

PREDICTORS OF THERAPY DROPOUT AND PSYCHOMETRIC CHANGES IN
PERSONALITY IN BINGE EATING DISORDER FOLLOWING COGNITIVE
BEHAVIOURAL THERAPY

by

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Submitted in partial fulfillment of
the requirements for
the Master of Arts (MA) in Psychology

The Office of Graduate Studies
Laurentian University
Sudbury, Ontario, Canada

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THESIS DEFENCE COMMITTEE/COMITÉ DE SOUTENANCE DE THÈSE
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Title of Thesis Titre de la thèse	PREDICTORS OF THERAPY DROPOUT AND PSYCHOMETRIC CHANGES IN PERSONALITY IN BINGE EATING DISORDER FOLLOWING COGNITIVE BEHAVIOURAL THERAPY	
Name of Candidate Nom du candidat	Andrews, Jordan	
Degree Diplôme	Master of Arts	
Department/Program Département/Programme	Psychology	Date of Defence Date de la soutenance October 06, 2023

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ABSTRACT

Binge eating disorder (BED) is a recent addition to the 5th edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5). There is limited clinical data in research literature about this disorder and how it is treated. Several studies have been done to examine predictors of therapy dropout for other eating disorders but very few have been done on BED specifically. The current study sought to better understand which factors would predict therapy dropout in a population of BED clients. A group with BED took part in a 20-week course of group-based CBT in an eating disorders program and approximately two thirds of these clients did not complete the full course. The clients' self-reported levels of depression, anxiety, coping strategy preferences for stressful situations, and eating disorder symptomology were measured before and after the CBT course and the goal of this study was to examine if differing levels of pre-treatment symptoms could predict a client's likelihood for successfully completing CBT. This study also examined the post-treatment changes in binge eating frequency, coping strategies, state and trait anxiety, eating disorder symptomology and depression. Overall, no significant predictors of therapy dropout were identified. Other findings showed that after their treatment the clients who remained in treatment reported less eating disorder symptomology, depression, endorsed fewer emotional coping strategies and more task-oriented coping strategies, and reported fewer binge eating episodes. A correlation between time spent in treatment and a reduction in binge eating episodes was also found. While no predictors of therapy dropout were found in these pre-treatment measures, this study suggests that clients who completed treatment had several positive outcomes, and it highlights the need for further investigation into alternative screening methods for treatment retention beyond quantitative tests.

Keywords: cognitive behaviour therapy, binge eating, eating disorders, therapy dropout, coping in stressful situations, state and trait anxiety, depression

Acknowledgements

To my supervisor, my committee, my friends, my classmates, and my family.

Special thanks to Larry Dahmer and HSN.

Table of Contents

<i>Signatures of Examining Committee</i>	ii
<i>Abstract</i>	iii
Keywords	iv
<i>Acknowledgements</i>	v
<i>Chapter One: Introduction and Literature Review</i>	1
BED Introduction, Definition and Prevalence	1
Triggers and Contributory Factors	3
Binge Eating Symptom Reduction and Treatment	8
Factors of Treatment Dropout	13
Is Treatment Successful?	18
The Current Study	20
<i>Chapter Two: Methods</i>	22
Measures	24
Data Collection	27
Existing Data	30
Data Transformation and Analysis	30
<i>Chapter Three: Results</i>	31
Demographics of the HSN Clients	31
Demographics of the Control Group	31
Pre-Treatment Psychometric Scores of Therapy Dropout Among the Clinical Sample	32

Pre-Treatment Psychometric Scores as Predictors of Binge Eating	32
Self-Reported Symptoms Before and After Treatment	33
Eating Disorder Symptomology	33
Stressful Situation Coping Strategies	35
Depressive Symptoms on the BDI-II	38
State and Trait Anxiety	40
Binge Eating Occurrences Over the Course of Treatment	40
Binge Occurrences Over Time Compared to the Control Group	42
Changes in Coping Strategies	45
Pre-Treatment Coping Strategies	45
Post-Treatment Coping Strategies	46
Changes in Eating Concerns	48
Pre-Treatment Eating Concerns	48
Post-Treatment Eating Concerns	49
Clinical Test Scores Compared to the Control Data and Normative Data	50
BDI-II	50
STAI	52
CISS-A	54
EDE-Q	58
Post-Hoc Power Analysis	63
<i>Chapter Four: Discussion</i>	63
Summary of Key Findings	63
Demographics of the Clinical and Control Groups	64

Predictors of Therapy Dropout	65
Stress Management Strategies	66
EDE-Q	72
STAI	76
BDI-II	78
Pre-Treatment Psychometric Scores as Predictors of Binge Behaviour	79
Binge Occurrences Over the Course of Treatment	81
Future Directions and Limitations	83
<i>Chapter Five: Conclusions</i>	86
<i>References</i>	89

List of Tables

Table 1. Descriptive statistics for the EDE-Q global scores and subscales from before and after treatment.	35
Table 2. Descriptive statistics for the CISS-A subscales from before and after treatment.	38
Table 3. Normality tests results of the binge eating occurrences of the control group from the 3 weeks of sampling.	43
Table 4. Clinical group pre-treatment means for CISS-A subscales compared to the normative means from a population of adult women.	54
Table 5. Clinical group post-treatment means for CISS-A subscales compared to the normative means from a population of adult women.	55
Table 6. Control group means for CISS-A subscales compared to the normative means from a population of adult women.	56

Table 7. MANOVA results comparing the control group and pre-treatment clinical group scores on the CISS-A.	57
Table 8. MANOVA results comparing the control group and post-treatment clinical group scores on the CISS-A.	58
Table 9. Clinical group pre-treatment p-values for EDE-Q subscales.	59
Table 10. Clinical group post-treatment means, standard deviations, and p-values for EDE-Q subscales.	60
Table 11. P-values for control group compared to normative means of EDE-Q subscales.	60
Table 12. MANOVA Results comparing the control group and pre-treatment clinical group scores on the EDE-Q.	61
Table 13. MANOVA Results comparing the control group and post-treatment clinical group mean scores on the EDE-Q.	62

List of Figures

Figure 1. The mean raw scores of the EDE-Q global scores and subscales from before and after CBT Treatment.	34
Figure 2. The mean raw scores of the CISS-A subscales from before and after CBT Treatment.	37
Figure 3. The mean raw scores of the Beck Depression Inventory II from before and after CBT Treatment.....	39
Figure 4. Linear regression showing the relationship between the mean binge occurrences during an episode and weeks spent in CBT treatment.....	41

Figure 5. Linear regression showing the relationship between the mean binge days during a week and weeks spent in CBT treatment..... 42

Figure 6. Mean binge occurrences across 3 sampled time points. 44

Figure 7. Means plot of standardized scores from the 5 CISS-A subscales for all clients prior to CBT treatment. 46

Figure 8. Means plot of standardized scores from the 5 CISS-A subscales for clients who completed CBT treatment.47

Figure 9. Means plot of standardized scores from the 4 EDE-Q subscales prior to CBT treatment. 48

Figure 10. Means plot of standardized scores from the 4 EDE-Q subscales following CBT treatment. 50

Figure 11. Means, and P-values for the control Group compared to the Pre-Treatment Samples on the BDI-II. 51

Figure 12. The mean raw scores of the STAI Trait subscale from before and after CBT Treatment compared to Control mean scores. 53

I. INTRODUCTION AND LITERATURE REVIEW

BED Introduction, Definition and Prevalence

Binge-eating disorder (BED) is a feeding disorder in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) (American Psychological Association, 2022). It is related to anorexia nervosa (AN) and bulimia nervosa (BN) and is characterized by episodes of consuming a large amount of food in a small amount of time compared to what would be considered “normal”. These episodes must occur at least once a week for a period of three months (APA, 2022).

The 12-month prevalence of BED is 0.44%-1.2% of the population with higher rates in women than men (0.6% to 1.6% and 0.26% to 0.8% respectively) (APA, 2022). Further, the Global Burden of Diseases, Injuries and Risk Factors Study (GBD) estimates that there are 17.3 million cases of BED globally (Santomauro et al., 2021). In addition to prevalence, significant shame, guilt and depression are experienced by those who suffer from BED (Craven & Fekete, 2019; Pearl et al., 2014; Schulte, 2016). This condition is a burdensome disorder with complex and far-reaching negative effects. The need for effective treatment is evident and the purpose of this proposed research is to better understand how mental health clients with BED respond to treatment and if there are certain factors that predict why some clients may choose to withdraw from treatment. This study also hopes to address whether eating behaviour changes during treatment and if so, how, and to what degree.

Prior to the inclusion of BED in the DSM-5 as a disorder, it was included under eating disorder not otherwise specified (EDNOS) in the DSM-IV. Noting that a large proportion of EDNOS patients were presenting binge eating behaviours that fit the description of provisional BED, Striegel-Moore and Franko (2008) made the case that BED should be included in the

DSM-5. They did this by addressing each criterion for DSM inclusion highlighted by Blashfield et al. (1990) to present a case why BED should be a disorder in its own right. These criteria include (1) having ample literature on the proposed syndrome; (2) clearly articulated diagnostic criteria; (3) the ability to differentially diagnose the proposed syndrome from other similar syndromes; (4) evidence of diagnostic reliability and (5) diagnostic validity. Striegel-Moore and Franko (2008) were able to make the case that the criteria were met, justifying the inclusion of BED in the soon-to-be-released DSM-5. The authors stated that there is limited evidence of inter-clinician reliability of BED and that they cannot claim this criterion as being met.

Although binge-eating episodes are common to both disorders, BED is distinct from bulimia nervosa in that individuals with BED do not exhibit compensatory behaviours following a binge-eating episode (APA, 2022). These compensatory behaviours can include purging activities such as vomiting, which is the most common, and the use of diuretics and laxatives (APA, 2022). Excessive exercising is also considered compensatory whether it be long-term, such as a months-long fitness regimen or short-term such as a single high-intensity workout (Vaz et al., 2001). These compensatory behaviours are the primary distinction between BED and BN.

Another important component of BED is the feeling of loss of control. A study by Pollert et al. (2013) showed that individuals experiencing binge-eating episodes were 3-4 times more likely to experience a sense of losing control than non-binge-eaters, regardless of negative affective states. The authors of this paper suggest that an effective treatment for binge-eaters should include interventions for both the problematic behaviour as well as dysfunctional cognitions. Since cognitive behaviour therapy is meant to address cognitions, clients with BED might benefit from this treatment. This point will be discussed in later section.

BED is a prevalent, standalone disorder that merits unique clinical and research attention. As stated, this study hopes to add to the growing literature to assist clinicians in the treatment of BED. The following sections will go into more detail about the relevant literature and how this study will contribute.

Triggers and Contributory Factors

Up to this point, the following arguments have been made: BED should be considered a standalone disorder; that BED is distinct from BN in that it lacks the compensatory behaviours (excessive exercise, purging behaviours and laxative abuse) characteristic of BN; and that there must be a feeling of loss of control on the part of the sufferer (APA, 2022). Given that BED is a unique disorder with its own features, it would be beneficial for successful treatment to have a better understanding of how BED episodes are triggered.

Understanding the factors that lead to binge eating is an important consideration for treatment. Loss of control and negative affective states have been discussed as separate important factors. It has been suggested in the literature that negative affect leads to a binge eating episode (Smith et al., 2022; Wonderlich et al., 2022) and the two factors may interact to trigger a binge eating episode. Dingemans et al. (2015) suggested that a negative mood might lower a person's threshold of control, making them more susceptible to a binge eating episode. It is possible that distress tolerance could be an important factor in the maintenance of BED. In their work, it was noted that, following a triggered negative mood increase via a film clip to induce sadness, participants with lower feelings of control and poorer task-shifting ability were more likely to report feelings of losing control while eating. The task-shifting element is important in that it speaks to the ability to stop oneself from over-eating and to engage in

healthier habits (Dingemans et al., 2015). In other words, it relates to executive functioning and its role in the maintenance of BED. In addition to a loss of control and executive function leading to binge-eating behaviour, the emotional states that follow binge-eating episodes are also an important consideration. The next section will present evidence of the internal and external factors that might lead to binge eating episodes. These factors can be both acute and chronic, meaning that they might be situational or part of the over-arching traits of the person.

It has been hypothesized that bingeing and purging behaviour is triggered by negative emotional states and that these behaviours are meant to alleviate negative moods (Polivy et al., 1984; Schnepper et al., 2021; Wedig & Nock, 2010). If it is true that unhealthy behaviours observed in eating disorders are a strategy to avoid uncomfortable emotional states, it is important to consider how eating disorders interact with mood disorders. For example, depression has been observed in BED patients more than in the non-BED population and other conditions have been reportedly comorbid with BED and depression including Type II Diabetes (Çelik et al., 2015). It is possible that negative moods brought on by other conditions may contribute to eating disorder symptomology. It is not clear how these comorbidities affect each other but it is worth noting that they occur. By addressing one or more with treatment, it is possible that overall improvements might be seen.

Since BED represents a pattern of behaviour, researchers and clinicians must not only understand what triggers it but also determine the factors that maintain its symptomology. Previous research has suggested that shame plays a large role in BED symptomology (Duarte et al., 2016; Edwards-Gayfield, 2021; Zeeck et al., 2011). As an example, Melo et al. (2020) demonstrated that both internal and external shame had a positive correlation with binge eating severity and that this was true for both men and women. Further, the authors also found evidence

of increasing internal and external shame following binge eating episodes, supporting the concept of a feedback cycle of shame and binge eating. More specifically, they discussed the role of cognitive fusion, that is the idea that internal and transient thoughts (thoughts that should pass quickly) and emotions become perceived as reality. In the context of binge eating, cognitive fusion refers to when an individual thinks something subjective about themselves and/or their eating and believes that thought to be a universal, objective truth. This is relevant because believing a distressing thought to be true might contribute to feelings of distress and, therefore, increase the frequency of binge eating episodes.

BED clients with depression are less able to cope with negative moods, increasing the likelihood that they will engage in binge-eating behaviour (Dingemans et al., 2009). It has been suggested that some individuals who engage in binge eating find themselves being triggered by increased negative affect and reach a “tipping point”, a term used by Lavender et al. (2016). This speaks to the idea that those who binge eat may experience lower distress tolerance than non-binge eating individuals. Lavender et al. (2016) reported that negative affect decreased following a binge eating episode and this distinguishes negative affect and depression from the shame associated with binge eating as discussed earlier. This suggests that the binge eating provides relief from the negative affect that triggered the binge episode but the binge eating itself brings about a new feeling of shame. Therefore, these elements must be dealt with separately.

If it is true that BED is affected by mood, emotions must be considered as well. In their study with patients seeking treatment for BED, Masheb and Grilo (2006) reported that binge eating episodes were significantly associated with emotional overeating triggered by anxiety, sadness, loneliness, tiredness, anger, and even happiness. There were also no gender differences reported in their study. It is, therefore, important to consider that if a person with a BED

diagnosis finds themselves feeling emotionally charged (either negatively or positively in terms of mood), their susceptibility for a binge episode is increased. If emotionally charged states can trigger binge eating episodes, coping ability in stressful situations must be an important factor in the maintenance of BED.

Anxiety has been theorized to be the result of uncertainty caused by internal conflict (Grupe & Nitschke., 2013). Escandón-Nagel et al. (2018) highlight the fact that individuals with BED have higher levels of cognitive conflict as defined by dilemmatic constructs and implicative dilemmas. In other words, these individuals are feeling that they are being presented with two subjectively unappealing courses of action. For example, a person may view themselves in an unfavourable way and desire change. They may, however, be afraid of what this change will require or be uncertain about the outcome and anxiety results from this conflict. This is an important concept to consider in the treatment of BED and therefore, the role of anxiety in the maintenance and triggering of binge eating behaviours should be investigated.

Anxiety has also been observed to play a large role in BED and it can be both a life-time current comorbidity of BED (Grilo et al., 2009). It has been suggested that anxiety can interact with BED as an acute state or a chronic trait. The phrases state-anxiety and trait-anxiety have been developed to describe these terms. In terms of BED and state-anxiety, Klatzkin et al. (2018) reported a positive relationship between stress-induced, or state, anxiety and larger snack servings. It should be noted that this anxiety was not significantly associated with actual caloric intake in the study; rather it was associated with an increased intention to consume more calories. This is to say that, according to this study, the increased state-anxiety may not have led to a binge eating episode, it agrees with other referenced studies that negative moods can contribute to a desire to overeat and lead to the previously discussed “tipping point”. With respect to trait-

anxiety, comorbid generalized anxiety disorder has been observed with BED (McElroy et al., 2013; Pawar et al., 2023; Peters et al., 2019). These findings demonstrate that both trait and state anxiety should be considered as potential triggers for binge eating behaviour.

Understanding behavioural cues and/or triggers for binge eating episodes is important for understanding the maintenance of BED and informing effective treatments. A significant relevant factor is a person's coping strategy in a stressful situation. In a study done by Boggiano et al. (2014) in both an undergraduate sample of 247 students and a clinical sample of 249 weight-loss seeking patients, "coping" as a motive for eating was associated with higher binge eating. To measure "coping", the authors gave a questionnaire with items such as, "How often do you eat these tasty foods to forget about your problems?". "Coping" was also associated with moderate/severe scores on binge eating questionnaires as well as increased BMIs in both groups. Understanding the behavioural cues that can increase state anxiety and lead to binge eating episode and coping styles for stress will be important factors in how a client might respond to treatment.

It has now been established that some people eat foods because they feel they need to "cope" with a problem they are experiencing. More specifically, what has yet to be clearly understood is whether people may engage in binge eating because of overarching, chronic depressed or anxious emotional states or whether they may be reacting to acute negative feelings or a combination of both. In a study investigating the interaction of acute states and chronic traits, Dingemans et al. (2009) observed the amount of food consumed between a clinically depressed group and a non-depressed sample of BED clients after watching a distressing film clip, and it was shown that both groups were equally affected by the clip in regard to their levels of distress and both groups experienced an increased positive mood following a taste test. Not

everyone in the groups were affected by the taste test equally however, and it was found that clients in the depressed group ate more food when they experienced a greater mood shift. The authors suggest that the increased food intake may have been a way for the participants to alleviate a state of unhappiness and that those who had been affected most by the change in mood, ate the most calories (Dingemans et al., 2009). This study suggests that people may eat more as a coping mechanism, regardless of negative affect, but may be more susceptible to increased intake if they were already experiencing depression. The results of the study lend support to the idea that a temporary negative mood state can be alleviated by eating and this can be affected by a chronic trait of persistent negative, low mood patterns such as pessimistic thinking patterns leading to depression. Coping, and its relationship with depression, is therefore an important factor in the maintenance of BED.

