent and discriminant validity (Wiklund et al., 2003). Wiklund et al., (2003) did not examine a total score for this measure. To represent an overall score of IBS symptoms, other studies (Karling, Danielsson, Adolfsson & Norrback, 2007; Ljotsson et al., 2011; Lindfors et al., 2012) have used a sum of all 13 items. This gives a total score between 13 and 91. A score of 13 indicates that no IBS symptoms are present. When using the GSRS-IBS in this manner the other studies did not report on the reliability of the total score. The current study required a unified score of IBS symptoms and has therefore used the total score of all 13 items. In the present study the Cronbach's alpha (for total score) for each individual group was .91 (university group), .87 (IBS symptoms group) and .90 (disordered eating group). The Cronbach's alpha for the three groups combined was .92

The Cognitive Scale for Functional Bowel Disorders (CS-FBD; Toner et al., 1998) is a 25 item self-report measure which assesses cognitions relevant to the characteristics of IBS, such as bowel functioning, pain and anxiety. Items are rated on a seven-point scale, from 1 (strongly disagree) to 7 (strongly agree). A total score is derived through a sum of scores between 31 and 175. The higher the score the more marked the IBS-related cognitions. The scale has high internal consistency (.93) and high concurrent criterion validity, content validity, face validity and acceptable convergent validity (Toner et al., 1998). Within this study the Cronbach's alpha for each individual group was .94 (university group), .92 (IBS symptoms group) and .95 (disordered eating group). The Cronbach's alpha for the three groups combined was .96.

The Eating Disorder Examination Questionnaire (EDE-Q 6.0: Fairburn & Beglin, 1994, Fairburn, 2008) is a 28-item self-report measure derived from the Eating Disorder Examination interview. It provides a comprehensive assessment of disordered eating behaviours and attitudes focussed on the past 28 days. Items are rated on seven-point, forced choice scales. Although used as a diagnostic tool the EDE-Q has also been validated in a community sample (Mond, Hay, Rodgers, Owen, & Beumont, 2004), and is often used as an outcome measure. The EDE-Q has good concurrent validity and acceptable criterion validity in the community (Mond et al., 2004) and strong internal

consistency (.90) (Peterson et al., 2007). In the present study the Cronbach's alpha for each individual group was .88 (university group), .34 (IBS symptoms group) and .82 (disordered eating group). The Cronbach's alpha for the three groups combined was .66.

The Experiences in Close Relationships Scale – Short Form (ECR; Wei, Russell, Mallinckrodt, & Vogel, 2007) is a 12-item self-report measure assessing adult attachment. Each item is rated on a seven-point scale ranging from 1 (strongly disagree) to 7 (strongly agree). Four items are reverse scored and the scale is split into avoidant and anxious attachment. The items in each scale are totalled with a higher score indicating attachment insecurity and a lower score indicating a secure attachment. The scale has shown good internal consistency (.77 and .78), test-retest reliability and good construct validity (Wei et al., 2007) across five studies. In the present study the Cronbach's alpha for the avoidance scale for each individual group was .70 (university group), .74 (IBS symptoms group) and .82 (disordered eating group). The Cronbach's alpha for the attachment anxiety scale for each individual group was .73 (university group), .70 (IBS symptoms group) and .63 (disordered eating group). The Cronbach's alpha for the three groups combined was .79 and .72.

The Patient Health Questionnaire -9 (PHQ-9; Spitzer, Kroenke, & Williams, 2001) is a nine item widely used self-report measure assessing symptoms of depression. Each item is rated on a scale of 0 (not at all) to 3 (nearly every day). The measure has shown excellent internal consistency (0.89) and good construct validity, criterion validity and external validity (Kroenke, Spitzer, & Williams, 2001). In the present study the Cronbach's alpha for each individual group was .90 (university group), .87 (IBS symptoms group) and .86 (disordered eating group). The Cronbach's alpha for the three groups combined was .93.

The Generalised Anxiety Disorder -7 (GAD-7; Spitzer, Kroenke, Williams, & Lo We, 2006) is a seven item widely used self-report measure which assesses anxiety. Each item is rated on a scale of 0 (not at all) to 3 (nearly every day). The measure has excellent internal consistency (0.92), good test retest reliability and good construct and factorial validity (Spitzer et al., 2006). In the present study the Cronbach's alpha for each group was .92 (university group), .89 (IBS symptoms group) and .90 (disordered eating group). The Cronbach's alpha for the three groups combined was .91.

Demographic variables collected were age and gender.

Results

Data analysis

Once collected, data were cleaned, converted and transferred to Statistical Package for the Social Sciences version 19.0 (SPSS, 2011).

Data analyses were carried out in four steps. The first step was to determine the descriptive characteristics of the samples. The second step was to check the parametricity of the data. Data were checked for outliers. Groups of outliers were found for the; GSRS-IBS (five participants), CS-FBD (two participants) and PHQ-9 (six participants) in the university group; CS-FBD (two participants) and EDQ 6.0 (one participant) in the IBS symptoms group; and ECR attachment anxiety scale (three participants) in the disordered eating group. These outliers were visually checked through the extreme values table SPSS. The outliers did not seem to be due to a stereotypical response, input error or missing data. In addition, once skewed variables were transformed the 5% trimmed mean was similar to the overall mean of the transformed variables indicating that the groups of outliers were not affecting the data inappropriately. Therefore, there did not seem to be a justification for excluding these outliers as they seemed to be meaningful groups of people who were coherently scoring high or low on a measure.

Visual and statistical checks were made for linearity and normality by examining histograms, skewness and kurtosis (-1 to 1). Some variables were positively or negatively skewed.⁶ Skewed variables were transformed using square root and reflect square root. Data were screened again for parametricity using the same criteria. All variables met normality criteria except the transformed anxiety variable in the disordered eating sample. Due to the amount of missing data, Little's (1998) missing completely at random test was performed on the untransformed data. Data from the three groups were found to be missing at random (University: $\chi^2 = 9.484$, DF = 7, p. = .220, disordered eating: $\chi^2 = 6.107$, DF = 3, p. = .107, IBS symptoms: $\chi^2 = 6.557$, DF = 7, p. = .476). Therefore, all responses were included in the analyses and dealt with by list pairwise in all analyses. Sample size for each analysis will be indicated. For the third step, partial correlations were conducted for each group to examine the relationships between IBS symptoms, IBS-related cognitions, anxious and avoidant

⁶ Please see Appendix H for a summary of skewed variables

attachment, anxiety, depression and disordered eating whilst controlling for gender. Gender was controlled for as it was correlated with most variables in the university sample. The fourth step involved a multiple regression analyses to determine what variables predicted disordered eating. Stepwise regression was used due to the exploratory cross-sectional nature of the study (Field, 2013). The alternative, hierarchical regression was not used due to the research area being novel and limited in existing literature. This made it difficult for the author to accurately decide what predictors would be important to enter first in a hierarchical regression. The multiple regression was only carried out in the university sample due to limitations of power.

A medium effect size was anticipated at the standard alpha level of .05 and power of 0.80 for correlational and multiple regression analyses (Cohen, 1988; 1992). Using these parameters Cohen's d power table for effect sizes (Cohen, 1988) was consulted for the correlational analyses (question 1) and G-Power analysis was conducted (Faul, Erdfelder, Lang, & Buchner, 2007) for the multiple regression (question 2). The power analysis for the correlational analyses suggested a sample of 98 participants to detect a medium effect size. The power analysis for the multiple regression also suggested a sample of 98 participants to detect a medium effect size.

Characteristics of sample

Figure 2.1 is a flowchart of the attrition process and illustrates the individual sample sizes for both the completed and partially completed data sets for all three groups. Two participants were excluded for not providing information as to where they accessed the survey and 64 potential participants only provided demographics. Table 2.1 displays the descriptive statistics for the included sample (those who completed and partially completed questionnaires).

Participants were predominantly female in all three groups. A series of t-tests in the university group demonstrated that women scored significantly higher on IBS symptoms ($t(404) = -5.80$, $p = .000$); IBS-related cognitions ($t(372) = -3.32$, $p = .001$); anxiety ($t(340) = -4.82$, $p = .000$); depression ($t(340) = -3.15$, $p = .002$); and disordered eating ($t(358) = -6.72$, $p = .000$). There was no significant difference between men and women for the variables; attachment avoidance; ($t(350) = 1.82$, $p = .070$) and attachment anxiety ($t(349) = -1.82$, $p = .072$). It was not possible to compare gender means in the IBS symptoms group and the disordered eating group due to the very small number of men (IBS

group $n=6$ and disordered group $n=3$). Tables of the means, t-tests and correlations are provided in Appendix I and J.

Age was not correlated with any of the measured variables (see Appendix J). Mean age was higher in the IBS symptoms group compared to the university group and disordered eating group, whose mean ages were similar.

It can be seen that each group is quite distinct and exhibited scores in the expected ranges for the EDE-Q, GSRS-IBS and CS-FBD. Mean EDE-Q in the university group was similar to that found to the mean EDE-Q score in the community (1.42) (Mond et al., 2004). In addition, mean EDE-Q score for the disordered eating group was found to be similar to that found in eating disorder populations (4.02) (Aardoom, Dingemans, Slof Op't Landt, & Van Furth, 2012).

Across the three groups the full range of severity of symptoms was observed. The disordered eating group had a higher mean score for anxiety, depression, avoidant and anxious attachment. This group was followed by the IBS symptoms group then the university group. The IBS symptoms group and university group had similar levels of anxious attachment. An independent t-test confirmed that there was no significant difference between these two groups, $(t(384), -.081, p = .081)$.

Within group differences were examined between completers, partial completers and non-completers in each of the separate three groups (university group, IBS symptoms group and disordered eating group). A comparison of means in the university group between those who completed all questions and those who partially completed found that those who were older $(t(403)=2.88, p=.005)$; and those who reported more IBS symptoms $(t(403)=2.14, p=.035)$ were significantly more likely to complete all the questionnaires. A chi-square test revealed no relationship between gender and the completion status of the questionnaires, $(X^2(2, N = 405) = .509, p = .287)$.

The non-completers (Table 2.2) who accessed the surveys via the university can only be compared on age and gender. There was no significant difference between the age of completers and non-completers $(t(102.44)=1.89, p=.063)$. It was found that university women were more likely to begin the questionnaires compared to university men $(X^2(2, N = 394) = .12.83, p = .001)$.

With regards to IBS symptoms group and the disordered eating group there were no significant within group differences for all variables between (a) completers and partial completers and (b) completers and non-completers. It was not possible to compare all of the variables due to low numbers in the partial and non-completer groups for each individual variable. Examining the means for the IBS group the age of the non-completers was much lower compared to those included in the study. It is possible that older participants in the IBS group were more likely to complete the questionnaires.

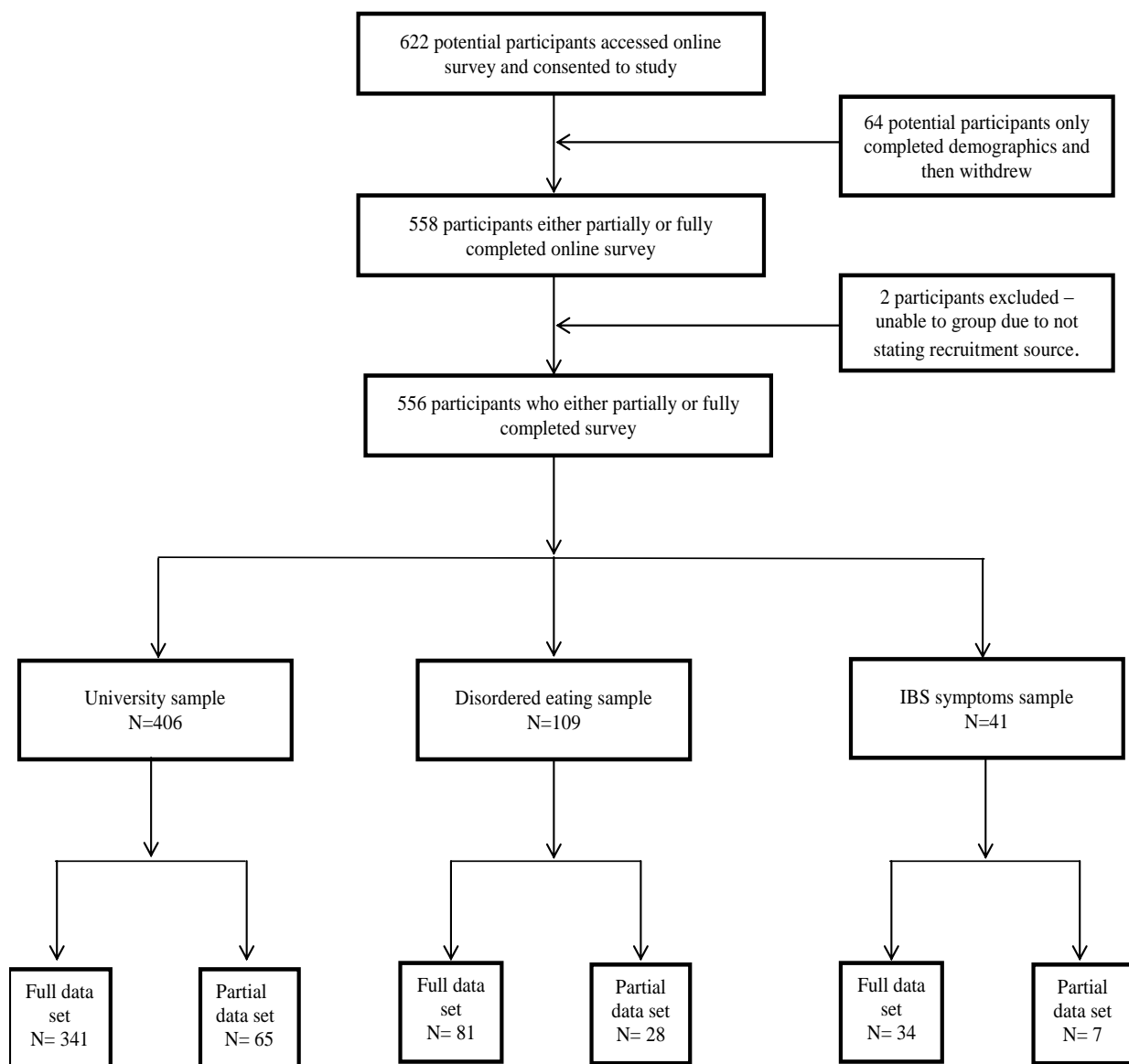


Figure 2.1: Flowchart illustrating full and partial data sets for all three groups

