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Disordered Eating Treatment Programs for Adolescents and Emerging Adults: A Meta-Analytic Review of Treatment Effectiveness and Moderators of Treatment Success

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LOYOLA UNIVERSITY CHICAGO

DISORDERED EATING TREATMENT PROGRAMS FOR ADOLESCENTS AND
EMERGING ADULTS: A META-ANALYTIC REVIEW OF TREATMENT
EFFECTIVENESS AND MODERATORS OF TREATMENT SUCCESS

A DISSERTATION SUBMITTED TO
THE FACULTY OF THE GRADUATE SCHOOL
IN CANDIDACY FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

PROGRAM IN CLINICAL PSYCHOLOGY

BY

ALEXANDRA C. KIRSCH

CHICAGO, IL

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ABSTRACT

This meta-analysis systematically reviewed interventions for disordered eating in the adolescent and young adult population. A systematic search identified 30 interventions that could be compared to controls and 88 specific interventions that could be compared to other specific interventions. An in-depth analysis of the current state of the literature is provided. Results indicated that eating disorder interventions were effective overall when compared to control for both eating disorder and non-eating disorder outcomes, with differential effects across diagnoses, outcome categories, and outcome source, as well as some maintenance of effects at follow-up. Additionally, multiple moderators of treatment effectiveness for eating disorder outcomes emerged including: duration of diagnosis, whether females were targeted, qualifications of administrator, type of control group, rationale for study size, modality, inclusion of psychoeducation, a social interaction component, and use of homework. Preliminary comparisons between specific types of treatment indicated are discussed with caution. Clinical implications and recommendations for future research on eating disorder intervention for adolescents and young adults are highlighted.

CHAPTER ONE

INTRODUCTION

Although research has attempted to identify risk factors and mechanisms for treating disordered eating, eating disorders remain a significant public and mental health concern with high associated mortality rates (Hoang, Goldacre, & James, 2014). Overwhelmingly affecting adolescent and emerging adult females, eating disorders, which includes the diagnoses of anorexia nervosa, bulimia nervosa, binge eating disorder, and eating disorder not otherwise specified, can have lasting complications including increased risk for depression, obesity, substance use, and serious health problems (Wilson, Becker, Heffernan, 2003). While numerous prevention and intervention programs have been developed to address disordered eating, research indicates that a majority of individuals with anorexia or bulimia nervosa display a chronic course and do not fully recover (e.g., Agras, Walsh, Fairburn, Wilson, & Kraemer, 2000). Thus, it is important to critically evaluate existing interventions for adolescents and young adults.

While previous researchers have systematically reviewed prevention programs (e.g., Hart, Cornell, Damino, & Paxton, 2015), reviews of treatments for disordered eating have been limited to a specific type of treatment and/or a specific eating disorder (e.g., CBT and bulimia nervosa, Lundgren, Danoff-Burg, & Anderson, 2004; Group therapy and bulimia nervosa, Fettes & Peters, 1992), are not specific to adolescents and young adults, a population of known risk for development of disordered eating (e.g., Whittal, Agras, & Gould, 1999), or have not examined a variety of important potential moderators of treatment. Further, advancing research and emerging

treatments, such as mobile interventions (Aardoom, Dingemans, Spinhoven, & Van Furth, 2013), require up-to-date examination of treatment effectiveness. Over the last few decades, meta-analytic review processes have become the gold standard for conducting comprehensive, systematic reviews (Borenstein, Hedges, Higgins, & Rothstein, 2009; Cooper, Hedges, & Valentine, 2009) and developing treatment recommendations, guidelines, and evidence-based practices.

This study was designed to build upon prior reviews and be a detailed, comprehensive examination of disordered eating treatment effectiveness for adolescents and young adults. The study tests moderators of treatment effectiveness that could help to target interventions more effectively. Researchers and theorists have indicated that it is imperative to consider moderators of treatment effectiveness to evaluate the success of available interventions (Lipsey, 2003). The goals of this study are to: (1) comprehensively describe treatments of eating disorders in youth and adolescents available in the literature, (2) compare different types of treatment (e.g., CBT, group therapy, family therapy) and their effectiveness for eating disorders in general and within specific eating disorder diagnoses, and (3) explore moderators of treatment (e.g., treatment length, severity of patient population, age of population) and how they might affect treatment outcomes.

Defining Disordered Eating

The term eating disorders refers to a set of diagnoses in the Diagnostic and Statistical Manual for Mental Disorders (DSM), the American Psychiatric Association's standard classification system, in which there is an eating-related disturbance. The DSM-5 includes

disorders such as Pica, rumination disorder, and avoidant/restrictive food intake disorder within a section titled “Feeding and Eating Disorders” (5th ed.; DSM-5; American Psychiatric Association, 2013); however, most typically the term eating disorders refers to three distinct diagnoses, anorexia nervosa (AN), bulimia nervosa (BN), and binge eating disorder (BED), but sometimes can include eating disorders not otherwise specified (EDNOS) that typically include subclinical presentations of symptoms or a mixed symptom presentation of the three main eating disorders (American Psychiatric Association, 2013; Machado, Machado, Goncalves, & Hoek, 2007). While conceptualized as falling under the umbrella term of disordered eating, anorexia nervosa, bulimia nervosa, and binge eating disorder remain discrete disorders with collections of specific symptoms. Although these disorders do share core components including distorted sense of body image, fear of weight gain, issues with losing control, and senses of guilt and distress associated with eating (American Psychiatric Association, 2013), understanding the specific criteria for each diagnosis is important in evaluating and understanding treatment outcomes.

Anorexia Nervosa

The diagnosis of anorexia nervosa is given when the following three criteria are met:

A. Restriction of energy intake relative to requirements, leading to a significantly low body weight in the context of age, sex, developmental trajectory, and physical health. *Significantly* low body weight defined as a weight that is less than minimally normal or, for children and adolescents, less than that minimally expected; B. Intense fear of gaining weight or of becoming fat, or persistent behavior that interferes with weight gain, even though at a significantly low weight; C. Disturbance in the way in which one’s body weight or shape is experienced, undue influence of body weight or shape on self-evaluations, or persistent lack of recognition of the seriousness of current low body weight (DSM-5; American Psychiatric Association, 2013, p. 338-339).

This disorder includes two subtypes, restricting type and binge-eating/purging type. The restricting subtype is characterized by non-engagement in binge eating or purging behaviors. That is, the low body weight is achieved mostly through means to limit food intake (e.g., dieting, fasting; American Psychiatric Association, 2013). The binge-eating/purging subtype is given when someone meets the main characteristics for anorexia nervosa and has engaged in recurrent binge eating or purging behavior, which will be defined in the context of bulimia nervosa (American Psychiatric Association, 2013).

Typically, Criterion A, which requires significantly low body weight, is assessed using Body Mass Index, which takes into account an individual's weight as compared to their height (Hebebrand, Himmelmann, Hesecker, Schäfer, & Remschmidt, 1996); however, BMI is not always an accurate measurement and for children and adolescents, for whom failure to gain an appropriate amount of weight for stage of development and age is a more appropriate indicator (American Psychiatric Association, 2013). For adults, the Centers for Disease Control and Prevention (CDC) has determined that a BMI of 18.5 is the lower limit for normal body weight (Centers for Disease Control and Prevention, 2011).

The second criterion for the disorder refers to the intense fear or worry about gaining weight (Yager & Andersen 2005), which is rarely alleviated even when losing weight. Further, even though people with this disorder have a significantly low body weight, this fear remains very salient and many continue to reduce food intake drastically (Timulak et al., 2013). Many individuals suspected of meeting criteria for this disorder often feel this fear subconsciously or fail to acknowledge the fear (American Psychiatric Association, 2013).

The final criterion relates the reality that many individuals with anorexia nervosa misperceive their body to varying degrees. While some, despite low body weight, feel perpetually overweight, others who recognize their thin state continue to identify particular body parts that are not thin enough (e.g., abdomen, thighs; American Psychiatric Association, 2013; Castellini et al., 2013; Garner & Garfinkel, 1981). Oftentimes, this can prompt actions meant to assess their shape, including frequent weighing, measuring of body parts, and consistent checking in a mirror (American Psychiatric Association, 2013; Breithaupt, Payne, & Rose, 2014). Further, this criterion underlies the importance of weight and shape on these individuals' self-esteem. Expanding upon this, their ability to lose or gain weight carries extreme importance. That is, the ability to lose weight is viewed often as a success because of the necessary associated self-control, while gaining weight is viewed as a personal failure.

Bulimia Nervosa

The diagnosis of bulimia nervosa is given when an individual meets the following criteria:

A. Recurrent episodes of binge eating. An episode of binge eating is characterized by both of the following: (1) Eating, in a discrete period of time (e.g., within any 2-hour period), an amount of food that is definitely larger than what most individuals would eat in a similar period of time under similar circumstances; (2) A sense of lack of control over eating during the episode (e.g., a feeling that one cannot stop eating or control what or how much one is eating); B. Recurrent inappropriate compensatory behaviors in order to prevent weight gain, such as self-induced vomiting; misuse of laxatives, diuretics, or other medications; fasting; or excessive exercise; C. The binge eating and inappropriate compensatory behaviors both occur, on average, at least once a week for 3 months; D. Self-evaluation is unduly influenced by body shape and weight; E. The disturbance does not occur exclusively during episodes of anorexia nervosa (American Psychiatric Association, 2013, p. 345)

Bulimia nervosa, unlike anorexia nervosa, is characterized primarily by episodes of what is known clinically as binge eating, which refers to an almost uncontrollable intake of an abnormally large amount of food in a short period (Peterson et al., 2012). Typically a short period refers to an amount of time that is less than two hours, and a binge eating episode does not have to be restricted to a single location (American Psychiatric Association, 2013; Peterson et al., 2012). However, it is necessary that individuals experience a feeling of loss of control over their eating, which is typically represented by a sense that one cannot stop eating (American Psychiatric Association, 2013; Peterson et al., 2012). Alternatively, loss of control can occur when an individual gives up efforts to control their eating, experiences a general pattern of uncontrollable eating, or even a planned event of extreme eating.

Additionally, individuals with this disorder engage in what is called compensatory behaviors to prevent gaining weight because of their binge eating (American Psychiatric Association, 2013; Binford & Le Grange, 2005). These compensatory behaviors include vomiting, consuming toxins that will induce vomiting, using laxatives, and engaging in other rarer compensatory behaviors (American Psychiatric Association, 2013). Although these compensatory behaviors most typically follow binge eating episodes, those with bulimia also can use purging behaviors after consuming a small amount of food (Keel, 2010). Additionally, similar to those with anorexia, individuals with bulimia are characterized by over-emphasizing the importance of weight or shape on how they evaluate themselves (American Psychiatric Association, 2013).

Binge Eating Disorder

The diagnosis of binge eating disorder was only introduced to the diagnostic classification system in the most recent edition of the DSM (DSM-5, American Psychiatric Association, 2013). Binge eating disorder is characterized by the following criteria:

A. Recurrent episodes of binge eating. An episode of binge eating is characterized by both of following: (1) Eating, in a discrete period of time (e.g., within any 2-hour period), an amount of food that is definitely larger than what most people would eat in a similar period of time under similar circumstances; (2) A sense of lack of control over eating during the episode (e.g., a feeling that one cannot stop eating or control what or how much one is eating); B. The binge-eating episodes are associated with three (or more) of the following: (1) eating much more rapidly than normal; (2) Eating until feeling uncomfortably full; (3) Eating large amounts of food when not feeling physically hungry; (4) Eating alone because of feeling embarrassed by how much one is eating; and (5) Feeling disgusted with oneself, depressed, or very guilty afterward; (C) Marked distress regarding binge eating is present; (D) The binge eating occurs, on average, at least once a week for 3 months; (E) The binge eating is not associated with recurrent use of inappropriate compensatory behavior as in bulimia nervosa and does not occur exclusively during the course of bulimia nervosa or anorexia nervosa (American Psychiatric Association, 2013, p. 350).

Similar to bulimia nervosa, binge eating disorder is characterized by recurrent binge eating episodes. These binge eating episodes must cause significant distress to the individual and must not be followed regularly by the use of inappropriate compensatory behaviors to limit weight gain (American Psychiatric Association, 2013; Wonderlich, Gordon, Mitchell, Crosby, & Engel, 2009). Unlike anorexia nervosa and bulimia nervosa, binge eating disorder is not necessarily characterized by weight or shape being overly influential on self-esteem (American Psychiatric Association, 2013). However, research has suggested that many individuals with binge eating disorder demonstrate over-valuation of body weight and shape, and that those individuals experience a prolonged course and heightened eating psychopathology (Grilo, White,

Gueorguieva, Wilson, & Masheb, 2013). Further, because of the many episodes of over-eating, binge eating disorder is often associated with obesity (de Zwaan 2001; Hill & Pomeroy, 2001; Hudson, Hiripi, Pope, & Kessler, 2007; Striegel-Moore & Franko, 2003). Given that this is a more recent unique diagnosis, there is limited research and more conflicted findings for binge eating disorder compared with the other two core eating disorders.

Eating Disorder Not Otherwise Specified (EDNOS) or Other Specified Feeding or Eating Disorder

This diagnostic category refers to symptom presentations that are distressing, but do not meet full criteria for one of the other disorder categories. Typically, this includes people who are engaging in disordered eating behaviors but do not endorse all of the necessary symptoms, or who engage in the behaviors less than the frequency required to meet the criteria (Machado et al., 2007; Schwitzer, 2012). While these were originally known as *eating disorder not otherwise specified (EDNOS)*, the most recent revision of the DSM renamed the category to *other specified feeding or eating disorder* (American Psychiatric Association, 2013). Research indicates that half of individuals who seek treatment for eating pathology do not meet criteria for anorexia nervosa, bulimia nervosa, or binge eating disorder (Eddy, Celio, Hoste, Herzog, & le Grange, 2008; Fairburn & Bohn, 2005; Fisher, Schneider, Burns, Symons, & Mandel, 2001). This category includes individuals who meet many of the central criteria of disordered eating, but may not meet a specific element such as low body weight (Machado et al., 2007). Research has supported that individuals with this diagnosis demonstrate similar levels of functional impairment as those with anorexia nervosa, bulimia nervosa, or binge eating disorder (Keel,

Brown, Holm–Denoma, & Bodell, 2011; Stice, Marti, Shaw, & Jaconis, 2009; Thomas, Vartanian, & Brownell, 2009). Prior to the most recent revision of the DSM, binge eating disorder fell under this umbrella term (American Psychiatric Association, 2000). Additionally, EDNOS includes individuals who present with mixed features of multiple eating disorders (Machado et al., 2007) or may present purging behavior without prior binge eating (Keel, 2010; Machado et al., 2007).

Prevalence, Age of Onset, and Course of Disordered Eating

Disordered eating represents a significant public health concern; however, identifying the prevalence rates, ages of onset, and course of specific disorders is complicated by differences across diagnostic categories, cohort effects, changes in diagnostic criteria, reclassification and new diagnoses, and assessments of different populations (e.g., clinic samples, national surveys). While the epidemiology and course of eating disorders is well-researched, there remains debate about prevalence and course of disordered eating (Machado et al., 2007).

Prevalence

Overall, research estimates that between 10% and 13% of young females meet criteria for one of the categories of disordered eating (Hudson et al., 2007; Stice, Marti, & Rohde, 2013; Stice et al., 2009; Wade, Bergin, Tiggemann, Bulik, & Fairburn, 2006), with around 5% meeting criteria for one of the main three disorders, anorexia nervosa, bulimia nervosa, or binge eating disorder (Hudson et al., 2007; Stice et al., 2013). However, prevalence rates differ for each type of disorder, and some have been better researched than others. A recent study using new DSM-5 criteria estimated the lifetime prevalence for females by age 20 as 0.8% for anorexia nervosa,

2.6% for bulimia nervosa, and 3.0% for binge eating disorder (Stice et al., 2013). Stice and colleagues (2013) found that an additional 11.5% met criteria for EDNOS. These rates were somewhat higher than studies that used DSM-IV diagnoses (Favaro, Ferrara, & Santonastaso, 2003; Kjelsås, Bjornstrom, & Gotestam, 2004; Lewinsohn, Striegel-Moore, & Seeley, 2000; Patton, Coffey, Carlin, Sanci, & Sawyer, 2008; Stice et al., 2009; Wade et al., 2006), which placed overall rates around 12% and rates for specific disorders as slightly less than those reported using DSM-5 criteria, which is in line with the reductions in thresholds for meeting criteria in the most recent revision of the DSM (Stice et al., 2013). Specifically, 0.8% prevalence for anorexia remains similar compared to previous prevalence studies using DSM-IV criteria (0.6%; Hudson et al., 2007), while new rates for bulimia nervosa and binge eating disorder exceed previous estimations, between 0.8% and 1.0% and between 1.4% and 2.8% respectively (Hudson et al., 2007; Kessler et al., 2013). However, prevalence estimates are complicated not only by changing criteria, but also by the belief that increasing numbers of people are engaging in disordered eating (Hoek & van Hoeken, 2003; Hudson et al., 2007; Keel & Klump, 2003; Kendler et al., 1991; van Son et al., 2006). A recent study highlighted that while prevalence rates for eating disorders have remained stable in adults, rates for adolescents and young adults have increased (Smink, Van Hoeken, & Hoek, 2012). Overall, prevalence data suggest that eating disorders are common and support the need for developing and evaluating effective treatment programs.

Research has indicated that anorexia nervosa and bulimia nervosa are more common among females than males (Hoek, 2006; Kjelsås et al., 2004; Striegel-Moore & Bulik, 2007).

Specifically, lifetime prevalence for anorexia nervosa for females is 0.9% compared 0.3% for males (Hudson et al., 2007). For bulimia nervosa, rates for females (1.5%) exceed rates for males (0.5%; Hudson et al., 2007). Similarly, females evidence a greater lifetime prevalence for binge eating disorder (3.5%) than males (2.0%; Hudson et al., 2007). Population-based studies and clinical case registry studies indicate that males only represent between 10 and 15% of the proportion of eating disorder patients (Fairburn & Beglin, 1990; Garfinkel et al 1996; Hoek & van Hoeken, 2003). However, less is known about differences in prevalence across sex for the EDNOS category (Schwitzer, 2012). Given the limited research, small populations, and the mixed findings, solid information about the prevalence among males is not yet known.

Research has indicated that some ethnic minority females, specifically black and Latina females, are less likely to have certain eating disorders, specifically anorexia nervosa and bulimia nervosa (Chamorrow & Flores-Ortiz, 2000; Marques et al., 2011; Striegel-Moore et al., 2003). However, the lower prevalence rates for minorities do not seem to carry over to binge eating disorder where rates are similar or greater among ethnic minorities (Alegria, Woo, Cao, Meng, & Striegel-Moore, 2007; Smith, Marcus, Lewis, Fitzgibbon, & Schreiner, 1998; Striegel-Moore et al., 2003). While some research supports similarities in prevalence for disordered eating for White and Asian females (Barnett, Keel, & Conoscenti, 2001; Jackson, Keel, & Lee, 2006), others have demonstrated a much lower rate of disordered eating among Asian females (Marques et al., 2011). Further, research has indicated that females from ethnic/racial minority populations are less likely to seek treatment and receive services for their disordered eating (Marques et al., 2011), suggesting a population for which their needs are not being met.

Reviewing information on who is being targeted by disordered eating intervention research and considering whether ethnic minority status or sex may act as a moderator to treatment success will help indicate if the current guidelines are well-serving of typically under-served populations.

Age of Onset

Further, prevalence and age of onset research highlights that anorexia nervosa, bulimia nervosa, and binge eating disorder most typically occur during adolescence or young adulthood (Attia & Walsh, 2007; van Son et al., 2006), with the median age of onset ranging from 18 to 21 years (Hudson et al., 2007). For this reason, many researchers and clinicians understand adolescence and young adulthood as a period of heightened risk for developing disordered eating (Bailey et al., 2014). Other studies have supported this, indicating that peak ages of onset fall between 16 and 20 years of age (Stice et al., 2013). Disordered eating is believed to rarely begin before puberty or after the age of 40 (American Psychiatric Association, 2013), although research indicates that binge eating disorder is more regularly present in children than are other eating disorder diagnoses (Decaluwé & Braet, 2003). Epidemiological studies estimate that three fourths of the cases of anorexia nervosa and bulimia nervosa, and half of the cases of binge eating disorder and EDNOS, occur before the age of 22 (Hudson et al., 2007; Oakley-Browne, Wells, Scott, & McGee, 2006). Further, research has supported increased rates of disordered eating during adolescence with each new generation, while adult rates have remained stable (Lucas, Crowson, O'Fallon, & Melton, 1999; van Son et al., 2006). Thus, research highlights the importance of identifying appropriate and effective treatments especially for adolescents and young adults, who represent an at-risk population.

Course

While most individuals develop disordered eating during adolescence or early adulthood, the courses of eating disorders are highly variable. A majority of individuals who are diagnosed with an eating disorder demonstrate a period where they display some subthreshold symptomatology or period of changed eating behavior prior to diagnosis (American Psychiatric Association, 2013). Research on average episode duration is mixed, ranging from months to years depending on the population being studied and how recovery is measured (Hudson et al., 2007; Stice et al., 2013). While some individuals will recover after a single episode, many display a more chronic and persistent course (American Psychiatric Association, 2013; Steinhausen, 2002). While some population research suggests that the average amount of time that one meets the criteria for anorexia nervosa, around 2 years, is significantly lower than for bulimia nervosa and binge eating disorder, which both last around 5-8 years on average (Hudson et al., 2007; Kessler et al., 2013), others have demonstrated that anorexia nervosa can also follow a chronic course (Steinhausen, 2002). Research has suggested that two thirds of individuals will continue to meet criteria for longer than two years and around half will have episodes that exceed three years (Keski-Rahkonen et al., 2007). Yet other research has shown that few individuals meet criteria for anorexia nervosa across 12 months (Hudson et al., 2007) while over 30% will continue to meet criteria for bulimia nervosa and binge eating disorder over this time period (Hudson et al., 2007; Kessler et al., 2013). However, it is important to note that many people with anorexia nervosa may cross over into one of the other diagnostic categories, rather than remit entirely from having an eating disorder (Fitcher & Quadfleig, 2007).

Even as advances in treatment and identification of disordered eating have emerged, research indicates that disordered eating often remains a chronic, important issue for those who are diagnosed (Steinhausen, 2002). A recent review of the literature indicated that only around 50% of individuals with anorexia nervosa will meet clinical recovery (Steinhausen, 2002). Findings for bulimia nervosa are more favorable and indicate that around 70% of those will achieve recovery, 20% will continue to be symptomatic but see improvement, and 10% will remain chronically ill after 5 years (Fitcher & Quadfleig, 2007; Herzog et al., 1999; Keel & Mitchell, 1997). However, rates of clinical recovery vary across studies depending on definition and measurement (see, Keski-Rahkonon et al., 2007). Although research on binge eating disorder is still limited, some data suggests that between 66 and 82% of individuals recover or improve, while 4-6% continue to meet criteria (Fairburn, Cooper, Doll, Norman, & O'Connor, 2000; Fitcher & Quadfleig, 2007). However, other research studies suggest that binge eating disorder can be as chronic as diagnoses of anorexia nervosa and bulimia nervosa (Hudson et al., 2007). Given the heterogeneous nature of the EDNOS category, less is known about its course and development (Keel, 2010). Overall, it is clear that disordered eating can represent a significant concern for many adolescents and emerging adults for a substantial period of time.

Associated Costs of Disordered Eating

Although research has attempted to identify risk factors and mechanisms for treating disordered eating, eating disorders remain a significant public and mental health concern (Hudson et al., 2007). Beyond their significant health care cost to society (Simon, Schmidt, & Pilling, 2005), those who engage in disordered eating often demonstrate considerable

psychological and physical impairment, typically demonstrating a chronic course associated with psychiatric and medical co-morbidities (Fairburn & Brownell, 2002) and increased risk for death (Harris & Barraclough, 1998; Hoang et al., 2014; National Institute of Mental Health, 2011). Understanding these significant costs highlights the need for the development and comprehensive evaluation of treatments.

Eating disorders are associated with a host of medical problems and increased mortality rates (Hoang et al., 2014; National Institute of Mental Health, 2011). Because symptoms of eating disorders involve eating behaviors that often lead to malnutrition, there can be multiple negative medical side-effects (Mitchell & Crow, 2006). Specifically, having an eating disorder, even a subthreshold or EDNOS, is associated with osteoporosis, obesity, severe dehydration, and heart and fertility problems (Golden et al., 2003; Mitchell & Crow 2006; National Institute of Mental Health, 2011; Wilson et al., 2003). While some of these medical side-effects are reversible once the individual has recovered and meets a healthy body weight, certain medical side-effects are life-long (Mitchell & Crow, 2006). These medical side-effects, if untreated and severe enough, can lead to organ failure, heart attack, brain damage, and sometimes death (Arcelus, Mitchell, Wales, & Nielsen, 2011; Crow et al., 2009; Hoek, 2006; Mitchell & Crow, 2006).

A recent review indicated that mortality rates are twice as high for individuals with a bulimia nervosa or EDNOS and close to six times higher for those with anorexia nervosa when compared to expected population mortality rates (Arcelus et al., 2011). These increased mortality rates are not simply a result of death due to the medical side-effects; they also are due to

increased rates for suicidality among individuals with an eating disorder diagnosis (Preti, Rocchi, Sisti, Camboni, & Miotto, 2011). A review of the literature has suggested that between 3 and 20% of individuals with anorexia nervosa endorse suicidality (Franko & Keel, 2006), with around 17% of individuals with anorexia reporting at least one suicide attempt (Bulik et al., 2008). Anorexia nervosa has the highest associated mortality rate of any psychiatric disorder (Crow et al., 2009; Sullivan, 2002). Fewer individuals die as a result of bulimia nervosa (Keel & Mitchell, 1997), but there remains a significant risk for suicide. Around 25-35% of individuals with bulimia nervosa will have a suicide attempt (Corcos et al., 2002). Little research has considered the mortality and suicide rates associated with binge eating disorder or EDNOS (Bulik & Reichborn-Kjennerud, 2003).