Several factors that maintain and contribute to BED have been discussed in this section. These include depression, anxiety, state and trait dispositions, and coping ability. A more in-depth review of how these elements may be addressed in the treatment of BED will be discussed in the next section.

Binge Eating Symptom Reduction and Treatment

Up to this point, the factors that maintain and contribute to BED have been discussed. This section will address the factors that reportedly help reduce BED symptomology and discuss possible treatments for the disorder.

Shame and guilt have been discussed as factors that potentially trigger BED. Research involving guilt and shame surrounding body image and weight has suggested that having a better understanding of one's eating habits can reduce the impact of this shame on binge eating

behaviours (Craven & Fekete, 2019). Specifically, “intuitive eating” refers to giving permission to oneself to eat when hungry rather than in response to an emotion (Craven & Fekete, 2019). Indeed, people who binge eat tend to show higher levels of weight-related stigma and treatments would be wise to address this (Palmeira et al., 2018). Therapies treating BED should help clients distinguish between subjective and objective truths about themselves and help them develop the self-awareness needed to engage in intuitive eating.

Binge eating episodes that characterize BED involve a combination of negative affect and cognitive distortions (Brownstone et al., 2013) and CBT is meant to help clients become aware of and combat cognitive distortions. There is literature to support the use of CBT in treating those with BED. As mentioned, Palmeira et al. (2018) suggest that binge eating needs specific interventions that target weight self-stigma, which was observed to be higher than in people who did not binge eat. Since CBT is useful in treating problematic cognitions, it could be used to help clients reduce the thinking errors that contribute to self-directed stigma and negative self-talk.

Based on literature, the use of CBT is warranted for the treatment of BED. Research suggests that CBT is more useful than some other forms of treatment and clients enrolled in either individual or group CBT programs for BED show significant improvement over those on a waitlist, as pointed out in a meta-analysis by Linardon et al. (2017b) that included studies conducted on CBT, non-CBT, and pharmacological interventions with randomized control trials. Other evidence is presented by Brownley et al. (2016), in their review of binge eating literature, who reported that CBT does improve BED symptomology when compared to waitlisted clients or those receiving a placebo. Not only this but using an inappropriate form of treatment has been seen to make symptoms worse. Specifically, in their review of cognitive treatments of eating disorders Södersten et al. (2017) found CBT to be more useful than psychoanalytic therapy in the

treatment of eating disorders to the extent that the latter was reported to make symptoms of disordered eating in clients with bulimia worse. It is therefore crucial to use appropriate treatment when addressing disordered eating.

Fairburn et al. (2003) have noted several elements of BN and AN that are addressed by CBT. They found that individuals with eating disorders evaluate themselves more than others in terms of body image and eating habits. In other words, they are more likely to judge themselves more harshly than they would judge others. They also noted that binge eating episodes are “products” of clients’ efforts to restrict eating and, therefore, can increase the self-stigma, shame and subjective distress, potentially leading to further binge episodes. This supports the conclusions of Dingemans et al. (2007) who reported that higher levels of emotional reactivity predicted higher eating disorder psychopathology. Fairburn et al. (2003) posit that bingeing episodes are triggered by lapses in clients’ self-imposed dietary rules. This is similar to the “tipping point” where a person will no longer be able to tolerate negative affect and engage in disordered eating, as discussed by Lavender et al. (2016). Finally, Fairburn et al. (2003) discuss mood tolerance and describe clients with eating disorders inability to cope with emotional states. This is a concept that has been discussed at length in the literature. The principles of CBT state that moods are influenced by cognitions and these cognitions are often flawed (Burns, 2000), CBT would therefore be an appropriate therapy for BED.

It is important for clinicians to be aware of what cognitions should be highlighted and targeted when using CBT. As has been discussed above, increasing a person’s intuitive eating (Craven & Fekete, 2019) and reducing emotional eating would be a wise objective for CBT clinicians. Dingemans et al. (2009) caution that clinicians should also be aware of how severe depressive symptoms can affect BED. These authors report that mood swings can cause

individuals to consume more food during a binge eating episode. The authors make the claim that overeating *may* be a way to repair negative mood, but they do not report that an absence of negative mood means an absence of binge eating. This suggests that while reducing depressive symptoms might decrease the amount of food consumed during a binge episode, it might not eliminate binge eating behaviours altogether.

While clinicians ought to be aware of this depressive side of BED and other eating disorders, it is important to note that treating BED with CBT may not alleviate depressive symptoms. As noted in Brownely et al. (2016), CBT alone reportedly did not reduce depressive symptoms and the best approach for BED treatment was a combination of CBT and pharmacological treatments according to their meta-analysis. If left untreated, the symptoms of depression might increase the likelihood for a client to relapse. These authors suggested that the trials reviewed in their meta-analysis involved participants with low-level mood symptoms and that the CBT treatment focused on eating-related cognitions and behaviours rather than depressive cognitions and behaviours. These studies are important because they suggest that different styles and therapeutic goals can affect the outcomes of treatment for clients with BED. Depressive symptoms, eating related cognitions and disordered eating do not operate in a vacuum; they interact. This interaction might influence treatment dropout, success, and disorder relapse. Therefore, understanding how these factors might be interacting will be discussed.

It is important to consider the presence of a causal relationship between emotional and cognitive symptoms and disordered eating. Södersten et al. (2017) suggested that emotional and cognitive symptoms are caused by disordered eating in clients with anorexia and bulimia, while other research suggests the reverse is true (Duarte et al., 2017) and some suggest negative feelings and disordered eating exist in a cyclical relationship (O’Loughlen et al., 2021). It is

possible that some form of causal relationship could exist in BED. Indeed, Södersten et al. (2017) suggest that the success of CBT for treating BED could be improved by shifting the focus of the interventions to the behavioural side, in other words the disordered eating. Reducing these behaviours could be a better way of addressing the depressive symptoms that might be caused by disordered eating (Södersten et al. 2017). However, other research suggests that only focusing on behavioural interventions is not as effective as CBT (Munsch et al., 2007). More research is needed to examine the relationship between these mood symptoms, the cognitive eating symptoms and binge eating behaviours that may influence the success rate of CBT.

Brownley et al. (2016) report that both therapist-led and guided self-help forms of CBT were consistent in improving many aspects of BED including cognitive control over hunger and eating and worry concerning shape and weight. Concerns of anxiety and worry must also, therefore, be considered in the treatment of BED. In terms of other eating disorders, CBT has been found to be effective in treating anorexia and bulimia and in one study it was noted that those who did not complete treatment were higher in self-reported anxiety (Knott et al., 2015). Further, Moore et al. (2021) showed that successful use of CBT for BED significantly reduced anxiety and depression on self-report measures. It is of note that the most significant changes in the symptoms occurred within the first 4 weeks of the 10-week course of CBT. These results seem contradictory to Södersten et al. (2017) who argued that it was more important to target the behavioural symptoms of disordered eating than the cognitive symptoms alone using CBT. As it relates to the current study, it is important for researchers and clinicians to be aware that focusing on different elements of treatment (i.e., the behavioural or the cognitive) can affect the effectiveness of treatment of BED and this will be discussed in a later section.

The case has been made that CBT is warranted because it addresses several elements of BED. These elements are behavioural symptoms such as disordered eating, depression, shame and guilt, and cognitive symptoms involving eating behaviours. Specifically, it has been argued that binge eating episodes are characterized by cognitive distortions, that the behavioural symptoms of disordered eating are influenced by negative affect and mood and that CBT is able to address these elements. In other words, CBT is meant to help clients notice and avoid making cognitive errors, and reduce depression, shame and guilt which lead to disordered eating and thereby reduce disordered eating.

The reduction and treatment of disordered binge eating has been discussed. Specifically, it has been argued that CBT is an effective and appropriate method for the treatment of BED and the cognitive distortions, mood changes, and weight concerns that affect disordered eating symptomology. Understanding these factors will help explain how and why clients might improve in psychopathology, such as depressive and anxious symptoms and eating disorder symptomology, after CBT. The next section will address how not all clients successfully complete treatment and what factors might influence these rates.

Factors of Treatment Dropout

Several factors can influence the success of CBT for eating disorders. Dingemans et al. (2007) noted several mediators of treatment success. The authors stated that abstinence from binge eating was mediated by decreases in restraint from eating and concerns about body weight, body shape, and eating behaviour during CBT treatment. It was also noted that seeking distraction such as smoking, drinking and/or relaxation was predictive of less favourable outcomes in treatment (Dingemans et al., 2007). In other words, these distraction-based coping

strategies were associated with less improvement in eating disorder symptomology and the clients with less emotional reactivity saw more improvement in terms of their eating disorders. This seems to support the idea that people engage in binge eating behaviours to escape a negative mood. Since negative affect is observed to abate following a binge (Lavender et al., 2016), they may find that eating is a more pleasant distraction than smoking or drinking. Because they are not able to address why they feel the need to escape a negative feeling, the behaviour is only a temporary measure.

After the introduction of CBT as a method of therapy, studies began examining its efficacy and what possible factors might be useful in predicting either client success or dropout. Persons et al. (1988) offered an “equation” for CBT dropout based on a study of 70 adults seeking treatment for depression. It was observed that the presence of a personality disorder and higher Beck Depression Inventory scores were both associated with an increased likelihood of treatment dropout. Age, gender, employment, use of drugs and alcohol were not considered to be significant factors in predicting dropout rates. A recent study, however, has observed that substance abuse was a significant predictor of CBT dropout when treating ADHD (van Emmerik-van Oortmerssen et al., 2020). Concurrent personality disorders have also been identified as a possible predictor of dropout (Schindler et al., 2013). Given that dropout factors for CBT have been identified in a general sense, narrowing the focus to treatment dropout among eating disorder populations is warranted. Research addressing eating disorders and factors that affect dropout rates from their treatment will now be discussed. Looking at these will give a better insight to factors that would affect treatment dropout rates.

Dropout factors have been examined more specifically in eating disorders. The rates at which clients remain in treatment or drop out vary. Studies report retention rates that include

approximately 60% (Graham & Walton, 2011; Walsh et al., 2004), 24% (Linardon et al., 2018) and 15% (Levallius et al., 2020) as examples. Reasons for this attrition were varied in this study between those who felt treatment was too rigorous and those who felt treatment was not rigorous enough. As previously stated, Södersten et al. (2017) suggest that CBT is more successful when focusing on the behavioural aspects of problematic eating rather than the cognitive symptoms (such as attitudes about eating and bodyweight) alone, noting that fewer clients receiving behavioural therapy dropped out of treatment than those participating in CBT. It should be noted that Södersten et al. (2017) were referencing a study by Freeman et al. (1988) who originally reported that, although fewer participants dropped out of the CBT group, the difference was not significant (11 dropouts compared to 5). Regarding other reasons for attrition, Gregertsen et al. (2019) reviewed studies examining treatments for AN and reported that having lower motivation to get better in therapy, lower BMI and being of a binge-purge subtype was predictive of higher dropout. Other pre-treatment variables have been noted such as higher psychopathology in clients being treated for AN and BED (Fairburn et al., 2013; Lammers et al., 2015; Linardon et al., 2017a). In this context, general psychopathology refers to levels of agoraphobia, anxiety, depression, somatisation, distrust, hostility and sleeplessness as measured by the Symptom Checklist 90 (Lammers et al., 2015). It is clear there are specific, and varied, factors influencing the treatment of eating disorders.

Therapy success and dropout rates for multiple eating disorders have been examined. In their examination of AN patients and therapy dropout, Fairburn et al. (2013) interpreted the higher eating disorder symptomology at dropout as being indicative of a need for more urgent care. Specifically, this was defined as a body mass index below 16.5. A possible explanation for increased eating disorder pathology in BED leading to dropout is that higher levels of shame

contribute to binge eating severity (Melo et al., 2020). Higher levels of shame and weight-related concerns are also associated with binge eating symptomology (Craven & Fekete, 2019). If a person is feeling increased shame, guilt and are self-conscious, it may be possible that they are experiencing social isolation. Indeed, believing oneself to be socially isolated is associated with binge eating behaviour (Mason et al., 2016) and lower social involvement has been observed in patients who drop out of therapy (Vroling et al., 2016).

Other literature reports that there are pre-treatment variables such as demographic information, including “age, sex, marital status, employment status, socio-economic status, level of education, race, distance travelled to clinic, number of children, availability of transportation and childcare resources, and previous experience of psychiatric treatment” (Mahon, 2000 p. 205) and scores on the Beck Depression Inventory and State-Trait Anxiety Inventory (Dalle Grave et al., 2008) that were not significant predictors of therapy attrition. These studies examined patients seeking treatment for eating disorders prior to the inclusion of a BED in the DSM. These included AN, BN, and EDNOS. While Mahon (2000) reports pre-treatment data such as demographics such patient characteristics, and personality, and previous diagnoses do not appear to be strongly related to dropout, the data highlight that childhood trauma, such as parental separation, was predictive of dropout for BN and Dalle Grave et al. (2008) found similar results in their study. Similar to literature on BED, there is research suggesting that eating disorders are influenced by personality disorders (Park et al., 2014). It should be noted that in contrast to research already discussed, Park et al. (2014) report on cluster C personality disorders and report that eating disorder attitudes closely resembled these disorders. These include those disorders that are avoidant, obsessive-compulsive, and dependent (APA, 2022). These authors report that those higher in dependent personality traits dropped out of treatment prematurely and observe

that there were no significant differences in scores on the Eating Disorder Examination Questionnaire (EDE-Q) between patients that dropped out of CBT and those who did not. Taken together, these results suggest that there are commonalities to the factors (or lack thereof) that predict therapy drop-out of BED and other eating disorders.

Other factors have been observed to influence therapy success. In a review of BED literature, Dingemans et al. (2007) note that the presence of Cluster B personality disorders predicted higher levels of binge eating at a 1-year follow-up after treatment. Cluster B personality disorders include antisocial, histrionic, borderline, and narcissistic personality disorders and involve subjective distress and maladaptive behaviours in interactions with other people (Kraus & Reynolds, 2001). Wilfley et al. (2000) suggest that the reason that clients with Cluster B personality disorders might relapse into binge eating behaviours is that these clients find themselves in distress often (both subjectively and objectively) and that this distress may make binge eating more likely to occur. There is little literature to explain how these diagnoses might predict therapy dropout among clients with BED. It is clear that eating disorder factors are complex and research is merited.

Few studies have been done to examine specific predictors of CBT dropout for BED. One such study by Vroling et al. (2016) examined a population in a single institution and observed that higher eating disorder pathology, lower agreeableness, higher preoccupations of eating, body shape and weight, and a lack of social embedding were predictive of dropout. A person is said to be socially embedded when they live with a family, or are in a relationship (Vroling et al., 2016). In other words, they have more social ties than those who are not socially embedded. In contrast to other research, these authors found no evidence of general psychopathology, such as depression, to be predictive of dropout. Although it may appear overreaching to suppose that

general trends might apply from one eating disorder to another, there is evidence to suggest that CBT dropout rates are similar between eating disorders (Agüera et al., 2013).

Although BED has been considered a standalone disorder in the DSM-5 since its publication, very little research has been done to examine factors that may be predictive of dropout during CBT. Whereas the factors that predict treatment success in CBT and eating disorders have been studied separately, there seems to be little literature to bring these two concepts together. This study hopes to develop this link and to build on the work of Vroling et al. (2016) who stress the importance of having similar studies completed in different care settings. The current study will investigate CBT treatment of BED in a Northern Ontario hospital setting. As such, this study will be unique in that it will help address the questions of treatment for eating disorders and will speak to a unique population in a unique setting.

Is Treatment Successful?

Having established background research on therapy dropout, it is important to discuss treatment success as a separate consideration. This is because a person seeking treatment may not necessarily experience relief from their problems even if they remain in treatment. Therefore, factors influencing treatment success are worth discussing. The success of treatment is dependent, in part, upon how people respond to it and how it leads to adaptive change in a client's life. Several studies have examined short-term and long-term success rates of CBT by reporting remission and/or relapse rates of clients. For the purposes of this discussion, the focus will be on studies investigating eating disorders. The ability of CBT to treat eating disorders appears to be effective as discussed in previous sections. With an understanding of the varied

rates of success of CBT for BED, it is worthwhile to examine the factors that might influence these rates and what successful treatment looks like.

As stated, the success of CBT for binge eating clients is varied. Hilbert et al. (2012) observed a 52% remission rate among BED clients following CBT treatment and 72% of these were to subclinical levels. In other words, about half of these clients experienced a loss of binge eating symptoms and most of those people were comparable to those who did not meet the criteria for BED. The authors go on to say that there was a “significant tendency to relapse” (Hilbert et al., 2012, p. 236) among those in the CBT group such that 80% of the participants who had recovered from experiencing bulimic episodes following treatment had been reduced to 30% at long-term follow-up. Further, the authors report that other psychological symptoms, such as depression and anxiety as measured by subscales of the Brief Symptom Inventory, also increased relative to their levels immediately following treatment.

While the previous study suggests that efficacy for CBT is low as defined by a tendency to relapse, there is evidence suggesting otherwise. Fischer et al., (2014) found a 66% increase in binge eating abstinence at a four-year follow up (the same definition of “long-term” as used by Hilbert et al., 2012). Further, where the Hilbert et al. (2012) study showed psychopathology worsening, Fischer et al. (2014) showed a decrease in depressive symptoms. It should be noted that in the Fischer et al., (2014) study, the clients received “booster sessions” of CBT following their primary treatment. It is possible that these differences are due to clinician styles and methods, individual differences among the clients themselves and several other factors. Further, in the already inconclusive work on CBT efficacy for BED, there appears to be little research comparing post-treatment clients who have gone through CBT treatment compared to non-clinical samples. It is clear that the evaluation of client success, when compared to non-clinical

populations in terms of symptomatology, is an important consideration. It will be addressed in the current study.