Table 2.1

Summary of demographics for all groups

Variables	University <u>Number (%)</u>	Disordered eating	Irritable bowel symptoms
Gender (% female)	361 (78%)	106 (97%)	36 (85%)
	<u>Mean (sd)</u>		
Age	24.29 (7.89)	26.40 (8.20)	35.67(11.48)
IBS symptoms	14.46(13.15)	28.48(15.50)	32.52(16.50)
IBS cognitions	48.54(29.83)	76.63(33.40)	102.67(25.67)
Avoidant attachment	11.39 (7.22)	17.14 (8.26)	13.68 (7.86)
Anxious attachment	16.28 (7.51)	18.93 (6.56)	16.35 (6.53)
Anxiety	7.76 (5.82)	14.02 (5.98)	9.29 (5.67)
Depression	7.80 (5.95)	15.15 (6.52)	8.68 (6.24)
Disordered eating	1.95 (1.40)	3.99 (1.59)	1.52 (1.34)

Note. Raw data were analysed

Table 2.2

Summary of age and gender for 64 participants who did not complete questionnaires

Variables	University (n=53) <u>Number (%)</u>	Disordered eating (n=10)	Irritable bowel symptoms (n=1)
Gender (% female)	30 (57%)	9 (90%)	1 (100%)
	<u>Mean (sd)</u>		
Age	23.08 (4.82)	23.20 (7.24)	22.00 (0.00)

Note. Raw data were analysed

Correlational analyses (Aim 1)

Partial correlations were conducted to explore the relationships between IBS symptoms, attachment anxiety, attachment avoidance, IBS-related cognitions, anxiety, depression, and disordered eating in all three samples whilst controlling for gender.

University group

In the university sample all correlations, except one, were significant (Table 2.3). No association was found between attachment avoidance and IBS symptoms. All associations were in the hypothesised direction. IBS symptoms were positively correlated with disordered eating ($r = .25, p = .000$) and IBS-related cognitions ($r = .66, p = .000$). Attachment anxiety was positively correlated with IBS symptoms ($r = .13, p = .012$), IBS-related cognitions ($r = .20, p = .000$) and disordered eating ($r = .40, p = .000$). Attachment avoidance was positively correlated with IBS-related cognitions ($r = .16, p = .002$) and disordered eating ($r = .24, p = .000$) but was not significantly correlated with IBS symptoms ($r = .13, p = .128$). Effect sizes for all but one of the attachment anxiety and attachment avoidance associations were small. IBS-related cognitions were positively correlated with anxiety ($r = .41, p = .000$) and depression, ($r = .37, p = .000$). Anxiety ($r = .37, p = .000$; $r = .45, p = .000$) and depression ($r = .52, p = .000$; $r = .41, p = .000$) were positively correlated with disordered eating and IBS symptoms.

Disordered eating group

In the disordered eating group (Table 2.4). Attachment anxiety was positively associated with IBS-related cognitions ($r = .30, p = .006$). Attachment anxiety was not correlated to IBS symptoms ($r = .21, p = .060$). Attachment avoidance was not correlated with IBS symptoms or IBS-related cognitions ($r = .04, p = .730$; $r = .08, p = .500$). Both attachment anxiety ($r = .40, p = .000$) and attachment avoidance ($r = .42, p = .000$) were positively associated with disordered eating. There was a large positive association between IBS symptoms and IBS-related cognitions ($r = .80, p = .000$). IBS-related cognitions were positively correlated with anxiety ($r = .40, p = .000$) and depression ($r = .25, p = .024$). Anxiety ($r = .43, p = .000$; $r = .33, p = .002$) and depression ($r = .56, p = .000$; $r = .26,$

$p = .018$) were positively associated with disordered eating and IBS symptoms. There was no direct correlation between IBS symptoms and disordered eating ($r = .10, p = .364$). In order to check for a potential ceiling effect, the distribution of scores for IBS symptoms were examined. A substantial proportion (72%) of participants in the disordered eating group scored above the mid-range score for IBS symptoms. An independent t-test confirmed that IBS symptoms to be significantly higher in the disordered eating group ($n = 109$) compared to the university group ($n = 406$), (disordered eating: $M = 5.06, SD = 1.70$, university: $M = 3.34, SD = 1.83, t(512), -8.878, p = .000^7$).

Table 2.3

Partial correlations (controlling for gender) in University group

	1	2	3	4	5	6	7
1. IBS symptoms	-						
2. IBS cognitions	.66 (.000) N=371	-					
3. Avoidant attachment	.07 (.128) N=349	.16 (.002) N=349	-				
4. Anxious attachment	.13 (.012) N=348	.20 (.000) N=348	.30 (.000) N=348	-			
5. Anxiety	.45 (.000) N=339	.41 (.000) N=339	.16 (.004) N=339	.36 (.000) N=339	-		
6. Depression	.41 (.000) N=339	.37 (.000) N=339	.31 (.000) N=339	.47 (.000) N=339	.69 (.000) N=339	-	
7. Disordered eating	.29 (.000) N=357	.25 (.000) N=357	.24 (.000) N=349	.40 (.000) N=348	.37 (.000) N=339	.52 (.000) N=339	-

Note. IBS, Irritable Bowel Syndrome; N= number in sample for measured association; Hypotheses are two-tailed

⁷ The means and standard deviation reported for this t-test are geometric due to data transformation.

Untransformed means are (disordered eating: $M = 28.48, SD = 15.49$, university: $M = 14.46, SD = 13.15$)

IBS symptoms group

The IBS symptom group (table 2.5) was the smallest sample (*n* ranges from 31 to 36 for correlations). IBS symptoms were strongly positively correlated with IBS-related cognitions ($r = .55$, $p = .000$). Anxiety ($r = .47$, $p = .006$) and depression ($r = .39$, $p = .024$) were positively correlated with disordered eating. Anxiety ($r = -.02$, $p = .920$) and depression ($r = .17$, $p = .350$) were not associated with IBS symptoms or IBS cognitions ($r = .39$, $p = .070$; $r = .19$, $p = .290$). Neither attachment avoidance or attachment anxiety were associated with IBS symptoms ($r = .19$, $p = .296$; $r = -.07$, $p = .682$) or IBS-related cognitions ($r = .34$, $p = .852$; $r = .05$, $p = .792$). Only attachment anxiety was positively correlated with disordered eating ($r = .36$, $p = .038$). There was no significant association between IBS symptoms and disordered eating ($r = .13$, $p = .482$). An independent t-test revealed the university group to have significantly more disordered eating than the IBS group (university: $M = 1.29$, $SD = 0.54$, IBS symptoms: $M = 1.68$, $SD = 0.60$, $t(393)$, 2.143 , $p = .033$).

Table 2.4

Partial correlations (controlling for gender) in disordered eating group

	1	2	3	4	5	6	7
1. IBS symptoms	-						
2. IBS cognitions	.80 (.000) N=91.	-					
3. Avoidant attachment	.04 (.730) N=80	.08 (.500) N=80	-				
4. Anxious attachment	.21 (.060) N=80	.30 (.006) N=80	.19 (.092) N=80	-			
5. Anxiety	.33 (.002) N=78	.39 (.000) N=78	.17 (.144) N=78	.34 (.002) N=78	-		
6. Depression	.26 (.018) N=78	.25 (.022) N=78	.31 (.006) N=78	.30 (.006) N=78	.68 (.000) N=78	-	
7. Disordered eating	.10 (.364) N=82	.16 (.152) N=82	.42 (.000) N=80	.40 (.000) N=80	.43 (.000) N=78	.56 (.000) N=78	-

Note. IBS, Irritable Bowel Syndrome; N= number in sample for measured association; Hypotheses are two-tailed

Table 2.5

Partial correlations (controlling for gender) in IBS symptoms group

	1	2	3	4	5	6	7
1. IBS symptoms	-						
2. IBS cognitions	.55 (.000) N=36	-					
3. Avoidant attachment	.19 (.296) N=31	.34 (.852) N=31	-				
4. Anxious attachment	-.07 (.642) N=31	.05 (.792) N=31	.40 (.020) N=31	-			
5. Anxiety	-.02 (.920) N=31	.19 (.290) N=31	.27 (.132) N=31	.43 (.014) N=31	-		
6. Depression	.17 (.350) N=31	.39 (.060) N=31	.41 (.016) N=31	.51 (.002) N=31	.72 (.000) N=31	-	
7. Disordered eating	.13 (.482) N=32	.15 (.388) N=32	.27 (.130) N=31	.36 (.038) N=31	.47 (.006) N=31	.39 (.024) N=31	-

Note. IBS, Irritable Bowel Syndrome; N= number in sample for measured association; Hypotheses are two-tailed

Regression analyses (Aim 2)

A multiple stepwise regression was conducted to explore which psychological factors predicted disordered eating in the university group. Attachment anxiety, attachment avoidance, IBS symptoms, IBS-related cognitions, depression and anxiety were entered. Variance inflation factors (VIF) were evaluated as multicollinearity may affect the validity of the results of individual predictors. The highest VIF value was 1.23 indicating that multicollinearity was in the acceptable range and therefore the interpretability of the results was not compromised. In addition, the correlation matrices were reviewed and there were no substantial correlations between variables ($r > .8$). Cases were excluded pairwise due to missing data. Therefore, the complete dataset for this analyses was $n = 341$. Heteroscedasticity was ruled out by means of visual examination of scatter plots.

Initially, the regression analysis was conducted whilst controlling for gender in the university group. In this analysis IBS symptoms and disordered eating were not associated. As the study sample

was predominantly female a t-test was conducted to explore whether there was a significant number of females reporting disordered eating in the university group. An independent t-test confirmed this observation (females: $M = 2.38$, $SE = 1.75$, males: $M = 2.38$, $SE = 1.78$, $t(403) = -5.80$, $p = .000$). Therefore, it was decided to run the regression without gender as an independent variable⁸. In this regression IBS symptoms predicted disordered eating. The overall regression model for disordered eating was statistically significant, $F = 56.90$, $p = .000$ (Table 2.6). This model contained three predictors; depression ($t = 7.17$, $p = .000$); attachment anxiety ($t = 3.96$, $p = .000$); and IBS symptoms ($t = 2.48$, $p = .014$). Overall, these predictors accounted for 34% of the variance of disordered eating. Disordered eating was primarily explained by depression which explained 30% of the variance and to a lesser extent, attachment anxiety and IBS symptoms accounted for approximately 3% and 1% of the variance of disordered eating.

Table 2.6

Stepwise regression predicting disordered eating in university group.

Dependent	Predictors	Unstandardized coefficients				Model summary			
		b	SE B	95 % CI	B	t	R ²	ΔR ²	p
ED	Depression	0.18	0.03	(0.13, 0.23)	.40***	7.17	.30		.000
	Anx attachment	0.01	0.00	(0.01, 0.02)	.20***	3.96	.32	.03	.000
	IBS symptoms	0.01	0.01	(0.01, 0.06)	.12*	2.48	.33	.01	.014

Note. CI - (U, L); *** $p < .001$, ** $p < .01$, * $p < .05$. Anx attachment – anxious attachment, Av attachment – avoidant attachment, IBS – irritable bowel syndrome, ED – eating disorders

Discussion

The aims of the current study were to investigate the links between IBS symptoms and eating disordered behaviour, primarily focussing on potentially explanatory variables; and to examine which of these variables predicted disordered eating. Three samples with eating problems, IBS symptoms or no overt clinical problems (university group) were investigated. Correlational and regression analyses in the university sample provide evidence for the proposed associations. Initial support for the hypothesised associations was also found in the disordered eating group but not the IBS symptoms group. As in previous studies, IBS symptoms and disordered eating were related in the disordered

⁸ The results of the regression analyses whilst controlling for gender are included in Appendix L

eating sample and university sample. However, this relationship was not found in the IBS sample. A novel finding in the current study is the significant relationship between attachment anxiety and IBS symptoms in the university sample. Causal relationships between the common psychological factors, IBS symptoms and disordered eating cannot be extrapolated from the current data. To achieve this, studies employing path analysis and prospective longitudinal designs are needed.