Beyond the negative medical side-effects associated with disordered eating, individuals with eating disorders also are at risk for additional emotional and mental health concerns (e.g., Kessler et al., 2013). This cluster of diagnoses is associated with an increased risk for depression, substance use, insomnia, and social withdrawal (Attia & Walsh, 2007; National Institute of Mental Health, 2011; Wilson et al., 2003; Yager & Andersen, 2005). Research has shown that more than half of individuals with anorexia nervosa, almost all individuals with bulimia nervosa, three fourths of individuals with binge eating disorder, and over half of individuals with subthreshold eating pathology meet criteria for another diagnosis (Hudson et al., 2007). Most commonly, individuals with an eating disorder diagnosis also are likely to have comorbid mood or anxiety disorders (O'Brien & Vincent, 2003). Substance abuse and personality disorders have higher rates of comorbidity in bulimic individuals than in anorexic individuals, although are

present in both (Bulik et al., 2004; Franko et al., 2005; Holderness, Brooks-Gunn, & Warren, 1994; Rosenvinge, Martinussen, & Ostensen, 2000). Disordered eating also is positively related, although less commonly, to impulse control disorders (Hudson et al., 2007). The medical, emotional, and social costs of meeting criteria for an eating disorder highlight the need to evaluate and improve upon available treatments.

Interventions for Disordered Eating

Given the significant cost of having an eating disorder, many researchers and clinicians have attempted to identify treatments that would be successful in reducing symptomatology and improving life functioning for individuals with these disorders. While much research has been conducted examining the effectiveness of specific interventions in treating the symptoms of disordered eating, most of these studies have focused on bulimia nervosa or binge eating disorder, leaving comparatively less known about how to intervene successfully for anorexia nervosa or EDNOS (Fairburn, 2005; Hay & Claudino, 2010). Further, much of the research on eating disorder treatments, excluding family based-treatments, has used adult or mixed samples, rather than being specific to adolescents and young adults (Lock, 2010).

Review of Types of Treatments

Many different styles and methods of treatment have been attempted as treatment for disordered eating. The most commonly used and researched interventions for disordered eating include cognitive-behavioral therapy, interpersonal therapy, family therapy, and dialectical behavior therapy (Hay & Claudino, 2010). However, other treatments including focal psychoanalytic psychotherapy (FPT), cognitive-analytical therapy (CAT), and intensive short-

term dynamic psychotherapy (ISTDP) also have been examined (Hay & Claudino, 2010). This section highlights the central elements of each type of therapy and how they are targeted to address disordered eating.

Cognitive-behavioral therapy (CBT). Cognitive-behavioral treatments for disordered eating are based on the theory that there are thought and behavior processes and mechanisms that maintain disordered eating (Fairburn, Cooper, & Shafran, 2003; Wilson, 2010). This therapy treats the over-concern with weight and shape as the core component that leads to and maintains maladaptive eating and weight-management behaviors (Fairburn et al., 2003; Wilson, Fairburn, & Agras, 1997). Thus, treatment focuses both on reducing the over-importance of weight and shape, and on challenging negative thoughts about the body and perceptions of how the body should look, and uses behavioral techniques to reduce maladaptive behaviors such as bingeing and purging (Fairburn et al., 2003; Wilson, 2010). Targeted cognitive-behavioral therapy has been supported strongly for treating bulimia nervosa and binge eating disorder, while limited support has been found for anorexia and EDNOS (for a review, see Hay & Claudino, 2010).

Interpersonal psychotherapy (IPT). Interpersonal psychotherapy is used to treat disordered eating by targeting the interpersonal difficulties that either led to the onset of the disorder or serve to maintain the disorder (Freeman & Gil, 2004; Tanofsky-Kraff & Wilfley, 2010). While originally developed to treat depression, IPT can be adjusted to examine how interpersonal struggles may contribute to disordered eating (Tanofsky-Kraff & Wilfley, 2010). Therapy is then designed to reduce those interpersonal problem areas by providing strategies for interpersonal success or interpersonal management, with the hope that addressing these concerns

will reduce the symptoms of disordered eating (Tanofsky-Kraff & Wilfley, 2010). Interpersonal therapy has some, but limited support in treating anorexia nervosa, bulimia nervosa, and binge eating disorder (National Institute for Clinical Excellence [NICE], 2004).

Dialectical behavior therapy (DBT). Dialectical behavior therapy was originally designed as an outpatient treatment for females with extreme emotional shifts and suicidal tendencies, specifically those with borderline personality disorder (Chen & Safer, 2010; Linehan, 1987). This style of treatment integrates behavioral techniques with acceptance-based practices such as mindfulness (Chen & Safer, 2010; Linehan, 1987). In a DBT model, negative eating patterns are thought to be the result of difficulty with affect regulation (Chen & Safer, 2010). Thus, DBT is used to teach affect regulation as a means to target and reduce one's reliance on negative weight or eating behaviors (Bankoff, Karpel, Forbes, & Pantalone, 2012; Chen & Safer, 2010). A recent review of dialectical behavior therapy for disordered eating yielded large effects for disordered eating episodes and medium effects for depression, suggesting that dialectical behavior therapy may be an effective means to treat disordered eating especially when presented with comorbid depression (Lenz, Taylor, Fleming, & Sermna, 2013)

Family therapy. While a family therapy model perceives a strong link between family dysfunction and the development of disordered eating behaviors, recent research has highlighted the familial problems that can arise during and as a result of an eating disorder, which also should be targeted in therapy (Dare & Eisler, 1997; le Grange & Eisler, 2009; le Grange, Lock & Dymek, 2003). A research group known as the Maudsley group has done a majority of the research related to family therapy and disordered eating; however, others also have incorporated

family therapy approaches to successfully reduce disordered eating (le Grange & Hoste, 2010). Studies of family therapy have supported its use especially for children and adolescents (le Grange & Hoste, 2010), and a recent review indicated that this was the most commonly researched treatment for anorexia nervosa (Bailey et al., 2014). Further, some research has suggested that while family therapy may produce similar effects as other treatments at post-treatment, family therapy may have more long-term benefits than other treatments (Couturier, Kimber, & Szatmari, 2013).

Other treatments. A host of other treatments have been developed or used to treat disordered eating including focal psychoanalytic psychotherapy (FPT), cognitive-analytical therapy (CAT), and intensive short-term dynamic psychotherapy (ISTDP) and have found some support for their use with at least one study supporting them as effective (Hay & Claudino, 2010). Specifically, while cognitive-behavioral therapy is most supported for bulimia nervosa, these other treatments are commonly used and acceptable for the treatment of anorexia nervosa, binge eating disorder, and EDNOS (NICE, 2004). The current study is an important step in identifying various research studies that have used these treatments specifically with adolescents and young adults.

Interventions for Different Eating Disorder Diagnoses

While there are multiple different styles of treatment and conceptualization that have been used to treat disordered eating, our current body of literature is stronger for certain eating disorder diagnoses than others (Fairburn, 2005; Hay & Claudino, 2010). This section highlights the current state of the literature and treatment guidelines that exist for each specific disorder.

Anorexia nervosa. While many interventions have been identified and used in treating anorexia nervosa, no specific type of treatment has been identified as highly successful or more effective than another treatment (Bulik, Berkman, Brownley, Sedway, & Lohr, 2007; Fairburn, 2005; Hay & Claudino, 2010). One review found the same level of support, either a randomized control trial or a meta-analytic review of controlled trials with positive findings, for cognitive-behavioral therapy (CBT), behavioral therapy (BT), focal psychoanalytic psychotherapy (FPT), cognitive-analytical therapy (CAT), family therapy, and group therapy (Hay & Claudino, 2010). The National Institute for Health and Clinical Excellence published guidelines in 2004 recommending the use of any of these treatments, as well as family therapy for children and adolescents, for anorexia nervosa (NICE, 2004).

Other studies have attempted to compare various treatments to identify the most effective types. While some studies have found no differences between various types of treatment (e.g., cognitive-behavioral or behavioral; Channon, De Silva, Hemsely, & Perkins, 1989), others have demonstrated greater success of one type of treatment, such as cognitive-behavioral over cognitive-analytical (Dare, Eisler, Russell, Treasure, & Dodge, 2001) or cognitive-behavioral over interpersonal (McIntosh et al., 2005). Further, while there are a variety of family therapies, research has indicated that different types of family therapy are not more or less successful (Eisler et al., 2000; Geist, Heinmaa, Stephens, Davis, & Katzman, 2000), and that short- and long-term family therapy yield similar results (Lock, Agras, Bryson, & Kraemer, 2005).

Further complicating research for anorexia nervosa is the fact that treatment needs and goals differ pre- or post-weight restoration. For many with anorexia nervosa, a significant

portion of initial therapy is focused upon regaining weight until the individual falls within a healthy weight range (Hay & Claudino, 2010). Treatment for this may even involve a period of inpatient hospitalization (Lock, 2010). Thus, it often is hard to compare treatments given in inpatient units to those in outpatient care, given the stark differences in goals, time frames, and intensity.

Thus, while research supports certain types of intervention for anorexia nervosa specifically, there remain mixed messages about what treatment is most effective (Bulik et al., 2007). Further, research has highlighted that the same treatment is not as successful for different types of presentations (Eisler et al., 1997), indicating the need to examine not just which treatments have demonstrated success, but whether there are important variables that hinder success of treatments for anorexia nervosa specifically.

Bulimia nervosa. Compared to anorexia nervosa, there is a clearer picture of best treatments for bulimia nervosa. Specifically, multiple reviews and randomized control trials have supported cognitive-behavioral therapy targeted at bulimia nervosa (CBT-BN) as an efficacious treatment (Hay & Bacaltchuk, 2008, NICE, 2004; Shapiro et al., 2007). Additionally, meta-analytic reviews have favored CBT-BN over wait-list control and other psychotherapy treatments (Hay, Bacaltchuk, & Stefano, 2007). However, because evidence is continually building and many reviews rely on level of support provided, there are additional treatments that have reached the same level of support, including interpersonal therapy and dialectical behavioral therapy (Hay & Claudino, 2010). Further, some research with children and adolescents has supported the efficacy of family therapy (Doyle, McLean, Washington, Hoste, &

le Grange, 2009), while others have suggested that it is not as effective as CBT (Schmidt et al., 2007).

Thus, two main concerns remain about the current body of literature and scope of the reviews on bulimia treatments. Although the reviews highlight which studies are supported, they have not compared various treatment methods to each other regularly, and when they do they have produced mixed results. Also, in a review of these meta-analyses, findings suggest that while CBT-BN is effective for a wide range of outcomes, there remain differences between treatments or populations that are related to treatment success (Hay & Claudino, 2010). Thus, the current study is designed to examine treatment effectiveness in relation to other treatments while also exploring moderators of treatment effectiveness for adolescents and young adults with bulimia nervosa.

Binge eating disorder. Similarly to bulimia nervosa, cognitive-behavioral therapy has been supported as a solid means of treating binge eating disorder (Hay & Claudino, 2010). However, because of the relative newness of the diagnosis, and thus the lack of high-quality randomized control trials, there is not as much empirical evidence establishing treatment efficacy (Hay & Claudino, 2010). However, studies have shown that CBT is effective in reducing binge episodes and decreasing symptoms of depression (Gorin, le Grange, Stone, 2003). However, comparisons of cognitive-behavioral therapy to interpersonal therapy have found little significant difference in outcomes (Wilfley et al., 2002). Further, a randomized control trial of dialectical behavior therapy supported this therapy in reducing symptoms of binge eating disorder over wait-list control (Telch, Agras, & Linehand, 2001). Binge eating disorder treatment research is

complicated by the goal of weight reduction that is not common to the other eating disorder treatments. Thus, continued research and reviews of intervention studies are necessary to come to a conclusion about treatment recommendations for binge eating disorder.

Eating disorders not otherwise specified. Much of the research in interventions for EDNOS focused on binge eating disorder before it became its own separate diagnosis (Hay & Claudino, 2010). However, a recent review highlighted cognitive-behavioral therapy, interpersonal therapy, and dialectical behavior therapy as the most recommended for treating individuals who meet criteria for EDNOS (Schwitzer, 2012). More research is needed to identify relevant studies that have used an EDNOS population to identify successful interventions for this unique and heterogeneous set of symptomatology.

Issues with Recovery and Relapse

While some research studies have demonstrated success in treating disordered eating, long-term recovery is typically quite low, with many individuals who have received treatment relapsing at a later time (Fitcher & Quadflieg, 2007; Herzog et al, 1999; Keski-Rahkonon et al., 2007; Steinhausen, 2002). While rates of recovery and relapse are variable depending on how recovery and relapse are conceptualized and measured (see, Keski-Rahkonon et al., 2007), the continued rates of relapse are concerning and suggest the need to identify what might encourage or discourage treatment success (Halmi et al., 2005) across longer periods of time. Thus, this review evaluates the current literature for regularity of follow-up assessments and analyze success of treatments at follow-up.

Meta-Analysis

Over the last few decades, meta-analytic review processes have become the gold standard for conducting comprehensive, systematic reviews (Borenstein et al., 2009; Cooper et al., 2009) and in developing treatment recommendations, guidelines, and evidence-based practices. Meta-analysis refers to a variety of methods to synthesize and analyze the quantitative results from multiple studies (Allen, 2009; Hedges & Olkin, 1985; Quintana & Minami, 2006). Meta-analyses are based on the tenet that combining samples to yield an average effect across multiple studies reduces Type II error, that is the potential to accept a null hypothesis that is, in fact, false (Allen, 2009; Hedges & Olkin, 1985). The reduction in Type II error occurs because combining the results across studies shrinks the confidence interval for an estimated effect size, which results in a more accurate and precise estimate for the parameter of interest (Allen, 2009; Lipsey & Wilson, 2001). The term effect size refers to multiple different types of standardized indices that can be computed from data in other research studies (Quintana & Minami, 2006). Because of this ability to estimate effects more accurately, and the dramatic increase in numbers of primary research studies available in the literature, meta-analyses have become an important and valued system of research synthesis.

The first meta-analysis, as well as the term, is credited to Smith and Glass (1967) who assessed the efficacy of psychotherapy using this statistical, method. The idea of synthesizing and combining findings from multiple studies had existed prior (Cochran, 1954), but since this first study combining effects across multiple research studies, meta-analyses have become more popular and accepted as a form of review (Quintana & Minami, 2006). As of 1993, over 290

meta-analyses had been conducted (Lipsey & Wilson, 1993), and those numbers have continued to grow (Quintana & Minami, 2006). Between 1981 and 2000, over 2000 articles addressed or used meta-analysis with more than half of those being published since the mid-1990s (Field, 2001). These meta-analyses have been conducted in a variety of different fields including, but not limited to, medicine, psychology, and education (Cohn & Becker, 2003; Shadish, 1996).

Broadly, meta-analyses are conducted through multiple important steps. First, similar to literature reviews, meta-analysis involves a thorough review of the available literature on a certain topic or finding (e.g., the relationship between autism and obsessive compulsive disorder or the effectiveness of social skills training; Lipsey & Wilson, 2001). The goal in a meta-analytic review is to find all possible research studies conducted on a specific topic, including those that are published and unpublished (Cooper & Hedges, 1994; Lipsey & Wilson, 2001). Although publication bias remains a significant concern in meta-analytic review, the goal is to gather as comprehensive of a sample of research studies as possible on the topic of interest to synthesize. This can include multiple methods such as database searching, contacting researchers in the field, hand searching relevant journals, and looking through conference presentations and theses (Cooper & Hedges, 1994; Lipsey & Wilson, 2001). Studies to be included in a meta-analytic review must meet specific inclusion criteria, and then effect sizes for the data question of interest are calculated (Lipsey & Wilson, 2001; Quintana & Minami, 2006). These effect sizes represent the data used in analysis and allow for findings to be standardized and compared across studies (Hedges & Olkin, 1985; Lipsey & Wilson, 2001). A variety of types of data can be transformed into a standardized effect size (Quintana & Minami, 2006). From an effect size, it is possible to

understand both the magnitude and direction of a specific effect. Meta-analysis then pools the effect sizes across studies to make a conclusion about the original research question (Muncer, Taylor, & Craigie, 2002).

Given their methodologies, meta-analyses have become a powerful tool for advancing our understanding of the field of literature available. Many benefits of meta-analyses have been identified, most significantly the major increase in power that improves the ability to estimate effects (Cohn & Becker, 2003). Individual research studies rely on statistical significance, which often is dependent on power and sample size (Cohn & Becker, 2003; Quintana & Minami, 2006). Meta-analyses reduce this reliance by pooling effects, and it is possible for a meta-analysis to produce significant findings even with a set of primary studies that had small to moderate effects that did not reach statistical significance (Lipsey & Wilson, 1993). Further, research has suggested that with the increase in power, finding a non-significant effect in a meta-analytic review is a meaningful scientific finding (Quintana & Minami, 2006). Additionally, meta-analysis allows a summary of the literature that does not over-inflate the differences found between studies and can include a large number of studies that would be hard to review and synthesize in the traditional descriptive manner (Hedges & Olkin, 1985). Further, because meta-analytic reviews are comprised of multiple studies conducted with a variety of types of participants, populations, and interventions, they provide more robust and generalizable findings (Shadish, 1996; Shadish & Sweeny, 1991).

While there have been many identified benefits to conducting meta-analytic reviews, others have challenged their utility and benefit. In the medical discipline, discrepancies between

meta-analytic reviews and large-scale randomized control trials have been used to challenge the validity of meta-analytic findings (LeLorier, Gregoire, Benhaddad, Lapierre, & Derderian, 1997). Surprisingly, this research demonstrated that meta-analytic findings contradicted large scale RCTs as to what was effective in 33% of the cases (LeLorier et al., 1997). Findings such as this highlight the remaining limitations in conducting a meta-analytic review. Specifically, the common exclusion of unpublished studies or those not in English, combined with the regular inclusion of studies that may have inadequate designs and methodology, can produce a biased pool of research studies (Gregoire, Derdeian, Le Lorier, 1995; Muncer et al., 2002; Rosenthal, 1979). Further, some researchers and theorists question meta-analytic findings due to the lack of detail found in the methods and results of the primary research, use of non-standardized or non-validated measures, and inclusion of studies with small sample sizes (Muncer et al., 2002). The publication bias against negative results that exists in the field challenges the ability for reviews, such as meta-analyses, to validly synthesize the results because many studies with null findings are never published, and thus are not accessible (Song et al., 2010). Because of these limitations in the primary literature, some theorize that meta-analytic reviews over-estimate true effect sizes (Muncer et al., 2002). While some have raised concerns about meta-analytic reviews, they remain an important avenue for assessing treatment effectiveness and provide an opportunity to explore not just relations between variables, but also moderators of treatment effectiveness.

Moderators in Meta-Analytic Reviews

While meta-analyses can provide important information about average effect sizes of treatments for specific issues, there remain questions about whether specific aspects of the focal

population or the treatment under investigation influence treatment outcomes, that is moderate the relationship between treatment and outcome (Shadish & Sweeny, 1991). Moderators allow researchers to explore whether the relationship between treatment and outcome is impacted by a third variable (Baron & Kenny, 1986). That is, an important contribution of meta-analysis is to say not just whether a treatment works overall, but also whether treatment effects depend on some other qualitative (e.g., race of participants, diagnosis) or quantitative (e.g., number of sessions) variable (Shadish, 1996; Shadish & Sweeny 1991).

Many different types of variables have been analyzed as moderators of treatment effectiveness and can include aspects such as sex of therapist, therapist experience, use of a manual, or sex of client. Because analyzing moderators is common in meta-analytic reviews, the methods to test moderators are clear (Shadish, 1996; Shadish & Sweeny, 1991). To test a moderator, the interaction between treatment and any variable of interest is tested through regression or through group comparison (Shadish & Sweeny, 1991). This is based on the understanding that moderation occurs when the magnitude of the effect size for treatment varies as a function of the level of another variable (Shadish, 1996). Because of the importance of testing these more complex models of treatment effectiveness, the ability to test for moderation is built into many types of meta-analytic statistical software (CMA-V2; Borenstein, Hedges, Higgins, & Rothstein, 2005). Thus, one of the primary benefits of meta-analysis is the ability to assess differences across treatment outcomes to potentially identify populations that are poorly served, aspects of treatment that enhance success or adherence, and influential elements of therapist or client characteristics.

While many moderators of treatment effectiveness might exist, past research has highlighted some specific moderators that deserve continued research. Prior research has demonstrated that certain clinical factors may be related to worse outcomes, and thus, may function as moderators of treatment success. Specifically, longer duration of diagnosis, older age of onset for diagnosis, severity of diagnosis, presence of comorbid conditions have been associated with poorer overall outcomes (e.g., Hsu, Crisp, & Harding, 1979; Lowe et al., 2001; Morgan & Russell, 1975; Nozoe et al., 1995). Given that many of the treatments have been designed for females and that less research has examined the effectiveness of treatments for males (Fairburn & Beglin, 1990; Garfinkel et al., 1996; Hoek & van Hoeken, 2003), there is a potential that treatments for males require significant modification to demonstrate the same level of success. Further, certain treatment elements have been hypothesized to be related to treatment outcome, including expertise of intervention administrator, size of group in group therapy, as well as duration and intensity of treatment (e.g., Hoag & Burlingame, 1997; Smith & Glass, 1977). Thus, when examining potential moderators of eating disorder intervention outcomes, it is critical to examine both the moderators that have emerged in past literature, as well as other potential moderators in an exploratory fashion.

Limitations of Past Research and Previous Reviews of Disordered Eating Treatment Programs

Many researchers have previously researched or reviewed treatment programs for different eating disorder diagnoses. Although this is not an under-researched area, many questions remain about how to treat disordered eating successfully, especially in adolescents and

young adults (Wilson et al., 2007). While reviews of the literature exist, these reviews are limited in important ways that have guided the design of the current meta-analytic review. Specifically, these reviews have either been limited by their scope, method of review, specific treatments being studied, specific disorders being studied, population, or by lack of examination of important moderators of treatment effectiveness.

Researchers in the field have systematically reviewed eating disorder intervention research through both qualitative reviews (Allen & Dalton, 2011; Bell, 2003), and using meta-analytic techniques (Fisher, Hetrick, & Rushford, 2010; Hay, Bacaltchuk, Stefano, & Kashyap, 2009; Newton & Ciliska, 2006; Pratt & Woolfenden, 2002; Reas & Grilo, 2008; Stice, Shaw, & Marti, 2007; Vocks et al., 2010). However, many of the past reviews have focused on a specific disorder, such as anorexia nervosa (e.g., Bulik et al., 2007; Fisher et al., 2010; Hay, Bacaltchuk, Byrnes, Claudino, Ekmejian, & Yong, 2003), bulimia nervosa (e.g., Fettes & Peters, 1992; Lundgren et al., 2004; Shapiro et al., 2007; Whittal et al., 2000), or binge eating disorder (e.g., Brownley, Berkman, Sedway, Lohr, & Bulik, 2007; Reas & Grilo, 2008; Vocks et al., 2010), limiting their ability to compare treatment effectiveness across diagnoses. Other reviews have been limited to combinations of specific disorders (eg., BN, BED, and EDNOS; Hay et al., 2009; Perkins, Murphy, Schmidt, & Williams, 2006), which allows only partial comparison across diagnoses and often views the disorders in an oversimplified manner.

While specific diagnoses have been studied but not compared, there have been very few studies examining treatments of eating disorders not otherwise specified (Bailey et al., 2014). Studies and reviews often either include patients with EDNOS by classifying them along with

the diagnosis that they most closely resemble (e.g., AN or BN) or exclude patients with EDNOS diagnoses from the review completely (Rutherford & Courturier, 2007). Thus, it is important for a review to include each diagnosis within the disordered eating cluster to compare treatment effectiveness across diagnosis, as well as to advance the understanding of treatment for under-researched diagnoses (e.g., EDNOS) or diagnoses with mixed findings (e.g., anorexia nervosa).

Another way in which past reviews have been limited is the common focus on one type of treatment. Reviews that focus solely on a specific type of treatment, such as cognitive-behavioral therapy (e.g., Lewandowski, Gebing, Anthony, & O'Brien, 1997; Lundgren et al., 2004), family therapy (e.g., Couturier et al., 2013), or group therapy (e.g., Fettes & Peters, 1992), for instance, are inadequate in that they do not allow for comparison of treatment success across different modalities or methods of treatment. Additionally, prior reviews have been limited in that they only assess certain methods of treatment (e.g., self-help; Allen & Dalton, 2011; Perkins et al., 2006) or certain treatment locations (e.g., through primary care, Allen & Dalton, 2011).

Despite the fact that the age of onset for eating disorders is typically early to late adolescence, much of the research into intervention strategies has focused solely on adult populations (Lock, 2010; Mitchell, Agras, & Wonderlich, 2007; Wilson, Grilo, Vitousek, 2007). Often this has resulted in recommendations and treatments designed for adults being used with adolescents, with minimal modifications or research as to their appropriateness (Lock, 2010). Further, reviews conducted may use mixed age groups, focus on adults, or ignore age as a variable of interest (e.g., Berkman, Lohr, & Bulik, 2007; Whittal et al., 1999). Thus, researchers have highlighted the need for a comprehensive synthesis of adolescent and young adult treatment

studies that can be used to provide guidance about the appropriateness of specific interventions in the adolescent and young adult population, a population of known risk (Bailey et al., 2014; Wilson et al., 2007).

Only a few reviews have analyzed treatments for each diagnosis in the same review (Allen & Dalton, 2011; Bailey et al., 2014; Hubbard, 2013). However, two of these reviews did not use meta-analytic procedures (Allen & Dalton, 2011; Bailey et al., 2014), and two of the reviews were not focused on adolescents and young adults (Allen & Dalton, 2011; Hubbard, 2013). Further, Allen and Dalton (2011) reviewed mostly self-help interventions in primary care settings. While Bailey and colleagues (2014) did focus their review on young people, their review primarily focused on reviewing the state of the literature – that is, how many studies were available for what types of treatments and disorders – rather than reviewing the success or outcomes associated with those treatments. Thus, there remains an important gap in the literature for a review of eating disorder treatments for adolescents and young adults. See Table 1 for a description of previous reviews and their limitations.

Researchers have highlighted the need to better match treatment features to the patient, which requires a full picture of what types of treatments work for what types of individuals, and what aspects of treatment promote success (Bailey et al., 2014; Timulak et al., 2013), necessitating the continued examination of important moderators of treatment success. Research has indicated that these moderators might be specific to certain types of treatments (Stice et al., 2008), demanding the consideration of moderators in general for treatment effectiveness and within specific treatment types. As new treatments, such as mobile interventions (e.g., Aardoom

et al., 2013), are developed and new treatment studies are conducted, evidence-based practice requires up-to-date examination and comparison of treatment effectiveness to develop appropriate treatment guidelines and recommendations.