Beyond understanding how much people can be expected to benefit from CBT treatment for BED, it is useful to compare those who are in treatment for BED to those who are not, such as those on a waitlist. On this point, research findings evidence some support for the idea that some treatment is better than none (Linardon et al., 2017b; Munsch et al. 2019; Schlup et al., 2009). For example, Dingemans et al. (2007) noted that abstinence from binge eating episodes was significantly higher among those enrolled in CBT for BED (63%) than it was for those on the waitlist (18%). Further, Gorin et al. (2003) compared patients under active CBT treatment for BED to those in a wait-list control group and found that those in the treatment group showed significant improvements in eating psychopathology, depressive symptoms and self-esteem. In other studies, improvements have been observed with other forms of treatment including guided self-help dialectical behaviour therapy (Masson et al., 2013), mindfulness-based eating awareness training (Kristeller et al., 2014), and self-compassion training (Kelly & Carter, 2015). The results of these studies add to the body evidence in support of the idea that treatment for BED is more beneficial to a sufferer than no treatment at all.

The Current Study

There are two research questions that this study hopes to answer: Could factors that predict therapy dropout be found in the pre-treatment measures completed by a BED population and whether eating behaviour and psychometric personality changes will occur during the treatment. As stated in the previous section, there is little literature addressing how post-treatment clients compare to non-clinical controls. There is, however, research to support the use

of treatment compared to waitlisted clients, and it would be useful to determine whether post-CBT clients are significantly different compared to a non-clinical control group. Furthermore, investigating this will contribute to the literature on treatment effectiveness.

This study's first research question hopes to determine what factors in the pre-treatment testing may have influenced these clients' treatment termination. This will be useful for clinicians hoping to spot "red flags" that could help them keep more of their clients in treatment. Secondly, this study hopes to contribute to the inconclusive literature covering the efficacy of CBT for binge eating disorder. It has been shown that treatment in many forms is better than no treatment at all for clients with BED, but how much they improve compared to non-clinical symptomology is unknown. Understanding how much a client can hope to improve in treatment may increase their motivation to remain in that treatment, further reducing therapy dropout and increasing the effectiveness of care. Based on the literature already discussed, it is expected that differences in scores on psychometric tests will be predictive of this outcome. Specifically, it is not expected that higher depression alone will predict higher treatment dropout (Lavender et al., 2016; Linardon et al., 2017a; Vroling et al., 2016), but that increased eating disorder symptomology will predict an increase in treatment dropout (Fairburn et al., 2013) as will increased general psychopathology, in other words mental health disorder symptoms such as increased self-reported symptoms of anxiety (Dingmans et al., 2007) and depression (Dingmans et al., 2007; Schindler et al., 2013). It is also expected that if self-reports do not reflect a change in disordered eating behaviours and increased wellbeing early in treatment, the likelihood of dropout will be higher (Schindler et al., 2013).

The second research question is whether scores on psychometric testing will be significantly different between before and after the treatment period and whether there will be a

difference between the clinical and control groups' scores. While it is true that there is some improvement for binge eating clients following CBT (Wilson et al., 2010), it is not clear if the clients are still considered clinically elevated. As has been discussed, there is a lack of consistent research to say whether general psychopathology will decrease. Further, the literature does not focus on comparisons to those who are not in need of clinical intervention.

It is expected that depression, anxiety and eating disorder scores will go down and become more comparable to the control sample. It is expected that bingeing episodes will decrease, and it is expected that clients will experience less restricted eating. It is also expected that participants in the clinical group will endorse distraction as a form of coping at the beginning of treatment and less so at the end. This latter point could be a source of potential confound however as the measure for coping in this study does not distinguish between different forms of distraction as a method of coping. It would be possible that the clients are using food less but have found other ways to distract themselves from stress such as substances or relaxation methods (Dingemans et al., 2007).

II. METHODS

This research hopes to determine if the scores on pre-treatment psychometric tests were significantly different between those clients who remained in treatment and those who did not. It also hopes to determine the difference in scores on these tests between the clients who completed treatment in a northern Ontario hospital setting and a non-clinical population sampled from Laurentian University students. The research involved a mix of primary and secondary data. The primary data were collected from the non-clinical sample and the secondary data were gathered

from a hospital in Sudbury, Ontario, Canada. Lastly, the study data will be quasi-experimental in nature.

The research questions will be answered by analyzing the data from a group of clients at Health Sciences North (HSN) in Sudbury, Ontario and a control group recruited from the student body of Laurentian University. Twenty-four clients took part in CBT courses at the Eating Disorders Program. Each of the clients were given a series of psychometric tests and were to complete these measures before and after the completion of the CBT program. The clients were also to complete a weekly symptom checklist that tracked their adherence to meal plans, exercise habits, bingeing and purging occurrences, and general and mental wellbeing. Sixteen of these clients remained with the program to completion while the others did not complete or did not turn in their post-treatment psychometric tests.

This study relies on a mix of previously collected secondary data and primary data. The secondary data were collected by clinicians at HSN while conducting a 20-week course of group cognitive behavioural therapy with clients living with BED. At the beginning of treatment, clients filled out psychometric tests to measure levels of depression, anxiety, styles of coping with stressful situations and eating disorder symptomology. These measures were repeated at the end of treatment. Clients were also tracking their eating disorder symptomology using weekly checklists developed by a clinician from McMaster University. The current study is making use of this data with permission from HSN. The primary data for this study is being collected from Laurentian University students. To maintain consistency and comparability, the same measures chosen by clinicians at HSN to study their clients will be used to collect the primary data. The psychometric tests are used with permissions from the respective publishers. The weekly symptom checklist is also used with permission from the original developer.

Collecting primary data on eating disorder symptomology for the non-clinical group from Laurentian University is of special importance. One of the research questions is whether clients who successfully completed treatment improved in their symptomology and, if so, whether they are comparable to a non-clinical control group in their symptomology. To this end, before administering questionnaires for anxiety, depression, and coping styles, eating disorder symptomology will be measured in the control sample. Those whose scores are similar to the pre-treatment scores of the clinical group will be screened out of data. The data collection prior to the screening process will be referred to as Study 1, and the data collection after the screening process will be referred to as Study 2. The specific psychometric tests will be discussed in more detail in the following section.

Measures

The tests used by the HSN clinicians were the Beck Depression Inventory-II (BDI-II; Beck et al., 1996), the State-Trait Anxiety Inventory (STAI; Spielberger et al., 1983), the Coping Inventory for Stressful Situations (CISS; Endler & Parker, 1990), and the Eating Disorders Examination Questionnaire (EDE-Q; Fairburn & Beglin, 1994).

The Beck Depression Inventory-II has 21 items and is used to quantify the construct of depression. Each item is measured on a 4-point scale (from 0-3) to indicate severity of symptomology. Total scores range from 0-63 with a higher score indicating higher levels of depression and the test has shown high internal consistency and validity (Dozois et al., 1998). The BDI-II has been frequently used in research involving binge eating disorder (Kuehnel & Wadden, 1994; Ricca et al., 2009; Udo et al., 2015). It is interpreted using three categories based on a respondent's score: Minimal (0 –13), mild (14 – 19), (20 –28), and severe (29 – 63). These

values were retrieved from Beck et al. (1996). Permission was given to the researchers by Pearson, the publishers of the BDI-II, for use in this study with the non-clinical group. As noted, Health Sciences North administered the BDI-II to the clinical group under their own usage licence. To maintain the integrity of the protected test, non-clinical participants completed the BDI-II through a secure link on Pearson's online platform Q-Global. The researchers were able to download the results and add them to the data file.

The State Trait Anxiety Inventory is a 40-item self-report measure (Speilberger et al., 1983). It consists of 20 items that measure state anxiety (anxious feelings that are felt in the present moment) and 20 items that measure the construct of trait anxiety (anxious feelings that are more pervasive in a person's overall personality). Each item is rated on a 4-point scale with higher scores indicating higher anxiety in both subscales. Test-retest reliability and validity are reportedly high (APA, 2011); however, it should be noted that the State factor has somewhat less reliability (Julian, 2011). This is to be expected given that it is related to a scale meant to measure a construct that is highly dependent on "being in the moment". The STAI has been widely used in research and is appropriate for comparing samples that are healthy or clinically elevated (Julian, 2011). The STAI has also been used when conducting research with binge eating disorder (Izydorczyk, 2012; Matos et al., 2002; Vinai et al., 2015). The STAI has been exactly reproduced for use in this study with the explicit permission of the publishers, Mind Garden. Participants filled out the STAI as the first part of the second study after initial screening in Study 1.

The Coping Inventory for Stressful Situations-Adult (CISS-A; Endler & Parker, 1990) is a 48-item self-report questionnaire that assesses different methods of coping. The measure is composed of 5 different coping strategies: emotion, task, social, avoidance and distraction. Each

item is scored on a Likert Scale from 1-5, with 1 being “Not at all” and 5 “Very Much”. The CISS-A has demonstrated good reliability and validity (McWilliams et al., 2003) and has been used in eating disorder research. While little research has been done using the CISS-A in binge eating disorder specifically, the CISS-A has been used to evaluate coping styles in the binge-type of bulimia nervosa (Nagata et al., 2000). The CISS-A has been exactly reproduced as a virtual self-report measure for participants in the control group that were invited to partake in Study 2 after being screened in Study 1. Appropriate permissions were given to the researchers by MHS Assessments, the publishers of the CISS-A.

The Eating Disorder Examination Questionnaire (EDE-Q) is a 28-item self-report measure which asks respondents to focus on the last 28 days when answering the items (Fairburn & Beglin, 1994). There are 4 four subscales to measure eating disorder symptomology: restraint, eating concern, shape concern, and weight concern to which individuals respond using a scale ranging from 0 (Not at all) to 6 (Markedly). The four subscales of the EDE-Q have been shown to have high internal consistency and test-retest reliability (Berg et al., 2012; Luce & Crowther, 1999) and the measure has been shown to reliably distinguish between those who do and do not have an eating disorder (Berg et al., 2012). The EDE-Q is reportedly useful in assessing objective binge eating episodes and attitudes of eating disorders in patients with BED but less useful when reporting subjective binge eating episodes (Reas et al., 2006). When compared to other measures of binge eating behaviour, it was found that items from the EDE-Q were best at assessing the frequency of binge eating episodes (Celio et al., 2004). It should be noted that Celio et al. (2004) point out that, while the EDE-Q is useful in assessing binge eating behaviours and frequency, it cannot be used to diagnose BED as the measure only focuses on the past 28 days of a respondent’s experience.

The weekly symptom checklists asked participants about the frequency of certain behaviours. These included if and, as applicable, how often they engaged in binge eating behaviour, weighed themselves, engaged in planned physical exercise, and engaged in non-structured physical activity such as walking, taking the stairs etc. This checklist is comprised of questions taken from a larger checklist to measure disordered eating symptoms. Questions more related to bingeing and purging behaviours were retained and more clinical questions such as how often a respondent communicated with their nutritionist were removed.

Data Collection

This study makes use of previously collected data and newly collected data from a non-clinical control group. While some research uses non-clinical normative data, the current study makes use of a non-clinical control group. There are advantages to this including having a sample from a similar geographical location as the clinical group, and the fact that since normative data is typically gathered at a single point in time (Cambridge Cognition, 2016).

There is much research that makes use of smaller non-clinical control groups rather than large samples of non-clinical normative data. For example, Wald et al. (2020) made use of community recruiting of non-clinical participants for comparison with children with anxiety. More relevant to the current study, Shorey et al. (2013) sampled data from pre-existing patient records of a substance use treatment program and from a non-clinical control group of undergraduate psychology students at a proximal university with significant comparisons. More relevant still, Kaufman (2015) studied eating disorder symptomology in a clinical group and recruited a non-clinical control group using the SONA program at a local university. The use of non-clinical control groups has been used as criteria for inclusion in a meta-analysis of eating

disorder studies (Smith et al., 2018). It is clear that the use of a non-clinical control group is common practice in the literature and the methods of the current study are within accepted practices.

The non-clinical control group was recruited by advertising the study on Laurentian University social media pages, as well as on the university's SONA site that included 23 undergraduate psychology courses at the time of recruitment for this study. The study was advertised as investigating "eating disorders and cognitive behaviour therapy". A notice was included to advise individuals who experience disordered eating not to enroll. Students' participation was compensated using course credit awarded through SONA. Each part of the study had a course credit assigned to it for participation.

Regardless of how they heard about the study (Laurentian social media or Sona), the non-clinical participants were instructed to use their Laurentian University SONA accounts to locate the study and participate in Study 1 which was open to all. Social media advertisements consisted of 2 posters: one explaining the study in simple terms and how participants would be compensated and another listing mental health resources. In all descriptions of the study on social media and on SONA, it was explained that individuals that experience disordered eating were not advised to participate in the study. This was done to ensure a proper non-clinical sample, as well as to avoid potentially distressing individuals with disordered eating by highlighting their behaviours. The list of mental health resources was included as a safeguard for this reason.

In Study 1, participants filled out an informed consent following which they were asked to provide some demographic data, such as birthdate, gender identification, and an email address to be contacted for the second part of the study. They also completed the EDE-Q that allowed the

researchers to screen for disordered eating. Any individual who obtained a Z-score of +2 or more, when compared to normative data, was considered elevated in eating disorder symptomology and was not invited to participate in Study 2. Of those who were deemed eligible based on this, 40 were initially randomly selected to participate in Study 2. This sample size was chosen because it is comparable to the sample size from HSN. The non-clinical sample was also larger than the HSN sample by 15 to account for those who did not respond to the Study 2 invitation or did not complete all measures. These randomly selected non-clinical participants were contacted through SONA using the participant list generated from Study 1. Participants were given instructions and a unique participation code using the first three characters of their email address and the digits from their birth year and month to complete Study 2.

In Study 2, participants were asked to complete the remaining psychometric tests that included the STAI, CISS-A and BDI-II. The STAI and the CISS-A were completed as REDCap surveys. The BDI-II had to be completed on a protected platform as per the instructions from the publishers. In the invitation to Study 2, participants were given an individual secure link to the Q-Global platform to complete the BDI-II and the data was retrieved from there by the researchers. In the initial phase of Study 2, the participants also completed the first of three weekly eating symptom checklists on REDCap. SONA would then distribute the second of these seven days later followed by the third seven days after it. Three Amazon gift cards, each with a value of \$50.00 CAD, were offered as incentives for participation. Each participant from both studies were converted into an integer and three winners were chosen by a random number generator.

Existing Data

Existing data for the clinical group were gathered by a clinician formerly of the Eating Disorders Program at HSN in Sudbury, Ontario. Permission was sought and granted in accordance with the Privacy and Confidentiality policies of HSN and all mental health clients were de-identified prior to researcher access. The data consisted of clients' age, marital status, gender identification, body mass index before and after treatment, weekly scores on eating symptom checklists, and pre- and post-treatment scores on the psychometric tests discussed above. The data from the psychometric tests were converted, as discussed in *Data Transformation and Analysis*, as per the publisher's manual for each respective test.

Data Transformation and Analysis

The data was transformed according to each measure's respective manual from its publishers. The STAI was transformed into percentiles, the CISS-A into t-scores, and the EDE-Q into z-scores. These standardized data were used when the scores of different sub-scales from the same test were compared. For example, when the Task and Emotion scales of the CISS-A were compared to each other, the standardized scores were used for analysis. One-sample t-tests for comparisons to normative means, independent samples t-tests, repeated measures ANOVA and MANOVA tests, logistic regression, stepwise multiple linear regression, and Kruskal-Wallis analyses were used throughout this study. How and when each test was used will be discussed in more detail in the Results section.

III. RESULTS

Demographics of the HSN Clients

In terms of demographic variables of the clinical group, there was a total of 24 clients from Health Sciences North. The youngest participant was 17 years old and the oldest was 63. Eight identified as single, nine as married, two in common law relationships, one as divorced, three as separated, and one who did not disclose their marital status. Three participants identified as men, and the other 21 identified as women. Finally, eight of the participants did not complete treatment, and 16 completed the treatment. Of these 16 who completed, only one identified as a man.

Demographics of the Control Group

The control group was sampled from Laurentian University via the SONA system and university social media. For Study 1, 75 students participated. Of these, 62 identified as women, 11 identified as men, one identified as non-binary and one did not disclose. The mean age of the participants was approximately 24 years with the youngest participant being 18 and the oldest 56 (SD = 8.38)

For Study 2, 13 participants were screened out of Study 1 for having EDE-Q Global Z-scores 2 or higher. Of the remaining 62 participants, 40 were randomly selected using a random number generator. Of these 40, 33 identified as women, 6 as male and 1 as non-binary. The youngest participant was 18 and the oldest was 56 (SD = 8.85).

Pre-Treatment Psychometric Scores as Predictors of Therapy Dropout Among the Clinical Sample

Logistic regression was used to analyze the relationship between treatment dropout (called “Completion status”) and all predictor variables in the same analysis. These included pre-treatment scores on the STAI subscales, CISS-A subscales, EDE-Q subscales, the BDI-II and pre-treatment “binge days” per week and “binge times” per episode. A significant model was not found ($B = 0.693$, $SE = 0.50$, $Wald = 1.922$, $p = 0.166$, $Exp(B) = 2.00$), with none of the variables acting as predictors. The implications of this result will be discussed in the next chapter.

Pre-Treatment Psychometric Scores as Predictors of Binge Eating

Multiple linear regression was used to analyze the relationship between the pre-treatment psychometric test scores and binge eating “times” and binge eating “days”. Binge eating “times” are defined as the number of binges in a self-reported, subjective binge episode. Binge “days” is measured by the number of days in each week that a self-reported, subjective binge occurred on. With each analysis, pre-treatment scores on the STAI subscales, CISS-A subscales, EDE-Q subscales, the BDI-II and pre-treatment BMI were used as predictors.

For binge times, starting with possible predictors mentioned above, the forward stepwise linear regression revealed that scores on the EDE-Q eating concern subscale and BDI-II were selected as potential predictors. The stepwise analysis revealed a significant model for binge times with these two predictors ($R^2 = 0.512$, $F(2, 13) = 6.812$, $p = 0.001$, $F^2 = 1.024$) The fitted model was: $Binge\ Times = -40.309 + 8.460(EDE-Q\ Eating\ Concern) + 0.863(BDI-II)$. In other

words, the more a person was concerned about their eating habits and the more depressive symptoms they showed, the more likely they were to binge eat more often.