Correlational and regression findings

University group

As predicted, IBS symptoms and disordered eating were modestly associated with each other replicating previous studies (Porcelli et al., 1998; Lau & Alsaker, 2001; Emmanuel et al., 2004; Boyd et al., 2005; Boyd et al., 2010; Abraham & Kellow, 2011; Lobera et al., 2011; Quick et al., 2012). The majority of these studies found this relationship in clinical samples. Those which explored this relationship in a community sample examined constipation or IBS amongst other diet-related chronic health conditions. Therefore, the current study is unique in examining whether IBS symptoms and disordered eating are associated in a non-clinical sample. It was important to examine a non-clinical sample so as to focus on the full spectrum of disordered eating and IBS symptoms and not just diagnostic categories. The use of diagnostic measures in IBS has been criticised for being restrictive and limited (Boyce, Koloski & Talley, 2000). Research samples which use such measures may therefore not accurately reflect the experience of IBS symptoms. Similarly, classification of an eating disorder can be arbitrary. The majority of eating disorders are classified as Eating Disorder Not Otherwise Specified (Fairburn, 2008). In addition, diagnosis of an eating disorder is not stable as diagnoses tend to change, for example, from anorexia nervosa to bulimia nervosa (Milos, Spinder, Schnyder & Fairburn, 2005).

The university sample is considered to be clinically relevant as IBS symptoms and disordered eating are common. IBS affects up to 33% of people worldwide (Quigley et al., 2009) and disordered eating, including dieting, is common (Patton, Selzer, Coffey, Carlin & Wolfe, 1999). This is especially true for females where up to 68% of adolescent females have been found to be dieting with eight per cent engaging in severe dieting (Kenardy, Brown, & Vogt, 2001). In addition it can be seen from the distribution of scores obtained that there was a degree of pathology observed. For example,

those in the disordered eating group scored similarly on the EDE-Q in comparison to other eating disorder clinical samples (Mond et al., 2004). Those in the IBS group scored within a range of total GSRS-IBS scores witnessed in other studies (Lindfors et al., 2011; Ljotsson et al., 2011). As for the psychological variables measured, a full range of severity was observed across the three groups.

One could speculate that individuals in the community, who are self-managing IBS symptoms, may engage in disordered eating behaviours such as dieting or avoiding foods. For some, this cycle of IBS symptoms and disordered eating may render them at increased risk of developing an eating disorder. In support of this idea, those with diet-related chronic health condition such as IBS have been found to be twice as likely to be diagnosed with an eating disorder (Quick et al., 2013) and those with GI symptoms and disordered eating have been found to be at risk of developing an eating disorder (Lau & Alsaker, 2001).

The present study found attachment anxiety to be positively associated with IBS symptoms, disordered eating and IBS-related cognitions in the university group. Again, in the university group, attachment avoidance was found to be positively associated with disordered eating and IBS-related cognitions. However, the effect sizes for these associations were small. The associations between attachment insecurity, IBS symptoms and IBS-related cognitions are novel findings with important implications. There is no previous research which has specifically explored these relationships. However, attachment insecurity is indicated as a predictor of other physical health problems (Puig et al., 2013; McWilliams & Bailey, 2010), medically unexplained symptoms (Taylor et al., 2000) and pain-related thoughts (Meredith et al., 2005). The relationship between attachment insecurity and disordered eating is consistent with the literature (Abbate-Daga et al., 2010).

Drawing on attachment theory, a child whose caregiver does not help to regulate their emotions specifically in times of stress will be less able to coherently organise their experiences and regulate emotions in later life (Streeck-Fischer & van der Kolk, 2000; Van Der Horst, LeRoy, & Van Der Veer, 2008). Those who struggle due to attachment insecurity are likely to have maladaptive responses to stress (Mikulincer & Florian, 1998). GI symptoms such as constipation and abdominal bloating are common. Those with attachment anxiety may interpret these symptoms as dangerous and react by becoming hypervigilant to other IBS symptoms. The current study is consistent with this

hypothesis but cannot confirm it. IBS symptoms were found to have a strong correlation to IBS-related cognitions, which in turn were related to attachment insecurity. Unhelpful cognitions have been found to be strongly associated with emotional distress (Williams & Garland, 2002). Hence, if an individual negatively interprets their IBS symptoms and struggles to regulate their emotions, it is suggested that they may engage in maladaptive behaviour (disordered eating) to ameliorate the emotional distress. Disordered eating has been demonstrated to perpetuate IBS (Janssen, 2010). It is possible that as IBS symptoms become stronger and persist (and if the individual experiences concurrent unhelpful cognitive thinking styles and emotional distress), this may result in further disordered eating.

In the present study, multiple regression analysis confirmed the association between IBS symptoms and disordered eating. In the university group, attachment anxiety and depression were the only other psychological factors that predicted disordered eating in the university group. Depression explained most of the variance and attachment anxiety only explained an *additional* 1% of the variance in disordered eating. Even though attachment anxiety only contributed an additional 1% it could still be an important factor. Attachment anxiety and depression are linked (Roberts, Gotlib & Kassel, 1996) and that the predictive value of attachment anxiety may be masked by depression.

The fact that all psychological factors, (aside from no association between attachment avoidance and IBS symptoms), were found to be associated with each other in the university group indicates that psychological factors may play a role in the co-morbidity of IBS symptoms and disordered eating.

Disordered eating group

All psychological factors (attachment anxiety, attachment avoidance, IBS-related cognitions, depression and anxiety) were associated in the same manner as the university sample, apart from the association between attachment avoidance and IBS-related cognitions and either attachment style and IBS symptoms. It should be noted that that IBS symptoms and disordered eating were not directly correlated. However, further investigation into the distribution of scores revealed that the majority of participant's scores were clustered at the upper end of the scale meaning that those in the disordered eating group were reporting a higher level of IBS symptoms. This could be explained as a ceiling

effect or evidence that IBS symptoms are more prevalent in those who experience disordered eating. Further analyses found that the disordered eating group did report a significant level of IBS symptoms. Therefore it seems clear that IBS is a common phenomenon in those with eating disorders. This is consistent with previous research. Boyd et al., (2005) found 98% of outpatients with an eating disorder to have at least one FGID (52% IBS). Perkins et al. (2005) found 64% of individuals with a current or past eating disorder met Manning Criteria (Manning, 1978) for IBS. Attachment anxiety, in this group, was not found to be associated with IBS symptoms. However, this significance level was just above the five per cent alpha level and in a larger sample, with greater power, there may be a significant association. In the current study IBS symptoms were positively associated to IBS-related cognitions, anxiety and depression. Similarly IBS-related cognitions were positively related to anxiety and depression, (which are both positively related to disordered eating).

IBS symptoms group

Both attachment anxiety and attachment avoidance were not correlated with IBS symptoms or IBS-related cognitions. Observing the means for this group, attachment anxiety was more elevated in the IBS symptom group than in the university group. However, this mean difference was not significant. This finding may indicate that attachment insecurity is not related to IBS symptoms or IBS-related cognitions for those with IBS symptoms. IBS symptoms and disordered eating were also found not to be associated in this group. In fact, those in the university sample were found to have significantly more disordered eating than those in the IBS symptom group.

The findings in the IBS group should be interpreted with caution due to possible sampling bias, the small sample size and the lack of internal consistency of the EDE-Q for this group. A possible explanation as to why eating disordered scores were lower in the IBS symptoms group compared to the university group is sampling bias. It is possible that the university group participated because eating problems were particularly salient to them. There may have been a sampling bias in favour of those with concerns about eating, shape and weight. This might account for their greater average scores on the EDE-Q compared with the IBS group, whose primary concern was IBS symptoms. The low alpha score indicates that the EDE-Q was not an appropriate measure of disordered eating in those who identified themselves to be primarily concerned with IBS symptoms. It

is unclear as to why this measure was not a reliable measure of disordered eating in this IBS symptoms sample. One possible point is that those with IBS symptoms are generally concerned about eating whether they are “disordered eating” or not. Therefore, if they are all concerned about eating the internal consistency might be reduced, with some items relating to disordered eating and others being relevant to disordered eating and IBS symptoms. However, it is also possible that within this self-selected sample those who identified with having IBS symptoms may not identify with having disordered eating, and, therefore in a small sample, the EDE-Q scale would only be appropriate to very few individuals. Due to the poor reliability the statistical implications are limited as it is not clear that the EDE-Q is accurately capturing the experience of disordered eating in this group. Due to this the results from the IBS group have not been relied upon in relation to the interpretation of the findings. However, they are acknowledged and differences in results are demonstrated.

The remaining correlations are partly consistent with the other two groups. IBS symptoms were positively associated with IBS-related cognitions. IBS-related cognitions were not associated with depression and anxiety. However both depression and anxiety were positively correlated with disordered eating. An unexpected finding was that IBS symptoms were not correlated with either depression or anxiety. This relationship is consistently reported in the literature (Garakani et al., 2003; Palsson & Drossman, 2005; Drossman et al., 2009). Again the means for anxiety and depression were higher in this group in comparison to the university sample. An association may have been found with a larger sample.

The results in the current study raise questions; a) can the associations between IBS symptoms, associated psychological factors and disordered eating make some individuals vulnerable to developing a diagnosable eating disorder (Quick et al., 2013; Lau & Alasker, 2001)? and b) can comorbid IBS symptoms and eating disorder in combination with psychological factors, including eating disorder attitudes and behaviours maintain eating disorders? These questions need to be explored and tested in future research studies. This study discusses one potential explanation informed by the findings from the university and disordered eating groups which found IBS and disordered eating to overlap.

For those with IBS symptoms, having an insecure adult attachment style may contribute to the development of unhelpful cognitive thinking styles associated with GI symptoms. For some individuals these unhelpful IBS-related cognitions may be associated with the development of emotional distress, for example, in the form of anxiety and depression. In order to neutralise these IBS-related cognitions and emotional distress it is suggested that some individuals with IBS symptoms may engage in disordered eating. This disordered eating coping style, along with the stress of having the IBS symptoms and associated negative cognitions and emotions, may increase the severity of the IBS symptoms and disordered eating. Potentially, this cycle is a risk factor in terms of the development of an eating disorder.

In individuals who have an existing eating disorder, the experience of IBS symptoms may be interpreted through the existing eating disorder beliefs, rules and assumptions. It is possible that these processes may trigger IBS-related cognitions and consequently, emotional distress. For example, feeling bloated and being constipated may be interpreted as being fat. This may reconfirm extant eating disorder attitudes and cause distress. In order to manage this distress and the unhelpful thoughts, further disordered eating may be engaged in. Therefore, the individual who feels fat and overweight due to their IBS symptoms may further restrict their food or take laxatives thus maintaining the eating disorder. An implicit assumption here is that in eating disorders and disordered eating, weight and shape are the primary concern of those affected. This is reflected in the items comprising the EDE-Q. Furthermore, on experiencing bloating and feeling of fullness, those with both eating problems and IBS assume that these are indicators of increasing weight and looking fat. Restricting eating and other disordered eating behaviours may occur so as to counteract these assumptions, rather than to directly affect the IBS symptoms themselves. These implicit assumptions need teasing out and testing. These speculations must be tentative due to the finding that those in the IBS group had the lowest score on the disordered eating measure (EDE-Q) and the limitations of both the IBS group and disordered eating samples.

Clinical Implications

These findings are relevant to two groups; those with IBS symptoms who are at risk of developing an eating disorder; and those with an existing eating disorder experiencing IBS symptoms.

Having an awareness of the co-occurrence IBS symptoms and disordered eating would be important for professionals working with these populations. Professionals working in eating disorder services could screen for IBS symptoms and ask about the presence and impact of IBS symptoms during the assessment. If IBS symptoms were present the preliminary findings from this study could help inform formulation and treatment of the client's eating disorder.

In gastroenterology services, professionals could be trained to recognise the presence and impact of disordered eating and refer this client group to psychology services where an appropriate assessment can be conducted.

Knowledge of this relationship for those with IBS symptoms will highlight the potential risks of engaging in disordered eating. This awareness may prevent the development of an eating disorder in some individuals or the maintenance of an existing eating disorder.

Eating disorders are complex mental health problems with an array of factors that should be accounted for in formulated interventions. Accounting for IBS symptoms and attributions regarding symptoms may help relevant individuals manage their problems more readily. Acknowledging and treating the overlap of IBS symptoms and disordered eating might improve the treatment of eating disorders. If future research finds that the combination of IBS symptoms and disordered eating put some people individuals at risk to develop an eating disorder, acknowledging this overlap may potentially prevent the development of an eating disorder for some.

Limitations and future research

The study has several limitations. The samples were self-selecting. Those who chose to take part in the study may have been more distressed by their IBS symptoms and disordered eating. Those who fully completed the surveys compared to those who partially completed were more likely to report a higher level of IBS symptoms. It is possible that this population may report heightened psychological distress. Many more women than men took part and women were significantly more likely to report higher levels of IBS symptoms, IBS-related cognitions, disordered eating, anxiety and depression. It is likely that the association between IBS symptoms, disordered eating and studied psychological variables only applies to women. When gender was controlled for, the association between IBS symptoms and disordered eating was not found.