Table 1. Information and Limitations of Prior Reviews

Citation	Type of Review	Information About Review				Limitations of Review		
		Main Conclusions	<i>k</i>	Average Effect size	Specified Age	Type of Treatment	Type of Disorder	Other limitations
Allen & Dalton, 2011	Systematic review	Guided self-help CBT via a self-help book may be beneficial for reducing bingeing and purging symptoms	5	Not reported	No limit	4 of 5 self-help	AN, BN, BED	Setting: Primary care Published: Only Published
Bailey et al., 2014	Literature review	Evidence base for treatment of eating disorders in young people is not well established and significant gaps remain	N/A	N/A	Adolescents and young adults	No limit	All	General: Reviews state of literature Published: Only Published
Brownley et al., 2007	Systematic review	The literature regarding treatment efficacy for BED is variable	19	N/A	No limit	No limit, includes pharmacological	BED	Design: Only RCTs Published: Only Published
Bulik et al., 2007	Systematic review	Evidence for AN treatment is weak and evidence for differential outcome by sociodemographic factors is nonexistent	19	N/A	No limit	No limit	AN	Design: Only RCTs Published: Only Published
Couturier et al., 2013	Meta-analysis	Although FBT is not superior to individual treatment at end of treatment, there are benefits at 6–12 month follow-up for adolescents	6	$z = 1.62$, $p = 0.11$ compared to individual	Adolescents (age 12-20)	Family therapy	All	Design: Only RCTs with ITT Published: Only Published
Cox & Merkel, 1989	Literature review	Although most studies used behavioral or cognitive-behavioral strategies, no modality of treatment has shown clear superiority	32	N/A	No limit	No limit	BN	Published: Only Published
Fettes & Peters, 1992	Meta-analysis	Group treatment for bulimia is beneficial at post-treatment	31	$d = .75$	No limit	Group therapy	BN	Published: Only Published
Fisher et al., 2010	Cochrane review	Family therapy is effective compared to TAU. No differences in relapse, symptoms, weight, or dropouts between family therapy and other treatments	10	$z = 0.03$ to 3.03 depending on outcome	Adolescents and young adults (M age < 25)	Family Therapy	AN	Design: Only RCTs
Hartman et al., 1992	Meta-analysis	No difference between style of treatment or setting of treatment on treatment outcomes. Number of sessions linked to outcome	9	$M = 1.04$	No limit	No limit	BN	No limit

Hay et al., 2003	Cochrane review	No firm conclusions, but participants who did not receive psychotherapy did poorly	6	No overall effect reported	Adolescent and adults (age >16)	Excluded family therapy	AN	Design: Only RCTs
Hay et al., 2009	Cochrane review	CBT and especially CBT-BN are effective in treating BN and related eating disorder syndromes	48	No overall effect reported	No limit	No limit	BN, BED, EDNOS	Published: Only Published
Hubbard, 2013	Meta-analysis	Significant effects of treatment at post, CBT preferred to alternative treatment and internet preferred to control	27	$d = 0.33$	No limit	No limit	All	Design: Only RCTs
Laessle et al., 1987	Meta-analysis	Psychotherapy in general, especially when combined with dietary management was superior to drug therapy	25	ES = 1.14 - 7.30	No limit	No limit, includes pharmacological	BN	Not specified
Lewandowski et al., 1997	Meta-analysis	CBT yields positive effects at post test for behavioral and cognitive outcomes	26	$r = 0.67 - 0.69$ depending on outcomes	No limit	CBT	BN	No limit
Lundgren et al., 2004	Review of clinical significance	CBT produces clinically significant change for many treatment outcome measures when using the reliable change index for BN	15	N/A	No limit	CBT	BN	Not specified
Perkins et al., 2006	Cochrane review	Self-help may be useful first step in treatment or alternative or therapist-delivered treatment	15	RR = 0.72 - 0.86 compared to wait list	No limit	Self-help	BN, BED, EDNOS	Design: Only RCTs or CCTs
Reas & Grilo, 2008	Meta-analysis	Pharmacotherapy produced positive outcomes, adding psychotherapy did not improve outcomes	13	RR = 0.74; 95% CI: 0.66–0.84	No limit	Pharmacotherapy	BED	Design: Only RCTs Published: Only Published
Richards et al., 2000	Literature review of reviews	Quantitative reviews rare, and are often limited to one diagnosis or treatment	28	N/A	No limit	No limit	AN, BN	N/A
Rutherford & Courturier, 2007	Literature review	Family therapy most effective for treating AN, CBT most effective for BN	N/A	N/A	Children and Adolescents	No limit	Exclude EDNOS	N/A
Shapiro et al., 2007	Systematic review	Evidence for medication and behavioral treatment is strong, while evidence for self-help is weak	47	N/A	No limit	No limit, includes pharmacological	BN	Design: Only RCTs Published: Only Published
Thompson-Brenner et al., 2003	Meta-analysis	Psychotherapy leads to large improvements. Around 40% of patients recover completely, although 60% maintain symptoms	46	ES = 0.52 – 1.01 depending on outcome	No limit	No limit	BN	Published: Only Published

Vocks et al., 2010	Meta-analysis	Psychotherapy and structured self-help, based on CBT interventions, produce positive outcomes	38	$d = 0.52-0.84$	No limit	No limit, includes pharmacological	BED	Design: Only RCTs Published: Only Published
Whitbread & McGown, 1994	Meta-analysis	CBT yields large post-treatment effect sizes	19	ES = 1.0 - 1.72 depending on therapy	No limit	No limit, includes pharmacological	BN	Published: Only Published
Whittal et al., 2000	Meta-analysis	CBT yielded better effects compared to medication	35	ES = 1.22 – 1.35 depending on outcomes	No limit	No limit, includes pharmacological	BN	Design: Only RCTs Published: Only Published
Wilson et al., 2007	Literature review	Continued research is necessary in mediators and moderators of treatment effectiveness	N/A	N/A	No limit	No limit	All	N/A

CHAPTER TWO

CURRENT STUDY AND SPECIFIC AIMS

Current Study

A popular psychology research quote was posed by Gordon Paul (1967) when he asked, "*What* treatment, by *whom*, is most effective for *this* individual with *that* specific problem, and under *which* set of circumstances?" This study is designed to expand the understanding of what types of treatments are successful in treating disordered eating for adolescents and young adults, who are at an increased risk for disordered eating. To date there has not been a comprehensive review of treatments for all diagnoses under the disordered eating cluster, specifically for adolescents and young adults.

Additionally, this study goes further than simply examining which treatments are effective, by testing which treatment modalities are most effective for each disordered eating diagnosis. As prevalence rates continue to rise (Bulik et al., 2006), it is important to identify and understand which treatments are most effective for which types of people and to identify what important elements of treatment should be highlighted or promoted. Another advantage of the current study is the focus on comparing and identifying moderators of treatments to refine treatment guidelines for this critical and costly mental health disorder.

Aims

Specific Aim 1

The first goal of this study is to comprehensively explore treatment of eating disorders in youth and adolescents and describe treatments that are currently available in the literature. This will identify disorders for which the research base is lacking and draw conclusions about the efficacy of psychotherapy in general. Additionally, as part of this goal, this study will highlight other aspects of the research base (e.g., types of outcomes measured, whether follow-ups are included in treatment studies, how often ethnicity data is reported in treatment studies).

Based on prior findings and the current literature review, it is expected that psychotherapy overall will yield significant positive effects for eating disorder outcomes [ED outcomes] across diagnoses and for each specific diagnosis (Hypothesis 1). It is hypothesized that the effects at follow-up will be significantly smaller than the effects at post-intervention for ED outcomes (Hypothesis 2). These hypotheses will be tested in an exploratory fashion for non-eating disorder outcomes [non-ED outcomes] as well.

Specific Aim 2

The second major goal of this study is to compare results for different types of treatments and disorders. Specifically, this study will compare different types of treatment (e.g., CBT, Mindfulness, family therapy) to determine if specific types of treatment yield significantly better results. Further, the study is expected to identify which disorders are associated with the most success after treatment. Finally, this research aims to determine which types of treatments are most effective for which diagnoses.

Based on prior reviews, it is expected that certain types of treatments will produce more significant effects for specific disorders. Specifically, it is expected that CBT and family therapy will yield significantly larger effects for ED outcomes compared to other treatments across diagnoses for adolescents and young adults (Hypothesis 3). There is no hypothesis comparing family therapy to CBT; however, differences will be tested in an exploratory fashion. It is expected that the effects of CBT will be significantly greater for diagnoses of bulimia nervosa and binge eating disorder compared to anorexia nervosa and EDNOS on ED outcomes (Hypothesis 4). It also is expected overall that effect sizes for ED outcomes associated with bulimia nervosa will be significantly greater than for other disorders (Hypothesis 5). Preliminary analyses will examine if these findings are similar or different for non-ED outcomes.

Specific Aim 3

The third major aim of the current study is to explore variables that might act as moderators of treatment success (e.g., treatment length, severity of patient population, age of population). That is, this study examines a host of variables to see if they are related to better or worse outcomes. Ideally, this will be used to target effective treatments in general and within specific disorder types. Additionally, these analyses will indicate if there are certain populations of people that are not achieving successful outcomes in treatment.

It is expected that certain participant variables will be related to significantly greater effect sizes. Specifically, it is expected that studies with participants with a younger age of onset, participants without comorbid conditions, participants with less severe diagnoses, participants with shorter duration of diagnosis, and samples with greater numbers of females will produce

significantly greater effects for ED outcomes (Hypothesis 6-10). It also is expected that certain design- and intervention-level variables will be associated with better outcomes. Specifically, it is expected that interventions with smaller groups, longer duration of treatment in weeks, higher intensity of treatment in overall hours, and higher levels of therapist qualifications will be associated with significantly greater post-intervention ED outcome effect sizes (Hypothesis 11-14). Other potential moderator variables will be tested in an exploratory fashion. Additionally, all moderators will be examined for non-ED outcomes, as well, in an exploratory fashion.

CHAPTER THREE

METHOD

Search Strategy

The literature was searched using multiple methods to gather a non-biased representative sample of the relevant studies. First, the following 3 databases, PsycInfo, PubMed, and Proquest Dissertations and Theses, were searched using a combination and variants of several search terms meant to capture disordered eating treatment studies conducted with adolescents and emerging adults. These search terms can be provided by request. Studies published prior to the year 2015 were eligible for inclusion. Published studies include those published as part of journals and those published for early access online. Second, the tables of contents of top journals in the field of treatment and disordered eating were searched by hand to identify additional reports that might meet inclusion criteria. A list of journals searched can be provided by request. Third, reference lists of previous reviews on similar topics and of each study that was included in the review were inspected for qualifying studies that were not identified through database search methods. Finally, researchers who have conducted multiple qualifying interventions were contacted in an effort to find potentially unpublished interventions.

Inclusion Criteria

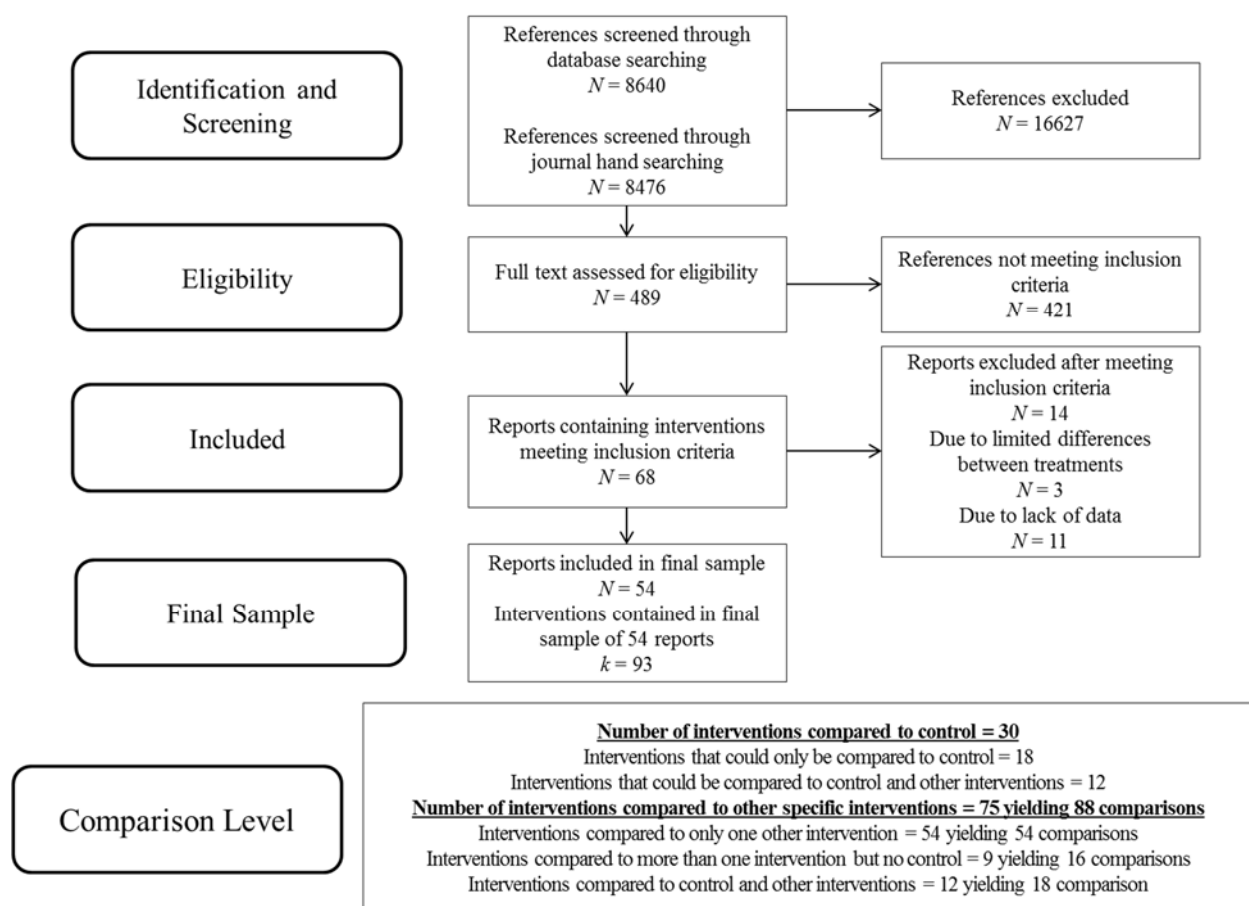
To be included in the final sample, studies had to meet certain inclusion criteria. First, studies had to evaluate an eating disorder treatment or intervention. Only interventions with a primary focus on treating patients diagnosed with anorexia nervosa, bulimia nervosa, binge

eating disorder, or eating disorder not otherwise specified, using the classification system of the diagnostic and statistical manual of mental disorders (DSM-5; American Psychiatric Association, 2013) or the international classification of diseases (ICD-10; World Health Organization, 1992) were included. Treatment studies include interventions designed either to reduce symptomatology or frequency of specific behaviors or to improve functioning of someone with the disorder. Thus, this review excludes prevention studies, which have been analyzed in previous reviews (Bailey et al., 2014; Beitner, Jacobi, & Taylor, 2011; Cororve Fingeret, Warren, Cepeda Benito, & Gleaves, 2006; Newton & Ciliska, 2006; Pratt & Woolfenden, 2002; Stice et al., 2007), and relapse prevention studies. Second, included interventions had to have been conducted with adolescents or young adults. For the purposes of this meta-analytic review, the interventions had to have a mean age of participants between 12 and 25 years of age or specify using an adolescent or young adult population exclusively. Interventions with both adult and adolescent participants were included if the mean age of participants is under 25 years as has been done in prior reviews (Bailey et al., 2014). Third, treatment interventions that used biological or pharmacological methods or used these methods in combination with other methods of treatment were excluded as they have been reviewed previously (Allen & Dalton, 2011; Bailey et al., 2014; Bulik et al., 2007; Perkins et al., 2006; Reas & Grilo, 2008; Vocks et al., 2010); however, if a study included a biological or pharmacological intervention and another intervention that met the inclusion criteria, the non-biological intervention was included for review. Fourth, only studies that included a control group for comparison were included in this review. For the purpose of this study, this control group can be a non-active control group (e.g., wait-list control group) or an active treatment control group that is being used as a comparison

group (e.g., individual psychotherapy). If a study includes two active and distinct interventions with one intervention used as control, both interventions were included using the other intervention a comparison group. Fifth, included studies had to examine a specific ED outcome, such as an eating disorder symptom measure, checklist, or inventory, a diagnostic interview, body mass index (BMI), or a specific disordered eating targeted behavior (e.g., binge/purge frequency). Sixth, studies were required to be available in English to be included.

Figure 1 shows flow chart of sample selection and inclusion.

Figure 1. Flow Chart of Identification and Screening of Interventions, as well as Final Sample of Intervention Broken Down at Comparison Level



The above search procedures identified 489 potentially relevant reports, which were screened for the specific inclusion criteria. Interventions that did not meet the inclusion criteria were excluded from the review. Multiple qualifying interventions within the same report were coded separately, as distinct interventions. Type of control group was coded to determine if outcomes were affected by different levels of control groups used.

Missing data is common for studies in meta-analytic reviews. If reports did not include necessary statistical data to calculate effect sizes, authors were contacted in an attempt to obtain the necessary data. Any studies for which no data could be found and for which effect sizes could not be estimated were excluded. This screening process yielded a final sample of 93 interventions that were systematically reviewed, coded, and analyzed.

Study Coding

Studies were coded on multiple variables in each of the following categories: (a) general study features; (b) design features; (c) participant characteristics; (d) intervention features; and (e) outcome features. A detailed description of each code and options for coding can be provided by request.

General Study Features

Studies were coded on general study features including year of publication, country of publication, and source of article (e.g., published article, book chapter, unpublished thesis). Given advances in intervention strategies, year of publication was considered as a moderator in an exploratory fashion.

Experimental Design Features

Specific design features of the study also were coded for later analysis. These included experimental design, type of comparison group (e.g., waitlist control, treatment as usual, other specific treatment), initial and final sample size, total and differential attrition for intervention and control groups, and whether baseline differences were assessed or adjusted for.

Study Quality Indicators

While it has become common for meta-analyses to assess the quality of studies, there remains much debate on how to best measure study quality (de Craen, van Vliet, & Helmerhorst, 2005). Many composite measures have been developed, but recent research has highlighted that examining individual variables related to study quality is more beneficial than using a single score of quality (De Craen et al., 2005; Juni, Witschi, Bloch, & Egger, 1999), and many of the measures developed are more useful for the medical field than for the social sciences. Given this, a variety of individual variables that are often used to assess study quality were coded so as to look at their relationship to effect size, as has been done in prior research (Spring, Pagoto, Knatterud, Kozak, & Hedeker, 2007). These variables included whether the study used random assignment, gave a rationale for sample size or conducted a power analysis, specified a primary outcome, used validated measures, reported dropout, had less than 10% dropout, provided information on adherence, and used fidelity checks.

Participant Characteristics

A variety of information about the sample was coded. Specifically, information was coded about primary eating diagnosis and potential comorbid diagnoses within the sample. Additionally, the sex and ethnicity breakdown of the sample was coded, and information was

coded as to whether the sample was targeted or limited in any specific way (e.g., severe diagnoses, only females).

As this review includes a wide range of participant ages and the effectiveness of specific types of treatment may vary across these developmental time-frames, additional diagnostic information, including age, average age of onset, and duration of diagnosis, was also coded in order to examine these variables as potential moderators.

Intervention Features

Each study was coded on a variety of important intervention features, including primary intervention strategy, treatment modality (e.g., individual, group, family), intervention administrator training, use of manual, sex of intervention provider, duration of intervention, follow-up assessment, and content of intervention (e.g., receiving information, homework, use of technology). Additionally, each study was coded as to whether it reported engagement or perception of intervention data, whether it used fidelity checks, and whether the researchers conducted any moderation, mediation, or advanced analyses. Specific information on primary intervention strategy and content variables is provided below.

Primary intervention strategy. Each intervention was coded into one of 11 different categories according to its major method of treatment to create a primary intervention strategy code. Categories included: (1) **psychoeducation**, which relies on providing information as the main method of improving outcomes; (2) **cognitive-behavioral therapy (CBT)**, referring to interventions that focus on the monitoring and altering of negative cognitions; (3) **behavioral therapy**, including interventions that use tenets of learning to reduce or increase targeted behaviors; (4) **interpersonal therapy (IPT)**, referring to treatments that focus on the

interpersonal difficulties that a person may be experiencing, and that are considered the basis for the disorder; (5) **dialectical behavioral therapy (DBT)**, which includes interventions based on an emotion-regulation model of disordered eating; (6) **intensive short-term dynamic psychotherapy (ISTDP)**, which refers to brief, focused therapy aimed at reducing defenses and triggers to emotional eating; (7) **mindfulness**, including interventions that use techniques such as mindful eating, yoga, and meditation, with the goal of increasing awareness and acceptance of eating behaviors - this includes Acceptance and Commitment Therapy (ACT), Mindfulness Based Stress Reduction (MBSR), Mindfulness Based Cognitive Therapy (MBCT), and Mindfulness Based Eating Awareness Therapy (MB-EAT); (8) **group therapy**, which includes interventions focused on developing supportive relationships to explore important aspects of disordered eating behavior; (9) **family-based therapy (FBT)**, referring to treatments that involve the family throughout aspects of treatment due to the conceptualization that disordered eating will improve as changes are made in the family unit (this includes the Maudsley Approach); (10) **psychoanalytic psychotherapy (FPT)**, which involves using general psychoanalytic procedures to reduce symptoms of disordered eating; and (11) **cognitive-analytical therapy (CAT)** which combines analytical theories with a focus on the negative cognitions that are related to and important in maintain disordered eating. Additionally, there was a (12) **miscellaneous category of other intervention strategies** category that included interventions that did not fit into the defined categories, as well as a (13) **multiple interventions/blend** category that includes multiple intervention strategies. Family therapy and group therapy were only coded if the authors conceptualized those as the primary intervention strategy. Otherwise the main intervention strategy was coded with modality of treatment coded separately.

Content of intervention variables. Given that different types of interventions can incorporate various and multiple aspects of other types of interventions, specific intervention strategies present in each intervention were coded beyond the primary overarching strategy or model of intervention. A variety of variables related to content elements of interventions were coded. These included use of specific therapeutic strategies (i.e., cognitive, behavioral, mindfulness, psychoeducation, and relaxation), as well as other specific elements (i.e., nutrition management, supported meals, social interaction, homework, use of technology). These were coded if present, and interventions could include multiple of these components.

Outcome Features

Outcomes were classified into two categories: (a) eating-disorder-specific [ED outcomes], including diagnostic, symptom, and eating disorder behavior measures, and (b) non-eating-disorder outcomes [non-ED outcomes], which refer to additional outcomes such as self-esteem, body image, depression, or other measures of functioning.

ED outcomes were further coded for type of measure. That is, ED outcomes were coded for whether they are assessed with the following: (1) an eating disorder symptom measure (includes questionnaires, checklists, and inventories); (2) diagnostic interview; (3) biomarker such as body mass index (BMI) or weight gain; or (4) a specific eating disorder behavior (e.g., binge/purge frequency).

Non-ED outcomes were further coded as to specific type of outcome. These types of outcome included: (1) body image; (2) depression; (3) anxiety; (4) general psychological distress (e.g., anger, well-being); (5) social and emotional skills (e.g., assertiveness, emotion regulation);

(6) self-perceptions (e.g., self-efficacy); (7) interpersonal relationships (e.g., conflict); (8) family outcomes, and (9) other (e.g., health, motivation).

Outcomes also were coded as to whether they were self-reported or measured/assessed by an outside examiner or clinician.

Reliability of Coding

To establish reliability of coding, research assistants were trained on the coding scheme and use of the coding manual during a training phase. During this training phase, research assistants coded six of the eligible studies (11% of the sample) in conjunction with the lead author as a means to discuss discrepancies between coders and offer further training. Once this training phase was complete and there was greater than 90% agreement across coders, the remaining articles were coded independently by two coders (one research assistant and the lead author). Across this independent coding phase, there was 96.5% agreement across codes. Disagreements were resolved through discussion.

Meta-Analytic Strategy

Effect Size Calculation and Estimation

Using Comprehensive Meta-Analysis Version 3 (CMA-V3; Borenstein, Hedges, Higgins, & Rothstein, 2014), effect sizes were calculated for outcomes at any assessed time-point (e.g., pre/baseline, post, follow-up) using Hedges' g . Hedges' g is an effect size calculation of the difference between intervention and control group means at a specified time-point divided by the pooled standard deviation for the two groups; this procedure adjusts for small sample bias (Hedges & Olkin, 1985). Hedges' g can be estimated using a variety of reported statistics, as described by Lipsey and Wilson (2001) and followed in CMA-V3. Most commonly effect sizes

were estimated using means and standard deviations or estimated from reported p -values, t -tests, or F -statistics.

If the necessary data to calculate effect sizes were not available in the research report, the authors of the study were contacted in an effort to gather it. If the only information available, after attempts at contacting authors had not succeeded, indicated that an overall effect was nonsignificant, we conservatively set the corresponding Hedges' g to zero and the standard error to the average standard error across other included interventions (0.33).

Outlier effect sizes and outliers in any of our coded variables of interest, defined as values that fall beyond three standard deviations of their respective means, were winsorized, meaning reset at three standard deviations above or below the mean, in order to retain the data without over-influencing the findings (Lipsey & Wilson, 2001). Overall, 10 outcomes' positive effect sizes and 9 outcomes' negative effect sizes were winsorized. Specific intervention codes in starting sample size ($k = 2$), final sample size ($k = 3$), duration in total sessions ($k = 4$), and intensity of the total intervention in hours ($k = 1$) were also winsorized as they were more than three standard deviations from the mean, prior to any analyses.

We adjusted post and follow-up effect sizes for pre-intervention baseline when pre-intervention data were available. To do this, the pre-intervention effect sizes were subtracted from effect sizes for the later time-points, as is standard in meta-analytic reviews (e.g., Durlak, Weissberg, & Pachan, 2010; Wilson, Gottfredson, & Najaka, 2001).

Random-effects models were used as they are based on the assumption that true effects vary between studies (Borenstein et al., 2009), and we expected significant variability between effects due to multiple reasons (e.g., different diagnoses, different treatments). In contrast, fixed-

effects models rely on the assumption that the true effect is the same across studies (Borenstein et al., 2009), which was unlikely given the state of the literature.

Interpreting Effect Sizes

Each effect size is associated with a z -test, confidence interval, and p -value that can be used to assess statistical significance of effects. Significance of effect sizes were assessed using the 95% confidence intervals (CIs) around each obtained mean effect size. That is, confidence intervals that did not include zero were considered statistically significant. Positive effect sizes reflected the superiority of the intervention group over the control or comparison group. For all analyses, interventions compared to controls versus other specific interventions were analyzed separately.