For binge days, the same variables were used. The forward stepwise linear regression revealed that scores on the EDE-Q eating concern subscale and CISS-A emotion subscale were selected as predictors. The stepwise analysis revealed a significant model for binge times with these two predictors ($R^2 = 0.556$, $F(2, 17) = 10.625$, $p = 0.001$, $F^2 = 1.119$) The fitted model was: $\text{Binge Days} = -30.746 + 0.578(\text{CISS-A Emotion}) + 2.957(\text{EDE-Q Eating Concern})$. In other words, a person would binge eat on more days in a week if they were more likely to emotionally cope with stress and be concerned about their eating habits.

Self-Reported Symptoms Before and After Treatment

Eating Disorder Symptomology

The Eating Disorders Examination Questionnaire (EDE-Q) is a self-report test to measure eating disorder symptoms. A repeated measures MANOVA was used to test the hypothesis that CBT treatment would significantly reduce self-reported eating disorder symptoms on the EDE-Q. In the repeated measures MANOVA, the EDE-Q unstandardized scores from before and after treatment were compared. The overall MANOVA was found to be statistically significant ($F(4, 9) = 10.836$, $p = 0.002$, $\eta_p^2 = 0.828$). This result supports the hypothesis that CBT significantly reduced eating disorder symptoms as measured by the EDE-Q scores. Following the results of the MANOVA, repeated measures ANOVAs were used to determine which scores were significantly different between pre- and post-treatment reports.

Following the subsequent univariate analyses, the clinical participants showed a statistically significant decrease in the Global EDE-Q ($F(1, 12) = 39.773$, $p < 0.001$, $\eta_p^2 = 0.768$),

Restraint concern ($F(1, 12) = 14.701, p = 0.002, \eta_p^2 = 0.551$), Eating concern ($F(1, 12) = 36.116, p < 0.001, \eta_p^2 = 0.551$), and Shape concern ($F(1, 12) = 12.990, p = 0.004, \eta_p^2 = 0.520$). The changes of these post-treatment means are shown in Figure 1 and the descriptive statistics are shown in Table 1. These results support the hypothesis that eating disorder symptomology is reduced following CBT. It should be noted that the Weight Concern subscale was not included in the analysis as it failed to meet the assumption of normal distribution. Further, it also failed the assumption of symmetrical distribution and therefore, could not be analysed using the Wilcoxon Signed Rank test.

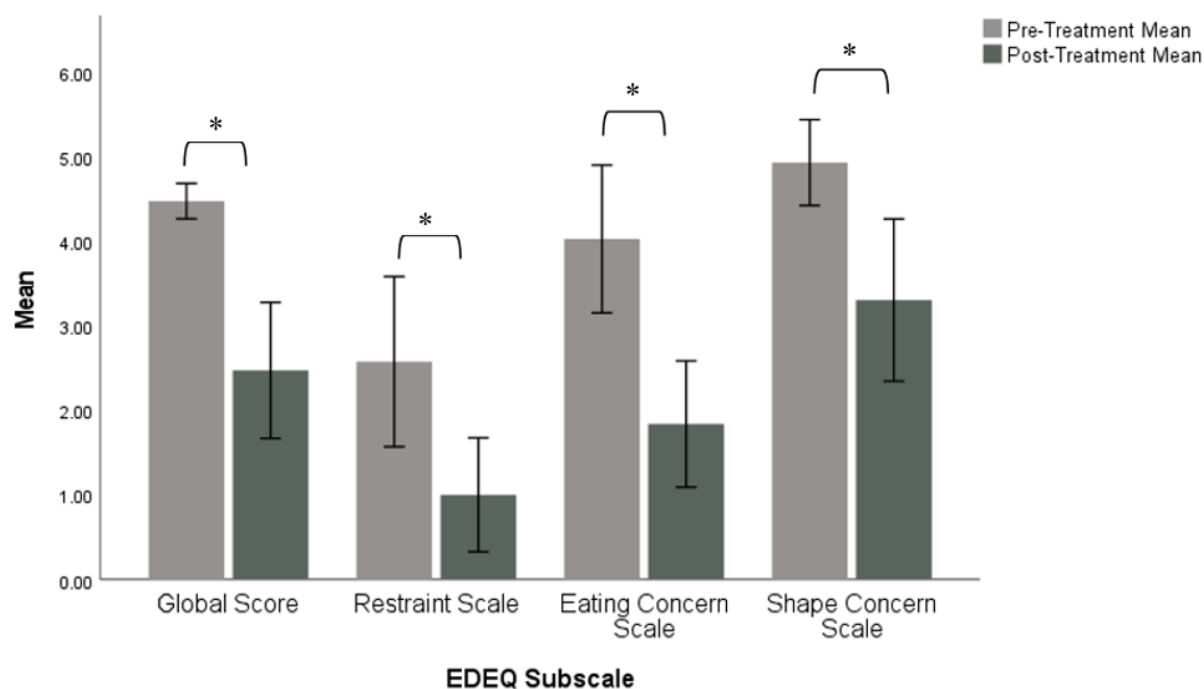


Figure 1.

The mean raw scores of the EDE-Q global scores and subscales from before and after CBT Treatment. Significance at the $p < 0.05$ level is indicated by an asterisk. Error bars represent a 95% confidence interval.

Table 1.

Descriptive statistics for the EDE-Q global scores and subscales from before and after treatment.

	Mean	SD	N
Pre-treatment Global Score	4.470	0.346	13
Post-treatment Global Score	2.470	1.331	13
Pre-treatment Restraint Concern Scale	3.077	1.729	13
Post-treatment Restraint Concern Scale	1.150	1.345	13
Pre-treatment Eating Concern Scale	4.462	1.332	13
Post-treatment Eating Concern Scale	2.110	1.411	13
Pre-treatment Shape Concern Scale	5.327	0.455	13
Post-treatment Shape Concern Scale	3.540	1.925	13

Stressful Situation Coping Strategies

The Coping Inventory for Stressful Situations – Adult Version (CISS-A) is a self-report test to measure how an individual would be more likely to use different coping styles in a stressful time. There are five coping styles measured on individual scales: Task, Emotion, Distraction, Avoidance and Social Diversion.

A repeated measures MANOVA was used to test the hypothesis that CBT treatment would significantly reduce nonadaptive self-reported coping styles on the CISS-A such as

emotional, distraction and avoidance-based coping strategies. In addition, this analysis tested the hypothesis that CBT would increase adaptive coping strategies such as task-based strategies. In the repeated measures MANOVA, the CISS-A unstandardized scores were compared from before and after treatment. The overall MANOVA was found to be statistically significant ($F(5, 10) = 9.147, p = 0.002, \eta_p^2 = 0.821$). This result supports the hypothesis that CBT had an effect on CISS-A scores. Follow-up tests were then used to determine exactly how these scores changed following treatment. Following the results of the MANOVA, repeated measures ANOVA tests were used to interpret scores to determine if they were significantly different between pre- and post-treatment reports.

Subsequent univariate tests revealed significant differences among the different subscales in the CISS-A. The clients' scores revealed a significant increase on the Task scale mean scores ($F(1, 14) = 21.577, p < 0.001, \eta_p^2 = 0.606$), a decrease on the Emotion scale ($F(1, 14) = 5.777, p = 0.031, \eta_p^2 = 0.292$), and an increase on the Social Distraction scale ($F(1, 14) = 5.860, p = 0.03, \eta_p^2 = 0.295$). Simply put, these tests show that CBT increased the clients' ability to cope with stress by learning from mistakes and making priorities as well as visiting friends and asking for advice. They also show that CBT reduced clients' habits of getting sad and taking out frustrations on others when faced with stress. The trend of these post-treatment differences is shown in Figure 2 and the descriptive statistics are shown in Table 2.

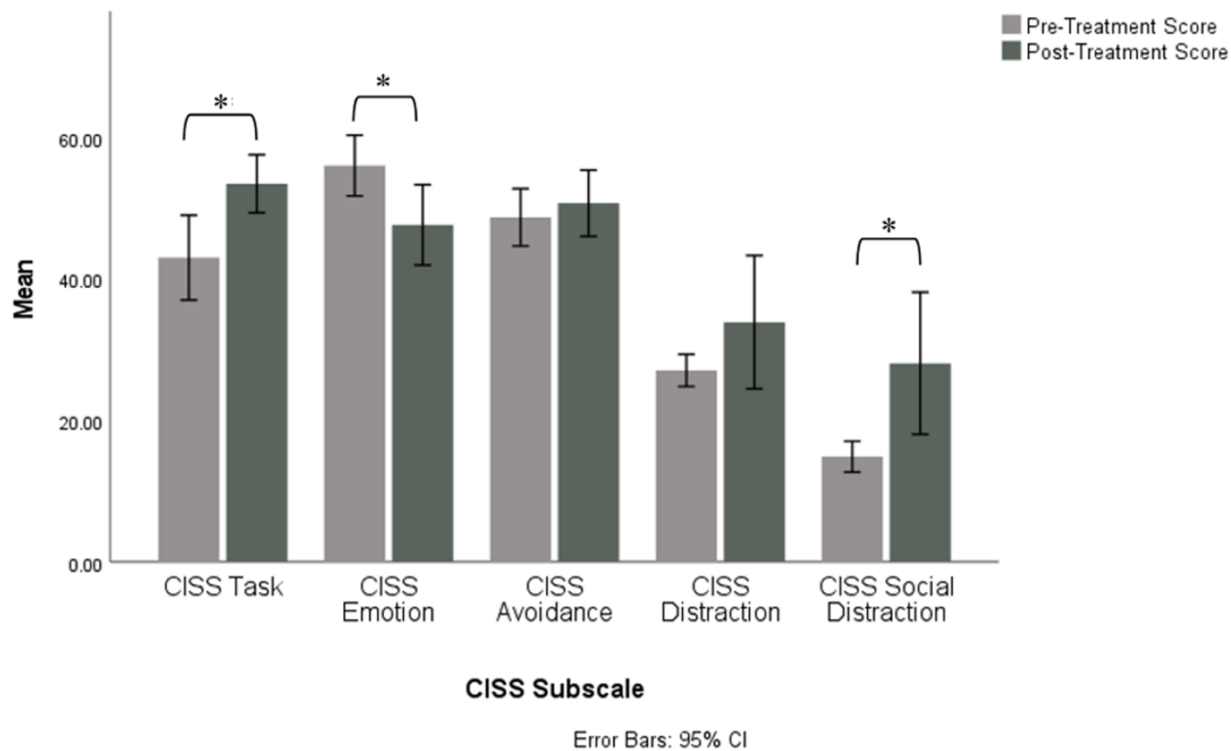


Figure 2.

The mean raw scores of the CISS-A subscales from before and after CBT Treatment.

Significance at the $p < 0.001$ level is indicated by three asterisks. Significance greater than $p < 0.05$ is indicated with one asterisk. Error bars represent a 95% confidence interval.

Table 2.

Descriptive statistics for the CISS-A subscales from before and after treatment.

	Mean	SD	N
Pre-treatment Task Scale	40.93	7.869	15
Post-treatment Task Scale	52.53	7.039	15
Pre-treatment Emotion Scale	56.47	8.105	15
Post-treatment Emotion Scale	47.60	11.044	15
Pre-treatment Avoidance Scale	47.47	6.046	15
Post-treatment Avoidance Scale	49.33	7.158	15
Pre-treatment Distraction Scale	26.73	4.217	15
Post-treatment Distraction Scale	31.13	14.327	15
Pre-treatment Social Distraction Scale	14.27	3.411	15
Post-treatment Social Distraction Scale	25.67	16.791	15

Depressive Symptoms on the BDI-II

The Beck Depression Inventory II (BDI-II) is a self-report measure for symptoms of depression. The clinical group pre-treatment mean would be considered to be at the high end of the moderate level (M = 28.54). In terms of the post-treatment mean, the clinical group mean would be considered to be in the minimal level (M = 13.19). The control group showed a mild level of depression (M = 14.29).

A repeated measures ANOVA was used to test the hypothesis that CBT treatment significantly reduced self-reported depressive symptoms among clients. In the ANOVA, the total raw scores from the BDI-II were used as the dependent variable and the pre- and post-treatment time points were used as the independent variable. The ANOVA revealed a significant result ($F(1, 15) = 30.689, p < 0.001, \eta_p^2 = 0.672$), supporting the hypothesis that clients reported fewer depressive symptoms following CBT treatment. Mauchly's Test of Sphericity proved to be statistically significant and therefore the Greenhouse-Geisser F-value has been reported. The pre-treatment mean was 28.13 (SD = 10.66) and the post-treatment mean was 13.19 (SD = 9.731) The change in the mean scores is shown in Figure 3.

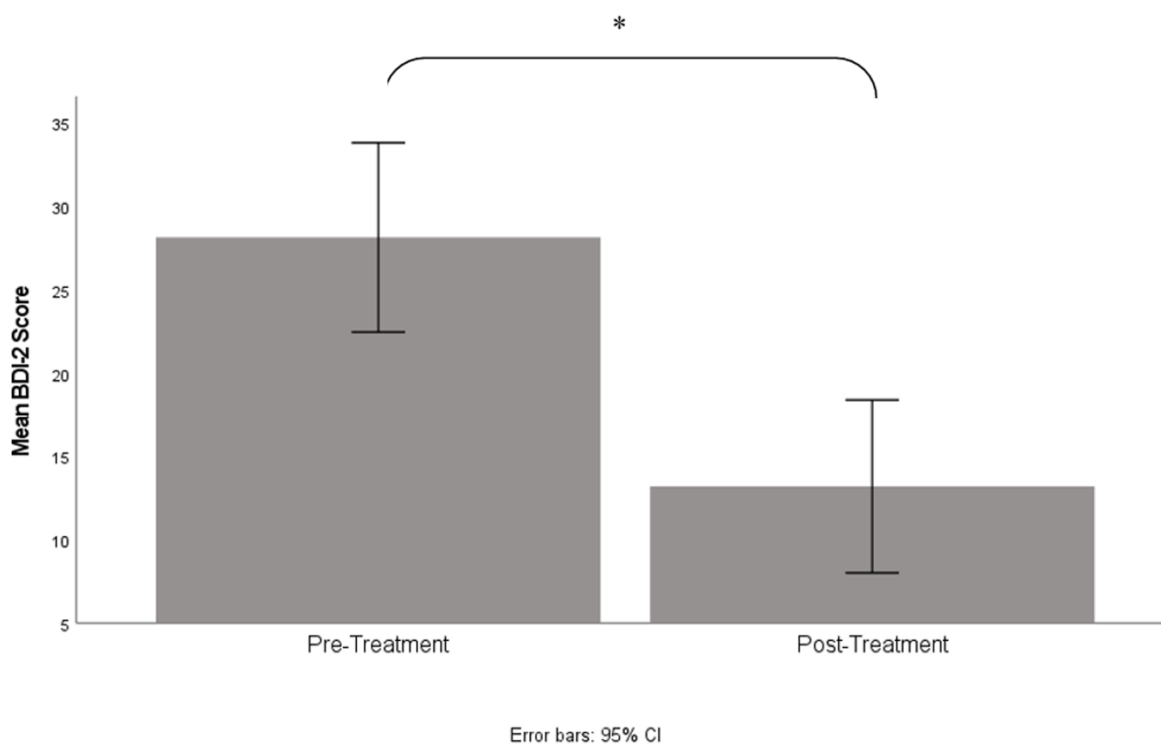


Figure 3.

The mean raw scores of the Beck Depression Inventory II from before and after CBT Treatment. Significance at the $p < 0.05$ level is indicated by an asterisk. Error bars represent a 95% confidence interval.

State and Trait Anxiety

A repeated measures MANOVA was used to test the hypothesis that CBT treatment would significantly reduce self-reported coping styles on the STAI. In the repeated measures MANOVA, the unstandardized scores from the STAI from before and after treatment were compared. The overall MANOVA was not found to be statistically significant ($F(2, 13) = 0.274$, $p = 0.7656$, $\eta_p^2 = 0.04$). This result does not support the hypothesis that CBT influenced STAI scores.

Binge Eating Occurrences Over the Course of Treatment

Two linear regression analyses were used to test the hypothesis that occurrences of binge eating would decrease as treatment progressed. Binge eating “days” (as measured by self-reported days in a given week of treatment on which binge eating episodes occurred) and “times” (as measured by number of binges per episode) were used as the outcome variables and week of treatment (numbered from 1 to 19) was used as the predictor variable.

The linear regression revealed that weeks spent in CBT was negatively correlated with binge days ($R^2 = 0.595$, $F(1, 17) = 25.025$, $p < 0.001$) and binge times ($R^2 = 0.387$, $F(1, 17) = 10.717$, $p = 0.004$). The respective fitted models were: Binge Times = $1.637 - 0.043(\text{week})$;

Binge Days = $2.598 - 0.119(\text{week})$. These results support the hypothesis that more weeks spent in CBT reduces the occurrences of binge eating.