Another limitation was the internal consistency for the EDE-Q. The EDE-Q alpha level was inadequate for the IBS symptoms group. This may have affected the relationships measured using the EDE-Q in this group. The low alpha score indicates that the EDE-Q was not a coherent measure of disordered eating in this group of people with IBS symptoms. Another potential measurement issue relates to the CS-FBD (which examined IBS-related cognitions). The CS-FBD has items that relate to anxiety and depression. It is possible that this overlap in measurement contributes to the significant associations between IBS-related cognitions, anxiety and depression.

As with all correlational studies there may be a number of unmeasured confounding or mediating factors. Other possible psychological factors which were not measured in this study and may have confounded the results are; low self-esteem and low self-concept. These have been found to interact with both eating disorders and IBS. Low self-concept has been suggested as a vulnerability factor for the development and maintenance of an eating disorder (Stein & Corte, 2003) and low-self-esteem has been associated with poor outcome in those with Bulimia Nervosa (Fairburn, Peveler, Jones, Hope, & Doll, 1993). In relation to IBS, Bengtsson et al. (2013) found that those who had high levels of IBS symptoms also had lower levels of self-esteem. It is possible that the psychological factors measured in this study, along with other unmeasured psychological factors such as low self-esteem and low self-concept may mediate the relationship between IBS and disordered eating.

A strength of this study was the size of the university sample ($n=406$). Analyses were adequately powered as they succeeded the suggested sample size of $n=98$ for both the correlation and multiple regression analysis when alpha was set at 0.5 and power at 0.80. However, the IBS symptoms group and some variables in the disordered eating group were underpowered. Inferences made from the IBS symptoms group should be interpreted with caution. Finally, cause and effect interpretations cannot be made due to the cross-sectional correlational design.

The relationships tested need to be explored further in replication studies. Groups of interest would be other community samples, large IBS and eating disorder groups. As FGIDs are common in eating disorders, other categories of FGIDs and their associated GI symptoms should also be investigated. To address the limitations of the small IBS symptom group in the current study, a future study could perform a regression analyses in a large IBS symptom sample. This would help to

determine whether the found psychological factors along with IBS symptoms predict disordered eating in those who report IBS symptoms. These future studies should also consider employing longitudinal designs and statistical methods such as structural equation modelling to determine potential pathways.

Furthermore, future research should aim to investigate what other common psychological factors may be present in individuals who experience both IBS symptoms and disordered eating. This could be done by drawing on the separate IBS and eating disorder literature and comparing common psychological factors in their development and maintenance (see introduction in Chapter 1). Attachment insecurity should be further investigated in relation to IBS symptoms and other FGIDs due to the mixed findings in the current study. Although, measuring adult attachment allows for hypotheses to be made about an individual's early infant attachment further investigation should include measuring both infant attachment and adult attachment.

Conclusion

In conclusion, the current study is the first to explore the overlap of IBS symptoms and disordered eating along with hypothesised associated psychological factors in three community samples. The findings suggest that attachment insecurity, IBS-related cognitions, anxiety and depression may play a part in the overlap of IBS symptoms and disordered eating. These findings have important implications for those who experience this overlap and professionals working with these individuals. To guide future research and clinical practice it is recommended that these psychological factors, along with others, are incorporated into further explorations of this relationship.

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CHAPTER 3: CONCLUDING DISCUSSION

This final chapter is a concluding discussion of the overall thesis with a key focus on its clinical implications and future directions. The methodological quality and findings from the systematic review (Chapter 1) will be briefly discussed. The empirical study, which explored a number of hypothesised relationships between IBS symptoms, disordered eating and psychological variables, will be discussed. This discussion will conclude with a proposal for future research and a lay summary.

For the ease of reading, the terms used in this thesis will once again be clarified.

- IBS will be used when referring to individuals who have been given this diagnosis using a diagnostic tool.
- IBS symptoms will be used when referring to GI symptoms associated to IBS (e.g. abdominal bloating, abdominal pain, constipation, diarrhoea and feeling full).
- “Eating disorder” will be used when referring to a diagnosed eating disorder
- “Disordered eating” will be used when referring to disturbed eating attitudes and behaviours such as, feeling fat, making oneself sick, not eating and being unhappy with body weight and shape. .
- “Eating pathology” will be used as a collective term for eating disorder and disordered eating.

Extended discussion

This thesis has attempted to understand the overlap between IBS symptoms and eating pathology from a psychological perspective. The objectives were:

1. To summarise which psychological factors (in the available literature) are related to the occurrence of both eating pathology (eating disorders and disordered eating) and IBS (including GI symptoms associated with IBS). This objective was addressed in Chapter One.
2. To explore the relationships between IBS symptoms, attachment anxiety, attachment avoidance, IBS-related cognitions, anxiety, depression and disordered eating in community samples (1) university staff and students, (2) those with IBS symptoms and (3) those with disordered eating. This objective was addressed in Chapter Two.

3. To hypothesise how shared psychological factors may be related to 1) disordered eating in those experiencing primarily IBS symptoms and 2) IBS symptoms in those primarily affected by eating problems in three groups.

Consistent with objective one, a systematic review was conducted investigating which psychological variables co-occurred with the overlap of IBS, IBS symptoms and eating pathology. Following a rigorous search, eight empirical studies were identified, quality assessed and reviewed. The literature review demonstrated that IBS/IBS symptoms and eating pathology were associated. As well as being associated, a number of psychological factors were also found to be related to IBS/IBS symptoms and eating pathology. These were parental mental health, parental alcohol misuse, parental FGID's and parental separation, neuroticism, unhelpful cognitive processes, depression, anxiety, feeling sad and confused and somatisation.

All eight studies were quality assessed using a quality assessment tool developed for the review. This tool paid particular attention to the study design and statistical methods in a checklist format. No studies were excluded based on the quality assessment.

Overall the quality of the reviewed studies was good with all of the studies meeting at least seven of the nine quality criteria. As all the studies met the majority of the assessment criteria, the findings and interpretations drawn from these studies are of sufficient quality to inform hypotheses for future research.

Although meeting quality criteria there were some minor methodological points worthy of note. Two studies were unclear regarding the exclusion criteria used (Boyd, Abraham, & Kellow, 2010; Lobera, Santed, & Rios, 2011). Six of the studies did not report on reliability and validity for the measures used, amendments made to measures or for the extraction of data (Abraham & Kellow, 2011; Boyd et al., 2010; Boyd, Abraham, & Kellow, 2005; Emmanuel, Stern, Treasure, Forbes, & Kamm, 2004; Lau & Alasker, 2001; Porcelli, Leandro, & De Carne, 1998). These issues could potentially make it difficult to replicate these studies. In addition, amending measures and not checking on the reliability and validity of the scale could compromise the meaning of the results.

Other limitations not captured by the methodological quality assessment were found. Samples were predominantly female (Abraham & Kellow, 2011; Boyd et al., 2010; Boyd et al., 2005;

Emmanuel et al., 2004; Lobera et al., 2001; Porcelli et al., 1998) and one study did not report gender (Quick, McWilliams, & Byrd-Bredbenner, 2012). The majority of studies were conducted with clinical samples (Abraham & Kellow, 2011; Boyd et al., 2010; Boyd et al., 2005; Emmanuel et al., 2004; Lobera et al., 2001; Porcelli et al., 1998). These sample limitations could potentially affect the generalisability of the findings. Conclusions drawn from these studies may only be applicable to women and those who have a diagnosis of IBS and eating disorders severe enough to be an inpatient or outpatient. Therefore, the psychological variables found may not explain the experience of men and those with sub-clinical presentations. Finally, the majority of included studies were of a cross-sectional design. Conclusions about cause and effect cannot be inferred from cross-sectional studies.

To further investigate the co-occurrence of IBS symptoms and disordered eating an empirical study was conducted. In line with objective two, the empirical study investigated the relationships between IBS symptoms, attachment anxiety, attachment avoidance, IBS-related cognitions, anxiety, depression and disordered eating in three community samples. These community samples were; staff and students at a university, users of an IBS charity website and users of an eating disorder charity website. As other studies in this area have mainly focused on clinical inpatient and outpatient samples the author felt it was important to broaden the focus to include the full spectrum of eating pathology and IBS. Thus, community samples were used including a university student and staff sample. In this emerging research area the investigation of non-clinical samples is important.

IBS symptoms and disordered eating have a high prevalence in the general population (Quigley et al., 2009; Patton, Selzer, Coffey, Carlin & Wolfe, 1999; Brown, 1998). Research within non-clinical groups may inform the literature and clinical practice about which psychological factors may be associated with the onset and development of IBS symptoms and eating pathology. This information may help to inform prevention and early intervention. Like most clinical problems, eating pathology and IBS are idiosyncratic, fluctuate and are on a continuum (Spiegel, Farid, Esrailian, Talley, & Chang, 2010; Becker, Eddy, & Perloe, 2009; Agrawal & Whorwell, 2006; Fairburn & Bohn, 2005; Milos, Spindler, Schnyder, & Fairburn, 2005). Non-diagnostic self-report measures were used to assess IBS symptoms (Wiklund et al., 2003), IBS-related cognitions (Toner, Stuckless, Ali, Downie, & Emmott, 1998), disordered eating (Fairburn & Beglin, 1994, Fairburn, 2008) adult

attachment (Wei, Russell, Mallinckrodt, & Vogel, 2007), depression (Spitzer, Kroenke, & Williams, 2001) and anxiety (Spitzer, Kroenke, Williams, & Lo We, 2006). Non-diagnostic measures were used to reflect the interest in a non-clinical sample. Using community samples and non-diagnostic measures the current study has been able to capture a full spectrum of disordered eating, IBS symptoms, anxiety, depression, attachment, and IBS-related cognitions across the three groups. It was hoped that these community samples would recruit more men as they have been under-represented in past studies.

Findings revealed that IBS symptoms were associated with disordered eating in the university and disordered eating groups. Attachment anxiety was found to be associated with IBS-related cognitions and disordered eating in the university and disordered eating groups. In the university group attachment anxiety was associated with IBS symptoms. Attachment avoidance was associated with IBS-related cognitions. Attachment avoidance was associated with disordered eating in both the university and disordered eating groups. All other psychological factors (IBS-related cognitions, depression and anxiety) were associated with each other, IBS symptoms and disordered eating. Not all of the above associations were found in the IBS group. However, it is possible that this was probably due to the small sample size.

The third objective of the current study explored which psychological variables may help to explain the co-occurrence of IBS symptoms and disordered eating in (1) those that primarily experience IBS and (2) those that experience eating pathology and then begin to experience IBS symptoms. The following section explores how the identified psychological factors may hypothetically contribute to the co-occurrence of IBS symptoms and disordered eating. Research is needed to further explore the associations and the hypothesised relationships.

Focusing on the first group (those who primarily experience IBS symptoms) one possibility is that experiencing an insecure attachment style may contribute to the experience of IBS symptoms. Those who did not have their emotions and experiences regulated by a consistent caregiver are likely to have maladaptive response to stress (Mikulincer & Florian, 1998). Physical symptoms such as constipation, abdominal bloating and pain may be interpreted as dangerous and a person with an insecure attachment may become hypervigilant to these experiences and have unhelpful thoughts

about being unable to cope. Examples of these include “my symptoms make me feel out of control” and “my symptoms are too much to handle” (Toner et al., 1998). It is possible that for some individuals the combination of IBS symptoms and unhelpful thoughts about these symptoms may make some feel anxious or depressed. Those who are cognitively and emotionally distressed by their IBS symptoms may engage in avoidance and compensatory behaviours (indicative of disordered eating) to neutralise the distress. Such behaviours may include dieting, eliminating certain foods, only digesting liquids and using laxatives. There is some support for this hypothesis. Guthrie, Creed and Whorwell (1990) found women who attended an outpatient clinic for their IBS significantly scored higher on disordered eating than controls. Specifically, they scored higher on items that related to engaging in dieting and a desire to be thinner. This paper reported that it was not uncommon for women to attribute bloating to fatness and then start dieting. Disordered eating is a risk factor for the development of an eating disorder. For example, young people with a diet-related chronic health condition such as IBS have been found to be at risk of developing disordered eating which puts them at risk of developing an eating disorder (Quick, Byrd-Bredbenner, & Neumark-Sztainer, 2013). This is supported by the body dissatisfaction and eating disorder literature. Body dissatisfaction has been found to be associated with dietary restraint (Dunkley, Wertheim, & Paxton, 2001). Elevated dietary restraint has been found to increase the risk of onset of eating disorders (Fairburn, Cooper, Doll, & Davies, 2005). Thus, the disordered eating in those with IBS/IBS symptoms may put them at risk of developing an eating disorder.

For individuals who have an existing eating disorder a similar but alternative explanation is hypothesised. Here it is suggested that the experience of IBS symptoms is interpreted through existing eating disorder beliefs and assumptions. For example, seeing ones stomach girth grow due to bloating and being constipated may be interpreted as being fat and full. This may reconfirm extant eating disorder attitudes and result in negative IBS-related cognitions. This process, for some, may result in feelings of anxiety and depression. In order to manage these difficult cognitive and emotional symptoms, further disordered eating is engaged in. Therefore, the individual who has an eating disorder and interprets their IBS symptoms as being fat and overweight may further diet, restrict their

food or use laxatives. This cycle is hypothesised to maintain the existing eating disorder attitudes, beliefs and behaviours.

These ideas are hypothetical and have not yet been tested. Further research with sophisticated research designs are needed to explore these hypotheses.

Clinical Implications

There are a number of clinical implications that can be drawn from the findings of this thesis, some of which have already been discussed in Chapter One and Chapter Two.