If more than one measure was used for any of our outcome categories in the same study (e.g., two measures of disordered eating), the effect sizes were aggregated to yield one effect per outcome category per intervention. This is important because the individual effect sizes included in a study are not independent of each other and thus should not be treated as such, so as not to violate our statistical assumptions of independence amongst outcomes (Shadish & Sweeny, 1991). In most cases, k was used to represent the number of interventions included in the analyses. There were a few analyses where outcomes could not be aggregated and effects are presented at the outcome level; in these cases, the number of outcomes, rather than the number of interventions, is presented for each effect. Further, we used weighted least squares analyses that assign a higher weight to studies with larger sample sizes, based on the belief that larger sample sizes produce more stable estimates with less error and thus are more likely to accurately estimate population effect sizes (Hedges & Olkin, 1985).

Analysis of State of Literature

To summarize descriptive findings from the state of the literature, all codes were entered into SPSS and descriptive analyses were conducted.

Heterogeneity

Heterogeneity within study outcomes in a meta-analysis suggests the existence of important variables or moderators that would explain differences amongst treatment success (Borenstein et al., 2009). To assess heterogeneity of data and assess the need to examine additional moderators, I^2 values were inspected for group means. As an index of heterogeneity, the guideline indicates that I^2 values up to 25% represent a low degree of heterogeneity, 25 to 75% represents a moderate degree, and above 75% indicates a high degree of heterogeneity (Higgins, Thompson, Deeks, & Altman, 2003).

Effect Size Comparisons

Following the guidelines of Cumming and Finch (2005), pairs of confidence intervals with no overlap were considered statistically different at the $p < .01$ level, and confidence intervals with less than 50% overlap were considered statistically different at the $p < .05$ level (Cumming & Finch, 2005). In general, comparisons were only conducted when there were five or greater interventions in each cell of the specific comparison. Any presented findings with small sample sizes (i.e., $k < 5$) are indicated as preliminary. Notably, many of the comparisons between specific types of interventions and other specific interventions involved small sample size (i.e., $k < 5$), yet are presented and must be interpreted with caution.

Moderators of Treatment Effectiveness

Using tools within CMA-V3, moderators of treatment effectiveness were examined. Q_{between} values, which are analogous to ANOVA, and their associated p -values were used to determine if categorical variables were significantly related to effect size.

For continuous variables, regression within CMA-V3 was used to see if continuous moderator variables were significantly linked to effect size outcomes. This analysis yields a point estimate similar to a beta-weight, as well as an associated p -value, which can be used to determine significance.

Exploratory Analyses of Iatrogenic Effects

Iatrogenic findings or findings that increase rather than decrease symptomatology have been found in programs meant to prevent and treat certain eating disorders (Garner, 1985; Stice & Shaw, 2004). Given the potential for iatrogenic effects, it was planned that any significant effects in an unexpected direction (e.g., intervention worse than control) would be examined further; however, there was only one significant intervention-level iatrogenic effect as detailed below. Thus, moderators of negative outcomes could not be assessed.

CHAPTER FOUR

RESULTS

Outline of Results

These results are structured to present the following information in three distinct sections:

(a) information on what interventions were included and their study characteristics across all interventions (whether compared to control or compared to other specific interventions), (b) data analysis and results for interventions compared to control groups, and finally (c) data analysis and results for specific interventions compared to other specific interventions.

Descriptive Information on Review Sample

Included Interventions

Figure 1 displays the flow chart of screened and included studies. The final sample included 93 interventions contained in 54 reports. Nearly 20% of the interventions ($k = 18$) could only be compared to some type of control group. Of the 63 specific interventions that could only be compared to other specific interventions, 54 of the interventions could only be compared to one other specific treatment (total of 54 comparisons). Also included were three reports that reported data for more than two interventions, in which case every possible comparison between specific interventions was conducted (9 interventions yielding a total of 16 comparisons). 12 interventions were included in reports presenting multiple interventions groups (total of 18 comparisons), as well as a control group, allowing for comparisons to control and between specific interventions. This yielded a total of 30 interventions compared to a control group and

88 specific interventions compared to other specific interventions. For the purpose of describing the review sample, all interventions (whether compared to control or compared to other specific interventions) are presented together in the *Study Characteristics* section below; however, these comparison types are presented separately for all further analyses. Descriptive statistics for the interventions included in the review are presented in Table 2.

Table 2. Descriptive Characteristics for the 93 Included Interventions (91 at Post, and 2 at Follow-Up Only)

	All Interventions (<i>k</i> = 93)	
	<i>k</i>	%
General Study Features		
Source		
Published Article	91	97.8%
Unpublished Dissertation/Thesis	2	2.2%
Year of Publication		
1980 - 1989	18	19.4%
1990 - 1999	23	24.7%
2000 - 2009	32	34.4%
2010 - 2015	20	21.5%
Country (<i>k</i> = 88)		
Inside the United States	38	43.2%
Outside the United States ^a	50	56.8%
Experimental Design Features		
Experimental Design (<i>k</i> = 90)		
Quasi-experimental	7	7.8%
Random	83	92.2%
Type of Comparison Group		
Control	18	19.4%
<i>No-intervention or wait-list control</i>	7	7.5%
<i>Information-only control</i>	2	2.2%
<i>Attentional control</i>	3	3.2%
<i>Treatment as usual</i>	6	6.5%
Other Intervention(s)	63	67.7%
Control Group and Other Intervention(s)	12	12.9%
Initial Sample Size (Intervention + Comparison Group) (<i>k</i> = 87)		
<i>Mean (SD)</i>	52.24	(33.7)
<i>Median (Range)</i>	42.0	(14.0 – 158.0)
0 – 50	53	60.9%
51-100	27	31.1%

101+	7	8.0%
End Sample Size (Intervention + Comparison Group) (<i>k</i> = 84)		
Mean (<i>SD</i>)	42.5	(28.8)
Median (<i>Range</i>)	35.0	(12.0 – 148.0)
0-50	61	72.6%
51-100	18	21.4%
100+	5	6.0%
Percent Total Attrition (<i>k</i> = 84)		
Mean (<i>SD</i>)	15.7%	(12.2%)
Median (<i>Range</i>)	16.0%	(0% – 45%)
Differential Attrition (<i>k</i> = 84)		
Mean (<i>SD</i>) of absolute value	8.2%	(9.4%)
Median (<i>Range</i>) of absolute value	6.2%	(0% – 47%)
Baseline Differences Assessed (<i>k</i> = 92)		
Didn't examine or adjust	30	32.6%
Examined but no differences	39	42.4%
Differences found and adjusted	14	15.2%
Differences found but not adjusted	9	9.8%
Study Quality Indicators (percent using)		
Self-Report engagement	4	4.3%
Participant perception	19	20.4%
Fidelity checks (<i>k</i> = 89)	71	79.8%
Training (<i>k</i> = 89)	37	41.6%
Rationale for study size	23	24.7%
Primary outcome	37	39.8%
Valid and reliable measures	91	97.8%
Drop-Out reported	75	80.6%
Drop-Out less than 10% (<i>k</i> = 85)	20	23.5%
Participant Characteristics		
Single Diagnosis Treated		
Yes	67	72.0%
No	26	28.0%
Diagnosis Treated		
Single	67	72.0%
Anorexia nervosa	29	31.2%
Bulimia nervosa	35	37.6%
Binge eating disorder	3	3.2%
Blend	26	28.0%
AN, BN, BED, EDNOS	4	4.2%
AN, BN, EDNOS	6	6.5%
AN, BN	2	2.2%
AN, EDNOS	5	5.3%
BN, EDNOS	2	2.2%
BN, BED	1	1.1%

<i>BN, BED, EDNOS</i>	6	6.5%
Particular Type of Patient Targeted		
No	33	35.5%
Yes	60	64.5%
<i>Females</i>	58	62.4%
<i>Purged immediately upon bingeing</i>	2	2.2%
Average Age of Onset Reported (k = 90)		
No	67	74.4%
Yes	23	25.6%
<i>Mean (SD) age in years (k = 23)</i>	16.7	(2.26)
<i>Median (Range) (k = 26)</i>	17.2	(13 – 21)
Average Duration of Diagnosis (in months)		
No	35	37.6%
Yes	58	62.4%
<i>Mean (SD) (k = 59 specified)</i>	46.19	(26.0)
<i>Median (Range) (k = 37 specified)</i>	50.0	(5.0-90.0)
Severity Assessed		
Yes	9	9.7%
No	84	90.3%
Percent Prior Treatment Reported (k = 91)		
Yes	20	22.0%
No	71	78.0%
Comorbid Diagnoses (k = 12)		
<i>Mean (SD)</i>	40.1%	27.7%
<i>Median (Range)</i>	34.0%	(0% – 77%)
Weight Reported (k = 84)		
Yes	81	96.4%
No	3	3.6%
Age		
<i>Mean (SD)</i>	20.9	(3.6)
<i>Median (Range)</i>	21.8	(13 – 25)
Percent Female (k = 85)		
<i>Mean (SD)</i>	97.92%	(3.7)
<i>Median (Range)</i>	100%	(85.9%–100%)
Ethnicity		
No information provided	58	62.4%
Partial breakdown	17	18.3%
Complete breakdown	18	19.4%
Percent Non-Caucasian (k = 32)^b		
<i>Mean (SD)</i>	17.0%	13.9%
<i>Median (Range)</i>	22.1%	(0% – 46%)
Intervention Features		
Primary Intervention Strategy		
Psychoeducation	3	3.3%

Cognitive-behavioral therapy	29	31.2%
Behavioral therapy	5	5.4%
Interpersonal therapy	1	1.1%
Intensive short-term dynamic psychotherapy	1	1.1%
Group therapy	3	3.3%
Family-based therapy	18	19.4%
Psychoanalytic psychotherapy	6	6.5%
Multiple strategies/blended	8	8.7%
Other Intervention Strategies	19	20.4%
Modality ($k = 90$)		
Primarily individual/one-on-one	42	46.7%
Primarily group	15	16.7%
Primary family	16	17.8%
Other	17	18.9%
Setting ($k = 89$)		
Inpatient	8	9.0%
Outpatient	80	89.9%
Partial hospitalization/intensive outpatient	1	1.1%
Intervention Administrator ($k = 81$)		
Licensed therapist(s)	23	28.4%
Psychiatric nurse(s)	1	1.2%
Student trainee(s)	14	17.3%
Other	2	2.5%
Multiple levels (e.g., licensed therapist and trainee)	41	50.6%
Sex of Intervention Administrator ($k = 72$)		
Male	3	4.2%
Female	25	34.7%
Multiple	44	61.1%
Use of Manual		
Yes	42	45.2%
No	22	23.7%
Was not mentioned	29	31.1%
Number of Sessions ($k = 69$)		
<i>Mean (SD)</i>	16.5	(11%)
<i>Median (Range)</i>	15.0	(1.00 – 56)
Average Duration of Sessions in Minutes ($k = 58$)		
<i>Mean (SD)</i>	59.8	(24.2%)
<i>Median (Range)</i>	60	(0.82 – 120.0)
Intensity of Total Intervention in Hours ($k = 51$)		
<i>Mean (SD)</i>	19.1	(12.8%)
<i>Median (Range)</i>	15.8	(0.75 – 60.0)
Duration in Weeks ($k = 77$)		
<i>Mean (SD)</i>	22.8	(17.0%)
<i>Median (Range)</i>	18.0	(0.29 – 65)

Follow-up Assessed		
Yes	71	76.3%
No	22	23.7%
Additional Contact (e.g., booster sessions, follow-up emails)		
Yes	10	10.8%
No	83	89.2%
Content of Intervention – Specific Strategies (percent using)		
Cognitive strategies	46	49.5%
Behavioral strategies	47	50.5%
Mindfulness strategies	1	1.1%
Relaxation strategies	4	4.3%
Psychoeducation/Receiving information	39	41.9%
Nutritional management	30	32.3%
Supported meals	6	6.5%
Social interaction	13	14.0%
Homework	30	32.3%
Use of technology	9	9.7%
Advanced Analyses Included in Interventions (percent using)		
Moderator	11	11.8%
Mediator	3	3.2%
Advanced analyses (e.g., power analysis, SEM)	27	29.0%

Note: [†]ks do not always add to 96 due to missing data in some reports.

^a Countries include Australia, Austria, Canada, England, Germany, Israel, Spain, Sweden, UK.

^b Even though 35 interventions presented partial or complete ethnicity breakdown, percent minority could only be calculated for 32 interventions.

Study Characteristics of Included Interventions

This section presents data on various characteristics of the 93 interventions included in this review, organized into five sections containing information on: (a) general study features, (b) experimental design features, (c) study quality indicators, (d) participant characteristics, and (e) intervention features and advanced analyses.

General study features. All but two of the interventions were published. All of the reports appeared after 1981, and over half (56%) of the interventions had been published since 2000. Over 40% of the interventions were conducted in the United States. Of the 50 interventions conducted outside of the United States, the most common locations were the

United Kingdom ($k = 29$), followed by Canada ($k = 4$), Australia ($k = 3$), Spain ($k = 3$), and Sweden ($k = 3$).

Experimental design. Over 90% of the studies randomly assigned participants to control or intervention groups. Of those interventions with control groups, a majority were compared to no-intervention/wait-list controls ($k = 7$) or treatment as usual ($k = 6$). A few interventions were compared to information-only controls ($k = 2$) or attentional controls ($k = 3$).

An average of 52 people were initially included in the studies (range = 14 – 158), and the average attrition was 15.7%. Differential attrition (absolute value) between intervention and control or comparison group ranged from 0 to 47%, and was around 8% on average. Over 30% of the interventions did not assess baseline differences between the intervention group and the control or comparison group. Of the 62 interventions that assessed baseline differences, 39 found no differences, 14 found differences and adjusted for those differences, and 9 found differences but did not adjust for those differences.

Study quality indicators. Assessing self-reported engagement was rare ($k = 4$); however, over 20% of the interventions ($k = 19$) assessed participant perceptions of the intervention. Only 20% of the interventions did not present any information on fidelity checks, but more than 50% of interventions ($k = 52$) did not report any information about how those administering their intervention were trained. About a quarter of interventions ($k = 23$) provided a rationale for their study size. Less than half of the interventions ($k = 37$) specified a primary outcome, but almost all of the interventions used valid and reliable measures ($k = 91$). Over 80% of the interventions reported dropout ($k = 75$), and 20 of those interventions had less than 10% dropout.

Participant characteristics. Over 70% of the interventions targeted a single diagnosis, while 26 interventions included a blended sample of multiple diagnoses. Specifically, 29 interventions targeted anorexia nervosa, 35 interventions targeted bulimia nervosa, and 3 interventions targeted binge eating disorder. No interventions targeted EDNOS solely; however, EDNOS was included in 23 of the interventions that included multiple diagnoses. Over 64% of the interventions targeted a specific population, with all but two of those interventions targeting only females. Overall, the average percent female across interventions was 98%. The other two interventions specifically targeted individuals that purged immediately after bingeing. Only 25% of the interventions reported the age of onset for the diagnosis, with the average age of onset being 16.7 years. Over 60% of the interventions reported the duration of the diagnosis, with the average duration being 46 weeks. Only nine interventions assessed severity of diagnosis. Over 20% of the interventions presented information about the percent of their sample that had prior treatment for an eating disorder. Close to 70% of the interventions presented no information about their samples' comorbid conditions, with an additional 22% producing only partial information about comorbidity. Only 4 interventions reported a full breakdown of comorbid conditions. Across the 12 interventions reporting information about the percentage of their sample with comorbid conditions, the average percentage of the sample with a comorbid condition was 40%. Over 95% of the interventions reported some measurement of weight or BMI of their sample; however, due to different measurement methods across studies, an average of any measure of weight status could not be calculated. All of the interventions specified the age of their sample; the average age was 20.9 years. Over 62% of the interventions did not present any information on ethnicity of their sample and over 18% of the interventions only presented

partial information. Of the studies that reported ethnicity information, the average percentage minority was 17%.

Intervention features. Over 90% of the interventions used a primary intervention strategy, whereas the other 9% did not identify a primary strategy and used multiple or blended intervention strategies. Cognitive-behavioral interventions ($k = 29$) were most common, followed by family-based therapy ($k = 18$) and interventions that did not fit into other codes and were combined in a miscellaneous category of *other intervention strategies* ($k = 19$). Examples of these included guided self-help, eye movement desensitization, motivational enhancement therapy, and supportive expressive therapy. Psychoanalytic therapy ($k = 6$), behavioral therapy ($k = 5$), and group therapy ($k = 3$) were the next most common strategies. Close to 50% of interventions were delivered in an individual format ($k = 42$), with 17% of interventions being delivered in a group format and 18% in a family format. 17 interventions were either delivered in a hybrid format or via computer. Close to 90% of the interventions occurred in outpatient settings, and only one intervention was delivered in a partial hospitalization program. Most of the interventions were administered by multiple people with limited information provided about training status or sex; however, 23 of the interventions were delivered exclusively by licensed therapists, and 25 of the interventions were exclusively administered by females. Over 45% of the interventions used a manual.

The number of total sessions ranged from 1 to 56 ($\mu = 16.5$), with the average sessions lasting an hour (ranging from less than one hour to 2 hours). Overall, interventions spanned close to 23 weeks on average, ranging from less than 1 week to 65 weeks. Over 75% of the interventions assessed outcomes at a follow-up time-point; however, only 40 interventions

produced useable data at follow-up yielding a total of 43 comparisons. Only 11% of interventions incorporated additional contact with patients after the intervention was completed.

Content of intervention - Specific strategies. The interventions were coded as to whether they included certain types of strategies. Specifically, close to half of the interventions included cognitive strategies ($k = 46$) or behavioral strategies ($k = 47$). Over 40% of the interventions incorporated a psychoeducation component providing information ($k = 42$). Only a few interventions included relaxation ($k = 4$), and only a single intervention incorporated elements of mindfulness. Nutritional management ($k = 30$) was more common than supported meals ($k = 6$). Exactly 14% of the interventions ($k = 13$) included social interaction as a component of their intervention. Over 32% of the interventions used homework assignments, and 9 interventions used technology as part of their intervention.

Intervention analyses. Only 11 interventions conducted moderator analyses, and only 3 interventions conducted mediator analyses. In 29% of the interventions, some type of advanced analyses were conducted (e.g., power analysis).

Analyses Comparing Interventions to Control

This section presents the analyses of interventions compared to control groups. The first section presents (a) the overall effectiveness of interventions compared to control. The following sections present effects broken down by: (b) outcome categories (i.e., ED outcomes versus non-ED outcomes overall, specific outcome types within ED and non-ED outcomes, and sources of outcomes), (c) diagnostic category, (d) outcome type within specific diagnoses, (e) intervention strategy, and (f) intervention strategy within specific diagnoses. Then, moderator analyses within ED and non-ED outcomes are presented in three sections: (g) hypothesized moderator analyses,

(h) exploratory moderator analyses, and (i) discussion of exploratory analyses of multiple moderators. The final section presents data on the (j) effectiveness at follow-up including effects by outcome type and diagnosis, as well as moderators of follow-up effectiveness within ED and non-ED outcomes.

Overall Effectiveness of Interventions Compared to Control

As predicted, the overall mean ES across all outcomes for interventions compared to control (ES = 0.41, CI = 0.29 to 0.53; $k = 30$, $p < .001$) differed significantly and positively from zero. Table 3 provides general and effect size information on each of the 30 interventions compared to control for ED and non-ED outcomes. The average intervention-level ES for interventions compared to control across outcomes ranged from -0.71 to 1.23. Overall, there were only three negative study-level intervention effects when compared to control, and only one of those interventions yielded a statistically significant iatrogenic effect. Heterogeneity statistics ($I^2 = 37.87\%$) indicate moderate heterogeneity across interventions and the potential for moderators to exist. Application of Duval and Tweedie's (2000) trim and fill method, which can be considered a sensitivity analysis in that it adjusts for possible publication bias and missing studies, yielded a similar intervention effect for interventions compared to control (ES = 0.41, CI = 0.29 – 0.53).

Effects by Outcome Categories

Table 3 also presents the overall effectiveness for each intervention for both ED outcomes and non-ED outcomes (e.g., depression, anxiety, and social-emotional skills; specified for each study in Table 3). Overall, interventions compared to control produced significant effects for both ED outcomes (ES = 0.38, CI = 0.27 to 0.50; $k = 30$, $p < .001$) and non-ED

outcomes (ES = 0.37, CI = 0.24 to 0.50; $k = 21$, $p < .001$), and these effects did not significantly differ from each other.

Outcome type. Table 4 displays effect size and heterogeneity statistics broken down by outcome type. ED outcomes were further coded as to whether they were a biomarker, symptom measure, diagnostic interview, or a specific ED behavior. In these ED outcomes, only two outcomes types emerged as significant, symptom measure (ES = 0.45, CI = 0.31 to 0.59; $k = 18$, $p < .001$) and specific ED behavior (ES = 0.56, CI = 0.41 to 0.72; $k = 16$, $p < .001$), with ED behavior outcomes being significantly greater than symptom measure outcomes. Both ED behavior outcomes and symptom measure outcomes were significantly greater than biomarker outcomes (ES = 0.03, CI = -0.18 to 0.24; $k = 9$, $p = 0.798$) and diagnostic interview outcomes (ES = 0.12, CI = -0.28 to 0.51; $k = 5$, $p = 0.558$), which did not differ from each other.

Within non-ED outcomes, significant effects were found for all of the outcome types, including anxiety (ES = 0.27, CI = 0.09 to 0.45; $k = 12$, $p = .004$), body image (ES = 0.33, CI = 0.16 to 0.50; $k = 11$, $p < .001$), depression (ES = 0.35, CI = 0.18 to 0.52; $k = 12$, $p < .001$), general psychological distress, (ES = 0.22, CI = 0.04 to 0.39; $k = 12$, $p = .016$), interpersonal relationships (ES = 0.30, CI = 0.10 to 0.50; $k = 8$, $p = .003$), self-perceptions (ES = 0.39, CI = 0.19 to 0.59; $k = 10$, $p < .001$), and social-emotional skills (ES = 0.36, CI = 0.10 to 0.62; $k = 6$, $p = .007$), and there were no significant differences among these outcomes. The highest effects emerged for outcomes classified as other (ES = 0.63, CI = 0.35 to 0.90; $k = 5$, $p < .001$), which differed significantly from some of the specific outcome types.

Table 3. Selected Characteristics and Effect Sizes of 30 Interventions Comparisons Between Interventions and Control Groups and 88 Interventions Comparisons Between Specific Interventions and Other Specific Interventions

Study	N	Primary Intervention Strategy	Comparison Group	Modality	Duration (all information reported)	Types of Outcomes Targeted	Eating Disorder Outcome ES: Hedges' g (SE)	Non- Eating Disorder Outcome ES: Hedges' g (SE)
Interventions Compared to Control Groups								
Allen & Craighead (1999)	29 Females	Cognitive-Behavioral Therapy (<i>Appetite Awareness</i>)	Waitlist Control	Group	8 50-minute sessions, 8 weeks	ED Outcomes, Anxiety, Depression, Self-Perceptions	0.29 (0.44)	0.83 (0.45)
Andrewes et al (1996)	54 Participants	Psychoeducation (<i>DIET Computer Program</i>)	Attentional Control	Individual	1 week	ED Outcomes, Other	0.37 (0.27)	1.29 (0.28)**
Bergh et al (2002)	32 Participants	Other (<i>Feed and Satiety</i>)	Waitlist Control	Individual	--	ED Outcomes	0.70 (0.90)	--
Berry & Abramowitz (1989)	14 Females	Other (<i>Attention-Placebo + Experimental Stimulus</i>)	Control and Other Intervention(s) (<i>Treatment as Usual</i>)	Individual	6 15-minute sessions, 6 weeks	ED Outcomes	-0.02 (0.51) F/U: -0.19 (0.53)	--
		Multiple-Interventions/ Blend (<i>Educative/Support Group + Experimental Stimulus</i>)	Control and Other Intervention(s) (<i>Treatment as Usual</i>)	Individual	6 90-minute sessions, 6 weeks	ED Outcomes	0.56 (0.56) F/U: 0.43 (0.55)	--
		Psychoeducation (<i>Educative/Support Group + Neutral Stimulus</i>)	Control and Other Intervention(s) (<i>Treatment as Usual</i>)	Individual	6 90-minute sessions, 6 weeks	ED Outcomes	0.08 (0.50) F/U: 0.22 (0.50)	--
Bloomgarden & Calogero (2008)	86 Females	Eye Movement Desensitization and Reprocessing	Treatment as Usual	Individual	60 minute sessions	Body Image, Depression, General Psychological Distress, ED Outcomes	0.00 (0.33) F/U: 0.00 (0.33)	0.10 (0.32) F/U: 0.04 (0.32)
Burton & Stice (2006)	85 Participants	Multiple-Interventions/ Blend (<i>Healthy Weight Program</i>)	Waitlist Control	Group	6 sessions, 8 weeks	ED Outcomes	0.32 (0.23) F/U: 0.32 (0.22)	-- F/U: 0.00 (0.22)
Channon et al (1989)	24 Females	Behavioral Therapy	Control and Other Intervention(s) (<i>Treatment as Usual</i>)	--	18 60-minute sessions, 24 weeks	Anxiety, ED Outcomes, Body Image, Depression, General Psychological Distress, Interpersonal Relationships, Self-Perceptions	0.00 (0.33) F/U: 0.00 (0.33)	0.00 (0.33) F/U: 0.00 (0.33)