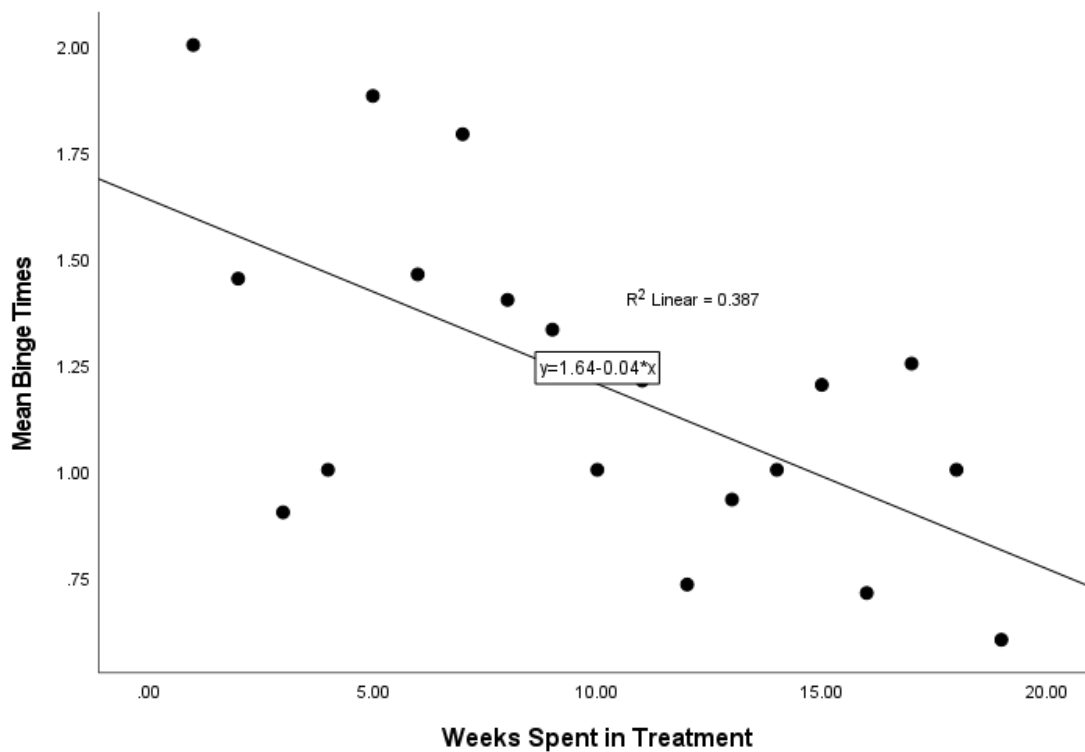


Figure 4.

Linear regression showing the relationship between the mean binge occurrences during an episode and weeks spent in CBT treatment. $R^2 = 0.387$.

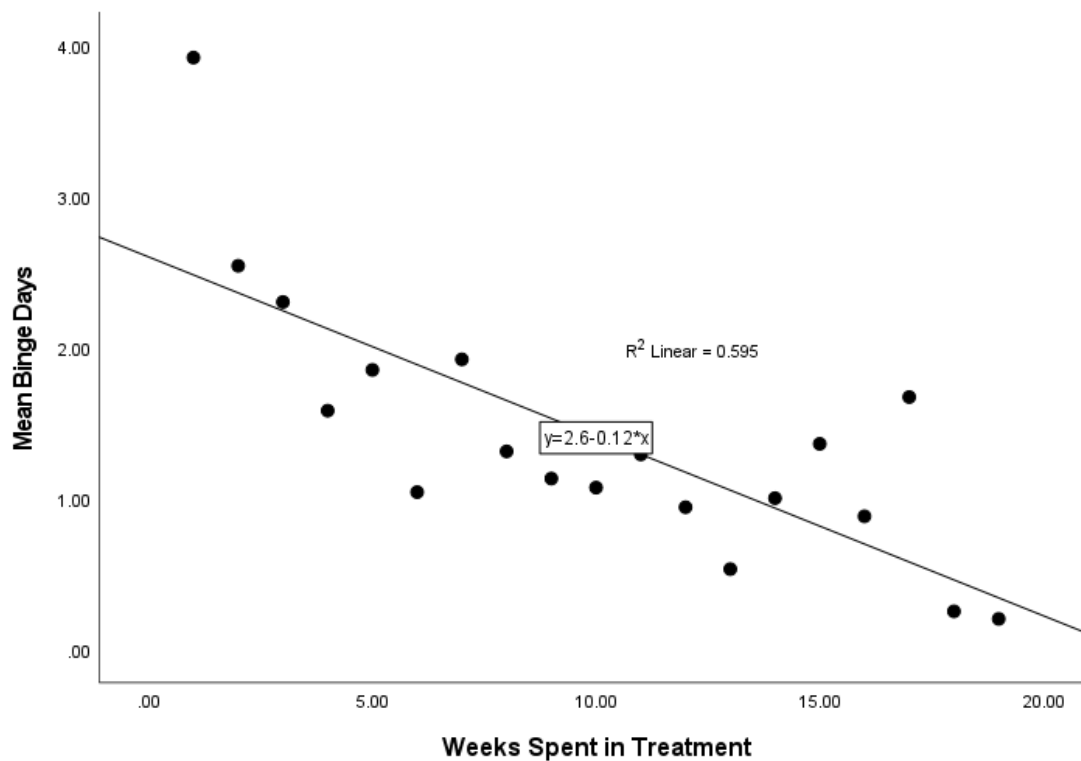


Figure 5.

Linear regression showing the relationship between the mean binge days during a week and weeks spent in CBT treatment. $R^2 = 0.595$.

Binge Occurrences Over Time Compared to the Control Group

It was hypothesized that binge occurrences over time would decrease over the course of treatment. This result was seen in the regression analysis. It was also hypothesized that the mental health clients seeking treatment for BED would report significantly higher episodes of binge eating in each week than the control group. The results from this analysis will now be discussed.

The binge eating behaviours of the control group were sampled from three time periods using behaviour checklists. The participants for this part of the study were screened for

heightened eating disorder symptomology and, therefore, it should be unsurprising that the occurrences of binge eating were very low. In fact, the reported occurrences were so low the control group data failed to meet tests for normal distribution. The results of these analyses and mean binge occurrences are shown in Table 3. Because these data fail to meet the assumptions of normal distributions, non-parametric tests were used to compare the means to the clinical group.

Table 3.

Normality tests results of the binge eating occurrences of the control group from the 3 weeks of sampling. Significance at the $p < 0.05$ level is indicated by an asterisk.

	Mean	Statistic	Shapiro-Wilk df	P-value.
Time 1	0.8750	0.827	16	0.006*
Time 2	0.4375	0.695	16	<0.001*
Time 3	1.1250	0.834	16	0.008*

Kruskal-Wallis analyses were conducted on the 3 samples of binge eating occurrences. The clinical group was asked to record the amount of binge occurrences in a day and how many days a binge episode occurred during the week as long as they remained in treatment. These values were used to calculate the number of weekly binge episodes for the clinical group. These values were then used to calculate the average number of binge episodes for each participant during 3 sampling times. For example, if a participant recorded a total of 15 weeks of binge occurrences, weeks 1 to 5 would represent the first sample, weeks 6 to 10 the second sample and weeks 11-15 as the third. This way, the control and clinical groups could be compared across three sample periods. The Kruskal-Wallis test showed that for the first two samples, the clinical group was significantly higher than the control group in terms of binge episodes (T1: Kruskal-

Wallis $H(2) = 23.919$, $p < 0.05$; T2: Kruskal-Wallis $H(2) = 14.339$, $p < 0.05$). In the third sample, there no significant differences between the groups (T3: Kruskal-Wallis $H(2) = 0.561$, $p = 0.454$). The general trend is shown in Figure 6.

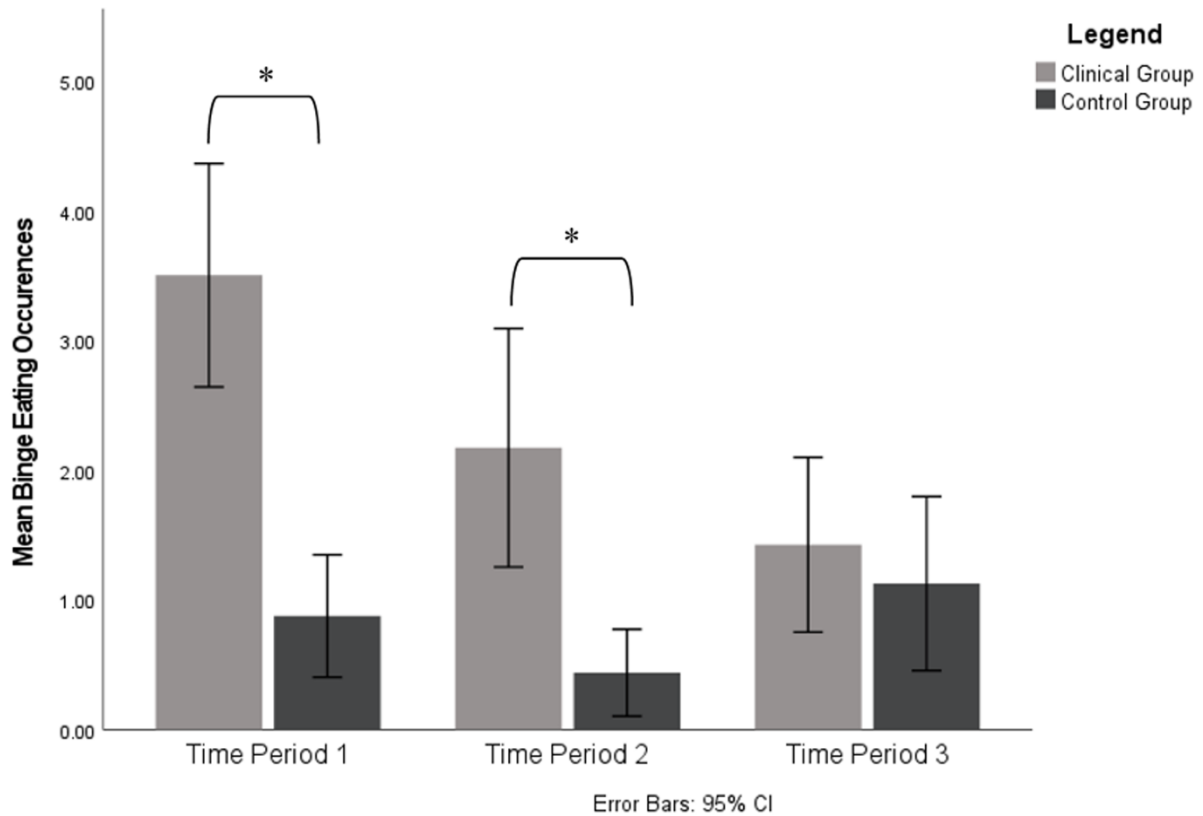


Figure 6.

Mean binge occurrences across 3 sampled time points. Significance at the $p < 0.05$ level is indicated with an asterisk. Error bars represent a 95% confidence interval.

Changes in Coping Strategies

Pre-treatment Coping Strategies

An ANOVA was used to test the hypothesis that clients would endorse different coping styles prior to CBT treatment when compared with coping styles after CBT treatment. In the ANOVA, the standardized scores from the five subscales on the CISS-A during pre-treatment administration were used. The ANOVA yielded significant results ($F(4, 115) = 33.907, p < 0.001, 95\% \text{ CI } [0.403, 0.620]$) supporting the hypothesis. Bonferroni post-hoc tests revealed that the most endorsed coping styles were emotion-based methods with a mean of 62.25 ($SD = 7.76$) and distraction-based methods of coping ($p < 0.01$) with a mean of 60.71 ($SD = 7.44$). These two subscales were not significantly different than each other ($p = 0.138$). The post-hoc comparisons revealed that the least endorsed coping style was task-oriented coping ($p < 0.01$) with a mean score of 34.250 ($SD = 11.479$). These differences are shown in Figure 7.

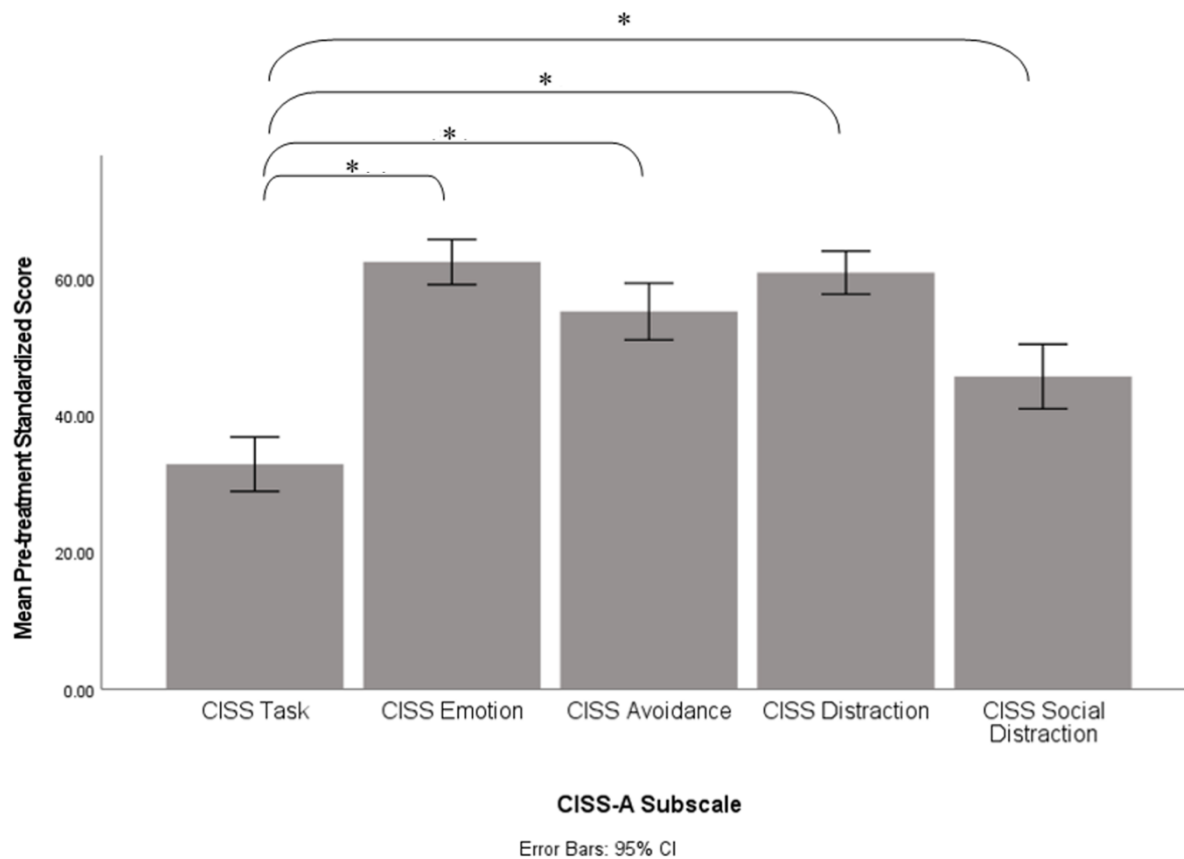


Figure 7.

Means plot of standardized scores from the 5 CISS-A subscales for all clients prior to CBT treatment. Significance at the $p < 0.05$ level is indicated with an asterisk. Error bars represent a 95% confidence interval.

Post-Treatment Coping Strategies

An ANOVA was used to test the hypothesis that clients would endorse different coping styles following CBT treatment. In the ANOVA, the standardized scores from the five subscales on the CISS-A during post-treatment administration were used. The ANOVA yielded significant results ($F(4, 74) = 5.706, p < 0.001, 95\% \text{ CI } [0.06, 0.36]$) supporting the hypothesis. Bonferroni post-hoc tests revealed that the least endorsed coping style were Task-based methods of coping

($p < 0.001$) with a mean score of 44.00 (SD = 8.98). No other subscale was significantly different from the others. These results are shown in Figure 8.

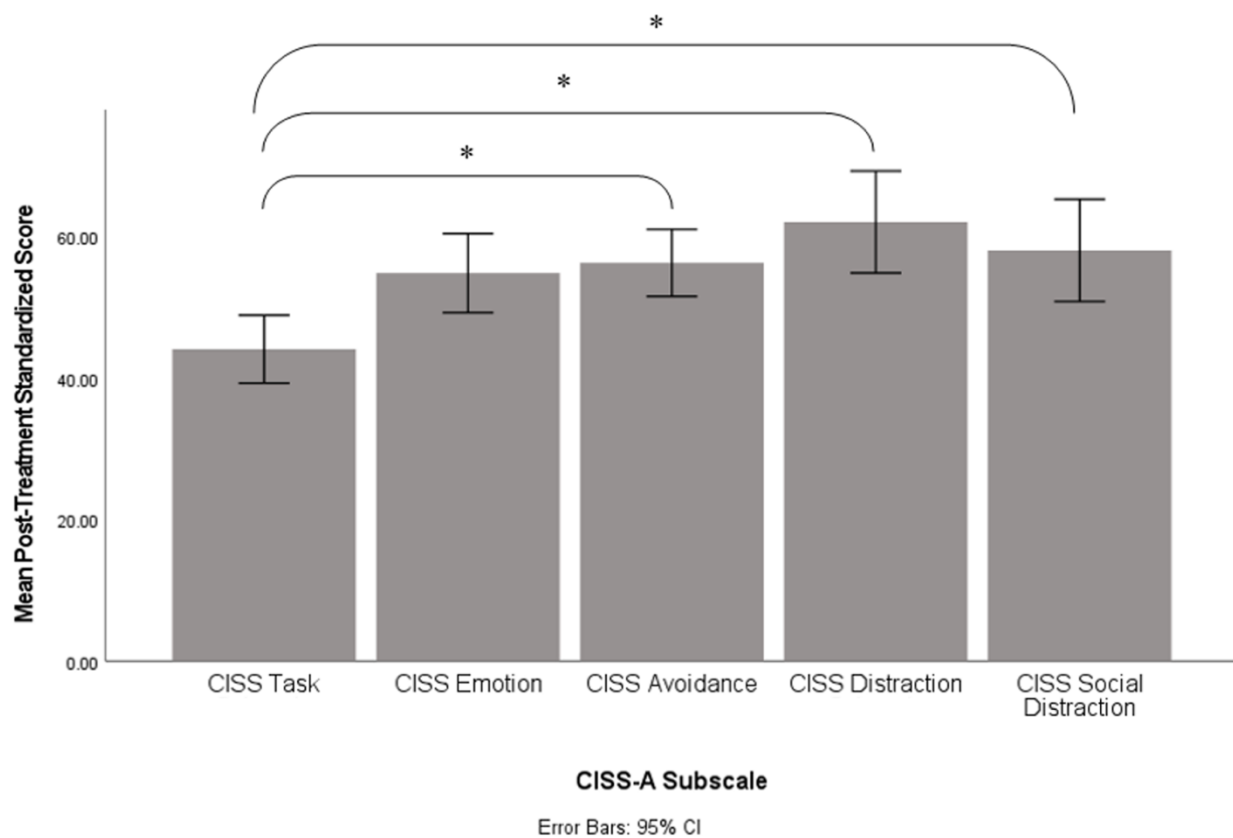


Figure 8.