IBS and IBS symptoms may be a barrier to the successful treatment of eating disorders and disordered eating, (a barrier which has previously not been incorporated into the understanding and treatment of eating pathology). In addition, accounting for the common experience of IBS and IBS symptoms into the treatment of eating disorders may provide additional therapeutic effectiveness for relevant individuals. Similarly, for those whose primary issue is IBS, the impact of disordered eating has not been acknowledged. Understanding this may be useful in helping individuals potentially at risk of developing an eating disorder due to their disordered eating and IBS symptoms.

Having an understanding of this relationship is useful for raising awareness for sufferers. For those at risk of developing an eating disorder, this awareness may be enough to prevent this from happening. For those with an existing eating disorder, to know that IBS symptoms are commonly experienced alongside eating pathology may help in a number of ways. If the person finds their IBS distressing and is aware this is leading them to engage in disordered eating they could seek help. Having an awareness of the association between IBS symptoms and disordered eating would be useful for professionals working with these populations. GP's could make more informed referrals to specialist services. Those with eating disorders have often been patients in gastroenterology services before receiving a diagnosis of an eating disorder (Ogg, Millar, Puszati, & Thom, 1997). This may be an indication of inappropriate referrals which can be costly for the National Health Service. Recognition of the co-occurrence of IBS symptoms and disordered eating and associated psychological factors will be cost-effective for services. Alternatively, the finding that some individuals have used gastroenterology services first may provide evidence for the hypothesis that those with IBS symptoms who engage in disordered eating are at risk of developing an eating

disorder. In gastroenterology services, professionals could be trained to recognise the presence and impact of disordered eating and refer this client group to psychology services where an appropriate assessment can be conducted. Gastroenterology services could also provide leaflets on IBS symptoms and its relationship with unhelpful thoughts, emotional distress and disordered eating.

Professionals working in eating disorder services could screen for IBS symptoms and ask about the presence and impact of IBS symptoms in assessment. This could be captured using standardised assessment measures, such as ‘The Cognitive Scale for Functional Bowel Disorders’ (Toner et al., 1998). This scale measures the cognitions associated with IBS. Professionals could also further explore these difficulties through asking the individual to keep diaries of symptoms, thoughts, behaviours and emotions. This would be good clinical practice considering the prevalence of IBS symptoms in those with an eating disorder (and the hypothesis that these IBS symptoms may be a barrier to effective intervention). Such information would provide the clinician with an idea as to whether or not the individual is experiencing IBS symptoms (and how the identified shared psychological processes are having an impact). For example, are individuals experiencing bloating and a heavy feeling due to constipation, self-focused attention on their stomach (and misinterpreting this as being fat), becoming distressed and therefore restricting their food intake further? The answers to these questions might be useful for formulating the delivery of effective interventions.

Formulating both disorders would make these complex and numerous problems more manageable for both the professional and client. Currently, it seems that one ‘disorder’ is formulated whilst the other is ignored (Harvey, Watkins, Mansell, & Shafran, 2008). In addition individuals interpersonal history and any vulnerability here would also be useful to assess due the presence of attachment insecurity in this group.

Eating disorders are aetiologically complex and recognised as a difficult to treat group (Kaplan & Garfinkel, 1999). For some the role of IBS symptoms and related factors will not be important. A transdiagnostic approach to understanding and treatment seems to be a more effective approach (Fairburn, 2008). A process focused approach is suggested for those who experience the overlap of IBS/IBS symptoms and eating pathology (Harvey et al., 2008). The psychological factors indicated could be the target in intervention. For example, it may be formulated that attentional

processes, such as self-focused attention or hypervigilance need to be the focus of intervention, and/or thought processes, such as rumination, and/or emotional distress, such as low mood or anxiety and/or behavioural processes, such as avoidance. Possible interventions for these processes and emotional distress could be attention training and mindfulness (attention processes; Wells, 1995; Segal et al., 2002); keeping negative automatic thought records and assessing, identifying and challenging metacognitive beliefs (thought processes; Greenberger & Padesky, 1995; Wells, 1995); distress tolerance using Dialectical Behaviour Therapy (emotional distress; McKay, Wood & Brantley, 2007) dropping safety behaviours and Acceptance and Commitment Therapy (behavioural processes; Salkovskis, Clark, Hackman, Wells, & Gelder, 1999; Hayes, Strosahl, & Wilson, 1999).

Understanding and treating eating pathology using a process focused approach may increase the effectiveness of treatment in those experiencing GI symptoms. This would be consistent with successful transdiagnostic process based interventions for eating disorders (Fairburn, Cooper & Shafran, 2003) and anxiety (McManus, Shafran, & Cooper, 2010).

As IBS shares a number of gastrointestinal symptoms with other functional gastrointestinal disorders it is hypothesised that these ideas can be applied to those who are experiencing mixed FGID's and eating pathology.

Methodological considerations

Although the present thesis has focussed on a wide a range of psychological factors related to IBS/IBS symptoms and eating pathology, further psychological factors may mediate the relationship between IBS, IBS symptoms and eating pathology such as low self-esteem and low self-concept. In addition biological and social factors were not considered. This should be held in mind when considering the applicability of the findings.

As mentioned in Chapter Two there are a number of key methodological considerations relating to the empirical study. As already discussed, the participants were self-selecting. It is possible that those who took part in the study may have been more motivated to do so through distress or concern about their symptoms. Therefore, the results from this study may be elevated and represent a group of people overly concerned about GI symptoms and disordered eating. Many more women than men took part. Women were significantly more likely to have IBS symptoms. Gender was controlled

for in the correlations suggesting that the relationships found applied to both men and women. However, in the multiple regression, when gender was entered, IBS symptoms and disordered eating were not associated. Future research would benefit from recruiting more men. Previous research has focused primarily on women with disordered eating and women with both disordered eating and IBS symptoms (Abraham & Kellow, 2011; Boyd, Abraham & Kellow, 2010; Boyd, Abraham & Kellow, 2005; Striegel-Moore et al., 2009). The empirical study employed an online survey as the data collection method due to the possibility of recruiting a large community sample. The study did not manage to recruit as many men as hoped.

A strength of the empirical study was the high number of participants that were recruited. Out of those who consented to the study 73% provided full data and a further 16% provided partial data. Altogether this was an 89% response rate. This is much larger than other online studies whose response rates were found to be between 20 to 47% (Nulty, 2008). The university sample was adequately powered for the planned statistical analyses. Unfortunately recruitment for the IBS symptoms sample was not as good. This sample suffered from advertisement problems such as the study being advertised in the wrong place with the wrong link. Due to the small sample size the IBS symptoms group was not adequately powered. The disordered eating sample was slightly underpowered. Despite the response rate being good, there was attrition and partial data within all three groups. It was found that those who had a higher level of IBS symptoms and who were older were more likely to complete the questionnaires. It is possible the findings from the empirical study can only be generalised to those who are older and who experience higher severity of IBS symptoms. The questionnaires were not presented in a randomised order in the online survey and therefore those at the end of the survey suffered from the most attrition. In addition, the author did not supply a question which asked the university sample whether they were students or staff therefore making it difficult to generalise the study's findings to these groups.

As the empirical study was a cross sectional design conclusions about cause and effect cannot be inferred. Other methodological and statistical designs may have been more sophisticated in exploring the associations found in this thesis. For example, a longitudinal design would allow causality to be inferred (Rutter, 1994) and structural equation modelling allows both exploratory and

confirmatory modelling with casual relationships. However as this is a novel area it was thought that making theory practice links based on the reviewed literature, well researched psychological theories and exploring these associations through a correlational cross sectional design was appropriate in the first instance.

Self-report measures were used in the empirical study to address the research aims. Measures were carefully chosen in order to attend to the research questions. However, there are some possible limitations with the measures selected. The scale used to measure IBS symptoms (Wiklund et al., 2003) was designed to measure severity of IBS. However, for the purpose of this study it was used to provide a continuum of IBS symptoms as an alternative to asking whether the participant had a diagnosis of IBS or using a diagnostic measure. As the scale ranged from not experiencing IBS symptoms to experiencing a high severity of IBS symptoms the measure was deemed appropriate to use. Those in the IBS symptoms group had a higher mean than the other groups.

The EDE-Q 6.0 (Fairburn & Beglin, 1994; Fairburn, 2008) is a measure usually used with clinical populations but has been normed in community populations. The EDE-Q means in this study for the university group were comparable to the community norms (Mond, Hay, Rodgers, Owen & Beumont et al., 2004). The disordered eating group mean was comparable to clinical norms (Aardoom, Dingemans, Slof Op't Landt, & Van Furth, 2012). This study did not focus on categories of disorders; however the study did want groups of individuals who identified themselves as experiencing IBS symptoms and disordered eating. Therefore the finding that the means were high indicates that the groups had self-selected themselves correctly and reinforced the appropriateness of the measures. However, the Cronbach's alpha for the EDE-Q was questionable. The internal consistency was good (.88) for the university and disordered eating group (.82) but poor (.34) for the IBS group. The low alpha score indicates that the EDE-Q was not an appropriate measure of disordered eating in those with primarily IBS symptoms. As this may have affected the relationships measured using the EDE-Q in the IBS group their results have not been relied upon in relation to the interpretation of the findings.

Cognitive processes were identified as a shared psychological factor in IBS symptoms and disordered eating. However, there are very few questionnaires that look at the interpretation of IBS

symptoms. The chosen measure The Cognitive Scale for Functional Bowel Disorders (Toner et al., 1998) is the only questionnaire which examines IBS-related cognitions. Cognitive content and cognitive processes differ. Cognitive content is concerned with the topic of the thought whereas cognitive processes include strategies such as ‘thinking about thinking’, attentional and appraisal processes (Wells, 1995; Harvey, Watkins, Mansell & Shafran, 2008). The Hospital and Depression Scale (Zigmond & Snaith, 1983) may have been a better measure of depression and anxiety due to the physical complaints in the studied population.

This is the first study to investigate whether attachment anxiety, IBS symptoms and IBS-related cognitions are associated. The majority of the associations found were small apart from attachment anxiety and IBS-symptoms in the disordered eating group which showed a medium effect size (Cohen, 1988; 1992). Future studies need to be conducted to examine this relationship further.

Future research

The empirical study was the first to explore IBS symptoms, disordered eating and associated psychological factors in three non-clinical samples. This is the first study which examines the attachment insecurity, IBS symptoms and IBS-related cognitions.

To further explore these relationships replication studies are needed. As the sample size was small in the IBS symptoms group it is recommended that the current study is replicated with a larger IBS sample. This could be done for those who a) identify themselves to have IBS symptoms and b) those who have received a diagnosis of IBS. It is also recommended that the study is replicated in a larger disordered eating population so more sophisticated statistical analyses can be carried out than the correlations performed in this study. Other groups of interest would be those who experience other FGIDs.

Future studies should consider employing longitudinal designs. This would allow for causality to be inferred. It would be useful to follow a group of individuals who identify themselves as experiencing IBS symptoms over a number of years. This would allow for the psychological variables to be tested over time and to see how they influence the relationship between IBS symptoms and disordered eating. This study design will also allow for the development of disordered eating to eating disorder to be observed. A longitudinal study in those with an eating disorder would also be

appropriate. These longitudinal studies should use more detailed statistical analysis, such as structural equation modelling.

Attachment insecurity should be further investigated in relation to IBS symptoms and other FGIDs due to the mixed findings in the current study. This could be done using larger samples and different attachment measures.

Research should consider a biopsychosocial framework when attempting to understand the association between eating problems and IBS symptoms. Furthermore, future research should identify other potential psychological factors that may be related to IBS symptoms and disordered eating. This could be done by drawing on the separate IBS and eating disorder literature and comparing common psychological factors in their development and maintenance (see Introduction in Chapter 1).

Considering all these future directions, the next step should be a single-case research study. There are currently no published case studies or case series of the overlap between IBS/IBS symptoms and eating pathology. There is only anecdotal clinical evidence (Dr Emma Winter, personal communication, May 2011). A case-series of individuals presenting with co-morbid IBS/IBS symptoms and eating pathology would provide important clinical information and evidence of the co-occurrence of IBS symptoms, eating pathology and related psychological variables. The findings from this research could be used to inform assessment, formulation and intervention. This would allow for a more detailed examination of the discussed relationship and its associated psychological factors. It would also allow for the identification of other potential factors, inform future research and the identification of the cognitive and behavioural processes common to this population. The identified cognitive processes would be useful for the development of a more appropriate cognitive measure which could be used in future experimental studies and ultimately CBT interventions.

Research Proposal

A brief research proposal for a case-series is presented. The purpose of this case-series is to test the clinical utility of the associations identified in this thesis and how they may inform assessment, formulation and intervention. The current thesis has not recommended a new treatment for the overlap of IBS/IBS symptoms and eating pathology. Rather, it has discussed a process treatment approach and third wave CBT. The proposed case-series is interested in how effective a

chosen intervention is after an individual's GI symptoms and disordered eating have been assessed and formulated taking into account the psychological factors found to be present in the co-occurrence of IBS symptoms and eating pathology.

Study Aims:

1. To confirm that the co-occurrence of IBS/IBS symptoms and eating pathology is a salient issue in both those with IBS/IBS symptom and those with eating pathology.
2. To learn more about the relationships between IBS symptoms, adult attachment, IBS-related cognitions, anxiety, depression and disordered eating.
3. To test the clinical utility and effectiveness of formulations which account for the investigated psychological variables.