		Cognitive-Behavioral Therapy	Control and Other Intervention(s) (<i>Treatment as Usual</i>)	--	18 60-minute sessions, 24 weeks	Anxiety, ED Outcomes, Body Image, Depression, General Psychological Distress, Interpersonal Relationships, Self-Perceptions	0.00 (0.33) F/U: 0.00 (0.33)	0.00 (0.33) F/U: 0.00 (0.33)
Dean et al (2008)	42 Participants	Motivational Interviewing (<i>Motivational Enhancement Therapy</i>)	Treatment as Usual	Group	24 75-minute sessions, 6 weeks	Anxiety, Body Image, General Psychological Distress, Interpersonal Relationships, ED Outcomes, Self-Perceptions, Social-Emotional Skills	-0.04 (0.33) F/U: -0.12 (0.38)	-0.27 (0.33) F/U: -0.01 (0.38)
DeBar et al (2013)	26 Females	Cognitive-Behavioral Therapy (<i>Cognitive Behavioral Treatment</i>)	Treatment as Usual	Individual	9.38 sessions	Anxiety, ED Outcomes, Depression, Other, Social-Emotional Skills	0.49 (0.48) F/U: 0.41 (0.45)	0.11 (0.39) F/U: 0.70 (0.41)
Fernandez-Aranda et al (2009)	62 Females	Cognitive-Behavioral Therapy (<i>Internet-based Therapy</i>)	Waitlist Control	Other	16 weeks	Anxiety, ED Outcomes, Body Image, General Psychological Distress, Self-Perceptions, Social-Emotional Skills	0.33 (0.25)	0.22 (0.25)
Freeman et al (1988)	112 Females	Cognitive-Behavioral Therapy (<i>Cognitive-Behavioral Therapy</i>)	Control and Other Intervention(s) (<i>Waitlist Control</i>)	Individual	15 60-minute sessions, 15 weeks	Anxiety, Body Image, ED Outcomes, Depression, General Psychological Distress, Self-Perceptions, Social-Emotional Skills	0.82 (0.31)**	--
		Behavioral Therapy (<i>Behavior Therapy</i>)	Control and Other Intervention(s) (<i>Waitlist Control</i>)	Individual	15 60-minute sessions, 15 weeks	Anxiety, Body Image, ED Outcomes, Depression, General Psychological Distress, Self-Perceptions, Social-Emotional Skills	0.95 (0.30)**	--
		Group Therapy (<i>Group Therapy</i>)	Control and Other Intervention(s) (<i>Waitlist Control</i>)	Group	15 60-minute sessions, 15 weeks	Anxiety, Body Image, ED Outcomes, Depression, General Psychological Distress, Self-Perceptions, Social-Emotional Skills	1.23 (0.31)**	--
Gendron et al (1992)	24 Females	Multiple strategies/ Blend	No Intervention	Group	48.00 hours, 0.29 weeks	ED Outcomes, Self-Perceptions	1.02 (0.42)*	0.93 (0.41)*
Gowers et al (1994)	40 Females	Psychoanalytic Psychotherapy (<i>Outpatient Psychotherapy</i>)	Information Only	Individual	12 sessions, 40 weeks	ED Outcomes, General Psychological Distress, Social-Emotional Skills	0.54 (0.32) F/U: 0.66 (0.32)*	0.12 (0.32) F/U: 0.11 (0.31)
Hall & Crisp (1987)	30 Females	Psychoanalytic Psychotherapy	Information Only	Other	12 60-minute sessions	ED Outcomes	0.00 (0.33) F/U: -0.04 (0.44)	-- F/U: 0.00 (0.33)

<i>(Psychotherapy Group)</i>								
Hsu et al (2001)	77 Females	Cognitive-Behavioral Therapy <i>(Cognitive Therapy)</i>	Control and Other Intervention(s) <i>(Attentional Control)</i>	Individual	16 60-minute sessions, 14 weeks	Anxiety, Body Image, ED Outcomes, Depression, General Psychological Distress, Interpersonal Relationships, Self-Perceptions	0.18 (0.32)	0.10 (0.33)
		Multiple strategies/ Blend <i>(Cognitive and Nutritional Therapy)</i>	Control and Other Intervention(s) <i>(Attentional Control)</i>	Individual	16 120-minute sessions, 14 weeks	Anxiety, Body Image, ED Outcomes, Depression, General Psychological Distress, Interpersonal Relationships, Self-Perceptions	0.53 (0.31)	0.51 (0.31)
Laessle et al (1991)	55 Females	Other <i>(Stress Management)</i>	Attentional Control	Group	15 120-minute sessions, 12 weeks	Anxiety, Body Image, Depression, General Psychological Distress, Self-Perceptions, ED Outcomes	0.13 (0.29) F/U: -0.06 (0.31)	0.29 (0.29) F/U: 0.01 (0.31)
Mitchell et al (1990)	65 Females	Cognitive-Behavioral Therapy <i>(Intensive Group Treatment Program)</i>	No Intervention	Group	120-minute sessions, 12 weeks	Anxiety, ED Outcomes, Depression	0.87 (0.26)**	0.87 (0.26)**
Pillay & Crisp (1981)	33 Participants	Other <i>(Social Skills/Social Anxiety Treatment)</i>	Attentional Control	Individual	12 sessions	Anxiety, ED Outcomes, Depression, General Psychological Distress, Social-Emotional Skills	-0.05 (0.40) F/U: -0.04 (0.40)	0.38 (0.41) F/U: 0.14 (0.41)
Robinson & Sefarty (2008)	97 Participants	Cognitive-Behavioral Therapy <i>(Email Bulimia Therapy)</i>	Control and Other Intervention(s) <i>(Waitlist Control)</i>	Other	12 weeks	Depression, ED Outcomes	0.76 (0.62)	0.00 (0.33)
		Other <i>(Unsupported Self-Directed Writing)</i>	Control and Other Intervention(s) <i>(Waitlist Control)</i>	Other	12 weeks	Depression, ED Outcomes	0.44 (0.62)	0.00 (0.33)
Sanchez-Ortiz (2011)	76 Females	Cognitive-Behavioral Therapy <i>(iCBT: Overcoming Bulimia Online)</i>	Waitlist Control	Other	12 weeks	Anxiety, Body Image, ED Outcomes, Depression, General Psychological Distress, Interpersonal Relationships, Health	0.64 (0.28)*	0.76 (0.28)**
Stein (2013)	69 Females	Other <i>(Identity Intervention Programme)</i>	Treatment as Usual	Other	20 60-minute sessions, 20 weeks	Body Image, ED Outcomes, General Psychological Distress, Interpersonal Relationships, Other, Self-Perceptions, Social-Emotional Skills	0.78 (0.33)* F/U: 0.77 (0.38)*	0.99 (0.35)** F/U: 0.64 (0.38)

Stice (2015)	131 Females	Other (<i>Counter Attitudinal Therapy</i>)	Treatment as Usual	Group	8 60-minute sessions, 8 weeks	Body Image, ED Outcomes, Interpersonal Relationships, Depression, General Psychological Distress	0.52 (0.19)** F/U: 0.39 (0.19)*	0.29 (0.19) F/U: 0.32 (0.20)
Wade (2009)	47 Participants	Other (<i>Motivational Interviewing</i>)	Treatment as Usual	Individual	--	ED Outcomes, Other	-1.51 (0.35)** F/U: -0.09 (0.31)	0.10 (0.34) F/U: 0.64 (0.34)
<u>Interventions Compared to Other Interventions</u>								
Agras et al (2014)	158 Participants	Family-Based Therapy (<i>Family-Based Therapy</i>)	Family-Based Therapy (<i>Systemic Family Therapy</i>)	Family	16 60-minute sessions, 36 weeks	Anxiety, ED Outcomes, Depression, General Psychological Distress, Self-Perceptions	0.02 (0.17) F/U: 0.08 (0.16)	-0.01 (0.16) F/U: -0.01 (0.16)
		Family-Based Therapy (<i>Systemic Family Therapy</i>)	Family-Based Therapy (<i>Family-Based Therapy</i>)	Family	16 60-minute sessions, 36 weeks	Anxiety, ED Outcomes, Depression, General Psychological Distress, Self-perceptions	-0.02 (0.17) F/U: -0.08 (0.16)	0.01 (0.16) F/U: 0.01 (0.16)
Bachar et al (1999)	34 Females	Other (<i>Self Psychological Treatment</i>)	Cognitive Orientation Therapy (<i>Cognitive Orientation Treatment</i>)	Individual	52 50-minute sessions, 52 weeks	ED Outcomes, General Psychological Distress	0.48 (0.42)	0.04 (0.37)
		Cognitive Orientation Therapy (<i>Cognitive Orientation Treatment</i>)	Other (<i>Self Psychological Treatment</i>)	Individual	52 50-minute sessions, 52 weeks	ED Outcomes, General Psychological Distress	-0.48 (0.42)	-0.04 (0.37)
Bailer et al (2003)	81 Females	Other (<i>Guided Self-Help</i>)	Cognitive-Behavioral Therapy (<i>Cognitive-Behavioral Therapy</i>)	Individual	18 20-minute sessions, 18 weeks	ED Outcomes, General Psychological Distress, Anxiety, Body Image, Depression, Interpersonal Relationships, Self-Perceptions	0.30 (0.28) F/U: 0.17 (0.27)	0.45 (0.27) F/U: 0.26 (0.27)
		'Cognitive-Behavioral Therapy (<i>Cognitive-Behavioral Therapy</i>)	Other (<i>Guided Self-Help</i>)	Group	18 90-minute sessions, 18 weeks	ED Outcomes, General Psychological Distress, Anxiety, Body Image, Depression, Interpersonal Relationships, Self-Perceptions	-0.30 (0.28) F/U: -0.17 (0.27)	-0.45 (0.27) F/U: -0.26 (0.27)
Ball & Mitchell (2004)	25 Females	Cognitive-Behavioral Therapy	Family-Based Therapy	--	25 60-minute	ED Outcomes, General Psychological Distress,	0.13 (0.45) F/U: -0.05 (0.45)	0.19 (0.43) F/U: -0.07 (0.46)

Berry & Abramowitz (1989)	21 Females	(Cognitive-Behavioral Therapy)	(Behavioral Family Therapy)		sessions, 52 weeks	Anxiety, Body Image, Depression, Interpersonal Relationships, Self-Perceptions		
		Family-Based Therapy (Behavioral Family Therapy)	Cognitive-Behavioral Therapy (Cognitive-Behavioral Therapy)	Family	25 60-minute sessions, 52 weeks	ED Outcomes, General Psychological Distress, Anxiety, Body Image, Depression, Interpersonal Relationships, Self-Perceptions	-0.13 (0.45) F/U: 0.05 (0.45)	-0.19 (0.43) F/U: 0.07 (0.46)
		Multiple Strategies/Blend (Educative/Support Group + Experimental Stimulus)	Other (Attention-Placebo + Experimental Stimulus)	Group	6 90-minute sessions, 6 weeks	ED Outcomes	0.00 (0.53) F/U: 0.26 (0.54)	--
			Psychoeducation (Educative/Support Group + Neutral Stimulus)	Group	6 90-minute sessions, 6 weeks	ED Outcomes	0.15 (0.58) F/U: -0.02 (0.57)	--
		Other (Attention-Placebo + Experimental Stimulus)	Multiple Strategies/Blend (Educative/Support Group + Experimental Stimulus)	Individual	6 15-minute sessions, 6 weeks	ED Outcomes	0.00 (0.53) F/U: -0.26 (0.54)	--
			Psychoeducation (Educative/Support Group + Neutral Stimulus)	Individual	6 15-minute sessions, 6 weeks	ED Outcomes	0.04 (0.52) F/U: -0.40 (0.52)	--
			Psychoeducation (Educative/Support Group + Neutral Stimulus)	Group	6 90-minute sessions, 6 weeks	ED Outcomes	-0.15 (0.58) F/U: 0.02 (0.37)	--
			Other (Attention-Placebo + Experimental Stimulus)	Group	6 90-minute sessions, 6 weeks	ED Outcomes	-0.04 (0.52) F/U: 0.40 (0.52)	--
Channon et al (1989)	16 Females	Cognitive-Behavioral Therapy (Cognitive-Behavioral Treatment)	Behavioral Therapy (Behavioral Treatment)	--	18 60-minute sessions, 24 weeks	Anxiety, ED Outcomes, Body Image, Depression, General Psychological Distress,	0.00 (0.33) F/U: 0.00 (0.33)	0.00 (0.33) F/U: 0.00 (0.33)

						Interpersonal Relationships, Self-Perceptions		
		Behavioral Therapy (<i>Behavioral Treatment</i>)	Cognitive-Behavioral Therapy (<i>Cognitive-Behavioral Treatment</i>)	--	18 60-minute sessions, 24 weeks	Anxiety, ED Outcomes, Body Image, Depression, General Psychological Distress, Interpersonal Relationships, Self-Perceptions	0.00 (0.33) F/U: 0.00 (0.33)	0.00 (0.33) F/U: 0.00 (0.33)
Cooper & Steere (1995)	31 Patients who Purged Immediately upon Binging	Cognitive-Behavioral Therapy (<i>Cognitive-Behavioral Treatment</i>)	Behavioral Therapy (<i>Exposure and Response Prevention</i>)	Individual	19 50-minute sessions, 18 weeks	Anxiety, ED Outcomes, Body Image, Depression, General Psychological Distress, Self-Perceptions	-0.10 (0.38) F/U: 0.28 (0.40)	0.12 (0.37) F/U: 0.58 (0.39)
		Behavioral Therapy (<i>Exposure and Response Prevention</i>)	Cognitive-Behavioral Therapy (<i>Cognitive-Behavioral Treatment</i>)	Individual	19 50-minute sessions, 18 weeks	Anxiety, ED Outcomes, Body Image, Depression, General Psychological Distress, Self-Perceptions	0.10 (0.38) F/U: -0.28 (0.40)	-0.12 (0.37) F/U: -0.58 (0.39)
Dunn et al (2006)	90 Participants	Other (<i>Motivation Interviewing + Self-Help</i>)	Other (<i>Self-Help Only</i>)	Other	1 45-minute session	Other (Motivation)	-- F/U: 0.18 (0.21)	-- F/U: 0.25 (0.21)
		Other (<i>Self-Help Only</i>)	Other (<i>Motivation Interviewing + Self-Help</i>)	Other	--	Other	-- F/U: -0.18 (0.21)	-- F/U: -0.25 (0.21)
Eisler et al (2000 & 2007)	40 Participants	Family-Based Therapy (<i>Conjoint Family Therapy</i>)	Family-Based Therapy (<i>Separated Family Therapy</i>)	Family	16.40 60-minute sessions, 52 weeks	Anxiety, ED Outcomes, Depression, General Psychological Distress, Self-Perceptions, Social-Emotional Skills	-0.10 (0.33)	0.64 (0.34)
		Family-Based Therapy (<i>Separated Family Therapy</i>)	Family-Based Therapy (<i>Conjoint Family Therapy</i>)	Individual	15.5 45-minute sessions, 52 weeks	Anxiety, ED Outcomes, Depression, General Psychological Distress, Self-Perceptions, Social-Emotional skills	0.10 (0.33)	-0.64 (0.34)
Elder (2003)	20 Females	Cognitive-Behavioral Therapy (<i>Cognitive-Behavioral Therapy</i>)	Cognitive-Behavioral Therapy (<i>Appetite-Focused CBT</i>)	Group	10 90-minute sessions, 10 weeks	ED Outcomes, Body Image, Depression, General Psychological Distress, Self-Perceptions	-0.08 (0.44) F/U: 0.43 (0.43)	0.33 (0.43) F/U: 0.37 (0.43)

		Cognitive-Behavioral Therapy (<i>Appetite-Focused CBT</i>)	Cognitive-Behavioral Therapy (<i>Cognitive-Behavioral Therapy</i>)	Group	10 90-minute sessions, 10 weeks	ED Outcomes, Body Image, Depression, General Psychological Distress, Self-Perceptions	0.08 (0.44) F/U: -0.43 (0.43)	-0.33 (0.43) F/U: -0.37 (0.43)
Fairburn et al (1986)	24 Females	Cognitive-Behavioral Therapy (<i>Cognitive-Behavioral Therapy</i>)	Psychoanalytic Psychotherapy (<i>Short-term Focal Psychotherapy</i>)	Individual	19 sessions, 18 weeks	ED Outcomes, Body Image, Depression, General Psychological Distress, Social-Emotional Skills	0.46 (0.43) F/U: 0.34 (0.42)	0.44 (0.42) F/U: 0.51 (0.43)
		Psychoanalytic Psychotherapy (<i>Shore-term Focal Psychotherapy</i>)	Cognitive-Behavioral Therapy (<i>Cognitive-Behavioral Therapy</i>)	Individual	19 sessions, 18 weeks	ED Outcomes, Body Image, Depression, General Psychological Distress, Social-Emotional Skills	-0.46 (0.43) F/U: -0.34 (0.42)	-0.44 (0.42) F/U: -0.51 (0.43)
Fairburn et al (1991 & 1993)	73 Females	Cognitive-Behavioral Therapy (<i>Cognitive-Behavioral Therapy</i>)	Behavioral Therapy (<i>Behavior Therapy</i>)	Individual	19 45-minute sessions, 18 weeks	ED Outcomes, Depression, General Psychological Distress, Social-Emotional Skills	0.29 (0.33)	0.00 (0.33)
			Interpersonal Therapy (<i>Interpersonal Therapy</i>)	Individual	19 45-minute sessions, 18 weeks	ED Outcomes, Depression, General Psychological Distress, Social-Emotional Skills	0.31 (0.33)	0.00 (0.33)
		Behavioral Therapy (<i>Behavior Therapy</i>)	Cognitive-Behavioral Therapy (<i>Cognitive-Behavioral Therapy</i>)	Individual	19 45-minute sessions, 18 weeks	ED Outcomes, Depression, General Psychological Distress, Social-Emotional Skills	-0.29 (0.33)	0.00 (0.33)
		Interpersonal Therapy (<i>Interpersonal Therapy</i>)	Cognitive-Behavioral Therapy (<i>Cognitive-Behavioral Therapy</i>)	Individual	19 45-minute sessions, 18 weeks	ED Outcomes, Depression, General Psychological Distress, Social-Emotional Skills	-0.31 (0.33)	0.00 (0.33)
Freeman et al (1985)	45 Participants	Cognitive-Behavioral Therapy (<i>Cognitive-Behavioral Therapy</i>)	Behavioral Therapy (<i>Behavior Therapy</i>)	Individual	15 60-minute sessions, 15 weeks	ED Outcomes, Depression, Self-Perceptions, Social-Emotional Skills	0.00 (0.33)	0.00 (0.33)
			Group Therapy (<i>Group Therapy</i>)	Individual	15 60-minute sessions, 15 weeks	ED Outcomes, Depression, Self-Perceptions, Social-Emotional Skills	0.00 (0.33)	0.00 (0.33)

					sessions, 15 weeks			
		Behavioral Therapy (<i>Behavior Therapy</i>)	Cognitive-Behavioral Therapy (<i>Cognitive-Behavioral Therapy</i>)	Individual	15 60-minute sessions, 15 weeks	ED Outcomes, Depression, Self-perception, Social-Emotional Skills	0.00 (0.33)	0.00 (0.33)
			Group Therapy (<i>Group Therapy</i>)	Individual	15 60-minute sessions, 15 weeks	ED Outcomes, Depression, Self-perception, Social-Emotional Skills	0.00 (0.33)	0.00 (0.33)
		Group Therapy (<i>Group Therapy</i>)	Cognitive-Behavioral Therapy (<i>Cognitive-Behavioral Therapy</i>)	Group	15 60-minute sessions, 15 weeks	ED Outcomes, Depression, Self-perception, Social-Emotional Skills	0.00 (0.33)	0.00 (0.33)
			Behavioral Therapy (<i>Behavior Therapy</i>)	Group	15 60-minute sessions, 15 weeks	ED Outcomes, Depression, Self-perception, Social-Emotional Skills	0.00 (0.33)	0.00 (0.33)
Freeman et al (1988)	112 Females	Cognitive-Behavioral Therapy (<i>Cognitive-Behavioral Therapy</i>)	Behavioral Therapy (<i>Behavior Therapy</i>)	Individual	15 60-minute sessions, 15 weeks	Anxiety, Body Image, ED Outcome, Depression, General Psychological Distress, Self-Perceptions, Social-Emotional Skills	-0.01 (0.29)	0.09 (0.32)
			Group Therapy (<i>Group Therapy</i>)	Individual	15 60-minute sessions, 15 weeks	Anxiety, Body Image, ED Outcome, Depression, General Psychological Distress, Self-Perceptions, Social-Emotional Skills	-0.09 (0.29)	0.00 (0.33)
		Behavioral Therapy (<i>Behavior Therapy</i>)	Cognitive-Behavioral Therapy (<i>Cognitive-Behavioral Therapy</i>)	Individual	15 60-minute sessions, 15 weeks	Anxiety, Body Image, ED Outcome, Depression, General Psychological Distress, Self-Perceptions, Social-Emotional Skills	0.01 (0.29)	-0.09 (0.32)
			Group Therapy (<i>Group Therapy</i>)	Individual	15 60-minute sessions, 15 weeks	Anxiety, Body Image, ED Outcome, Depression, General Psychological Distress, Self-Perceptions, Social-Emotional Skills	0.09 (0.27)	0.09 (0.32)

						Perceptions, Social-Emotional Skills		
		Group Therapy (<i>Group Therapy</i>)	Cognitive-Behavioral Therapy (<i>Cognitive-Behavioral Therapy</i>)	Group	15 60-minute sessions, 15 weeks	Anxiety, Body Image, ED Outcome, Depression, General Psychological Distress, Self-Perceptions, Social-Emotional Skills	0.09 (0.29)	0.00 (0.33)
			Behavioral Therapy (<i>Behavior Therapy</i>)	Group	15 60-minute sessions, 15 weeks	Anxiety, Body Image, ED Outcome, Depression, General Psychological Distress, Self-Perceptions, Social-Emotional Skills	-0.09 (0.27)	-0.09 (0.32)
Gamer et al (1993)	60 Females	Cognitive-Behavioral Therapy (<i>Cognitive-Behavioral Therapy</i>)	Other (<i>Supportive Expressive Therapy</i>)	Individual	16 sessions, 18 weeks	Anxiety, ED Outcome, Body Image, Depression, General Psychological Distress, Self-Perceptions, Social-Emotional Skills	0.44 (0.29)	0.26 (0.30)
		Other (<i>Supportive Expressive Therapy</i>)	Cognitive-Behavioral Therapy (<i>Cognitive-Behavioral Therapy</i>)	Individual	16 sessions, 18 weeks	Anxiety, ED Outcome, Body Image, Depression, General Psychological Distress, Self-Perceptions, Social-Emotional Skills	-0.44 (0.29)	-0.26 (0.30)
Geist et al (2000)	25 Females	Family-Based Therapy (<i>Family Therapy</i>)	Psychoeducation (<i>Family Group Psychoeducation</i>)	Family	8 45-minute sessions, 16 weeks	ED Outcomes, Body Image, Depression, Family Functioning, General Psychological Distress	-0.26 (0.39)	-0.08 (0.39)
		Psychoeducation (<i>Family Group Psychoeducation</i>)	Family-Based Therapy (<i>Family Therapy</i>)	Other	8 45-minute sessions, 16 weeks	ED Outcomes, Body Image, Depression, Family Functioning, General Psychological Distress	0.26 (0.39)	0.08 (0.39)
Hsu et al (2001)	50 Females	Cognitive-Behavioral Therapy (<i>Cognitive Therapy</i>)	Multiple strategies/ Blend (<i>Cognitive and Nutritional Therapy</i>)	Individual	16 60-minute sessions, 14 weeks	Anxiety, Body Image, ED Outcomes, General Psychological Distress, Interpersonal Relationships, Self-Perceptions	0.00 (0.33)	0.00 (0.33)
		Multiple strategies/ Blend (<i>Cognitive and Nutritional Therapy</i>)	Cognitive-Behavioral Therapy (<i>Cognitive Therapy</i>)	Individual	16 120-minute sessions, 14 weeks	Anxiety, Body Image, ED Outcomes, General Psychological Distress, Interpersonal Relationships, Self-Perceptions	0.00 (0.33)	0.00 (0.33)

Le Grange et al (1992)	18 Participants	Family-Based Therapy (<i>Family Counseling</i>)	Family-Based Therapy (<i>Conjoint Family Therapy</i>)	Family	18.9 sessions, 20 weeks	ED Outcomes, Self-Perceptions	0.25 (0.47)	0.05 (0.45)
		Family-Based Therapy (<i>Conjoint Family Therapy</i>)	Family-Based Therapy (<i>Family Counseling</i>)	Family	18.9 sessions, 20 weeks	ED Outcomes, Self-Perceptions	-0.25 (0.47)	-0.05 (0.45)
Le Grange et al (2007) ^a	80 Participants	Family-Based Therapy (<i>Family-Based Therapy</i>)	Other (<i>Supportive Psychotherapy</i>)	Family	20 sessions, 24 weeks	Depression, ED Outcomes, Self-Perceptions	0.37 (0.22) F/U: 0.27 (0.22)	-0.02 (0.22) F/U: -0.11 (0.22)
Lock et al (2005)	86 Participants	Family-Based Therapy (<i>Short-term Family Therapy</i>)	Family-Based Therapy (<i>Long-term Family Therapy</i>)	Family	10 60-minute sessions, 24 weeks	ED Outcomes, General Psychological Distress	-0.11 (0.22) F/U: 0.00 (0.21)	-0.17 (0.22)
		Family-Based Therapy (<i>Long-term Family Therapy</i>)	Family-Based Therapy (<i>Short-term Family Therapy</i>)	Family	20 60-minute sessions, 52 weeks	ED Outcomes, General Psychological Distress	0.11 (0.22) F/U: 0.00 (0.21)	0.17 (0.22)
Lock et al (2010)	116 Participants	Psychoanalytic Psychotherapy (<i>Adolescent Focused Therapy</i>)	Family-Based Therapy (<i>Family-Based Treatment</i>)	Family	32 45-minute sessions, 53 weeks	ED Outcomes	-1.79 (0.33)** F/U: -1.24 (0.23)**	--
		Family-Based Therapy (<i>Family-Based Treatment</i>)	Psychoanalytic Psychotherapy (<i>Adolescent Focused Therapy</i>)	Family	20 60-minute sessions, 52 weeks	ED Outcomes	1.79 (0.33)** F/U: 1.24 (0.23)**	--
Lock et al (2013)	46 Participants	Other (<i>Cognitive Remediation Therapy</i>)	Cognitive-Behavioral Therapy (<i>Cognitive-Behavioral Therapy</i>)	Individual	8 45-minute sessions, 8 weeks	ED Outcomes, Other, Self-Perceptions	0.39 (0.35)	0.69 (0.36)
		Cognitive-Behavioral Therapy (<i>Cognitive-Behavioral Therapy</i>)	Other (<i>Cognitive Remediation Therapy</i>)	Individual	24 sessions, 24 weeks	ED Outcomes, Other, Self-Perceptions	-0.39 (0.35)	-0.69 (0.36)
Marco et al (2013)	30 Females	Cognitive-Behavioral Therapy (<i>Standard CBT for Eating Disorders</i>)	Cognitive-Behavioral Therapy	Other	--	Body Image, ED Outcomes	1.18 (0.36)** F/U: 1.15 (0.36)**	1.30 (0.35)** F/U: 1.54 (0.36)**