Means plot of standardized scores from the 5 CISS-A subscales for clients who completed CBT treatment. Significance at the $p < 0.05$ level is indicated with an asterisk. Error bars represent a 95% confidence interval.

Changes in Eating Concerns

Pre-treatment Eating Concerns

An ANOVA was used to test the hypothesis that the clients would endorse different eating concerns shown by their scores on the EDE-Q prior to treatment. The clients' pre-treatment EDE-Q z-scores were used as the dependent variable and the four subscales as the independent variable. The ANOVA was significant ($F(3, 92) = 28.858$; $p < 0.001$, 95% CI [0.324, 0.582]) supporting the hypothesis. Bonferroni post-hoc tests revealed that Eating concern was most endorsed style prior to treatment with a mean z-score of 3.890 (SD = 1.666) ($p < 0.001$) and Restraint concern the least ($p < 0.001$) with a mean z-score of 0.836 (SD = 1.39) as shown in Figure 9.

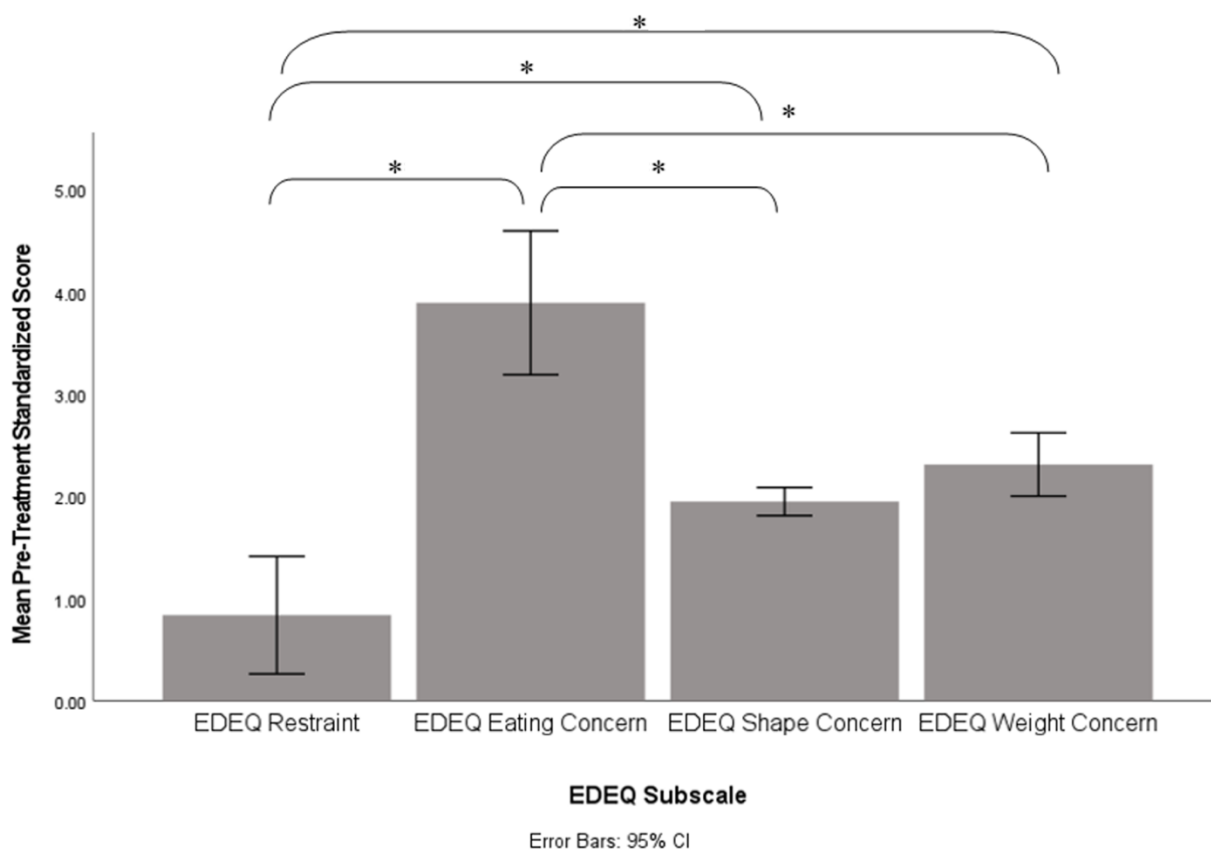


Figure 9.

Means plot of standardized scores from the 4 EDE-Q subscales prior to CBT treatment.

Significance at the $p < 0.05$ level is indicated with one asterisk. Error bars represent a 95% confidence interval.

Post-treatment Eating Concerns

An ANOVA was used to test the hypothesis that the clients would endorse different eating concerns shown by their scores on the EDE-Q following treatment. The clients' post-treatment EDE-Q z-scores were used as the dependent variable and the four subscales as the independent variable. The ANOVA was significant ($F(3, 60) = 5.111$; $p = 0.003$, 95% CI [0.029, 0.343]) supporting the hypothesis. Bonferroni post-hoc tests revealed that Eating concern was most endorsed following treatment ($p = 0.003$) with a mean z-score of 1.411 (SD = 1.632) as seen in Figure 8. In other words, following CBT the clients were most preoccupied with their eating habits leading to distraction in activities of daily living and fear of losing control of their eating. The means for the standardized scores are shown in Figure 10.

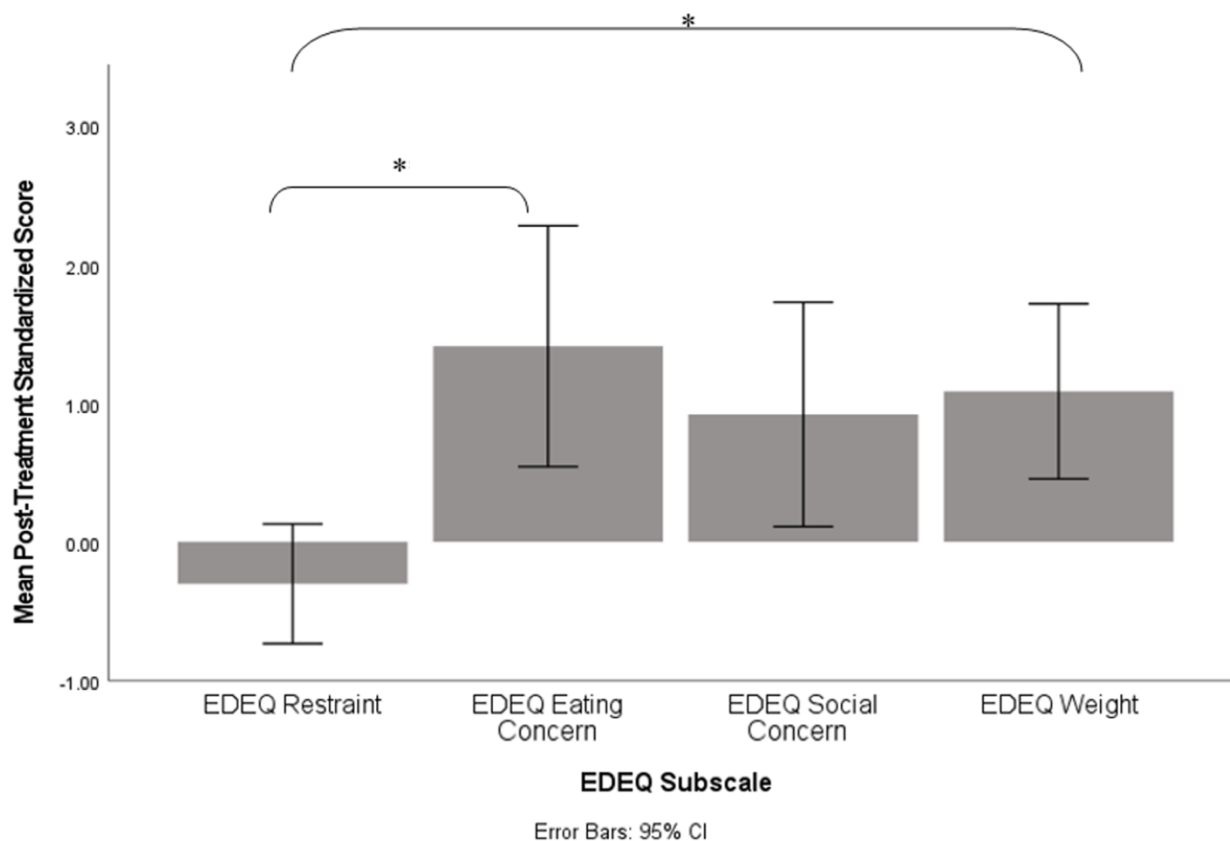


Figure 10.

Means plot of standardized scores from the 4 EDE-Q subscales following CBT treatment.

Significance at the $p < 0.05$ level is indicated with an asterisk. Error bars represent a 95% confidence interval.

Clinical Test Scores Compared to the Control Data and Normative Data

BDI-II

In terms of how the control group compared to the pre-treatment group, it was hypothesized that the clinical group would be significantly higher in depressive symptoms as reported by BDI-II scores than the control group. A One-Way ANOVA confirmed this to be the case ($F(1, 2) = 15.574, p < 0.001, 95\% \text{ CI } [0.146, 0.493]$) supporting the hypothesis. Bonferroni

post-hoc tests revealed that the BDI-II scores from the pre-treatment clinical group, which had a mean score of 28.541 (SD = 10.367) were significantly higher than the control group with a mean score of 14.286 (SD = 10.026) ($p < 0.001$) and the post-treatment group with a mean score of 13.188 (SD = 9.731) ($p < 0.001$). Further, no statistically significant differences were found between the control group and the post-treatment group ($p = 1.00$). These results support the hypotheses that CBT improves pre-treatment depression scores on the BDI-II and that the post-treatment scores would not be significantly different from a non-clinical population. The means for these groups are shown in Figure 11.

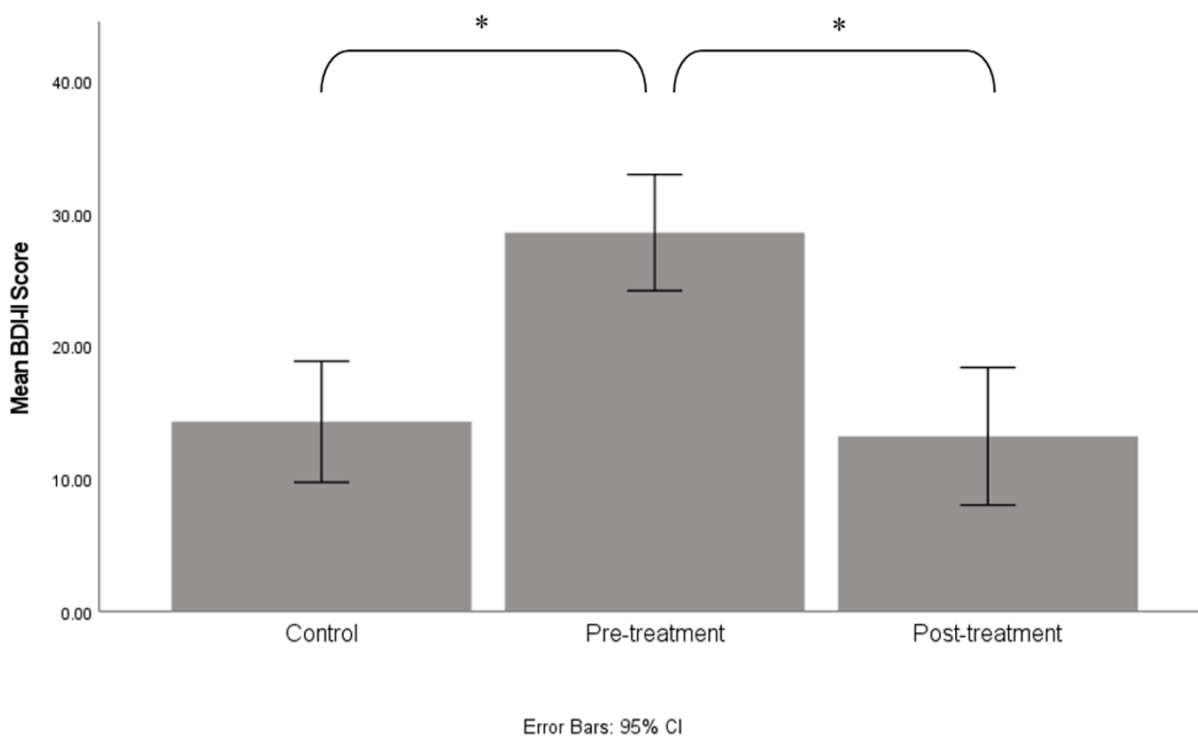


Figure 11.

Means, and P-values for the control Group compared to the Pre-Treatment Samples on the BDI-II. Significance at the $p < 0.05$ level is indicated by an asterisk. Error bars represent a 95% confidence interval.

STAI

The State-Trait Anxiety Inventory (STAI) is a self-report test to measure an individual's levels of anxiety in the moment (state) and as a personality characteristic (trait). A one-sample t-test was used to determine if the clinical group pre-treatment means differed from the normative means for both subscales on the STAI. The group means were compared to each normative mean retrieved from the publisher's manual which was the single sample. This test revealed that the clinical group mean was significantly higher than the normative mean for Working Female Adults on the State subscale ($t(23) = 19.355, p < 0.001, 95\% \text{ CI } [40.59, 50.30]$) with a mean score of 49.33 (SD = 15.24) and Trait subscale ($t(23) = 12.451, p < 0.001, 95\% \text{ CI } [32.29, 45.16]$) with a mean score of 54.67 (SD = 11.50). In simple terms, a higher score means more self-reported anxiousness. In terms of post treatment means, the same result was found that the clinical group was higher than the normative mean for both the State ($t(15) = 6.749, p < 0.001, 95\% \text{ CI } [24.64, 47.39]$) and Trait subscales ($t(14) = 11.776, p < 0.001, 95\% \text{ CI } [39.24, 56.72]$). The mean scores for the post-treatment State and Trait subscales were 46.63 (SD = 21.34) and 57.20 (SD = 15.78) respectively.

Regarding the control group and the treatment group comparisons, the control sample from Study 2 was not significantly different from the normative mean for Female College Students on the State subscale with a mean score of 40.964 (SD = 12.969) ($t(27) = 0.899, p < 0.376, 95\% \text{ CI } [-2.824, 7.233]$) and Trait subscales with a mean score of 43.750 (SD = 12.403) ($t(27) = 1.429, p < 0.164, 95\% \text{ CI } [-1.459, 8.159]$). A One-Way ANOVA was used to compare the Control sample to the Pre-treatment and Post-treatment groups for both State and Trait scales. In terms of the Trait scale, the overall ANOVA was found to be statistically significant ($F(2, 79) = 7.123, p = 0.001, 95\% \text{ CI } [0.027, 0.284]$). Post hoc Bonferroni analyses showed that

the Trait scores of control group ($M = 45.047$, $SD = 12.467$) were significantly lower than those of the pre-treatment group ($p = 0.013$, 95% CI $[-17.6328, -1.6075]$) with a mean of 54.667 ($SD = 11.503$) and the post-treatment group ($p = 0.007$, 95% CI $[-21.584, -2.723]$) with a mean score of 57.200 ($SD = 15.780$). The pre-treatment and post-treatment groups were not statistically different from each other. The mean scores are shown in Figure 12. The State scale was also analysed using a One-Way ANOVA; however, it yielded insignificant results. These results suggest that there were no changes to either state or trait anxiety following treatment. Further, the results from the State scale analysis suggests that the clinical group endorsed that they were experiencing more anxiousness at the time of testing than the control group.

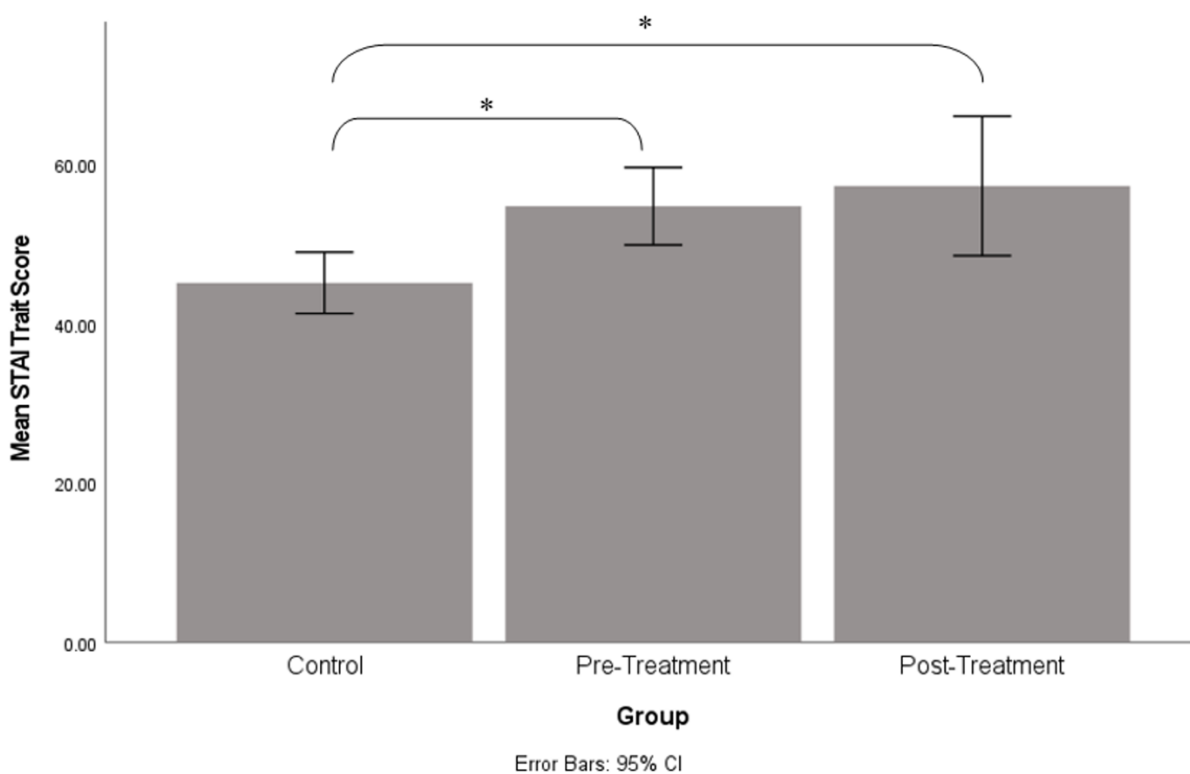


Figure 12.