Design

The study would comprise of a series of case studies which incorporate assessment, formulation and intervention.

Method

Participants: Inclusion criteria for participants would be experiencing both disordered eating and IBS symptoms. These individuals could be approached through gastroenterology and eating disorder services.

Measures: To provide some rigour the dependent variable (disordered eating) will be repeatedly measured to provide a baseline and capture change. The proposed study may consider another measure of eating pathology due to the questionable reliability in the empirical study.

Other factors (IBS symptoms, IBS-related cognitions, depression and anxiety) will be measured using the same assessment tools as the empirical study: The Gastrointestinal Symptom Rating Scale – IBS version (Wiklund et al., 2003); The Cognitive Scale for Functional Bowel Disorders (Toner et al., 1998); Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983)

Procedure: The proposed study will follow an AB design. During the baseline period (A), a psychological assessment will be conducted informed by the investigated psychological factors. Information regarding relationships, emotional distress and cognitive and behavioural processes will be collected. This will be done through clinical interview, the measures stated above and qualitative

assessment of symptoms through keeping a diary. A collaborative formulation will be developed. This formulation will identify the most salient psychological factors and processes, and along with the clients goals will inform the intervention. Once the intervention is agreed upon the case-series will move into the active stage (B). Throughout intervention, the targeted psychological factors and processes will repeatedly be assessed to monitor change.

Lay summary

The lay summary will be an electronic article aimed at users of the charity website, IBS Network and users of the charity website, beat. Users of these charity websites include individuals who experience IBS, IBS symptoms, issues with eating and eating disorders. Professionals also access these charities for resources. Both the IBS Network and beat have electronic monthly magazines. The format of the article is designed to be accessible to all audiences. As the audiences include both lay people and professionals, all technical words and concepts have been explained. The article uses the phrase 'IBS' which encompasses both a diagnosis of IBS and IBS symptoms for the ease of the reader. Disordered eating will be explained using non-psychiatric and non-stigmatising language and will be used separately from eating disorders.

Understanding IBS, problem eating and eating disorders: A psychological approach

Why was the study important?

We know that it is common for people to experience both IBS and problem eating and/or eating disorders. Problem eating and eating disorders include negative thoughts and behaviours about body shape and weight. For example, feeling fat and full, being unhappy with body shape, dieting, being sick, avoiding foods and using laxatives. IBS symptoms include bloating, constipation, diarrhea and pain.

Not much is known why IBS and problem eating or eating disorders occur together.

There are psychological factors common to those who experience both IBS and problem eating. Having a parent with mental health difficulties, alcohol problems or IBS themselves was found to be common. Having parents who had separated was also common. It is possible that these experiences may cause worry about relationships. These worries can be either; feeling unsure about

whether others are available and close enough or wanting to avoid relying on others. Other factors included unhelpful thinking styles (e.g. worrying and focusing on symptoms), depression and anxiety.

Aims of the study

We aimed to understand the relationships between worry about relationships, negative thoughts about IBS symptoms, feeling sad, feeling anxious, IBS symptoms and problem eating..

What did the study do?

We asked members of the public to take part. The study was advertised on the internet at the University of Liverpool, the IBS Network and beat (an eating disorder charity website). Five-hundred and fifty six people took part. More women than men answered the questionnaire.

What was found?

The results were spilt into three groups. A university group, a problem eating group and an IBS symptom group. In the university group, having more IBS symptoms, relationship worry, negative thoughts, feeling sad and anxious were found to be related. In the problem eating group, the same results were found apart from those with relationship worries did not have more IBS symptoms or unhelpful thoughts about their IBS symptoms. .

Results from the IBS groups were a little different. People who had relationship worries had more problems eating but not more IBS symptoms or negative thoughts about their IBS. They also did not feel as sad or anxious. It is difficult to be sure of these results because not many people from this group answered questions.

What to bear in mind when reading this article and what this means.

This is a new way of looking at the experience of both IBS and problem eating. This relationship needs to be explored further studying people over time. This will help us see if we have understood the experience of both IBS and problem eating. If we have this could be important for future psychological treatments of IBS and eating disorders.

I would like to thank all those who took part in the research. We had a huge response which shows how important this issue is too many people. I would also like to thank the IBS Network and beat for supporting the research.

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APPENDICES

Appendix A: Guidelines for authors on ‘*Clinical Psychology Review*’

Article structure

Manuscripts should be prepared according to the guidelines set forth in the Publication Manual of the American Psychological Association (6th ed., 2009). Of note, section headings should not be numbered.

Manuscripts should ordinarily not exceed 50 pages, including references and tabular material. Exceptions may be made with prior approval of the Editor in Chief. Manuscript length can often be managed through the judicious use of appendices. In general the References section should be limited to citations actually discussed in the text. References to articles solely included in meta-analyses should be included in an appendix, which will appear in the on line version of the paper but not in the print copy. Similarly, extensive Tables describing study characteristics, containing material published elsewhere, or presenting formulas and other technical material should also be included in an appendix. Authors can direct readers to the appendices in appropriate places in the text.

It is authors' responsibility to ensure their reviews are comprehensive and as up to date as possible (at least through the prior calendar year) so the data are still current at the time of publication. Authors are referred to the PRISMA Guidelines (<http://www.prisma-statement.org/statement.htm>) for guidance in conducting reviews and preparing manuscripts. Adherence to the Guidelines is not required, but is recommended to enhance quality of submissions and impact of published papers on the field.

Appendices

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

Essential title page information

Title. Concise and informative. Titles are often used in information-retrieval systems. Avoid abbreviations and formulae where possible. **Note: The title page should be the first page of the manuscript document indicating the author's names and affiliations and the corresponding**

author's complete contact information.

Author names and affiliations. Where the family name may be ambiguous (e.g., a double name), please indicate this clearly. Present the authors' affiliation addresses (where the actual work was done) below the names. Indicate all affiliations with a lower-case superscript letter immediately after the author's name and in front of the appropriate address. Provide the full postal address of each affiliation, including the country name, and, if available, the e-mail address of each author within the cover letter.

Corresponding author. Clearly indicate who is willing to handle correspondence at all stages of refereeing and publication, also post-publication. **Ensure that telephone and fax numbers (with country and area code) are provided in addition to the e-mail address and the complete postal address.**

Present/permanent address. If an author has moved since the work described in the article was done, or was visiting at the time, a "Present address" (or "Permanent address") may be indicated as a footnote to that author's name. The address at which the author actually did the work must be retained as the main, affiliation address. Superscript Arabic numerals are used for such footnotes.

Abstract

A concise and factual abstract is required (not exceeding 200 words). This should be typed on a separate page following the title page. The abstract should state briefly the purpose of the research, the principal results and major conclusions. An abstract is often presented separate from the article, so it must be able to stand alone. References should therefore be avoided, but if essential, they must be cited in full, without reference to the reference list.

Keywords

Immediately after the abstract, provide a maximum of 6 keywords, using American spelling and avoiding general and plural terms and multiple concepts (avoid, for example, 'and', 'of'). Be sparing with abbreviations: only abbreviations firmly established in the field may be eligible. These keywords will be used for indexing purposes.

Abbreviations

Define abbreviations that are not standard in this field in a footnote to be placed on the first page of the article. Such abbreviations that are unavoidable in the abstract must be defined at their first mention there, as well as in the footnote. Ensure consistency of abbreviations throughout the

Acknowledgements

Collate acknowledgements in a separate section at the end of the article before the references and do not, therefore, include them on the title page, as a footnote to the title or otherwise. List here those individuals who provided help during the research (e.g., providing language help, writing assistance or proof reading the article, etc.).

Footnotes

Footnotes should be used sparingly. Number them consecutively throughout the article, using superscript Arabic numbers. Many word processors build footnotes into the text, and this feature may be used. Should this not be the case, indicate the position of footnotes in the text and present the footnotes themselves separately at the end of the article. Do not include footnotes in the Reference list.

Table footnotes

Indicate each footnote in a table with a superscript lowercase letter.

General points

- Make sure you use uniform lettering and sizing of your original artwork.
- Embed the used fonts if the application provides that option.
- Aim to use the following fonts in your illustrations: Arial, Courier, Times New Roman, Symbol, or use fonts that look similar.
- Number the illustrations according to their sequence in the text.
- Use a logical naming convention for your artwork files.
- Provide captions to illustrations separately.
- Size the illustrations close to the desired dimensions of the printed version.
- Submit each illustration as a separate file.

Tables

Number tables consecutively in accordance with their appearance in the text. Place footnotes to tables below the table body and indicate them with superscript lowercase letters. Avoid vertical rules. Be sparing in the use of tables and ensure that the data presented in tables do not duplicate results described elsewhere in the article.

References

Citations in the text should follow the referencing style used by the American Psychological Association. You are referred to the Publication Manual of the American Psychological Association, Sixth Edition, ISBN 1-4338-0559-6, copies of which may be ordered from <http://books.apa.org/books.cfm?id=4200067> or APA Order Dept., P.O.B. 2710, Hyattsville, MD 20784, USA or APA, 3 Henrietta Street, London, WC3E 8LU, UK. Details concerning this referencing style can also be found at <http://humanities.byu.edu/linguistics/Henrichsen/APA/APA01.html>

Citation in text

Please ensure that every reference cited in the text is also present in the reference list (and vice versa). Any references cited in the abstract must be given in full. Unpublished results and personal communications are not recommended in the reference list, but may be mentioned in the text. If these references are included in the reference list they should follow the standard reference style of the journal and should include a substitution of the publication date with either 'Unpublished results' or 'Personal communication'. Citation of a reference as 'in press' implies that the item has been accepted for publication.

Web references

As a minimum, the full URL should be given and the date when the reference was last accessed. Any further information, if known (DOI, author names, dates, reference to a source publication, etc.), should also be given. Web references can be listed separately (e.g., after the reference list) under a different heading if desired, or can be included in the reference list.

References in a special issue

Please ensure that the words 'this issue' are added to any references in the list (and any citations in the text) to other articles in the same Special Issue.

Reference style

References should be arranged first alphabetically and then further sorted chronologically if necessary. More than one reference from the same author(s) in the same year must be identified by the letters "a", "b", "c", etc., placed after the year of publication. **References should be formatted with a hanging indent (i.e., the first line of each reference is flush left while the subsequent lines are indented).**

Examples: Reference to a journal publication: Van der Geer, J., Hanraads, J. A. J., & Lupton R. A. (2000). The art of writing a scientific article. *Journal of Scientific Communications*, 163, 51-59.
Reference to a book: Strunk, W., Jr., & White, E. B. (1979). *The elements of style*. (3rd ed.). New York: Macmillan, (Chapter 4).

Reference to a chapter in an edited book: Mettam, G. R., & Adams, L. B. (1994). How to prepare an electronic version of your article. In B.S. Jones, & R. Z. Smith (Eds.), *Introduction to the electronic age* (pp. 281-304). New York: E-Publishing Inc.

Appendix B: Comparison of Manning and Rome diagnostic criteria

Manning criteria - No recommendations were made of how many symptoms a person needed for a diagnosis. Therefore, some have used 2, 3 or 4 symptoms.

1. Abdominal pain that is relieved with a bowel movement
2. Pain associated with looser stools
3. Pain associated with more frequent stools
4. Sensation of incomplete evacuation
5. Passage of mucus
6. Abdominal distension

Rome III criteria - Recurrent abdominal pain or discomfort (an uncomfortable sensation not described as pain; for women not related to menstrual bleeding) for at least 3 days a month in last 3 months associated with two or more of criteria below:

1. Improvement with defecation
2. Onset associated with a change in frequency of stool
3. Onset associated with a change in form (appearance) of stool

Criteria must be fulfilled for the last 3 months with symptom onset at least 6 months prior to diagnosis for a diagnosis of IBS.