		<i>Enhanced by CBT for Body Image)</i>	<i>(Standard CBT for Eating Disorder Treatment)</i>	Other	--	Body Image, ED Outcomes	-1.18 (0.36)** F/U: -1.15 (0.36)**	-1.30 (0.35)** F/U: -1.54 (0.36)**
Marzola et al (2015)	92 Participants	Cognitive-Behavioral Therapy <i>(Standard CBT for Eating Disorder Treatment)</i>	Cognitive-Behavioral Therapy <i>(Standard CBT for Eating Disorders Enhanced by CBT for Body Image)</i>	Family	40.00 hours, 0.71 weeks	ED Outcomes	0.00 (0.33)	--
		Family-Based Therapy <i>(Single Family Intensive Family Therapy)</i>	Family-Based Therapy <i>(Multi Family Intensive Family Therapy)</i>	Other	40.00 hours, 0.71 weeks	ED Outcomes	0.00 (0.33)	--
		Family-Based Therapy <i>(Multi Family Intensive Family Therapy)</i>	Family-Based Therapy <i>(Single Family Intensive Family Therapy)</i>	Individual	23 55-minute sessions, 23 weeks	Body Image, Depression, ED Outcomes, General Psychological Distress, Interpersonal Relationships	0.04 (0.23) F/U: 0.29 (0.24)	0.27 (0.23) F/U: 0.11 (0.24)
Nevenon (2006)	82 Females	Multiple strategies/Blend <i>(Individual CBT and IPT)</i>	Multiple strategies/Blend <i>(Group CBT and IPT)</i>	Group	23 120-minute sessions, 20 weeks	Body Image, Depression, ED Outcomes, General Psychological Distress, Interpersonal Relationships	-0.04 (0.23) F/U: -0.29 (0.24)	-0.27 (0.23) F/U: -0.11 (0.24)
		Multiple strategies/Blend <i>(Group CBT and IPT)</i>	Multiple strategies/Blend <i>(Individual CBT and IPT)</i>	Individual	15.30 weeks	Body Image, ED Outcomes, Depression, General Psychological Distress	1.10 (0.43)**	1.16 (0.46)*
Ordman & Kirschenbaum (1985) ^a	20 Females	Cognitive Behavioral Therapy <i>(Full Therapy)</i>	Cognitive Behavioral Therapy <i>(Brief Therapy)</i>	Family	72-minute sessions, 63.60 weeks	ED Outcomes, Body Image, Depression, General Psychological Distress, Interpersonal Relationships, Self-perceptions	1.11 (0.42)** F/U: 0.57 (0.33)	0.16 (0.41) F/U: -0.12 (0.34)
Robin (1994)	24 Females	Intensive Short-term Dynamic Psychotherapy <i>(Behavioral Family Systems Therapy)</i>	Psychoanalytic Psychotherapy <i>(Ego-oriented Individual Therapy)</i>	Individual	45-minute sessions, 63.60 weeks	ED Outcomes, Body Image, Depression, General Psychological Distress, Interpersonal Relationships, Self-perceptions	-1.11 (0.42)** F/U: -0.57 (0.33)	-0.16 (0.41) F/U: 0.12 (0.34)
		Psychoanalytic Psychotherapy <i>(Ego-oriented Individual Therapy)</i>	Intensive Short-term Dynamic Psychotherapy <i>(Behavioral Family Systems Therapy)</i>					

Robin (1999)	38 Females	Family-Based Therapy (<i>Behavioral Family Systems Therapy</i>)	Psychoanalytic Psychotherapy (<i>Ego-oriented Individual Therapy</i>)	Family	72-minute sessions, 63.60 weeks	Anxiety, Depression, ED Outcomes, General Psychological Distress, Interpersonal Relationships, Self-perceptions	0.81(0.33)*	0.00 (0.34)
		Psychoanalytic Psychotherapy (<i>Ego-oriented Individual Therapy</i>)	Family-Based Therapy (<i>Behavioral Family Systems Therapy</i>)	Individual	45-minute sessions, 63.60 weeks	Anxiety, Depression, ED Outcomes, General Psychological Distress, Interpersonal Relationships, Self-perceptions	-0.81(0.33)*	0.00 (0.34)
Robinson & Serfaty (2008)	63 Participants	Cognitive-Behavioral Therapy (<i>Email Bulimia Therapy</i>)	Other (<i>Unsupported Self-Directed Writing</i>)	Other	12 weeks	Depression, Eating Disorder Outcomes	0.33 (0.33)	0.00 (0.33)
		Other (<i>Unsupported Self-Directed Writing</i>)	Cognitive-Behavioral Therapy (<i>Email Bulimia Therapy</i>)	Other	12 weeks	Depression, Eating Disorder Outcomes	-0.33 (0.33)	0.00 (0.33)
Schmidt et al (2007)	85 Females	Family-Based Therapy (<i>Family Therapy</i>)	Cognitive-Behavioral Therapy (<i>Individual CBT Guided Self-care</i>)	Family	13 sessions, 24 weeks	ED Outcomes	-0.14 (0.27) F/U: -0.13 (0.28)	--
		Cognitive-Behavioral Therapy (<i>Individual CBT Guided Self-care</i>)	Family-Based Therapy (<i>Family Therapy</i>)	Individual	13 sessions, 24 weeks	ED Outcomes	0.14 (0.27) F/U: 0.13 (0.28)	--
Scott Richards et al (2006)	122 Females	Other (<i>Spirituality Group</i>)	Cognitive-Behavioral Therapy (<i>Cognitive Therapy</i>)	Other	60.00 hours	Body Image, ED Outcomes, General Psychological Distress, Interpersonal Relationships, Other, Self-Perceptions, Social-Emotional Skills	0.75 (0.23)**	0.32 (0.23)
			Group Therapy (<i>Support Group</i>)	Other	60.00 hours	Body Image, ED Outcomes, General Psychological Distress, Interpersonal Relationships, Other, Self-Perceptions, Social-Emotional Skills	0.52 (0.21)*	0.47 (0.22)*
		Group Therapy (<i>Support Group</i>)	Cognitive-Behavioral Therapy	Group	60.00 hours	Body Image, ED Outcomes, General Psychological Distress, Interpersonal	0.28 (0.23)	-0.12 (0.23)

			(Cognitive Therapy)			Relationships, Other, Self-Perceptions, Social-Emotional Skills		
			Other (Spirituality Group)	Group	60.00 hours	Body Image, ED Outcomes, General Psychological Distress, Interpersonal Relationships, Other, Self-Perceptions, Social-Emotional Skills	-0.52 (0.21)*	-0.47(0.22)*
		Cognitive-Behavioral Therapy (Cognitive Therapy)	Other (Spirituality Group)	Other	60.00 hours	Body Image, ED Outcomes, General Psychological Distress, Interpersonal Relationships, Other, Self-Perceptions, Social-Emotional Skills	-0.75 (0.23)**	-0.32 (0.23)
			Group Therapy (Support Group)	Other	60.00 hours	Body Image, ED Outcomes, General Psychological Distress, Interpersonal Relationships, Other, Self-Perceptions, Social-Emotional Skills	-0.28 (0.23)	0.12 (0.23)
Vella-Zarb (2015)	47 Participants	Multiple strategies/Blend (Motivational Interview + Self-Help)	Multiple strategies/Blend (Psychoeducation + Self-Help)	Individual	1 week	ED Outcomes, Other	0.67(0.30)* F/U: -0.11 (0.29)	0.36 (0.29)
		Multiple strategies/Blend (Psychoeducation + Self-Help)	Multiple strategies; Blend (Motivational Interview + Self-Help)	Individual	1 week	ED Outcomes, Other	-0.67 (0.30)* F/U: 0.11 (0.29)	-0.36 (0.29)
Wagner et al (2013)	126 Females	Cognitive-Behavioral Therapy (Internet-delivered CBT)	Other (Guided Self-Help)	Other	30 weeks	ED Outcomes	0.03 (0.18) F/U: 0.18 (0.18)	--
		Other (Guided Self-Help)	Cognitive-Behavioral Therapy (Internet-delivered CBT)	Other	30 weeks	ED Outcomes	-0.03 (0.18) F/U: -0.18 (0.18)	--
Whitney (2012)	42 Participants	Family-Based Therapy (IFW)	Family-Based Therapy (FDW)	Family	18.00 hours	ED Outcomes, Interpersonal Relationships	0.08 (0.35) F/U: -0.14 (0.33)	-0.22 (0.40) F/U: 0.52 (0.41)

Wilson (1991)	25 Participants	Family-Based Therapy (<i>FDW</i>)	Family-Based Therapy (<i>IFW</i>)	Other		ED Outcomes, Interpersonal Relationships	-0.08 (0.35) F/U: 0.14 (0.33)	0.22 (0.40) F/U: -0.52 (0.41)
		Cognitive-Behavioral Therapy (<i>CBT with ERP</i>)	Cognitive- Behavioral Therapy (<i>CBT without ERP</i>)	Individual	20 sessions, 20 weeks	Anxiety, Depression, ED Outcomes, General Psychological Distress, Interpersonal Relationships, Self-Perceptions	0.00 (0.33) F/U: 0.00 (0.33)	-0.41 (0.42)
		Cognitive-Behavioral Therapy (<i>CBT without ERP</i>)	Cognitive- Behavioral Therapy (<i>CBT with ERP</i>)	Individual	20 sessions, 20 weeks	Anxiety, Depression, ED Outcomes, General Psychological Distress, Interpersonal Relationships, Self-Perceptions	0.00 (0.33) F/U: 0.00 (0.33)	0.41 (0.42)
Wilson et al (1986)	16 Participants	Cognitive-Behavioral Therapy (<i>Cognitive Restructuring</i>)	Cognitive- Behavioral Therapy (<i>Cognitive Restructuring + Exposure and Response Prevention</i>)	Individual	2 sessions	Anxiety, ED Outcomes, Body Image, Depression, General Psychological Distress, Social- Emotional Skills	-0.42 (0.51)	-0.64 (0.57)
		Cognitive-Behavioral Therapy (<i>Cognitive Restructuring + Exposure and Response Prevention</i>)	Cognitive- Behavioral Therapy (<i>Cognitive Restructuring</i>)	Individual	2 sessions	Anxiety, ED Outcomes, Body Image, Depression, General Psychological Distress, Social- Emotional Skills	0.42 (0.51)	0.64 (0.57)

Notes. When presented, we list the original researchers' unique terms for the intervention conditions. F/U = follow-up period. Dashes are used when no information was provided for specific cells.

* $p < .05$. ** $p < .01$.

^a Two interventions were compared to other specific interventions that were not hypothesized to be effective or were just used as a comparison with limited information reported on the intervention. Thus, only the main comparison is presented.

Table 4. Intervention Mean Post Effect Sizes (Hedges' g , SE, Confidence Interval) for ED and Non-ED outcomes, within-group Q Statistics, and I^2 values by Outcome Type for Interventions Compared to Control Groups

	Effect Size			Heterogeneity	
	k	ES (SE)	CI	Q	I^2
ED Outcomes	30	0.38 (0.06)**	0.27 – 0.50	62.04**	53.25%
Biomarkers	9	0.03 (0.11)	-0.18 – 0.24	3.20	0.00%
Symptom Measures	18	0.45 (0.07)**	0.31 – 0.59	33.66**	49.49%
Diagnostic Interviews	5	0.12 (0.20)	-0.28 – 0.51	32.56**	87.72%
Specific ED Behaviors	16	0.56 (0.06)**	0.41 – 0.72	23.11	35.06%
Non-ED Outcomes	21	0.37 (0.07)**	0.24 – 0.50	35.34*	43.41%
Anxiety	12	0.27 (0.09)**	0.09 – 0.45	19.71*	44.18%
Body Image	11	0.33 (0.09)**	0.16 – 0.50	21.62*	53.74%
Depression	12	0.35 (0.09)**	0.18 – 0.52	21.55*	48.95%
General Psychological Distress	12	0.22 (0.09)*	0.04 – 0.39	14.32	23.17%
Interpersonal Relationships	8	0.30 (0.10)**	0.10 – 0.50	28.07**	75.06%
Self-Perceptions	10	0.39 (0.10)**	0.19 – 0.59	18.82*	52.17%
Social-Emotional Skills	6	0.36 (0.13)**	0.10 – 0.62	4.48	0.00%
Other (e.g., health, motivation)	5	0.63 (0.14)**	0.35 – 0.90	13.47**	70.31%

Notes. k denotes the number of intervention in each cell. ED = eating disorder. Q refers to within-group heterogeneity.

* $p < .05$. ** $p < .01$.

Outcome source. Outcome source was a code that specified who assessed the outcome. Given how these were coded, effects were assessed at the individual outcome level, and thus number of outcomes, rather than k , is specified. For both ED outcomes and non-ED outcomes, outcome source emerged as a significant moderator, such that self-report outcomes (ES = 0.42, CI = 0.38 to 0.46, number of outcomes = 186, $p < .001$) were significantly greater than clinician-assessed outcomes (ES = 0.15, CI = 0.06 to 0.24, number of outcomes = 57, $p < .001$), although both were associated with significant effects.

Effects by Diagnosis

Table 5 presents effects for ED and non-ED outcomes broken down by diagnosis and outcome type. Due to small cell sizes, no comparisons were made among outcome types within each diagnosis, rather overall effects within ED outcomes and within non-ED outcomes are presented within each diagnosis.

Table 5. Intervention Mean Post Effect Sizes (Hedges' g , SE, Confidence Interval), Within-Group Q Statistics, and I^2 Values by Diagnosis and Outcome Type for Interventions Compared to Control Groups

		Multiple Diagnoses	Bulimia Nervosa	Anorexia Nervosa	Binge Eating Disorder
Eating Disorder Outcomes	ES (SE)	0.44 (0.10)**	0.56 (0.09)**	-0.12 (0.14)	0.29 (0.44)
	CI	0.23 – 0.64	0.39 – 0.73	-0.40 – 0.15	-0.56 – 1.14
	k	9	13	7	1
	Q	6.01	17.39	21.23**	0.00
	I^2	0.00%	30.98%	71.74%	0.00%
Biomarkers	ES (SE)	-0.04 (0.39)	-0.06 (0.17)	0.12 (0.15)	-0.10 (0.43)
	CI	-0.80 – 0.72	-0.40 – 0.28	-0.18 – 0.41	-0.95 – 0.75
	k	1	2	5	1
	Q	0.00	0.15	2.35	0.00
	I^2	0.00%	0.00%	0.00%	0.00%
Symptom Measures	ES (SE)	0.43 (0.10)**	0.57 (0.12)**	0.00 (0.23)	0.68 (0.44)
	CI	0.24 – 0.62	0.34 – 0.81	-0.46 – 0.46	-0.18 – 1.54
	k	9	6	2	1
	Q	21.46**	7.11	0.00	0.00
	I^2	62.73%	29.69%	0.00%	0.00%
Diagnostic Interview	ES (SE)	0.93 (0.26)**	--	-1.22 (0.33)**	--
	CI	0.43 – 1.44	--	-1.86 – -0.58	--
	k	3	--	2	--
	Q	0.60	--	5.23*	--
	I^2	34.63%	--	80.87%	--
Specific Eating Disorder Behavior	ES (SE)	0.32 (0.20)	0.61 (0.08)**	--	--
	CI	-0.07 – 0.70	0.44 – 0.79	--	--
	k	3	13	--	--
	Q	2.39	18.79	--	--
	I^2	16.33%	36.14%	--	--
Non-Eating Disorder Outcomes	ES (SE)	0.40 (0.10)**	0.46 (0.12)**	0.10 (0.15)	0.83 (0.45)
	CI	0.21 – 0.59	0.22 – 0.70	-0.20 – 0.40	-0.05 – 1.71
	k	9	6	5	1
	Q	23.61**	6.25	0.65	0.00
	I^2	66.12%	20.01%	0.00%	0.00%
Anxiety	ES (SE)	0.10 (0.19)	0.43 (0.13)**	0.05 (0.20)	0.32 (0.43)
	CI	-0.27 – 0.47	0.17 – 0.68	-0.35 – 0.45	-0.53 – 1.17
	k	3	5	3	1

	<i>Q</i>	9.52**	6.58	0.22	0.00
	<i>I</i> ²	78.98%	39.16%	0.00%	0.00%
Body Image	ES (SE)	0.57 (0.12)**	0.10 (0.15)	0.00 (0.23)	--
	CI	0.34 – 0.80	-0.19 – 0.39	-0.46 – 0.46	--
	<i>k</i>	5	4	2	--
	<i>Q</i>	12.85*	0.36	0.00	--
	<i>I</i> ²	68.86%	0.00%	0.00%	--
Depression	ES (SE)	0.27 (0.12)*	0.51 (0.19)**	0.22 (0.20)	1.36 (0.47)**
	CI	0.04 – 0.49	0.13 – 0.89	-0.18 – 0.62	0.44 – 2.29
	<i>k</i>	6	2	3	1
	<i>Q</i>	7.65	4.02*	3.69	0.00
	<i>I</i> ²	34.63%	75.10%	45.79%	0.00%
General Psychological Distress	ES (SE)	0.34 (0.16)*	0.26 (0.14)	0.00 (0.17)	--
	CI	0.04 – 0.65	-0.02 – 0.54	-0.33 – 0.34	--
	<i>k</i>	4	4	4	--
	<i>Q</i>	8.18*	3.38	0.41	--
	<i>I</i> ²	63.33%	11.32%	0.00%	--
Interpersonal Relationships	ES (SE)	0.30 (0.13)*	0.54 (0.22)*	0.00 (0.23)	--
	CI	0.05 – 0.56	0.11 – 0.97	-0.46 – 0.46	--
	<i>k</i>	4	2	2	--
	<i>Q</i>	20.40**	4.79*	0.00	--
	<i>I</i> ²	85.30%	79.14%	0.00%	--
Self-perceptions	ES (SE)	0.34 (0.24)	0.50 (0.13)**	0.00 (0.23)	0.80 (0.43)
	CI	-0.14 – 0.81	0.24 – 0.76	-0.46 – 0.46	-0.05 – 1.65
	<i>k</i>	2	5	2	1
	<i>Q</i>	7.90**	6.50	0.00	0.00
	<i>I</i> ²	87.35%	38.42%	0.00%	0.00%
Social-emotional skills	ES (SE)	0.45 (0.20)*	0.28 (0.25)	0.29 (0.25)	--
	CI	0.06 – 0.84	-0.22 – 0.77	-0.21 – 0.78	--
	<i>k</i>	3	1	2	--
	<i>Q</i>	3.97	0.00	0.12	--
	<i>I</i> ²	49.58%	0.00%	0.00%	--
Other	ES (SE)	0.74 (0.16)**	--	0.10 (0.34)	--
	CI	0.43 – 1.05	--	-0.56 – 0.76	--
	<i>k</i>	4	--	1	--
	<i>Q</i>	10.49	--	0.00	--
	<i>I</i> ²	71.39%	--	0.00%	--

Notes. *k* denotes the number of intervention in each cell. *Q* refers to within-group heterogeneity. **p* < .05. ** *p* < .01.

Within ED outcomes. Across ED outcomes, significant positive effects emerged for interventions targeting multiple diagnoses (ES = 0.44, CI = 0.23 to 0.64; *k* = 9, *p* < .001) and bulimia nervosa (ES = 0.56, CI = 0.39 to 0.73; *k* = 13, *p* < .001), and these effects did not differ significantly from each other. Interventions targeting anorexia nervosa did not produce

significant effects for ED outcomes (ES = -0.12, CI = -0.40 to 0.15; $k = 7$, $p = .392$) and were significantly smaller than interventions targeting multiple diagnoses and bulimia nervosa. Only one intervention targeted binge eating disorder; thus, reliable estimates cannot be made.

Within non-ED outcomes. Similar findings also emerged within non-ED outcomes, such that interventions targeting multiple diagnoses (ES = 0.40, CI = 0.21 to 0.59; $k = 9$, $p < .001$) and bulimia nervosa (ES = 0.46, CI = 0.22 to 0.70; $k = 6$, $p < .001$) yielded significant effects for non-ED outcomes, and these effects did not differ significantly from each other. Interventions targeting anorexia nervosa did not produce significant effects overall (ES = 0.10, CI = -0.20 to 0.40; $k = 5$, $p = .513$) and were significantly smaller than interventions targeting multiple diagnoses and bulimia nervosa. Only one intervention targeted binge eating disorder; thus, reliable estimates cannot be made.

Effects by Intervention Strategy

Across all outcomes, there were only two intervention strategies that included five or more interventions: cognitive-behavioral therapy and the miscellaneous category of *other intervention strategies*. The miscellaneous category of *other intervention strategies* is a combination of heterogeneous interventions that are not conceptually similar and thus does not represent a meaningful category of interventions, despite them yielding significant effects for non-ED outcomes (ES = 0.24, CI = 0.03 to 0.44; $k = 8$, $p = .023$) but not ED outcomes (ES = 0.14, CI = -0.07 to 0.35; $k = 10$, $p = .183$). Thus, while cognitive-behavioral therapy yielded significant, positive effects at post for ED outcomes (ES = 0.52, CI = 0.30 to 0.73; $k = 9$, $p < .001$) and non-ED outcomes (ES = 0.40, CI = 0.17 to 0.60; $k = 8$, $p < .001$), no other comparisons between intervention strategies (i.e., psychoeducation, behavioral therapy, group therapy,

psychoanalytic, and multiple) could be made, nor could these intervention strategy effects be broken down further by outcome type or diagnosis.

Analyses of Hypothesized Moderators

The results for the nine hypothesized moderators are presented in Table 6. Only variables that were significant moderators for either ED or non-ED outcomes are discussed in text.

Duration of diagnosis. Duration of diagnosis was significantly related to ED outcome effect size ($B = 0.02$, $SE = 0.00$, $p < .001$). Counter to the hypothesis, greater duration of diagnosis was positively associated with effect size for ED outcomes, such that interventions with samples that had longer durations of their eating disorder diagnoses yielded greater effects than interventions whose samples had shorter duration of diagnoses. Duration of diagnosis was not significantly related to effects for non-ED outcomes.

Table 6. Results of Moderation Analyses for Hypothesized Moderators Broken Down by ED and Non-ED Outcomes

Continuous Variables	<i>ED Outcomes</i>			<i>Non-ED Outcomes</i>		
	<i>B</i>	<i>SE</i>	<i>p</i>	<i>B</i>	<i>SE</i>	<i>p</i>
Age	0.04	0.05	.373	0.01	0.05	.883
Comorbid Diagnoses ^a	--	--	--	--	--	--
Severity ^a	--	--	--	--	--	--
Average Duration of Diagnosis	0.02	0.00	< .001	0.00	0.00	.266
Percent Female	0.15	0.08	.076	0.08	0.06	.153
Group Size ^a	--	--	--	--	--	--
Duration of Treatment (in weeks)	0.01	0.01	.641	0.00	0.01	.877
Intensity of Treatment (total hours of intervention)	0.01	0.11	.409	-0.02	0.01	.025
Categorical Variables	<i>Q</i>	<i>df</i>	<i>p</i>	<i>Q</i>	<i>df</i>	<i>p</i>
Therapist Qualifications	19.33	5	.002	6.08	5	.054
Females Targeted ^b	9.78	1	.002	0.20	1	.650

^a Too few interventions assessed duration of diagnosis, group size, and severity of diagnosis to be assessed as moderators.

^b Due to the potential restricted range in percentage female, whether females only were targeted was assessed as categorical moderator as well.

Sex of sample. Percentage female did not emerge as a significant moderator of ED outcome effect size ($B = 0.15$, $SE = 0.08$, $p = .076$). Due to the potential restricted range in percentage female, gender was assessed as categorical moderator (i.e., female-only versus mixed-gender samples) as well, and was significantly related to effect size for ED outcomes. Specifically, interventions targeting females only ($ES = 0.48$, $CI = 0.35$ to 0.62 ; $k = 22$, $p < .001$) produced significantly greater effects than interventions targeting males and females ($ES = 0.03$, $CI = -0.22$ to 0.28 ; $k = 8$, $p = .789$), which were not associated with positive effects in ED outcomes. Neither percentage female or whether treatments targeted only females was significantly related to non-ED effect size.

Intensity of treatment (total hours of intervention). Intensity of treatment (measured in hours of treatment overall) did emerge as a moderator for non-ED outcomes ($B = -0.02$, $SE = 0.01$, $p = .025$), such that less intense treatments yielded greater effects than longer, more intensive treatments. There was no such significant relationship for ED outcomes.

Qualifications of administrator. Qualifications of the intervention administrator also emerged as a moderator for ED outcomes, with interventions led by multiple administrators at different levels of training ($ES = 0.65$, $CI = 0.43$ to 0.88 ; $k = 9$, $p < .001$) yielding significantly greater effects than the non-significant effects of interventions led by licensed therapists only ($ES = 0.22$, $CI = -0.01$ to 0.45 ; $k = 6$, $p = .056$) and student trainees only ($ES = -0.11$, $CI = -0.43$ to 0.21 ; $k = 5$, $p = .500$), which were also significantly different from each other. Qualifications of administrator was not significantly related to effect size for non-ED outcomes.

Analyses of Exploratory Moderators

The results for the 37 exploratory moderators are presented in Table 7. Only significant moderators are discussed in text.

Experimental design. While not significant for ED outcomes, experimental design was significantly related to non-ED effect size, such that interventions that used random assignment (ES = 0.40, CI = 0.25 to 0.55; $k = 16$, $p < .001$) were associated with positive effects that were significantly larger than non-significant effects for interventions that used quasi-experimental design (ES = 0.26, CI = -0.02 to 0.53; $k = 16$, $p = .069$).

Type of control group. Type of control group moderated effectiveness for ED outcomes such that interventions compared to no-intervention/wait-list control groups (ES = 0.68, CI = 0.49 to 0.86; $k = 12$, $p < .001$) yielded significantly greater effects for ED outcomes than interventions compared to attentional control groups (ES = 0.25, CI = 0.00 to 0.49; $k = 8$, $p = .048$) and interventions compared to treatment as usual (ES = 0.12, CI = -0.10 to 0.33; $k = 7$, $p = .297$), which did not differ from each other. Type of control group also moderated effectiveness for non-ED outcomes such that interventions compared to no-intervention/wait-list control groups (ES = 0.49, CI = 0.26 to 0.72; $k = 7$, $p < .001$) yielded positive effects that were significantly greater than interventions compared to treatment as usual (ES = 0.19, CI = -0.02 to 0.41; $k = 7$, $p = .077$).