The mean raw scores of the STAI Trait subscale from before and after CBT Treatment compared to Control mean scores. Significance at the $p < 0.05$ level is indicated by an asterisk. Error bars represent a 95% confidence interval.

CISS-A

One-sample t-tests were used to determine if the clinical group pre-treatment means for each subscale on the CISS-A were significantly different than normative means. The single sample was the normative mean for each subscale retrieved from the publisher's manual. The tests revealed that the clinical group means were significantly different from all but the Avoidance subscale. Having a lower Task score indicates that the clinical group used fewer coping strategies that involved addressing the cause of the stress and having a lower Social Diversion score indicates that the clinical group coped less by visiting friends and asking for advice. Further, having higher scores on the Emotion and Distraction Scales indicate that the clinical group endorsed more coping strategies that involved becoming upset, blame themselves and engage in unrelated activities such as sleeping, shopping, and eating. The clinical group pre-treatment means, normative means and p-values are shown in Table 4.

Table 4.

Clinical group pre-treatment means for CISS-A subscales compared to the normative means from a population of adult women.

CISS-A Subscale	Pre-Clinical	SD	Normative	Two-tailed p-value
Task Score	44.08	10.81	58.60	<0.001*

Emotion Score	56.13	8.848	42.57	<0.001*
Avoidance Score	48.25	9.076	47.27	0.602
Distraction Score	26.75	4.532	21.24	<0.001*
Social Diversion Score	14.38	4.698	17.63	0.002*

In terms of post-treatment means, the clinical group means became non-significantly different from the normative means on the Emotion scale. It should also be noted that all other clinical group means approached non-significance differences to normative means in post-treatment. The clinical group post-treatment means, normative means and p-values are shown in Table 5.

Table 5.

Clinical group post-treatment means for CISS-A subscales compared to the normative means from a population of adult women.

CISS-A Subscale	Post-Clinical	SD	Normative	Two-tailed p-value
Task Score	53.44	7.703	58.60	0.017*
Emotion Score	47.63	10.67	42.57	0.078
Avoidance Score	50.69	8.784	47.27	0.141
Distraction Score	33.88	17.66	21.24	0.012*
Social Diversion Score	28.06	18.81	17.63	0.043*

The control group scores on each subscale were also compared to the normative means using a one-sample t-test. It should be noted that the control group was significantly different only from the normative value on the social diversion scale, indicating that the control sample makes less use of social strategies during times of stress than a normal population. All other

differences were not significant. The control group means, normative means and p-values are shown in Table 6.

Table 6.

Control group means for CISS-A subscales compared to the normative means from a population of adult women.

CISS-A Subscale	Control	SD	Normative	Two-tailed p-value
Task Score	56.93	10.19	58.60	0.393
Emotion Score	43.57	13.24	42.57	0.692
Avoidance Score	43.18	11.32	47.27	0.067
Distraction Score	21.79	6.124	21.24	0.641
Social Diversion Score	13.82	5.062	17.63	<0.001*

MANOVA tests were performed to test the hypothesis that the clinical group would endorse fewer task-related coping strategies and more emotional, avoidant and distraction-based strategies prior to treatment when compared to the control group. A separate MANOVA was conducted to test the hypothesis that these differences would not exist following treatment. Individual MANOVA tests were conducted to meet the assumption of independent sampling since the post-treatment clinical group members were also in the pre-treatment group. Tests indicated that homogeneity of variance and normality assumptions were met.

For the pre-treatment comparison, the hypothesis was partially confirmed such that the clinical group was significantly lower on the task scale, and higher on the emotion and

distraction scales but not significantly different on the avoidance and social distraction scales.

The means, p-values and partial eta squared values are shown in Table 7.

Table 7.

MANOVA results comparing the control group and pre-treatment clinical group scores on the CISS-A.

CISS-A Subscale Mean Scores	Pre-treatment	SD	Control	SD	p-value	η_p^2
Task Score	42.78	8.929	56.93	10.19	<0.001*	0.356
Emotion Score	56.43	8.912	43.57	13.24	<0.001*	0.244
Avoidance Score	47.43	8.333	43.18	11.32	0.14	0.044
Distraction Score	26.52	4.491	21.79	6.124	0.003*	0.163
Social Diversion Score	13.96	4.697	13.82	4.322	0.92	0.00

For post-treatment comparisons, the tests did not satisfy the assumption of normality for the Social Distraction scale in the post-treatment clinical group. As such, this scale was not included in the analysis. Tests of normality yielded the same result for the Distraction scale. The p-value for the normality test was $p = 0.044$ and was included in the analysis as it was close to non-significance. However, tests revealed that the assumption of homogeneity of variance was met for all measures except the Distraction scale which was not included in the reported results. The MANOVA partially supported the hypothesis that the clinical participants would endorse similar coping strategies to the control group following treatment. The control group was not significantly different from the post-treatment clinical group on the Task and Emotion scales and

was significantly different on the Avoidance scale. The means, p-values and partial eta squared values are shown in Table 8.

Table 8.

MANOVA results comparing the control group and post-treatment clinical group scores on the CISS-A.

CISS-A Subscale Mean Score	Post- treatment	SD	Control	SD	P-value	η_p^2
Task Score	53.44	7.702	56.93	10.19	0.242	0.032
Emotion Score	47.63	10.67	43.57	13.24	0.302	0.025
Avoidance Score	50.69	8.784	43.18	11.32	0.027*	0.111

EDE-Q

One-sample t-tests were used to determine if the clinical group pre-treatment means differed from the normative mean as sampled from a community-based group of women (Fairburn & Beglin, 1994) for each subscale on the EDE-Q. The normative mean from each subscale was used as the single sample to compare the corresponding clinical group mean. These values were retrieved from the publisher's manual. These tests revealed that the clinical group means were significantly higher on all four EDE-Q subscales ($p \leq 0.006$), indicating that the clients reported more eating disorder symptoms than the normative group. These values are displayed in Table 9.

Table 9.

Clinical group pre-treatment p-values for EDE-Q subscales.

EDE-Q Subscale Mean Scores	Pre-Clinical	SD	Normative	Two-tailed p-value
Global Score	4.020	0.862	1.554	<0.001*
Restraint Score	2.358	1.799	1.251	0.006*
Eating Concern Score	3.967	1.432	0.624	<0.001*
Shape Concern Score	5.010	0.836	2.143	<0.001*
Weight Concern Score	4.750	1.004	1.587	<0.001*

The same test was used to examine the post-treatment levels with differing results. It was found that the clinical group was not significantly different from the normative mean on the Restraint and Shape concern subscales. While the clinical group means were significantly higher than the normative means on the other measures of the EDE-Q, the p-values were closer to significance than the pre-treatment p-values. These values are displayed in Table 10. A test was also conducted to compare the control group to the normative data, which revealed the control group was significantly elevated on the Eating Concern scale ($p < 0.001$). The p-values and means for the control group and the Normative group are shown in Table 11.

Table 10.

Clinical group post-treatment means, standard deviations, and p-values for EDE-Q subscales.

EDE-Q Subscale Mean Scores	Post-Clinical	SD	Normative	Two-Sided P-value
Global Score	2.26	1.281	1.554	0.045*
Restraint Score	1.00	1.265	1.251	0.440
Eating Concern Score	1.84	1.401	0.624	0.003*
Shape Concern Score	3.30	1.801	2.143	0.21
Weight Concern Score	3.08	1.623	1.587	0.002*

Table 11.

P-values for control group compared to normative means of EDE-Q subscales.

EDE-Q Subscale Mean Scores	Control	SD	Normative	Two-Sided P-value
Global Score	1.864	1.163	1.554	0.095
Restraint Score	1.483	1.119	1.251	0.192
Eating Concern Score	1.376	0.712	0.624	<0.001*
Shape Concern Score	2.555	1.656	2.143	0.119
Weight Concern Score	2.298	1.608	1.587	0.007*

MANOVA tests were conducted to test the hypothesis that the pre-treatment clinical group would score significantly higher on all EDE-Q scales than the control group. Once outliers were removed, tests of normality indicated that these data met the assumption of normality. The assumption for equality of variances was not met for all scales except the Weight Concern scale,

however under Robust Tests of Equality of Means, both Welch's and Brown-Forsythe yielded a significant result. These results protect against committing a Type I Error when the assumption of equality of variances is not met. The MANOVA supported the hypothesis that the pre-treatment clinical group scored significantly higher on all scales of the EDE-Q indicating higher eating disorder symptomology. The means, p-values and partial eta squared values are shown in Table 12.

Table 12.

MANOVA Results comparing the control group and pre-treatment clinical group scores on the EDE-Q.

EDE-Q Subscale Mean Scores	Pre-treatment	SD	Control	SD	P-value	η_p^2
Global Score	4.36	0.401	2.44	0.958	<0.001*	0.602
Restraint Concern Score	3.09	1.605	1.85	0.993	0.005*	0.193
Eating Concern Score	4.30	1.191	1.70	0.657	<0.001*	0.602
Shape Concern Score	5.23	0.450	3.16	1.569	<0.001*	0.408
Weight Concern Score	4.84	0.871	3.04	1.418	<0.001*	0.350

As with the CISS-A analysis, individual MANOVA tests were conducted to meet the assumption of independent sampling since the post-treatment clinical group members were also in the pre-treatment group. Tests indicated that homogeneity of variance and normality assumptions were met. A MANOVA test was conducted to test the hypothesis that there would

be no significant differences between the post-treatment clinical group and the control group in terms of reported eating disorder symptoms. Once outliers were removed, tests of normality indicated that these data met the assumption of normality. The assumption for equality of variances was not met for all scales except the Eating Concern scale. Welch's and Brown-Forsyth Tests were not significant in this case, and it is reasonable to fail to reject the null hypothesis. The results of the MANOVA support the hypothesis that the post-treatment clinical group was not significantly different from the control group in terms of EDE-Q scores. The means, p-values and partial eta squared values are shown in Table 13.

Table 13.

MANOVA Results comparing the control group and post-treatment clinical group mean scores on the EDE-Q.

EDE-Q Subscale	Post-treatment	SD	Control	SD	P-value	η_p^2
Global Score	2.510	1.523	2.437	0.958	0.866	0.001
Restraint Concern Score	1.560	1.316	1.850	0.993	0.486	0.015
Eating Concern Score	2.240	1.634	1.700	0.632	0.173	0.057
Shape Concern Score	3.463	2.039	3.156	1.569	0.638	0.007
Weight Concern Score	3.080	2.007	3.042	1.418	0.950	0.000

Post-Hoc Power Analysis

After the main analyses were completed, a power analysis was conducted in SPSS to determine the required sample size in a subsequent repeat study. The power analysis indicated that a minimum sample of 93 participants would be needed to detect 95% power to detect a large effect size at an alpha level of 0.05 in a regression analysis. Should the study be repeated in the future, a sample size of at least 93 would be required from different treatment groups.

IV. DISCUSSION

Summary of Key Findings

This study has revealed several findings about the treatment of BED by cognitive behavioural therapy. Although no significant predictors of therapy dropout were found in the pre-treatment tests, this result in and of itself is informative for the proposed research question in that it suggests that factors that could predict dropout might not be found in quantitative data. Other key findings of this study reveal novel information about how BED clients change over the course of CBT. While some results, such as reduced eating disorder symptomology, lower depression and fewer binge eating episodes, might be expected following treatment, other findings are unique to this study. These include the results showing that the clinical participants changed their coping strategies for stressful situations, endorsed different eating behaviour concerns, and became less symptomatic to the point of no longer being statistically different from a non-clinical control sample. Further, a direct correlation between the time spent in CBT treatment and a reduction in binge eating occurrences were discovered. In addition, models relating stress coping strategies and eating concerns with binge eating behaviour were found. Specifically, models suggesting that concerns about eating habits and higher depression levels

were predictive of binge eating occurrences during a binge episode and those who were more likely to emotionally cope with stress and were more concerned about eating habits were likelier to binge eat on more days in each week. Each of these results will be discussed in the following section.

Demographics of the Clinical and Control Groups

In terms of the clinical group demographics, it is important to draw attention to the participants' gender identification. While the ages of the clinical group were widely spread, it should be noted that most of the clients in the pre-treatment group identified as women and all respondents in the post-treatment group identified as women. In terms of the control group, similar demographics were observed for both Study 1 and Study 2; roughly 80% women in both. The fact that the samples primarily identified as women is important to keep in mind when the results are discussed because they may represent a gender-specific result. In other words, it is possible that if the gender identification were more equally represented in a future study, different results may be observed. Indeed, it has been suggested that research into the treatment of eating disorders would benefit from increased participation by men due to gender differences in treatment length requirements and remission rates (Shingleton et al., 2015). Further, there have been gender differences noted in BED regarding lower depression rates in men (Brandt et al. 2023; Guerdjikova et al. 2014) as well as earlier onset of binge eating behaviour and higher BMI in men (Lydecker & Grilo, 2018). Given these differences, increased gender representation in BED research is warranted.

Predictors of Therapy Dropout

The proportion of clients that dropped out of the current treatment (approximately 30%) is generally consistent with what has been noted in previous studies (Fairburn et al., 2013; Melisse et al. 2022). No significant predictors of therapy dropout were found among several potential variables in the current study. This result was somewhat unexpected as previous work has shown that variables such as having a lower BMI, gender, and age are significant predictors of dropout among clients seeking cognitive treatment for BED (Gregertsen et al., 2019; Lammers et al., 2022). Fairburn et al. (2013) have shown that increased severity of eating disorders and general psychopathology can be significant predictors of treatment completion. More specifically, they demonstrated that scores on the EDE-Q global, weight and shape concern subscales, and binge frequency were significantly higher in those that did not complete cognitive behaviour therapy for eating disorders. While these authors' results do not align with those of the current study which found decreases in these values, other results do align. For example, Melisse et al. (2022) found no significant predictors of CBT drop out among group demographic variables such as age, gender, level of education and symptom severity. It should be noted that the referenced studies use different measures and deal with other eating disorders such as AN and BN. While exact comparisons to BED cannot be made, it provides a point of reference in the literature for the current study to make comparisons and to add to the body of research.

There is a paucity of research exploring approaches to coping with stressful situations in relation to therapy dropout and this study is believed to be unique in considering coping strategies as predictors of dropout. Amongst existing research, it has been suggested that coping ability may have been a significant predictor. For example, Dingemans et al. (2007) report that seeking distraction by smoking or drinking as measured by the Utrecht Coping List predicted

more negative outcomes of treatment for eating disorders. Given that the Utrecht Coping List specifically asks about seeking distraction (McAuliffe et al., 2006), it may have been reasonable to expect that scores on the Distraction subscale of the CISS-A to be a predictor, however this result was not observed in the current study. Further, Isaia et al. (2018) report that poor parent coping was a significant predictor of dropout in therapy for pediatric bipolar disorder. While not related to eating disorders, it is still noteworthy because it supports the hypothesis that stress coping ability has a relationship with therapy dropout. While the results of current study contribute to the literature, evidence for finding consistent predictors of therapy dropout remains mixed. It could be possible that using quantitative, in addition to psychometric measures to predict therapy dropout in eating disorder populations. This will be addressed in the *Future Directions* section.

Stress Management Strategies

To summarize the results in terms of coping strategies, it was observed that the means of the pre-treatment clinical group were significantly different from those of normative data on all subscales except the Avoidance and Social Diversion subscales (Table 4.). Specifically, the pre-treatment group were lower in Task coping, higher in Emotional coping and Distraction coping. This result was also noted when the pre-treatment group was compared to the control sample. These results are unsurprising given that there were also no significant differences between the control sample and the normative data except on the Social coping scale (Table 6.). The results support the hypothesis that the post-treatment group would be statistically comparable to the control group and normative data. In other words, the treatment appeared to normalize the clients' coping strategies.

In addition to the differences between the normative data, control group and treatment groups, the results of the current study suggest that BED clients who complete CBT treatment change their coping strategies in response to stress (Figures 2, 7, and 8). According to the difference in CISS-A scores between pre-treatment and post-treatment, emotional coping strategies became less endorsed after treatment meaning that, when faced with stressful situations, the clinical group was less likely to become upset, blame themselves, or worry after they had finished treatment. The hypothesis that task-oriented coping would increase after treatment was confirmed. Although, task-oriented strategies were least endorsed among the clinical group before and after treatment, it should be noted that there was a significant increase in task-oriented strategies over the course of treatment (see Figure 2). That is, the clients were no longer significantly different from the control sample at post-treatment and were still significantly higher than normative populations in terms of task-oriented strategies meaning that they were more likely to be pragmatic problem-solvers. These results suggest that the treatment was successful in increasing the abilities of the BED clients to focus more on pragmatic, adaptive solutions to stressful situations to the point where their strategies were comparable to a non-clinical group.

Another encouraging result was the finding that the clients reported a significant decrease in emotion-oriented coping strategies that such as blaming oneself, window shopping, or become tense (Figure 2.), which lends support to our hypothesis that emotional coping would decrease following treatment. Whereas prior to treatment the BED clients were significantly higher than both normative mean and the control population from the current study (Tables 4. and 7.), following treatment the clinical group was still significantly higher than the normative mean but were no longer significantly different from the control group (Tables 5. and 8.). This suggests

that the clients became less reactive in the face of stress and were less likely to become upset or blame themselves for their situations, and were still higher than the normative data. Taken together, the results from the Task and Emotion scales suggests that the clinical group were able to react more calmly when facing stress and focus on practical solutions to their problems after a course of CBT treatment.