Appendix C: Data extraction screen shots

Lit table 1 - Microsoft Excel

	A	B	C	D	E	F	G
1							Participants
2	Study title	Author & year	Aim of study	Objectives	N	Type	Setting
3	Exploring eating disorder quality of life and functional gastrointestinal disorders among eating disorder patients	Abraham & Kellow 2011	To explore the relationship between the QOL of ED patients and FGIDs.	Examine the ED QOL with presence of FGID Examine relationship of QOL ED scores with QOL IBS scores and IBS severity	N = 160 (Anorexia = 71, Bulimia = 29, EDNOS = 60)	Consecutive female patients admitted of reproductive age (18 to 45 years) fulfilling DSM IV criteria for an ED using BMI =<17.5 kg and omitting amenorrhoea criteria. Wide range of severity of ED	Specialised ED unit for treatment of ED Australia
	Psychological features are important predictors of FGIDs in patients with EDs	Boyd, Abraham & Kellow 2005	To determine type and prevalence of FGIDs in AN, BN and EDNOS and investigate these relationships including psychological characteristics and demographics	To describe FGIDs in Eds To compare the type and number of FGIDs in AN, BN & EDNOS To investigate the relationship between psy features, ED characteristics, ED attitudes and behaviours,	N=101 (Anorexia = 45, Bulimia = 22, EDNOS = 34)	Consecutive female patients attending ED unit for treatment. No age range mentioned. No signs of organic GI disease.	Specialised ED unit for treatment of ED Australia

Lit table 1 - Microsoft Excel

	H	I	J	K	L	M
1			Methodology			
2	Mean age	Exclusion	Outcome measures	Design	Data collection	Data analysis
	AN - 24 BN - 25 EDNOS - 25	No major medical or mental illness, such as, diabetes, epilepsy, bipolar depression or drug abuse	<p>Quality of Life: Eating Disorders (Abraham, Brown, Boyd, Luscombe & Russell, 2006) - enquires about past 28 days and 3 months - 3 months data used as this concides with the Rome II and IBS-QOL</p> <p>Rome II: The functional gastrointestinal disorders (Drossman, 2000)</p> <p>Quality of Life: Irritable Bowel Syndrome (Patrick, Drossman, Fredrick, DiCesare & Puber, 1998)</p> <p>Bowel Symptom Severity Scale (Boyce, Gilchrist, Talley & Rose, 2000)</p> <p>Eating and Exercise Examination (Abraham & Lovell, 1999)- Self-reported at computer and checked against clinical notes. No report of how this was done, by whom and what the comparisons revealed. Behaviours rated in past 28 days were avergaed for the past 3 months to concide with other measures.</p>	Questionnaire, self-report, retrospective, convenience	Completed Q few days after being admitted	<p>Partial correlations (controlling for age) between FGID categories, individual FGIDs and the QOL ED global and subscores (outcome vari)</p> <p>Significant correlations further explored in ANOVA (controlling for a and BMI)</p> <p>Partial correlations (controlling for age) between total and subscore QOL-IBS, BSSI and QOL-ED (outcome variable) then total scores examined in linear regression.</p> <p>Post hoc, partial correlations (controlling for age and BMI) between FGIDs and frequency of ED behaviours (binge eating, self-iduced vomiting, laxative use, excessive exercise).</p>
3	AN - 20.8 BN - 19.9 EDNOS - 20.7	5 patients were excluded for primary medical and psychiatric diagnoses (Coeliac disease, insulin-dependent diabetes (2), thyroxine-dependent	<p>Rome II modular questionnaire (Drossman, 2000) - for the purpose of this study heartburn and dysphagia were not mutually exclusive (WHY?).</p> <p>Eysenck Neuroticism Scale (from Eysenck Personaility Questionnaire) (Eysenck & Eysenck, 1975)</p> <p>Beck Depression Inventory - (Beck, Ward, Mendelson, Mock & Erbaugh, 1961)</p>		On admission all patients asked to complete series of questionnaires as part of standard	<p>Pearsons correlations and one-way ANOVAs - "implemented where appropriate, to determine any differences in demographic and other variables between ED types".</p> <p>Logistic regression stepwise backward (Wald) model approach (WH to determine predictors of FGIDs and 3 or more FGIDs in EDs.</p> <p>Significant independent variables from each category (Psy characteristics, eating disordered attitudes, eating disordered</p>

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Lit table 1 - Microsoft Excel

	N	O	P	Q	R
1					
2	<p>Non-response/missing data</p> <p>6 eligible for the study did not attempt or complete the questionnaires</p>	<p>Overall Findings</p> <p>No difference between IBS in AN, BN or EDNOS</p> <p>IBS (strongest association) and functional constipation correlated with QOL ED</p> <p>Body weight subscore sig correlated to IBS (those with lower weight more likely to have IBS)</p> <p>Those with IBS and functional incontinence were more likely to use laxatives - suggests laxatives maybe producing the results.</p> <p>The poorer the QOL ED is, the poorer the IBS QOL is and the more severe the IBS symptoms are</p>	<p>Findings relevant to lit Q</p> <p>Individual QOL ED questions that were significantly related to IBS were;</p> <p>"preoccupied with thoughts of food and eating"</p> <p>"preoccupied of thoughts of body weight and shape"</p> <p>"fear of loss of control over body/eating/feelings"</p> <p>"feeling confused/sad and less able to cope" - this suggests that IBS is related to psychological factors associated with ED rather than specific features of ED itself. Confirms previous data that psychological features are important predictors of FGIDs in EDs.</p> <p>Paper wonders whether women who suffer either an ED or IBS experience psychological distress use same language related to ED and/or IBS to communicate this.</p>	<p>Limitations</p> <p>Not an equal number of Ps in sample groups</p> <p>No quality report of measures self report</p> <p>Inpatient sample</p> <p>No control group</p> <p>Incomplete excluded - different group?</p> <p>Did they control for laxatives in psy variables?</p>	<p>Strengths</p>
3	<p>3 patients questionnaires incomplete (out of those eligible) and therefore excluded - 97% response rate</p>	<p>Most prevalent ED was AN. There were significant differences in BMI between the groups.</p> <p>96% met criteria for at least 1 FGID (IBS 52%, FH 51%, FAB 31%, FC 24%, Fdys 23% and Fano 22%). 52% 3 or more.</p>	<p>No difference of psy variables between ED groups. Somatization and anxiety significant predictors for individual FGIDs - IBS, FH, FC and FAno (no sig predictors for FAB or FDys) but not depression or neuroticism. Supported by somatization being found in a general IBS group. somatization may play a role in the FGIDs with pain.</p>	<p>Did not make clear what blood tests were used for</p> <p>Did not outline the exclusion criteria before they actually excluded.</p> <p>Incomplete excluded - different group?</p> <p>No research in introduction to evidence why</p>	<p>First study to administer Rome to ED patients</p> <p>Supports previous research that there is comorbidity of FGIDs and psychiatric disorder consistent with previous research that shows with FGID score higher on ED measures.</p> <p>First study to investigate predictors of FGIDs and find support for psy variables in relations</p>

Lit table 1 - Microsoft Excel

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Clipboard Font Alignment Number Styles Cells Editing

M1 Results

	S	T	U	V	W	X
1						
2	My conclusions (for review and for EP)	Differences between papers	Review references	Tasks		
		Slightly older than sample in next paper.	No relevant papers	Get measure papers		
3	<p>Could those with FGID who score higher on ED be because the FGID existed first? Page 931</p> <p>Could be that those with IBS somatise and then develop ED behaviours?</p> <p>Neuroticism = predisposition prolonged stress response = FGIDs response to chronic stress = chronic stress also relevant to ED, severity of</p>	Younger sample but from the same unit.	<p>2 for review of abstract - Chami, Anderson, Crowell, Schuster & Whitehead GI syms in BN: effects of treatment. AM J Gastroenterol 1995, 90, 88-92</p> <p>Waldholtz & Andersen GI syms in AN: a prospective study. Gastroenterology</p>	<p>Look into pros and cons of regression used</p> <p>What does "reference means" mean?</p> <p>Get references 29-31 pg 931, 34 PG 932 references 28 (systematic review) and 40</p>		

Sheet1 Sheet2 Sheet3

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Appendix D: Summary of studies' characteristics including measures

Study	Setting/Country	Design	Sample size	Sample type	% female	Mean age	Measure of FGID	Measure of ED/DE	Measure of ψ Variables	Attrition/missing data
<i>Cross-sectional</i>										
Abraham & Kellow (2011)	ED inpatient unit Australia	Self-reported Q on admission	160 AN 44.4% BN 18.1% EDNOS 37.5%	Consecutive inpatient	100	AN 24 BN 25 EDNOS 25	ROME-II BSSI IBS-QOL	DSM-IV EEE-C	QOL-ED	Non-response reported
Boyd et al. (2005)	ED inpatient unit Australia	Self-reported Q on admission	108 AN 44.4% BN 18.1% EDNOS 37.5%	Consecutive inpatient	100	AN 21 BN 20 EDNOS 21	ROME-II	DSM-IV EEE-C EDI-2 EAT	Eysenck Neuroticism Scale (EPQ) BDI STAI Somatization subscale (BSI)	Both reported & excluded
Boyd et al. (2010)	ED inpatient unit Australia	Self-reported Q on admission & 12 month follow-up	73	Consecutive inpatient	100	20 ± 5	ROME-II	DSM-IV EEE-C EDI-2 EAT	BDI STAI Somatization subscale (BSI)	Both reported & excluded
Emmanuel et al. (2004)	GE centre & ED service England	Case records. Interview follow-up	60 GI & AN n=20 AN 20 n=20 FC 20 n=20	Clinic referral	92	GI 30 AN 22 FC 32	Clinical judgement	ICD-10	Psychiatric and parental history	Not reported
Lau & Alsaker (2001)	High schools Norway	Self-reported Q	1117	Convenient	49	13	GSC	Self-reported dieting	WECI Feeling fat question	Missing data reported & included
Lobera et al. (2011)	ED outpatient & university Spain	Interview	245 ED n=78 Psych n=77 Student n=90	Clinic referral & convenient	77	ED 23 Psych 41 Student 22	ROME-II NDI PSQ-VAS	DSM IV-RT	TSF-Q BDI STAI	Not reported
Porcelli et al. (1998)	GE outpatients Italy	Self-reported Q on referral	260 FGID n=127 GD n=163	Consecutive clinic referral	67	FGID 39 GD 55	RDQ-FGID GSRS	DSM IV	HADS	Not reported
<i>Case-control</i>										
Quick et al. (2012)	Universities & DRCHCs websites USA	Self-report Q via internet Matched controls	2625 including 164 matched controls	Targeted & convenient	Not reported	20	Self-reported diagnosis	EDE-Q TEFQ-R18 NEQ	ASI PHQ-9 GAD-7 FOCI RSES HM CISS The Eating subscale (DTEDS) The regulations of emotions scale (WLEIS)	Not reported

Note. Measure of FGID refers to measure of IBS and associated GI symptoms. **Bolded** – total sample size Note for abbreviations: FGID, functional gastrointestinal disorder; ED, eating disorder; Psy, psychiatric; DE, disordered eating; GE, gastroenterology; DRCHC, diet-related chronic health conditions Q, questionnaire, AN; anorexia nervosa; BN, bulimia nervosa; EDNOS, eating disorder not otherwise specified; GI, gastrointestinal; FC, functional constipation; Psych, psychiatric; GD, gallstone disease. For information on measures; ROME II, Rome II: The functional gastrointestinal disorders; BSSI, Bowel Symptom Severity Scale; QOL-IBS, Quality of Life: Irritable Bowel Syndrome; GSC, Giessen Symptom Checklist for Children and Teens; NDI, Nepean Dyspepsia Index; PSQVAS, Patient Symptom Questionnaire Visual Analogue Scales; DSM IV/DSM IV-RT, Diagnostic and Statistical Manual of Mental Disorders (4th edition/4th edition revised); EEE-C, Eating and Exercise Examination; EDI-2, Eating Disorder Inventory-2; EAT, Eating Attitudes Test; ICD-10, International Classifications of Diseases 2010; TEFQ-R18, Three Factor Eating Questionnaire-18; NEQ, The Night Eating Questionnaire; QOL-ED, Quality of Life-Eating Disorders; EPQ, Eysenck Personality Questionnaire; BDI, Beck Depression Inventory; STAI, State-Trait Anxiety Inventory; BSI, Brief Symptom Inventory; WECI, Weight and Eating Concerns Inventory; TSF-Q, Thought-Shape Fusion Questionnaire; API, The Appearance Schema Inventory; PHQ-9, The Patient Health Questionnaire; GAD-7, The Generalized Anxiety Disorder Scale; FOCI, Florida Obsessive Compulsive Inventory; RSES, Rosenberg's Self Esteem Scale, HM, Health Motivation; CISS, The Coping Inventory for Stressful Situations; DTEDS, Dichotomous Thinking in Eating Disorders Scale; WLEIS, Wong & Law Emotional Intelligence Scale

Appendix E: Guidelines for authors on ‘*Psychology and Health*’

General guidelines

- Papers are accepted only in English. British spelling and punctuation is preferred. Please use single quotation marks, except where ‘a quotation is “within” a quotation’. A typical article will not exceed 30 pages (inclusive of tables/references/figure captions/footnotes/endnotes), with a font size of 12 in New Times Roman, and all margins should be at least 2.5cm. Papers that greatly exceed this will be critically reviewed with respect to length. Authors should include a word count with their manuscript. Manuscripts should be double-spaced throughout (including tables and references), and each page should be numbered consecutively.
- Manuscripts should be compiled in the following order: title page; abstract; keywords; main text; acknowledgments; appendixes (as appropriate); references; table(s) with caption(s) (on individual pages); figure caption(s) (as a list).
- [Abstracts](#) of no more than 200 words are required for all papers submitted. The primary headings for the structured abstracts will be: Objective, Design, Main Outcome Measures, Results, Conclusion.
- Each paper should have three to six [keywords](#) or phrases . These will be used for indexing and data retrieval, and so where appropriate we recommend using standard MeSH terms (the terms used for indexing articles for MEDLINE).
- Search engine optimization (SEO) is a means of making your article more visible to anyone who might be looking for it. Please consult our guidance [here](#) .
- All the authors of a paper should include their full names, affiliations, postal addresses, telephone numbers and email addresses on the cover page of the manuscript. One author should be identified as the corresponding author. The affiliations of all named co-authors should be the affiliation where the research was conducted. If any of the named co-authors moves affiliation during the peer review process, the new affiliation can be given as a footnote. Please note that no changes to affiliation can be made after the article is accepted.

- For all manuscripts non-discriminatory language is mandatory. Sexist or racist terms should not be used.
- Authors must adhere to [SI units](#) . Units are not italicised.
- When using a word which is or is asserted to be a proprietary term or trade mark, authors must use the symbol ® or TM.
- Reports of statistical tests should include an indication of effect size whenever possible.