Information on fidelity checks. For non-ED outcomes only, interventions that reported information on fidelity (ES = 0.24, CI = 0.07 to 0.40; $k = 14$, $p = .004$) yielded significantly smaller effects than interventions that did not (ES = 0.42, CI = 0.15 to 0.70; $k = 5$, $p = .003$), although both were associated with positive effects for non-ED outcomes.

Information on training of administrators reported. Interventions that reported training of their administrators (ES = 0.40, CI = 0.19 to 0.61; $k = 7$, $p < .001$) yielded positive and significantly greater effects than interventions that did not report on their administrators' training for non-ED outcomes (ES = 0.19, CI = -0.00 to 0.38; $k = 12$, $p = .055$), which were not associated with positive effects. This variable not related to effect size for ED outcomes.

Quality: Rationale for study size. While both significant overall for ED outcomes, interventions that included a rationale for their study size (ES = 0.68, CI = 0.32 to 1.05; $k = 5$, $p < .001$) produced a significantly greater effect than interventions that did not include a rationale for their sample size for ED outcomes (ES = 0.35, CI = 0.23 to 0.47; $k = 25$, $p < .001$). This variable could not be examined non-ED outcomes.

Additional contact. Interventions that included additional contact after the intervention was completed (e.g., booster sessions, follow-up emails; ES = 0.13, CI = -0.15 to 0.41; $k = 6$, $p = .373$) did not yield significant effects for non-ED outcomes, and those effects were significantly smaller for non-ED outcomes than interventions that did not include additional contact (ES = 0.44, CI = 0.29 to 0.59; $k = 15$, $p < .001$). Additional contact was not related to effect size for ED outcomes.

Content: Psychoeducation/Receiving information. Interventions that incorporated psychoeducation (ES = 0.48, CI = 0.31 to 0.65; $k = 13$, $p < .001$) yielded greater effects for ED outcomes than interventions that did not include this component (ES = 0.30, CI = 0.14 to 0.46; $k = 17$, $p < .001$), although both were associated with positive effects.

Table 7. Results of Moderation Analyses for Exploratory Moderators Broken Down by ED and Non-ED Outcomes

Categorical Variables	<i>ED Outcomes</i>			<i>Non-ED Outcomes</i>		
	<i>Q</i>	<i>df</i>	<i>p</i>	<i>Q</i>	<i>df</i>	<i>p</i>
Experimental Design	0.06	1	.807	1.85	1	.035
Type of Control Group	19.79	4	.002	6.67	4	.015
Participant Perceptions Assessed	0.64	1	.424	0.03	1	.854
Information on Fidelity Checks	0.60	1	.739	13.91	1	.001
Information on Administrator Training	0.50	1	.781	12.08	5	.034
Rationale for Study Size Provided ^b	2.86	1	.031	--	--	--
Primary Outcome Specified	0.05	1	.829	0.08	1	.778
Dropout Reported	0.30	1	.583	0.48	1	.487
Dropout <10% ^b	0.47	1	.792	--	--	--
Single Diagnosis Treated	0.45	1	.502	--	--	--
Modality	14.94	3	.033	2.77	3	.429
Sex of Administrator	4.74	2	.093	0.36	1	.105
Use of Manual	0.36	1	.547	0.30	1	.587
Additional Contact	0.12	1	.731	3.70	1	.045
Cognitive Strategies ^b	0.81	1	.367	--	--	--
Behavioral Strategies	0.06	1	.800	0.21	1	.651
Psychoeducation/Receiving Information	2.17	1	.041	5.30	1	.021
Nutritional Management	0.15	1	.697	0.02	1	.876
Social Interaction ^b	2.60	1	.017	--	--	--
Homework	8.46	1	.004	3.65	1	.036
Use of Technology	0.36	1	.550	1.44	1	.023
Continuous Variables ^a	<i>B</i>	<i>SE</i>	<i>p</i>	<i>B</i>	<i>SE</i>	<i>p</i>
Year of Publication	-0.01	0.01	.488	-0.01	0.01	.499
Initial Sample Size	0.00	0.00	.697	0.00	0.00	.639
Percent Attrition	0.27	0.86	.757	-0.35	0.79	.661
Differential Attrition	0.52	0.82	.522	-0.65	0.98	.504
Age of Onset of Diagnosis	0.11	0.21	.606	-0.01	0.08	.917
Percent of Sample with Prior Treatment ^b	-1.38	1.51	.359	--	--	--
Percent Non-Caucasian ^b	0.01	0.01	.400	--	--	--
Number of Sessions	0.01	0.02	.495	-0.02	0.02	.258
Average Session Length	0.01	0.01	.217	0.00	0.00	.204

^a There was too limited variability (i.e., < 5 in cells) to assess the following variables as moderators for either ED or non-ED outcomes: Publication status, whether participant engagement was assessed, whether valid and reliable measures were used, setting, use of mindfulness strategies, use of relaxation strategies, and use of supported meals.

^b Due either to limited variability or limited sample size, these variables could not be assessed as moderators of effect size for non-ED outcomes.

Similarly, interventions that incorporated information (ES = 0.55, CI = 0.35 to 0.675; $k = 9$, $p < .001$) yielded greater effects for non-ED outcomes than interventions that did not include this component (ES = 0.24, CI = 0.06 to 0.41; $k = 12$, $p = .008$), although both were associated with positive effects for non-ED outcomes.

Content: Social interaction. Including social interaction (ES = 0.54, CI = 0.32 to 0.77; $k = 9$, $p < .001$) was associated with significantly larger effects for ED outcomes than not including a social interaction component (ES = 0.33, CI = 0.19 to 0.46; $k = 21$, $p < .001$), although both yielded significant effects overall; however, this could not be examined for non-ED outcomes.

Use of homework. Counterintuitively, interventions that assigned homework (ES = 0.17, CI = -0.02 to 0.36; $k = 9$, $p = .356$) were not associated with a significant effect for ED outcomes and demonstrated a smaller effect than interventions that did not assign homework (ES = 0.53, CI = 0.37 to 0.38; $k = 21$, $p < .001$), which did yield an overall positive effect for ED outcomes. Similarly, for non-ED outcomes, interventions that assigned homework (ES = 0.22, CI = 0.02 to 0.42; $k = 8$, $p = .030$) demonstrated a smaller effect than interventions that did not assign homework (ES = 0.48, CI = 0.31 to 0.65; $k = 13$, $p < .001$), although both yielded positive effects overall for non-ED outcomes.

Use of technology. While not significantly related to effect size for ED outcomes, use of technology emerged as a moderator for non-ED outcomes, such that interventions that included technology (ES = 0.50, CI = 0.25 to 0.76; $k = 5$, $p < .001$) yielded greater effects for non-ED outcomes than interventions that did not include technology (ES = 0.32, CI = 0.17 to 0.48; $k = 16$, $p < .001$), although both yielded positive effects.

Exploratory Analyses of Multiple Moderators

Due to the number of significant moderators, collinearity issues, and sample size, multiple regressions including all of the significant moderators could not be conducted. Thus, it was not possible to examine the effect of individual moderators when taking into account the variance explained by other identified significant moderators.

Effectiveness of Interventions Compared to Control at Follow-Up

18 of the 30 interventions compared to control provided data at some follow-up period (Range = 4 to 260 weeks). Overall, the interventions yielded a significant effect at follow-up (ES = 0.29, CI = 0.14 to 0.44; $k = 18$, $p < .001$). This effect was significantly smaller than the overall effect at post (ES = 0.41, CI = 0.29 to 0.53; $k = 30$, $p < .001$). The effects for ED outcomes were similar at follow-up (ES = 0.41, CI = 0.26 to 0.56; $k = 18$, $p < .001$) to the effects at post (ES = 0.38, CI = 0.27 to 0.50; $k = 30$, $p < .001$). However, the effects for non-ED outcomes at follow-up (ES = 0.21, CI = 0.05 to 0.36; $k = 16$, $p = .009$) were significantly smaller than the effects for non-ED outcomes at post (ES = 0.37, CI = 0.24 to 0.50; $k = 21$, $p < .002$).

Effects by outcome type. Within ED outcomes, effects at follow-up were significant for biomarkers (ES = 0.47, CI = 0.26 to 0.68; $k = 10$, $p < .001$), symptom measures (ES = 0.35, CI = 0.13 to 0.56; $k = 8$, $p = .002$), and specific ED behaviors (ES = 0.28, CI = 0.00 to 0.55; $k = 7$, $p = .047$). Diagnostic interviews could not be examined as only one intervention assessed that specific type of ED outcome. The effects for biomarker outcomes were significantly greater than those for specific ED behaviors, but no other significant differences emerged.

Within non-ED outcomes, significant effects emerged at follow-up for social-emotional skills (ES = 0.64, CI = 0.39 to 0.90; $k = 8$, $p < .001$) and body image (ES = 0.41, CI = 0.19 to

0.63; $k = 7$, $p < .001$). Social-emotional skill outcomes were significantly greater than body image outcomes at follow-up, and both were significantly greater at follow-up than the other categories of outcomes, which were not significant at follow-up: anxiety (ES = 0.00, CI = -0.26 to 0.26; $k = 7$, $p = .985$), depression (ES = 0.16, CI = -0.06 to 0.37; $k = 8$, $p = .148$), general psychological distress (ES = 0.00, CI = -0.19 to 0.20; $k = 12$, $p = .980$), interpersonal relationships (ES = 0.02, CI = -0.18 to 0.23; $k = 7$, $p = .822$), self-perceptions (ES = 0.12, CI = -0.20 to 0.42; $k = 5$, $p = .426$), and other outcomes (ES = 0.05, CI = -0.23 to 0.32; $k = 5$, $p = .735$).

Effects by diagnosis. Unlike at post, interventions targeting anorexia nervosa, including those two interventions that only assessed effectiveness at follow-up, yielded significant follow-up effects (ES = 0.35, CI = 0.12 to 0.58; $k = 8$, $p = .003$), while interventions targeting bulimia nervosa did not yield significant effects at follow-up (ES = 0.11, CI = -0.19 to 0.41; $k = 5$, $p = .457$). Interventions targeting multiple diagnoses continued to yield significant effects at follow-up (ES = 0.31, CI = 0.04 to 0.57; $k = 5$, $p = .023$). When comparing the diagnoses targeted, interventions targeting anorexia nervosa and those targeting multiple diagnoses did not differ from each other, but both produced greater effects at follow-up than interventions targeting bulimia nervosa. The positive effects for anorexia nervosa were not retained when the two interventions that were not assessed at post were excluded from analyses (ES = 0.12, CI = -0.15 to 0.39; $k = 6$, $p = .392$).

Moderators. Hypothesized and exploratory moderators examined at post were also examined at follow-up; due to sample size, these analyses were examined across all outcomes, rather than broken down by ED and non-ED outcomes. Of the moderators that could be examined, only two moderators emerged as significant, use of behavioral strategies and use of

homework. Duration of follow-up assessment, which was not a relevant variable for post-intervention analyses, did not emerge as a significant moderator.

Use of behavioral strategies emerged as a significant moderator of follow-up effects, such that interventions that included behavioral strategies (ES = 0.13, CI = -0.09 to 0.35; $k = 8$, $p = .251$) yielded nonsignificant effects that were significantly smaller than the significant effects of interventions that did not include behavioral strategies (ES = 0.41, CI = 0.20 to 0.62; $k = 10$, $p < .001$). Additionally, whether interventions included homework was a significant moderator of treatment effectiveness, such that interventions that assigned homework were not significant at follow-up (ES = 0.20, CI = -0.01 to 0.40; $k = 7$, $p = .059$) and yielded significantly smaller effects than interventions that did not assign homework (ES = 0.37, CI = 0.15 to 0.59; $k = 8$, $p = .001$), which were significant.

Analyses Comparing Specific Interventions to Other Specific Interventions

This section presents findings from analyses of specific interventions compared to other specific interventions. Specifically, the first section presents the overall effectiveness of all possible pairings of specific interventions. The next section looks at specific comparisons between intervention types, including: (a) cognitive-behavioral therapy versus other types of interventions (with specific comparisons between cognitive-behavioral therapy and behavioral therapy and between cognitive-behavioral therapy with add-on components compared to base cognitive-behavioral therapy), (b) family therapy versus other types of interventions (with a specific comparison between group family therapy compared to individual family therapy), (c) family therapy versus cognitive-behavioral therapy, (d) interventions with motivational interviewing compared to interventions without this component, (e) group therapy versus other

interventions, and (f) self-help interventions versus other types of interventions. Additionally, a discussion of the limitations of examining moderators within these comparisons, and of examining data at follow-up, is presented.

Overall Effectiveness of Specific Interventions Compared to Other Specific Interventions

Table 3 provides general information for each of the 88 comparisons between pairs of specific interventions broken down by ED and non-ED outcomes. The overall mean ES for specific interventions compared to each other (ES = 0.02, CI = -0.05 to 0.08; $k = 88$, $p = .622$) was not significant, as expected due to the non-independent nature of effects.

The average intervention-level ES for pairs of specific interventions ranged from -1.79 to 1.79 . Negative effects were not interpreted further as these were expected when active interventions were compared to other active interventions. Heterogeneity statistics ($I^2 = 42.71\%$) indicated moderate heterogeneity across interventions and the potential for moderators to exist. Application of Duval and Tweedie's (2000) trim and fill method, which can be considered a sensitivity analysis in that it adjusts for possible publication bias and missing studies, yielded a similar overall effect (ES = 0.02, CI = -0.05 to 0.09).

Effects of Intervention by Comparison Types

Given the limited number of specific comparisons that could be made, overall effects were combined when similar specific interventions were compared to other similar specific interventions. For example, fifteen interventions compared cognitive-behavioral therapy to some other type of therapy, and these effects were combined to yield one overall effect of cognitive-behavioral therapy versus other interventions. Due to small sample size, many of these findings are preliminary and must be interpreted cautiously. Given this, all pairs with two or more

specific interventions of each type are presented here and noted as such, but should be interpreted with caution.

Cognitive-behavioral therapy (CBT) versus other types of interventions. 15 studies compared CBT to some other type of intervention. Effects of individual studies ranged from -0.54 to 0.45 and none of the interventions yielded significant effects when comparing CBT to other interventions. Overall, CBT was not associated with greater effects than non-CBT interventions for ED outcomes (ES = -0.09, CI = -0.25 to 0.06; $k = 15$, $p = .245$) or non-ED outcomes (ES = -0.05, CI = -0.20 to 0.11; $k = 15$, $p = .573$).

Cognitive-behavioral therapy (CBT) versus behavioral therapy (BT). Four interventions compared CBT to BT and did not yield significant differences within ED outcomes (ES = 0.05, CI = -0.27 to 0.37; $k = 4$, $p = .765$) or non-ED outcomes (ES = 0.05, CI = -0.28 to 0.38; $k = 4$, $p = .767$).

CBT with add-on components compared to base CBT. Four interventions compared CBT with an add-on component (e.g., ERP, body image focus) to basic CBT. While these effects are preliminary, CBT with an add-on component yielded significantly greater effects compared to base CBT for ED outcomes (ES = 0.37, CI = 0.20 to 0.73; $k = 4$, $p = .048$) and for non-ED outcomes (ES = 0.39, CI = 0.01 to 0.78; $k = 4$, $p = .045$).

Family therapy versus other types of interventions. Eight interventions compared family therapy to some other type of therapy, yielding a significant effect for ED outcomes (ES = 0.49, CI = 0.26 to 0.71; $k = 8$, $p < .001$), but not for non-ED outcomes (ES = -0.01, CI = -0.28 to 0.26; $k = 6$, $p = .956$) when compared to other interventions.

Group family therapy versus individual family therapy. Only two interventions compared group family therapy to individual family therapy, so these findings should be interpreted with caution. Findings demonstrate no difference between group family therapy when compared to individual family therapy for ED outcomes specifically (ES = -0.04, CI = -0.51 to 0.43; $k = 2$, $p = .880$). Non-ED outcomes could not be examined as only one of the studies included non-ED outcomes.

Family therapy versus cognitive-behavioral therapy. As only one intervention compared family therapy and cognitive-behavioral therapy directly, it was not possible to assess the relative effects of these types of interventions compared to each other.

Effectiveness of motivational interviewing (MI). Two studies yielded preliminary results about the effectiveness of including MI prior to treatment. Interventions that incorporated MI yielded significantly greater effects for ED outcomes than did interventions without MI (ES = 0.67, CI = 0.08 to 1.26; $k = 2$, $p = .027$). Interventions that included MI did not yield greater effects for non-ED outcomes (ES = 0.29, CI = -0.05 to 0.62; $k = 2$, $p = .094$).

Group therapy versus other interventions. Five interventions compared group therapy to other interventions. Group therapy did not yield different effects than other individual-based interventions for ED outcomes (ES = -0.04, CI = -0.29 to 0.21; $k = 5$, $p = .756$) and non-ED outcomes (ES = -0.11, CI = -0.37 to 0.16; $k = 5$, $p = .428$).

Self-help versus other interventions. Four self-help interventions were compared to other interventions, although they did not yield significantly different effects for ED outcomes (ES = 0.08, CI = -0.18 to 0.34; $k = 4$, $p = .528$) or non-ED outcomes (ES = 0.04, CI = -0.31 to 0.39; $k = 2$, $p = .808$).

Moderators of Treatment Effectiveness

Due to the small number of interventions within each comparison type and the need to examine moderators within the comparisons, moderators for specific interventions compared to other specific interventions were not examined.

Effectiveness of Interventions Compared to Interventions at Follow-Up

The effectiveness of specific interventions compared to other specific interventions was also assessed at follow-up. Due to small numbers, only two comparisons could be examined. Cognitive-behavioral interventions did not produce greater effects at follow-up compared to all other interventions (ES = -0.01, CI = -0.27 to 0.26; $k = 8$, $p = .961$). Family-based interventions continued to yield greater effects at follow-up compared to all other interventions (ES = 0.36, CI = 0.12 to 0.60; $k = 5$, $p < .004$).

CHAPTER FIVE

DISCUSSION

Review of Study

This meta-analytic review answers the call for increased evaluative research on interventions for disordered eating with a focus on adolescents and emerging adults. Building on prior reviews (e.g. Fisher et al., 2010; Hay et al., 2009; Newton & Ciliska, 2006; Pratt & Woolfenden, 2002; Reas & Grilo, 2008; Stice et al., 2007; Vocks et al., 2010), this study examined the effectiveness of interventions targeted at adolescents and young adults overall and for each eating disorder diagnosis. This study highlights available interventions and examines whether these interventions were effective compared to controls and to other specific types of interventions, whether there were features of these interventions that promoted success, and whether these intervention effects were maintained at follow-up.

State of Literature

The literature review highlighted that the current literature on eating disorder intervention is limited and often not specific to adolescents and young adults (Bulik et al., 2007; Whittal, 1999), who are at especially high risk for developing disordered eating (Bailey et al., 2014; Stice et al., 2013). Many interventions that had been evaluated with adults were used on younger populations with limited tailoring or evaluation regarding their appropriateness (Lock, 2010). Thus, one of the main goals of this study was to detail the types of interventions that have been researched in this population.

General Study Features

The literature search process yielded research on 93 interventions targeting eating disorders for adolescents and young adults. Most of the included interventions were presented in published studies, which increases risk for publication bias and the file-door problem (e.g., Ivengar & Greenhouse, 1988; Rosenthal, 1979). Given that this is common in meta-analytic reviews, researchers must quantitatively evaluate the potential for bias, as well as understand the limitations (Duval & Tweedie, 2000). All of the interventions appeared after 1980, and over half of the interventions were published in the last 15 years. This suggests that eating disorder intervention research is robust and continues to develop. Further, the interventions were conducted in many countries, increasing generalizability; however, a majority of the interventions were conducted in western countries. There remains limited information about the availability and success of interventions for young adults in non-western countries, where prior research has highlighted a significant gap between need and availability of mental health treatment (e.g., Prince et al., 2007; Saxena, Thornicroft, Knapp, & Whiteford, 2007).

Experimental Design Features

Only 20% of the interventions were compared to control groups; the remaining interventions were compared to other specific interventions. While this makes sense given the need to treat individuals with eating disorders and the potential ramifications for delaying treatment or using a less-effective treatment (Arcelus et al., 2011; Crow et al., 2009; Hoek, 2006; Kessler et al., 2013; Mitchell & Crow, 2006), comparing an intervention without an evidence base to a control group is commonly thought to be the necessary first step in demonstrating effectiveness (Kinser & Robins, 2013). Once research has established effective treatments,

emerging treatments and treatments with modifications can then be compared to those evidence-based treatments (Caldwell, Ades, & Higgins, 2005). If effects are comparable, those results can be used to support the efficacy of a new intervention; however, the ability to make these comparisons necessitates the establishment of treatments as effective through multiple studies and meta-analytic review. Thus, identifying only 30 interventions that could be compared to controls suggests that this first step is lacking in the current literature.

Interventions averaged 52 participants, which is promising from a power standpoint, as well as for feasibility and dissemination of interventions (Cohen, 1992; Nakagawa, 2004). Average attrition was around 15%, suggesting that despite the numerous interruptions that can occur due to co-existing and acute medical problems associated with eating disorders, most participants were able and willing to complete treatment. These findings highlight that treatment was feasible in terms of expectations and time-commitments. This would be further supported by data on engagement and perceptions of interventions; however, these data were rarely gathered, and when gathered, comparisons were impossible due to disparate assessments. Thus, more research should consider participant perceptions to highlight potential treatment barriers that may exist.

Study Quality Indicators

This study included a variety of study quality indicators based on previous research and suggestions (de Craen et al., 2005; Juni et al., 1999; Spring et al., 2007). Beyond the limited number of studies providing information on self-reported engagement and participant perceptions as reported above, less than a quarter of interventions provided a rationale for study size or had drop-out less than 10%. This introduces the potential for under-powered studies that

were not able to find significant effects (Cohen, 1992; Nakagawa, 2004), as well as the potential for bias due to the over-representation of those who are engaged and perceiving intervention benefits (Heckman, 1990). Additionally, less than half of the interventions provided information on training of administrators or specified primary outcome(s). This is especially problematic as it interferes with assessing level of training as a potential moderator and to examine if interventions are successful for primary outcomes.

Despite these limitations, over three quarters of the studies utilized fidelity checks, reported drop-out, and used valid and reliable measures. Fidelity to treatment is especially important as research has shown that many clinicians who treat eating disorders use eclectic approaches without an established evidence base, despite superior results from standardized treatments (Von Ranson, Wallace, & Stevenson, 2013). Thus, the fact that most researchers are not only utilizing means to check for fidelity to standardized treatments, but also are reporting how they assessed fidelity, allows for more detailed research into the relationship between fidelity and outcome. Further, reporting drop-out allows readers to examine the potential for self-selection bias and feasibility issues.

Participant Characteristics

Most interventions targeted a single diagnosis, most commonly bulimia nervosa. This is consistent with the general consensus that the literature is more established for bulimia nervosa than anorexia nervosa or EDNOS (Fairburn, 2005). Interventions targeting anorexia nervosa were relatively rare, which is especially problematic given that the intervention literature for anorexia nervosa is still unclear (Bulik et al., 2007; Eisler et al., 1997). No interventions targeted EDNOS directly; however, EDNOS was included in some of the interventions that included a

blend of diagnoses. This is potentially problematic as interventions that target EDNOS may be unique in that they have to treat disparate symptoms and may in general demonstrate less efficacy (Machado, et al., 2007). Given the lack of literature, it is impossible to examine treatment options for this population further. Only three interventions targeted binge eating disorder, which is not unexpected given that BED was only introduced into the DSM in 2013 (DSM-5, American Psychiatric Association, 2013); however, this highlights the need for further research on BED treatments. Given that previous research has demonstrated increased efficacy treating bulimia nervosa (Hay & Bacaltchuk, 2008, Shapiro et al., 2007), the lack of studies on anorexia nervosa or EDNOS may be due to publication bias and lack of significant findings for these diagnoses.

A sizeable portion of interventions targeted only females and the average percent female was 98% across interventions. No interventions targeted males specifically. While eating disorders are more common among females than males (Hoek, 2006; Hudson et al., 2007; Kjelsås et al., 2004; Striegel-Moore & Bulik, 2007), research suggests that males represent between 10 to 15% of eating disorder patients (Fairburn & Beglin, 1990; Garfinkel et al 1996; Hoek & van Hoeken, 2003), which is much greater than the number of males included in this sample of interventions. This supports the theory that existing interventions may not address the needs of males and females equally. Most of the existing interventions have been designed for females and limited research assesses the feasibility and efficacy of these treatments for males (Fairburn & Beglin, 1990; Garfinkel et al 1996; Hoek & van Hoeken, 2003). This lack of research on males highlights the need for studies to include both genders and to evaluate the efficacy of interventions for males specifically.

Despite the potential for age of onset, severity, prior treatment, and comorbidity to moderate treatment effectiveness, these variables could not be examined as too few interventions reported these characteristics. A majority of interventions reported weight and duration of diagnosis. Specifically, the average duration of diagnosis was over 3 years, suggesting that these diagnoses generally have been chronic, which is particularly notable for the adolescent and young adult population. While weight was commonly reported, the different means of assessing weight limited the ability to compare across studies. The literature needs recommendations to detail what information should be reported to increase cross-study comparison.

Less than half of the interventions reported information on ethnic breakdown of the sample, averaging 17% non-Caucasian individuals. Although this is not unexpected given the lower prevalence eating disorders in minorities (Chamorrow & Flores-Ortiz, 2000; Marques et al., 2011; Striegel-Moore et al., 2003), as well as barriers in seeking treatment (Marques et al., 2011), it prevents research from examining if treatment needs are being met, and if treatments are differentially effective for minority populations.

Intervention Features

Similar to previous reviews, the most common intervention strategy was cognitive-behavioral therapy (Hay & Bacaltchuk, 2008, Hay & Claudino, 2010; Shapiro et al., 2007). Also common were family-based strategies, which have particular potential for adolescents and young adults with disordered eating (le Grange & Hoste, 2010). Despite previous research supporting the use of interpersonal psychotherapy, dialectical behavioral therapy, and intensive short-term dynamic psychotherapy for eating disorders (Hay & Claudino, 2010; Lenz et al., 2013; NICE, 2004), only two studies specifically examined interpersonal psychotherapy and intensive short-

term dynamic psychotherapy for adolescents and young adults with eating disorders, and no studies examined dialectical behavioral therapy in this population. There were many other interventions (e.g., self-help, eye movement desensitization, motivational enhancement therapy, and supportive expressive therapy) that could not be coded under another primary intervention strategy code.

Close to half of the interventions incorporated cognitive components, behavioral components, and/or psychoeducation. Less common features included mindfulness, relaxation, or social interaction, which may be particularly useful in treating disordered eating (Chen & Safer, 2010), but could not be thoroughly assessed. Nutritional management was more common than supported meals. Only a limited number of interventions used technology, highlighting that there is still limited research on these new modalities of treatment (Aardoom, 2013).

Individual therapy was common, as was family and group therapy. Additionally, therapies delivered in other modalities (e.g., self-help) were also common, and most interventions were delivered in outpatient settings. Most of the interventions were delivered by multiple individuals at different levels of training, but many interventions were delivered solely by student trainees. Later analyses examined if these features, that may be more feasible, easier to disseminate, and cost-effective, are equally effective.

Very few interventions included moderator or mediator analyses, which are vital in assessing the success of interventions (Lipsey, 2003). Moderation analyses allow us to further examine if treatments are effective across different types of settings and participants, and mediation analyses are necessary to establish mechanisms of treatment. Despite calls for these analyses (Bailey et al., 2014; Timulak et al., 2013), few interventions conducted these analyses,

which would allow researchers to identify ways that their interventions could be more effective, fine-tuned, or streamlined.

Interventions Compared to Control

Overall interventions targeting adolescents and young adults with eating disorders were effective in improving ED and non-ED outcomes, across diagnoses, when compared to a control. This is consistent with hypotheses and suggests that emerging adults and adolescents are generally seeing positive effects when participating in eating disorder treatment programs. Given their elevated risk for disordered eating (Bailey et al., 2014; Stice et al., 2013), as well as the significant associated medical and psychiatric costs (Simon, Schmidt, & Pilling, 2005; National Institute of Mental Health, 2011), it is promising that interventions significantly decreased disordered eating for this population. There was moderate heterogeneity within this overall effect suggesting that there were moderators of treatment effectiveness and that not all treatments were equally effective (Higgins & Thompson, 2002). Thus, further analyses of differential effects across diagnosis, treatment, and other moderating variables are presented below.

Intervention Effects by Outcome Type and Source

Interestingly, eating disorder interventions were equally effective for ED outcomes and non-ED outcomes. This suggests that disordered eating programs reduce targeted symptoms and also improve broader, secondary outcomes (e.g., body image, depression, interpersonal relationships). This is important as having an eating disorder is associated with increased risk for other psychiatric diagnoses, as well as significant social-emotional problems (e.g., Kessler et al., 2013; National Institute of Mental Health, 2011). Further, eating disorders are known to be multi-dimensional, and research has shown that non-ED factors, such as depression and anxiety,

are known to contribute to the development and maintenance of disordered eating (Garner, 1983). Thus, it is important that interventions that target disordered eating are effective not just for eating symptomatology, but also for related social-emotional factors.

Within ED outcomes, effects varied depending on outcome type. Specifically, interventions significantly improved symptom measures and specific ED behaviors, but not biomarkers or diagnostic interviews. There are many possible explanations for this finding. First, this effect may be driven by the fact that diagnostic interviews are typically assessed by clinicians, whereas symptom measures are often self-reported. This current study found significantly greater effects for self-report measures versus clinician-assessed measures. Individuals may display self-report bias (Adams, Soumerai, Lomas & Ross-Degnan, 1999; Hebert, Clemow, Pbert, Ockene, & Ockene, 1995), and thus be more likely to over-estimate change or be more sensitive to these changes compared to clinicians. Additionally, physical outcomes do not respond to treatment as quickly due to resistance to weight gain and increased time needed to produce physical changes (e.g., Eisler et al., 2000; Kohn, Golden, & Shenker, 1998). These differential findings suggest that while interventions may be yielding significant improvements in specific behaviors or movement along symptom measures scales, they might not be improving physical health (e.g., weight, menstruation status) or actual diagnosis within the same time frame.

Interventions yielded significant, comparable effects across all non-ED outcomes, highlighting the success of interventions for a variety of secondary outcomes that expand past eating disorder symptomatology. Further, interventions are equally effective across secondary outcomes and eating disorder symptomatology. Body image outcomes were not associated with

greater effects despite their link to disordered eating (for a review, Cash & Deagle, 1997). Thus, interventions are improving adolescents' perceptions of their bodies, as well as many other non-ED factors.

Effects by Diagnosis

Supporting the hypotheses, targeted diagnosis moderated treatment effects. Specifically, interventions targeting bulimia nervosa or multiple diagnoses were associated with comparable, positive outcomes at post that were significantly greater than interventions that targeted anorexia nervosa. This supports prior research that has produced more favorable outcomes for interventions targeting bulimia nervosa than anorexia nervosa (e.g., Fairburn, 2005; Hay & Claudino, 2010; Lohr, 2007; NICE, 2004). Additionally, as can be seen in Table 1, many of the interventions that targeted multiple diagnoses included bulimia nervosa, although the exact breakdown of participants within each diagnosis was not coded. Thus, the greater success rate among interventions targeting bulimia nervosa may be driving the similar, significant finding among interventions that targeted multiple diagnoses.

This study highlights that current interventions for anorexia nervosa do not significantly improve adolescent and young adult disordered eating. This is concerning given the significant associated costs and medical risks (e.g., Arcelus et al., 2011; Kessler et al., 2013; Mitchell & Crow, 2006). Additionally, little research examined EDNOS and BED specifically, limiting the ability to make treatment recommendations for these patients. Thus, it is critical that researchers continue to develop new treatment models and evaluate their success when compared to a control group before comparing two treatments. Otherwise there is a risk of comparing two non-effective

treatments and making erroneous assumptions about the clinical significance of a difference, or lack of difference, between treatments.

Effects by Intervention Strategy

There were, unfortunately, many intervention strategies that were not well-researched enough to examine their effectiveness. There were only enough interventions to accurately assess the effects for cognitive-behavioral therapy, across diagnoses, and the miscellaneous category of *other intervention strategies*, which was not further assessed given the heterogeneous nature of these conceptually dissimilar interventions. Cognitive-behavioral interventions were associated with significant results for both ED outcomes and non-ED outcomes (see, Hay & Bacaltchuk, 2008; Hay et al., 2007; Hay & Claudino, 2010; Shapiro et al., 2007). Thus, there are likely important components of cognitive-behavioral therapy that are useful in reducing symptomatology among adolescents and young adults.

Unfortunately, many specific intervention types lacked sufficient studies comparing interventions to controls to assess their effectiveness in this current review. Despite emerging support for IPT (NICE, 2004; Tanofsky-Kraff & Wilfley, 2010), DBT (Bankoff et al., 2012; Chen & Safer, 2010; Lenz et al., 2013), and family therapy (Couturier et al., 2013; le Grange & Hoste, 2010), they could not be fully supported in the current review due to limited research. Thus, it is important that researchers continue to examine these treatments for adolescents and young adults, and that clinicians understand the current limited evidence.

Effects by Diagnosis and Intervention Strategy

Our sample size did not allow for effects to be broken down by diagnosis and intervention strategy. Despite the desire to examine whether specific strategies were

differentially effective for specific diagnoses, this was not possible in the current review. This highlights the continued need for research to examine specific types of treatments compared to control across various diagnoses, and represents a continued limitation of the current literature for this population. Given our findings that both diagnosis and intervention strategy are related to effect size and differential effects in previous literature (e.g., Fairburn, 2005; Hay & Claudino, 2010), it is expected that intervention strategies are not equally effective for different eating disorder diagnoses. For instance, the positive effects of CBT may have been present for interventions targeting bulimia nervosa, but not anorexia nervosa (for prior research, Fairburn, 2005; Hay & Claudino, 2010), but that hypothesis could not be tested. Thus, continued research needs to examine different types of treatments for different eating disorder populations, and test if intervention effects are moderated by diagnosis.

Moderator Analyses

One of the benefits of conducting a meta-analytic review is the ability to look at whether specific variables are related to outcome, that is whether participant features or aspects of the intervention moderate treatment success (Shadish, 1996; Shadish & Sweeny 1991). This review examined a variety of hypothesized and exploratory moderators, and these results are presented and discussed in detail below. However, multiple moderator analyses could not be conducted due to small sample size and multicollinearity. Thus, it was impossible to examine the relationship between moderators or whether certain moderators accounted for the effects of others. While all moderation effects are discussed and possible explanations presented, many are preliminary and should be considered with caution.

Hypothesized moderators. Of the hypothesized moderators, only duration of diagnosis, whether females were targeted, qualifications of the administrator, and intensity of treatment emerged as significant moderators. Too few interventions reported information on comorbidity, severity, and group size to assess these as moderators. Given the potential for these to be associated with treatment outcomes (Hsu et al., 1979; Lowe et al., 2001; Morgan & Russell, 1975; Nozoe et al., 1995), it is important that researchers not only assess these variables, but also examine them as potential moderators. Further, against our hypotheses, age of sample, percent female, and duration of treatment did not emerge as significant moderators for ED or non-ED outcomes.

Counter to the hypothesis and prior research (e.g., Bemis, 1978; Hsu et al., 1979; Lowe et al., 2001), interventions with samples with longer durations of diagnoses yielded greater ED effects than interventions whose samples had shorter durations. Much of the ED research examining duration of diagnosis and outcome has been conducted with adults (e.g., Bemis, 1978; Hsu et al., 1979). Thus, it is possible that duration of diagnosis among adolescents and young adults is not a risk factor for a more severe, treatment-resistant course. One such explanation may be that for adolescents most treatment involves notification and interaction with parents around treatment, which could result in greater oversight on treatment adherence, or greater internally and externally driven motivation to recover. Additional research will need to replicate this effect and examine reasons for which longer length of diagnosis would be associated with greater improvement in symptomatology for this population.

While percentage female did not emerge as a significant moderator, whether interventions only targeted females did, such that these interventions were associated with better

effects for ED outcomes, but not non-ED outcomes. There is a higher prevalence of females with diagnoses (e.g., Hudson et al, 2007) and much less research on males (Fairburn & Beglin, 1990), and many interventions are designed for females, but used on males with little tailoring (Garfinkel et al., 1996; Hoek & van Hoeken, 2003). Thus, interventions that include males may be less successful because males may not be benefiting as significantly from the intervention, due to differences in presentation and symptomatology. Thus, it is critical that intervention research continues to include males, assess whether gender is moderating outcomes, and if so, identify changes and modifications to interventions that may be necessary to promote recovery.

Moderation analyses revealed that interventions with administrators at multiple stages of training (e.g., a licensed therapist and student trainee) yielded significantly greater effects for ED outcomes than interventions that were administered by licensed therapists only or by student trainees. This effect should be considered with caution given less than half of interventions reported training level. This effect does not appear to be driven by level of training, given that having multiple administrators at different levels of training was associated with greater effects than using only licensed clinicians. This could be due to the increased attention to treatment fidelity when teaching and training were a necessary component; however, more research is necessary to replicate this effect.

One moderator, intensity of treatment, emerged as significant for non-ED outcomes, but was not related to ED outcomes. Counterintuitively, less intense interventions were associated with greater improvements in non-ED outcomes. It is possible that shorter interventions are less targeted to ED outcomes and more towards general improvement, and evidenced in non-ED outcomes. While it is promising that non-ED outcomes may be improved with less intense

interventions, this contradicts prior research (e.g., Hoag & Burlingame, 1997; Pim, 1999; Smith & Glass, 1977), and should be interpreted with caution until replicated.

Non-hypothesized moderators. Thirty-seven exploratory moderators were examined, many of which could not be assessed due to sample size. While lack of moderation is important, only significant moderators are discussed further due to the scope and nature of this project. Many possible explanations for these effects are presented; however, these are limited in that previous research has not often considered these factors, nor have these effects been replicated or their inter-relations tested.

Interventions compared to wait-list or no intervention controls yielded greater effects, across ED and non-ED outcomes, than interventions compared to attentional control groups. This is not unexpected given that much research has documented that individuals with placebo treatments often display perceived changes in functioning (e.g., Beaugard, 2007; Rosenthal & Frank, 1956; Shapiro, 1964; Wampold, Minarri, Tierney, Baskin, Bhati, 2005), which would be associated with decreased differences between intervention and control.

Interventions delivered in groups and modalities coded as other (e.g., self-help, internet-based) yielded greater effects for ED outcomes than did interventions delivered individually. Lending support to the idea that interventions delivered as a group may be more effective, interventions that included social interaction as a specific intervention feature also were associated with significantly larger effects for ED outcomes. Thus, it seems that a social component is driving better outcomes for adolescents and young adults, despite prior concern that this may lead to iatrogenic or contagion effects for older adults (e.g., Dishion & Dodge, 2005). Group interventions and those with a social interaction component may promote

interaction that increases feelings of responsibility for one's recovery, and also may help normalize one's experience which may particularly impact adolescents' and young adults' recovery. Further, group interventions might improve motivation and feelings of efficacy of the intervention if participants are at different stages of the recovery process. Interventions delivered in non-traditional modalities may yield larger effects as many of them are primarily self-driven, which may require an increased commitment to treatment, as well as increased feelings of control and improved feasibility.

Other content variables also emerged as important to intervention success. First, providing psychoeducation appears to promote success, in both ED and non-ED outcomes. Many adolescents and young adults may enter treatment with limited understanding of their diagnosis. Providing them with information may be critical, as it likely highlights the detrimental health and psychosocial risks of disordered eating. Additionally, previous research has shown benefits of pure psychoeducation in treating disordered eating (Zabinski et al., 2001), suggesting that psychoeducation may be particularly useful. Use of homework was surprisingly associated with poorer outcomes. While use of homework has been positively related to treatment outcome for other diagnoses (e.g., Burns & Spangler, 2000; Kazantzis & Lamropoulos, 2002), it may be possible that homework is not as helpful or possibly that homework has not yet been as well-designed for eating disorder diagnoses. Thus, it is important for those who design and implement these interventions to evaluate whether use of homework is promoting success, rather than simply increasing work for participants. Only one study quality variable emerged as a moderator, such that interventions that provided a rationale for study size were associated with more positive effects for ED outcomes than were interventions that did not. This is likely related to the fact that

these interventions were planned with a focus on being well-powered to find significant effects (Cohen, 1992; Nakagawa, 2004).

Five variables were related to non-ED outcomes, but not ED outcomes, and as such are presented briefly. Specifically, one counterintuitive finding was that interventions that were followed up with additional contact (e.g., booster session) were associated with worse effects for non-ED outcomes. It is possible that general feelings of well-being were negatively affected by being reminded of treatment. Interventions that provided information on training of administrators and that did not provide information on fidelity checks were associated with larger effects for non-ED outcomes. Additionally, interventions that used random assignment were associated with larger non-ED outcome effects compared to those using a quasi-experimental design. Use of technology was also associated with larger non-ED effects, possibly due to flexibility that may allow for increased modules or content that is designed to improve such secondary outcomes.

Intervention Effects at Follow-up

More than half of the interventions assessed outcomes at follow-up, and overall they yielded a significant positive effect. This is promising given that long-term recovery is typically quite low, with high rates of relapse (Fitcher & Quadflieg, 2007; Herzog et al, 1999; Keski-Rahkonon et al., 2007; Steinhausen, 2002). Perhaps compared to previous research on older/mixed samples, the younger patients in the current meta-analysis experienced longer-term success, indicating that targeting eating disorder patients early in their disorder may predict longer-term recovery. Effects at follow-up were significantly smaller than at post-intervention, suggesting that some improvements were lost. More in-depth analyses of this finding indicated

that this was due to smaller effects at follow-up for non-ED outcomes, revealing that improvements in eating symptomatology are maintained at follow-up, but that the secondary, more general benefits are not as well-maintained.

Additionally, given the number of studies that included follow-up assessments, it was possible to look at factors that may be related to long-term success. Specifically, among ED outcomes, effects at follow-up continued to be significant for symptom measures and specific ED behaviors. Interestingly, biomarkers, which were not significant at post-treatment, were significant at follow-up, supporting the theory that changes in biomarkers may take longer periods to emerge. For non-ED outcomes, significant effects were only maintained for social-emotional skills and body image. This suggests that non-ED outcomes may need to be targeted specifically if previously-treated adolescents and young adults begin or continue to experience anxiety, depression, general psychological distress, self-perceptions, or interpersonal problems.

In terms of diagnosis, there were significant positive effects at follow-up for anorexia nervosa, but not for bulimia nervosa. Interventions targeting multiple diagnoses continued to demonstrate significant effects at follow-up. Further analysis of this finding indicated that these findings were primarily driven by two interventions targeting anorexia nervosa that did not present findings at post, but had significant positive effects at follow-up. Thus, the finding that significant effects for anorexia may emerge a while after the intervention ends needs to be interpreted with caution until replication. The finding that significant effects were not maintained for bulimia nervosa, while not surprising given the high rate relapse (Fitcher & Quadflieg, 2007; Herzog et al, 1999; Keski-Rahkonon et al., 2007; Steinhausen, 2002), is concerning and

highlights the need to examine factors that may promote, not just immediate, but long-term success.

Unfortunately, despite the call to further examine if there are other factors that may moderate long-term efficacy (Halmi et al., 2005), many moderators could not be examined due to small sample sizes. Of those that could be examined, only two variables were related to effect size, use of behavioral strategies and homework, such that interventions that used either of these components were associated with smaller effects than interventions that did not. This effect is surprising as both of these have been associated with positive effects (Burns & Spangler, 2000; Hay & Claudino, 2010; Kazantzis & Lamropoulos, 2002). Thus, it will be important to replicate this finding before making clinical recommendations.

Eating Disorder Interventions and Iatrogenic Effects

Prior researchers have presented the potential for iatrogenic effects in eating disorder treatment and prevention programs (Garner, 1985; Stice & Shaw, 2004). While many interventions did not yield positive effects at post, only one intervention yielded a significant iatrogenic effect at post (Ward, 2009). Thus, the current study suggests that the potential for iatrogenic effects for young adults in eating disorder treatment is low. While it is impossible to analyze specific features of this intervention and make hypotheses about why this effect emerged, there are certain features of this intervention that could have contributed. This intervention targeted anorexia nervosa only, which was associated with significantly smaller effects than other diagnoses and in general was not associated with positive effects in this current meta-analytic review. Additionally, this intervention was conducted in an inpatient setting, suggesting the potential for more severe psychopathology. The intervention was primarily

motivational interviewing with a cognitive component and assigned homework, delivered individually by student trainees. Given the single intervention with iatrogenesis, no conclusions about causation can be made.

Specific Interventions Compared to Other Specific Interventions

This review not only examined interventions compared to control, but also assessed the success of interventions compared to other specific interventions. First, it is important to note that the overall effect of interventions compared to other interventions is not discussed, as it is meaningless due to the non-independent nature of effects. Instead, these effects are broken down by comparisons between specific types of interventions. Many of these findings are preliminary and should be interpreted with caution due to small sample sizes. If supported by additional research, these findings could indicate which eating disorder treatments are more or less successful for adolescents and young adults.

Fifteen studies compared cognitive-behavioral therapy to other interventions and revealed no difference in treatment efficacy, countering prior research (Dare et al., 2001; Hay, Bacaltchuk, & Stefano, 2007; McIntosh et al., 2005). Although preliminary due to sample size, this study replicates the finding that cognitive behavioral therapy is not more effective than behavioral therapy (Channon et al., 1989). Many of the prior findings supporting the increased efficacy of cognitive-behavioral therapy have been specific to diagnosis, and unfortunately it was impossible to examine within specific diagnoses. An interesting, emerging finding that needs additional replication is that cognitive-behavioral interventions with add-on components (e.g., exposure and response prevention, focus on body image) were associated with better outcomes than base cognitive-behavioral interventions across outcomes. Thus, future researchers may

consider incorporating add-on components to improve outcomes. This may be especially useful when treating males, who are not experiencing as much recovery; however, this effect is still preliminary.

Family interventions yielded greater effects than other interventions, suggesting that for adolescents and young adults, incorporating patients' families may be a critical component to intervention success (for prior research, Bailey et al., 2014; le Grange & Hoste, 2010). While preliminary, the two interventions that compared group family interventions to family interventions delivered with a single family found no differences, suggesting that family interventions may be delivered with similar success in a more cost-effective and efficient group format. Group interventions yielded similar effects to individual interventions in general, suggesting that many interventions, either family or otherwise, could be delivered in groups, rather than one-on-one. Only one intervention compared family interventions to cognitive-behavioral interventions, thus a meta-analytic comparison between these types of treatments could not be made.

Two studies assessed interventions that included a motivational interviewing component to interventions that did not include this component and found increased success for ED outcomes. Interventions with add-on components (e.g., ERP, body image focus) were associated with positive outcomes. Additionally, motivational interviewing, which has been successful for other types of psychopathology (for a review, Rubak, Sandbæk, Lauritzen, & Christensen, 2005), may be useful to include to promote readiness to change and engagement in eating disorder interventions as well. Additionally, self-help interventions, which may be an important avenue

for reaching individuals who may experience significant barriers to typical forms of treatment, were equally as successful as other interventions.

Unfortunately, due to small sample sizes, effects for specific interventions compared to other specific interventions could not be broken down further by diagnosis, nor could the hypothesized and exploratory moderators examined among interventions compared to control groups be assessed among these specific intervention comparisons. Thus, it is critical that researchers continue to assess intervention effectiveness for adolescents and young adults with eating disorders to identify evidence-based and best practices.

Limitations

While this meta-analytic review has many important strengths and adds to the understanding of eating disorder treatments for adolescents and young adults, there are some limitations that should be noted.

Despite efforts to include unpublished interventions, most of the interventions that met inclusion criteria were published. Given that prior reviews have found significantly larger effects among published studies than unpublished studies (e.g., Conley, Durlak, Shapiro, Kirsch, 2016), as well as the publication bias that exists in psychology (Ivengar & Greenhouse, 1988; Rosenthal, 1979), it is critical to identify unpublished studies to more accurately represent the range of true effects. It is likely that our study over-estimates the success of interventions; however, the estimate of publication bias using Duval and Tweedie's (2000) trim and fill method did not suggest significantly smaller effects.

Another limitation of the current study was the inability to consider certain moderators, conduct multiple moderator analyses, and break effects down within specific diagnoses and

intervention types. That is, many of the findings in this review are limited by the current state of the literature. There were many variables (e.g., percent comorbidity, severity of diagnosis) that may be significantly related to effect size, but could not be assessed due to this fact. Thus, this review is limited in its ability to thoroughly answer the question of what interventions work, under what circumstances, and for whom. Without being able to critically examine these factors, key information that is necessary to tailor and improve interventions may be missing.

Further, with only 30 studies presenting interventions compared to controls, there is a limited ability to establish evidence-based eating disorder treatments for adolescents and young adults, which acts a poor stepping stone to critically evaluate the effects of interventions compared to other specific interventions. Additionally, while one of the main goals of this review was to compare treatments, most of our specific intervention comparisons remain preliminary and could not be assessed at follow-up to identify if these effects are maintained.

Future Directions for Research

Eating disorders remain a significant issue, with high associated medical and psychosocial costs, necessitating the need for effective treatment (Hudson et al., 2007; Kessler et al., 2013; Wilson et al., 2003). One focus of the current review was to evaluate the current state of research for eating disorder intervention targeting young adults and adolescents and make recommendations for future research. First, continued intervention research with this population is necessary to build a literature base that can be synthesized and evaluated to establish evidence-based practices. The literature indicates that we have been able to identify treatments that are effective for bulimia nervosa, but that we have not yet identified treatments that are successful for anorexia nervosa. Additionally, there were few interventions that targeted binge eating

disorder and EDNOS, promoting the need for continued intervention studies that target these diagnoses individually. Regardless, interventions that include multiple diagnoses should examine if treatment effects are similar across these varied diagnoses or if diagnosis moderates effectiveness.

More research evaluating various types of interventions, including those with previous support and emerging treatments (e.g., self-help, IPT, DBT) compared to control, remains necessary. Additionally, it is imperative that researchers continue to critically evaluate their own interventions to establish if their treatments are equally effective for different types of people. This necessitates examining moderators of treatment success, as well as attempting to identify critical mechanisms and components through advanced analyses, including mediation, which is currently rare. Minority females, males, and individuals from non-western countries, which were not regularly included, may not be benefiting from the current treatments, and it is vital that researchers and clinicians identify why and improve treatment for these populations. The current literature included few minority participants, suggesting a continued need to engage non-Caucasian individuals in treatment and research. More research also needs to examine the potential for effectiveness of technology-based and self-help interventions.

Further, this review highlights the need for future research to assess and report variables that could be critical to evaluating intervention success and could not be adequately assessed in the current review. Specifically, researchers should be reporting data on engagement and participant perceptions, as these may highlight specific ways that participants' enjoyment and success could be improved. Additionally, researchers should be routinely assessing whether

participants have engaged in prior treatment, severity of diagnosis, and presence of comorbid conditions, as these could predict treatment outcome.

This research highlighted the need to examine if effects are maintained at follow-up, as a significant number of interventions no longer produced significant effects at longer-term follow-up. Further, it also suggests that some outcomes may not show success, such as biomarkers, until a significant time post-intervention. Thus, researchers may consider assessing biomarkers at follow-up, rather than immediately post-treatment.

Clinical Applications

A major contribution of this review was to identify future directions for clinicians, and this review, while limited in some ways, yields important information about which treatments are effective, which aspects of treatments are associated with success, and what areas require additional research. While interventions were effective overall, moderation analyses revealed some important clinical considerations. One particularly important finding from the current review indicates that individuals with anorexia nervosa may display a more chronic, treatment-resistant course. Thus, treatments may need to be longer and more intense for adolescents and young adults with anorexia nervosa. Also important, this review also revealed that males are not experiencing similar success in interventions as females. Thus, it is necessary for clinicians to continue to target male disordered eating, with modifications and increased monitoring of treatment utility.

This review highlights that treatments delivered in group formats, and those with social interaction components, may be especially effective for adolescents and young adults, and preliminary findings suggest similar treatment outcomes for group family therapy as individual

family therapy. This study demonstrated greater effects for family therapy, suggesting that including adolescents' and young adults' families in interventions for disordered eating may be critical. Additionally, it is important that interventions include a psychoeducation component that has been shown to increase overall effectiveness. Preliminary information suggests that using self-help may be an effective means of treatment, and should be considered especially when barriers to treatment are high. Preliminary findings also suggest that add-on components, such as exposure and response prevention or motivational interviewing, may improve treatment outcomes. Thus, clinicians should evaluate if these components may be useful with specific patients. Finally, although eating disorder interventions showed some positive outcomes for non-ED outcomes, many of these effects were not maintained at follow-up, which suggests the need for clinicians to continue to evaluate the need for additional treatment for other mental health concerns post-treatment.

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