Reports of randomised controlled trials should state any registration details of the trial and should follow CONSORT guidelines where relevant (see Moher, D., Schulz, K.F. & Altman, D.G. for the CONSORT group, 2001. The CONSORT statement: Revised recommendations for improving the quality of reports of parallel-group randomized trials. *Annals of Internal Medicine*, 134, 657-662).

Style guidelines

Font: Times New Roman, 12 point. Use margins of at least 2.5 cm (1 inch).

Title: Use bold for your article title, with an initial capital letter for any proper nouns.

Authors' names: Give the names of all contributing authors on the title page exactly as you wish them to appear in the published article.

Affiliations: List the affiliation of each author (department, university, city, country).

Correspondence details: Please provide an institutional email address for the corresponding author. Full postal details are also needed by the publisher, but will not necessarily be published.

Anonymity for peer review: Ensure your identity and that of your co-authors is not revealed in the text of your article or in your manuscript files when submitting the manuscript for review. Advice on anonymizing your manuscript is available [here](#).

Abstract: Indicate the abstract paragraph with a heading or by reducing the font size. Advice on writing abstracts is available [here](#).

Keywords: Please provide five or six keywords to help readers find your article. Advice on selecting suitable keywords is available [here](#).

Headings: Please indicate the level of the section headings in your article:

- First-level headings (e.g. Introduction, Conclusion) should be in bold, with an initial capital letter for any proper nouns.
- Second-level headings should be in bold italics, with an initial capital letter for any proper nouns.
- Third-level headings should be in italics, with an initial capital letter for any proper nouns.
- Fourth-level headings should also be in italics, at the beginning of a paragraph. The text follows immediately after a full stop (full point) or other punctuation mark.

Tables and figures: Indicate in the text where the tables and figures should appear, for example by inserting [Table 1 near here]. The actual tables and figures should be supplied either at the end of the text or in a separate file as requested by the Editor. Ensure you have permission to use any figures you are reproducing from another source. Advice on artwork is available [here](#).

Running heads and **received dates** are not required when submitting a manuscript for review.

If your article is accepted for publication, it will be copy-edited and typeset in the correct style for the journal.

Appendix F: Participant information sheet



An exploratory study investigating the relationships between irritable bowel symptoms and associated unhelpful thoughts, disordered eating, adult attachment and distress

Thank you for taking the time to read this information sheet.

You are invited to take part in an online questionnaire study. Before deciding whether you wish to take part in the study or not, please read the following information carefully. The following information will explain why the research is being done, what you will be asked to do, and about confidentiality. If you would like more information or have any questions please contact me or my supervisor using the contact details below.

To take part you must be at least 18 years old. **You do not need a diagnosis of an eating disorder or irritable bowel syndrome** to take part but we are interested in difficult eating behaviours and irritable bowel symptoms, such as bloating, constipation and diarrhea.

As a thank you for completing the questionnaire you will be entered into a prize draw where you can win either high street vouchers.

What is the purpose of the study?

The purpose of this study is to explore the relationships between irritable bowel symptoms, thoughts about these symptoms, distress, eating behaviours and attachment. The study hopes to build more understanding and awareness of these relationships and hopes the results will be used to inform psychological treatment of difficult eating behaviours.

What will happen if I take part?

You will be asked to complete a set of online questionnaires. The questionnaires are about eating behaviours, bowel problems, experiences in close relationships and how you feel. It is estimated that it will take up to 25 minutes to complete the online questionnaire.

Confidentiality and withdrawing from the study

If you choose to take part in the study, any information you give will be anonymised. Your responses will only be viewed by the researchers involved in the study. Any data you provide will be stored in

accordance with the data protection act. If you choose to take part in the study and then decide it is not for you, you will be able to withdraw at any time during the online questionnaire. You can do this by closing the browser.

How will the information be used?

The results from the study will be written up as part of a Doctoral Degree in Clinical Psychology. It is expected that the findings will be published in an academic journal at a later date. Also, a summary of the research findings will be posted on the BEAT and IBS Network website once the study is completed in September 2013.

Are there any risks to taking part?

There are no direct risks to you from taking part in this study. However, you may find some of the questions difficult as they ask about your feelings, difficult eating behaviours and bowel problems. If you do feel upset or affected by the questions we advise you to contact your GP, the researchers and/or discuss with someone you trust. Details of organisations which may also help are provided at the end of the questionnaires.

Are there any benefits to taking part?

There will be no immediate direct benefits to you. However, it is expected that the research results may benefit people in the future who are experiencing difficult eating behaviours and bowel problems. The research aims relate to providing a better understanding of the relationships between these problems therefore, increasing awareness and improving psychological treatment and services.

What if I am unhappy or there is a problem?

Please contact Dr Sellwood on 0151 7945877 (sellwood@liverpool.ac.uk) or Gemma Culverwell (G.Culverwell@liverpool.ac.uk) and we will try to help. If you remain unhappy or feel that you cannot make a complaint directly to ourselves then please contact the Research Governance Officer for the University of Liverpool on 0151 794 8290 or (ethics@liverpool.ac.uk). Please provide details of the name, the researcher involved and the details of the complaint you wish to make.

Who can I contact if I have further questions?

Gemma Culverwell, Trainee Clinical Psychologist, Division of Clinical Psychology, University of Liverpool, The Whelan Building, Brownlow Hill, Liverpool, L69 3GB

Email: G.Culverwell@Liverpool.ac.uk

This study is supervised by Dr Bill Sellwood and Dr James Reilly at the University of Liverpool and Dr Emma Winter at Salford Royal Foundation Trust.

If you would like to be entered into a prize lottery as a thank you for taking part, please enter your email address or contact telephone number when requested to do so

Appendix G: CS-FBD measure

Please indicate how much you agree or disagree with each statement.

1 = Strongly Disagree

2 = Disagree

3 = Slightly Disagree

4 = Neutral

5 = Slightly Agree

6 = Agree

7 = Strongly Agree

Q1. I don't get to the toilet in time

Q2. I'm always unwell with the bowel problems

Q3. My symptoms are too much to handle

Q4. I can't function normally when sick with bowel problems

Q5. My bowel symptoms are agony

Q6. I do my absolute best at everything

Q7. I am frustrated by my bowel symptoms

Q8. My pain will never go away

Q9. I feel very down about my bowel symptoms

Q10. I worry about breaking wind in public

Q11. I worry about not finding a toilet when i need one

Q12. My bowel problems interfere with feeling good about myself

Q13. I worry about my bowel symptoms when out

Q14. I can't concentrate due to pain

Q15. It's embarrassing to keep going to the toilet

Q16. I'm concerned I won't last through events

Q17. Being late upsets me

Q18. I hate making a fool of myself

Q19. I do not take advantage of opportunities due to bowel problems

Q20. My symptoms make me feel out of control

Q21. I have bowel symptoms in restaurants

Q22. With frequent toilet visits others think something is wrong

Q23. I worry about losing control of my bowels in public

Q24. I feel guilty if I nurture myself

Q25. I must get home when I have my symptoms

Appendix H: Summary of skewed variables

Variables	University group	Disordered eating group	IBS symptoms group
IBS Symptoms	Positive	Positive	Normal
Disordered eating	Positive	Negative	Positive
IBS cognitions	Positive	Normal	Negative
Attachment avoidance	Positive	Normal	Normal
Anxiety avoidance	Normal	Normal	Normal
Depression	Positive	Negative	Positive
Anxiety	Positive	Negative	Normal

Appendix I: T-tests, means and standard deviations for gender and other variables in all three groups

	IBS symptoms		IBS cognitions		Avoidant attachment		Anxious attachment		Anxiety		Depression		Disordered eating	
	m	f	m	f	m	f	m	f	m	f	m	f	m	f
University	n=89	n=316	n=80	n=294	n=75	n=277	n=75	n=277	n=75	n=276	n=73	n=269	n=77	n=283
	M=2.58	M=3.60	M=5.90	M=6.80	M=3.37	M=3.07	M=14.85	M=16.61	M=2.00	M=2.69	M=2.14	M=2.63	M=.95	M=1.38
	(1.78)	(1.75)	(2.08)	(2.20)	(1.06)	(1.29)	(7.31)	(7.48)	(1.20)	(1.09)	(1.24)	(1.15)	(.51)	(.51)
t (p) University	t(404)= -5.80, p=.000		t(372)= -3.32, p=.001		t(350)=1.82, p=.070		t(349)= -1.82, p=.072		t(340)= -4.82, p=.000		t(340)= -3.15, p=.002		t(358)= -6.72, p=.000	
IBS symptoms	N=6	N=36	N=5	N=34	N=4	N=30	N=4	N=30	N=4	N=30	N=4	N=30	N=5	N=30
	M=37.17	M=31.75	M=4.92	M=5.34	M=9.00	M=14.30	M=12.75	M=16.83	M=7.25	M=9.57	M=2.24	M=2.78	M=.59	M=1.17
	(20.38)	(16.00)	(2.32)	(2.21)	(6.00)	(7.94)	(6.60)	(6.48)	(5.56)	(5.70)	(1.28)	(1.14)	(.61)	(.56)
Disordered eating	n=3	n=106	n=2	n=92	n=2	n=81	n=2	n=81	n=2	n=79	n=2	n=79	n=2	n=83
	M=5.72	M=5.04	M=111.0	M=75.88	M=19.00	M=16.46	M=23.00	M=18.15	M=2.80	M=3.22	M=3.45	M=2.70	M=2.37	M=2.32
	(1.96)	(1.70)	(28.28)	(33.23)	(17.00)	(9.22)	(5.66)	(7.60)	(.77)	(1.12)	(.14)	(1.60)	(.07)	(.44)

Note. IBS, Irritable Bowel Syndrome; m, male; f, female.

Appendix J: Age correlations

	University	IBS symptoms	Disordered eating
	Age	Age	Age
1. IBS symptoms	r =.03 (.836) N=405	r =.03 (1.67) N=42	r =.08 (.399) N=109
2. IBS cognitions	r =.10 (.542) N=374	r =.10 (1.08) N=39	r =.09 (.417) N=94
3. Avoidant attachment	r =.04 (.818) N=352	r =.04 (1.64) N=34	r = -.13 (.260) N=83
4. Anxious attachment	r =.09 (.609) N=351	r =.09 (1.22) N=34	r =.11 (.314) N=83
5. Anxiety	r =.02 (.912) N=342	r =.02 (1.82) N=34	r =.06 (.621) N=81
6. Depression	r =.06 (.430) N=342	r =.15 (.814) N=34	r = -.17 (.137) N=81
7. Disordered eating	r = -.27 (.113) N=360	r = -.27 (.226) N=35	r = -.11 (.330) N=85

Note. IBS, Irritable Bowel Syndrome; N= number in sample for measured association

Appendix K: Stepwise multiple regression including gender

Variables Entered/Removed^a

Model	Variables Entered	Variables Removed	Method
1	SQRTDepression		Stepwise (Criteria: Probability-of-F- to-enter <= .050, Probability-of-F- to-remove >= .100).
2	Sex		Stepwise (Criteria: Probability-of-F- to-enter <= .050, Probability-of-F- to-remove >= .100).
3	Anxiousattachment		Stepwise (Criteria: Probability-of-F- to-enter <= .050, Probability-of-F- to-remove >= .100).

a. Dependent Variable: SQRTEDTOTAL

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.543 ^a	.295	.293	.45233	.295	142.160	1	340	.000
2	.597 ^b	.356	.352	.43296	.061	32.105	1	339	.000
3	.619 ^c	.383	.377	.42440	.027	14.807	1	338	.000

a. Predictors: (Constant), SQRTDepression

b. Predictors: (Constant), SQRTDepression, Sex

c. Predictors: (Constant), SQRTDepression, Sex, Anxiousattachment

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	.669	.058		11.638	.000					
	SQRTDepression	.246	.021	.543	11.923	.000	.543	.543	.543	1.000	1.000
2	(Constant)	.464	.066		7.040	.000					
	SQRTDepression	.226	.020	.501	11.324	.000	.543	.524	.494	.972	1.029
	Sex	.325	.057	.251	5.666	.000	.335	.294	.247	.972	1.029
3	(Constant)	.349	.071		4.908	.000					
	SQRTDepression	.187	.022	.413	8.442	.000	.543	.417	.361	.762	1.313
	Sex	.321	.056	.247	5.705	.000	.335	.296	.244	.971	1.030
	Anxiousattachment	.013	.003	.187	3.848	.000	.405	.205	.164	.777	1.287

a. Dependent Variable: SQRTEDTOTAL

Appendix L: Gastrointestinal Symptom rating scale permission

Dear Gemma,

We have now received the filled in and signed Licence Agreement from you and we will send one copy back to you for your files.

Please confirm if this is the right address to send it to:

Att: Gemma Culverwell
University of Liverpool
D.Clin.Psychology Programme
Division of Clinical Psychology
Whelan Building, Quadrangle,
Brownlow Hill
Liverpool
L69 3GB, UK

Please find attached the GSRs-IBS questionnaire in the UK-English language + scoring instructions. No fee for hospital and university.

If you have any questions you are welcome to contact us again.

Best regards,

Kerstin Sundqvist

PRO Administrative Coordinator

AstraZeneca

PRO Information, Health Economics & Outcomes Research, Clinical Information Science

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