Results involving the avoidance, distraction and social strategies were less clear. There were no significant changes in distraction or avoidant strategies between pre- and post-treatment measurements (Figure 2). Further, the clinical group was not significantly different from normative data in terms of avoidant based strategies when compared to normative data prior to treatment (Table 4.). These results may indicate that avoidance strategies had little to do with BED recovery which does not necessarily agree with the literature (Della Longa & De Young, 2018; Duarte et al., 2017; Lewer et al., 2016). It should be noted that in these referenced studies, other measures that were not the CISS-A were used to measure avoidance. It is possible that the CISS-A Avoidance subscale addresses the construct of avoidance differently. Future studies might benefit from using other measures to address this discrepancy. In terms of social coping, there is literature to suggest that being more socially engaged, such as being involved with a partner or close family, is related to better outcomes in treatment for BED (Craven & Fekete, 2019; Deumens et al., 2012; Vroling et al., 2016). The conclusions from these authors and the results of the current study suggest that this is true, and the clinical group endorsed more socially based coping strategies after treatment than before treatment (Figure 2.). In other words, as social coping increased over the course of treatment, the BED symptoms decreased. It should be noted that a direct relationship between these constructs was not tested but could be the focus of a future study. Finally, in terms of distraction-based strategies, the clinical group was found to be

significantly higher than normative data and the control group before and after treatment (Tables 4., 5., 7., and 8.), no significant changes were observed between pre- and post-treatment groups (Figure 2.). This was not expected when considering the findings of Dingemans et al. (2007) who reported that more distraction-based coping was associated with less improvement of eating disorder symptoms. According to the current study results, the clinical group were just as likely to try to escape stressful situations, window shop, or watch TV. It could be possible that a method for measuring distraction that more directly addresses eating behaviour as a distraction would have yielded different results. As an example, Macht et al. (2005) specifically asked students if their choice to eat was to distract them from stress before an exam.

Some explanations for the results of the CISS-A comparisons can be found in current literature. Concerning avoidance, findings by Wolff et al. (2000) are completely contradictory to the findings of this study in that it was observed that a binge eating sample differed only in terms of avoidance-style coping and no other measures whereas in the current study, avoidance was one of the only constructs that did not appear to change over the course of treatment. When this coping style was removed from their analysis, there were no significant differences between their binge-eating group and their control group. It should be noted that coping was measured using the Daily Coping Questionnaire rather than the CISS-A (Wolff et al., 2000). These authors note that the Daily Coping Questionnaire is “not particularly sensitive to avoidance strategies that may be used by binge eaters” (p. 213). It is possible that if these authors had used the CISS-A, different results may have been observed as the CISS-A has at least one item that specifically addresses eating as a way of coping with stress. The result that the clinical group was higher than the normative mean in terms of emotional coping is supported by results from Sulkowski et al. (2011) who observed that emotional coping mediated the relationship between stress and binge

eating. However, the results of their study disagree with the current study regarding avoidant-style coping given that they observed binge eating behaviour to be associated with avoidance.

A possible explanation for the observed differences between avoidant coping in the literature and the current study might be the method of measuring coping styles. Whereas tests like the Coping Style Questionnaire asks its respondents how often they engage in certain behaviours, the CISS-A has been described as a dispositional measure (Southerland, 2000). In other words, rather than ask respondents to rate how often they engage in certain behaviours, the CISS-A asks how *likely* a respondent is to engage in a certain behaviour. There could potentially be a discrepancy between what people believe they would do in a situation versus what they actually do as in the case of social desirability on psychometric measures (Bernard, 2021; Matteucci, 2014; Vergés, 2022).

While there appears to be little research on how cognitive behaviour therapy affects coping strategies among those with eating disorders, there does exist literature on how coping is affected in other populations. The results of the current study show that there was a significant reduction in emotional coping styles in the clinical group but no significant changes in avoidant coping styles (Figure 2.). In a study of patients seeking treatment for panic disorder, a decrease in both avoidant styles and emotional styles was observed, although the reported levels were still significantly higher than the control group (Wesner et al., 2014). These results support some findings of the current study but not all. While Wesner et al. (2014) and the current study report a reduction in emotional coping Wesner et al. (2014) report an initial difference in avoidance, a decrease in avoidance, and a significant difference between a normative group and the clinical group in terms of emotional coping after treatment. In the current study, avoidance was not

different from the normative data, and it did not appear to change significantly following treatment.

In terms of emotional coping compared to a normative sample, the clinical group post-treatment means were not significantly different from the normative means of the CISS-A (Table 5.). This means that over the course of treatment, the clinical group became less likely to endorse emotional coping strategies when faced with a stressor to the point where they were not significantly different from the CISS-A baseline sample. This result was also seen when compared to the control group where it was noted that (Table 8.). Previous research tends to support these findings. Maskell (2008) found that binge eating severity in bulimia was significantly predicted by emotion-focused strategies when respondents encountered stress. Further, it was found that task- and avoidance-based strategies were not predictive. Maskell (2008) suggests that negative emotions such as anger, loneliness and anxiousness are correlated with emotional responses to stressors and predict higher binge eating behaviour. These results support those of the current study as they relate to the results of the CISS-A and could potentially be explained by the results showing a decrease in depression scores on the BDI-II. The results from Maskell (2008) do not explain why the clinical group's reported levels of anxiety did not significantly change following treatment while depression decreased. Given their argument, it would have been expected that depression and anxiety would have decreased but this was not observed in the current study.

The results of the current study support the hypothesis that coping styles are an important consideration in the treatment of eating disorders. The hypotheses that task-oriented styles would increase, and emotion-oriented styles would decrease have been supported (Figure 2.). Further, it

was confirmed that a course of CBT can change the symptom presentation of someone seeking treatment to that of a non-clinical presentation.

EDE-Q

Prior to treatment, it was found that the clinical group was significantly elevated on all EDE-Q subscales (Table 9.). It was further found that they were elevated when compared to the control sample which agrees with the initial research hypothesis. Interestingly, the control sample were shown to be significantly higher than normative data on the Eating and Weight Concern subscales (Table 11.). The results that the clinical group would be elevated were expected given that the clinical participants were seeking treatment for eating disorders and the control group was screened for participants scoring high in eating disorder symptomology during Study 1, however it was not expected that the control sample would be significantly elevated on any EDE-Q subscales.

After treatment, it was found that the clinical group was statistically higher than normative data on three EDE-Q scales (Table 10.). These were the Global Score, Eating and Weight Concern subscales. When compared to the control group, the clinical participants were not significantly different on any of the EDE-Q subscales (Table 13.). This makes sense when it is considered that the control sample were also significantly higher than normative data on the Eating and Weight Concern scales. It does not, however, explain the difference between the post-treatment clinical group and the normative data in the Global Score. A possible explanation for this difference is that the normative data for the EDE-Q requires updating or more specific normative data for the EDE-Q is required for a Canadian population. For example, more specific EDE-Q norms have been developed for Japanese undergraduate women (Nakai et al, 2014),

Spanish populations (Peláez-Fernández et al., 2013), United States college students (Quick & Byrd-Bredbenner, 2013), and Irish female university students (Keane et al., 2017). The hypothesis that the clinical group would show scores more closely resembling those of a control group after CBT treatment has been supported by the findings.

The current study found that global scores of the EDE-Q were significantly reduced following CBT in the clinical population (Figure 1.) although still higher than the normative mean (Table 10). These results appear to be supported by the literature. Specifically, CBT is efficacious at reducing EDE-Q self-reported symptoms compared to waitlists and pharmacotherapy (Linardon et al., 2017b) and decreases in all EDE-Q subscale scores were shown after treatment was completed (Figure 1.). These findings support the hypothesis that CBT treatment would reduce eating disorder symptomology. Findings from Fairburn et al. (2003) may help explain this. The authors state that individuals with eating disorders evaluate themselves based on body image and eating habits to a higher degree than other people. One of the goals of cognitive therapy is to help a client re-evaluate their thought patterns, which can include what a person values and why. It could be possible that, through cognitive therapy, the clients in this study learned to change their value systems and reduce their concerns about their eating behaviours and their bodies. Although the specific eating disorder discussed by Fairburn et al. (2003) was bulimia nervosa, it is possible that the same logic could hold true for BED. Future studies could investigate this more specifically.

The concept of cognitive fusion offers another possible explanation for the reduction of binge eating symptoms following cognitive therapy. Cognitive fusion (CF) refers to when a person's behaviour becomes governed more by internal thoughts and feelings rather than events from the outside world (Donati et al., 2021). In relation to eating disorders, Melo et al. (2020)

posit that this phenomenon can occur within a specific domain, such as body image or eating behaviours. The authors hypothesize that higher shame about one's body image results from the thoughts and feelings the person has about their body rather than how objectively appears. CF occurs when the person accepts these temporary thoughts and feelings as objective truths. It is reasonable to expect the same to be true about eating behaviours. For example, a person may have just eaten a large dessert and briefly imagined themselves as "fat". CF takes place and this person will then continue to think of themselves as "fat" and look for evidence in the real world to support this view. The result is that a temporary unpleasant thought of being "fat" becomes an unquestionable, albeit flawed, perceived truth. In their correlational study, Melo et al. (2020) found a positive association of CF with binge eating severity. Further, Trindade and Ferreira (2014) report that body-related cognitive fusion is associated with body dissatisfaction and eating disorder severity and CF has been shown to have an association with weight, shape and eating concerns which are all measured by the EDE-Q (Duarte et al., 2017). These latter authors suggest that BED clients' negative self-images contribute to binge eating symptoms.

As it relates to the current study, it is reasonable to hypothesize that CF was occurring in the clients in the clinical group, however this was not specifically examined. Treatments such as mindfulness-based intervention (Takahashi et al., 2020) and Acceptance and Commitment Therapy, also known as ACT, (Widroff, 2017) have been shown to be effective in treating CF whereas the literature regarding CBT's efficacy to reduce CF appears limited. In terms of treating body-image, CBT has been shown to be effective at improving body-image in women (e.g. Cassone et al., 2016), those with body-dysmorphia (e.g. Rosen et al., 1995; Specter & Wiss, 2014), and the sexual functioning and self-image of breast cancer survivors (e.g. Hummel et al., 2018), and therefore it would be reasonable for to expect CBT to address the body-image

concerns of those with BED. Widroff (2017) describes “cognitive diffusion” as a process in which clients learn to view negative self-perceptions as transitory and temporary. If CF were occurring in the current study’s clinical group, it may have been reduced by the CBT treatment such that the clients learned that their subjective beliefs about their bodies and eating habits did not represent reality. Prior to treatment, binge eating could have given the clients negative self-perceptions involving body image and eating habits which may have led them to endorse more items on EDE-Q subscales, however this causal relationship would have to be tested in later studies. Through CBT, the clients may have been able to unlearn negative self-perceptions and endorse fewer concerns related to eating, body shape, eating restraint and weight concerns on the EDE-Q. Future research might support a more direct connection between CF and CBT. Furthermore, future studies may be able to examine the relationship more specifically between binge eating and CF by including a measure such as the Cognitive Fusion Questionnaire-7 (CFQ-7) (Donati et al., 2021). It would be expected that clients would show less cognitive fusion after CBT in such a study.

The initial research hypotheses that the clinical group would improve in eating disorder symptomology after CBT was supported (Figures 1., 4., and 5.). It was also confirmed that the clients would become comparable to normative data and the control group (Tables 9. and 13.). Since those who scored significantly above the mean of the EDE-Q administered in Study 1 were screened out of Study 2, it was not expected that the control group would be different than the normative data on some EDE-Q scales which may indicate the need for more specific normative data. Lastly, the results of the current study may be explained by theoretical concepts such as cognitive fusion and these ideas may inspire future studies to examine these concepts more specifically.

STAI

The results showed that the clinical respondents entered treatment with elevated scores on both the State and Trait subscales of the STAI, when compared to both normative means and to the control group. These results are not surprising given that binge-eating has been associated with higher rates of anxiety (Garcia et al., 2020; Matos et al., 2002; Sawaoka et al., 2012). The results showing no significant differences between pre- and post-treatment anxiety scores are not supported by some current literature as, in most studies, cognitive therapy has been shown to significantly reduce anxiety in patients seeking treatment for BED (Dalle Grave et al., 2008; Carter et al., 2016; Ferrer-Garcia et al., 2019; Moore et al., 2021) and is not effective in reducing anxiety in others (e.g. Fischer et al., 2014).

The results indicating that the clinical group did not improve in the anxiety measures following treatment could potentially be explained when taken with the results suggesting that avoidant coping strategies did not change during treatment. The idea for this connection is inspired by Forrest et al. (2019) who report that avoidant behaviour in their study was specifically the avoidance of eating in front of other people. These authors suggest that avoidant behaviours could reinforce anxiety and eating disorder symptoms and that shape and weight concerns moderate avoidant behaviour and eating disorder symptoms. Given that avoidant coping did not change after CBT treatment, it could potentially explain the unchanged anxiety of the clinical group. It must be considered, however, that the CISS-A items on the Avoidance scale do not ask about the avoidance of eating in front of others. Forrest et al. (2019) developed a correlational network with different factors or “nodes”. It was found that eating concern was not one of the significant nodes. Although Forrest et al. (2019) did not identify eating concern as being a factor in the relationship between anxiety and eating disorder symptom, eating concern

on the EDE-Q did indeed decrease after treatment in the current study. This is surprising considering some items in the eating concern scale directly address eating in front of others. To test this further, closer attention should be paid to the specific avoidant behaviours of eating disorder patients in future studies.

Even if the unchanged anxiety could be explained by in part by Forrest et al. (2019), the fact that eating disorder symptomology decreased following treatment remains. Following the logic of Forrest et al. (2019), if anxiety were unchanged, then eating disorder symptomology could potentially be unchanged. This is not the case in the current study. A possible explanation for this is that the clinical group was still experiencing anxiety in their lives, but following CBT treatment, they were able to learn new coping strategies (as indicated by the increase in the Task scale) that were more effective in solving their problems. Given the language of the STAI asks its respondents how likely they are to be anxious or at ease in general, it is possible that overcoming eating disorder symptomology and being better problem-solvers gave them more self-confidence. Being more effective at solving problems has been shown to reduce depression. Indeed, it has been suggested that problem solving therapy alone is effective in reducing depression and can be used in conjunction with other treatments to reduce anxiety (Michelson et al., 2022). It is therefore possible that depression may have changed as result of learning task-oriented coping strategies and anxiety left unchanged. This would have to be more directly addressed in future studies.

Anxiety is pervasive mental health symptom that has been shown to relate to disordered eating. The results of the current study did not support the hypothesis that CBT treatment would reduce anxiety as measured by the STAI. Since other literature suggests that CBT does is effective in reducing anxiety, this does not agree with most literature on the subject and could

indicate that a different measure should be used in subsequent studies. At the very least, the methods of this study should be replicated to investigate if the STAI is the best tool for measuring anxiety as it relates to the treatment of BED with CBT.

BDI-II

As discussed in the introduction, depression levels were expected to be elevated in the clinical group prior to treatment. This was confirmed on the BDI-II as the mean score of the clinical group was fell within moderate range in depression (Beck et al., 1996). Further, consistent with what was hypothesized, the clinical group showed decreased levels (minimal range) of depressive symptomatology after treatment. Further, the results also showed that the clinical group's depression scores were higher than the control group prior to treatment and were not significantly different from the control group following treatment (Figure 11).

The results showed that those who completed treatment significantly reduced their depression symptoms (Figure 3). Unlike the results observed for anxiety, these results are consistent with most studies studying the effect of CBT on depression in binge eating populations, even when measured using different metrics (ter Huurne et al., 2021). A possible explanation for the decrease in depressive symptoms could be that, as treatment progressed, binge eating frequency decreased and negative moods decreased as a result. To address this possibility, there is research, such as Munsch et al. (2012), to suggest that binge eating disorder involves maladaptive emotion regulation and these authors observed that negative moods were higher for patients during binge days than non-binge days. Taken with the results from the CISS-A, the observations from Munsch et al. (2012) could help explain the results from the current study that the clinical group shifted from emotional coping to task-oriented coping over the

course of treatment. It is possible that the clients learned to solve their problems rather than react emotionally and avoid them. If the clients found that their problems were being solved, and they attributed this to their new coping skills, it lowered their depression. Indeed, there is a type of cognitive therapy called Problem Solving Therapy that was specifically designed to help mental health clients become more capable problem solvers and it has been shown to be effective in the treatment of depression (Bell & D’Zurilla, 2009). The results of the current study show that as treatment progressed, both binge days and binge times decreased (Figures 4. and 5.). What is not clear is the direction of this relationship. In other words, did the depression relief cause binge frequency to decrease or did fewer binge occurrences reduce depressive symptoms? Future studies could address this question more directly. The result that depression is predictive of binge eating is supported in the literature (Pearson et al., 2015; Sinclair-McBride & Cole, 2017). Lavender et al. (2016) report that negative affect is predictive of binge behaviour. While depressive symptoms are not exclusively considered negative affect, the two constructs are related (Danhauer et al., 2013). Depression is involved with eating disorder presentation but what is not clear is how the two are related. In other words, does depression cause eating disorder behaviours or do eating disorder behaviours cause depression? Having additional measures such as the CISS-A that specifically address negative affect and eating behaviours to test the direction of the relationship between depression and binge eating in a study like this would be beneficial.

Pre-Treatment Psychometric Scores as Predictors of Binge Behaviour

The current study shows that emotional responses to stress and a greater preoccupation with eating (as measured by the Eating Concern scale of the EDE-Q) is predictive of more bingeing days during a given week. Additionally, it was found that eating concerns and

depression scores were predictive of more binge times during an episode. While the literature on this subject is limited, these results do agree with research.

There is evidence for the role of emotional coping styles in eating behaviours. Fairburn et al. (2003) suggest that binge-eating is a product of individuals' efforts to restrict their own eating and that binge eating is triggered by lapses in these self-imposed rules. This suggests that a person who scores high on the CISS-A Emotion scale would be more likely to binge eat. Further, Fairburn et al. (2003) describe binge eating as an inability to cope with emotional states and Goldstein et al. (2017) observe that emotional coping can be positively associated with binge eating. The results of these studies align with those of the current study and could be explained by the fact that, over the course of treatment, the clinical group learned to manage their problems using problem-solving rather than emotional reactions. If the above logic is valid, less emotional reactions to stress would be related to less binge eating behaviour.

Peterson et al. (2012) suggest that even having a diagnosis of BED can interact with depression and anxiety symptoms to influence binge eating activity in a synergistic manner. In other words, depression and anxiety act together with the knowledge of having BED as a formal diagnosis to make binge eating worse than if the person did not have a diagnosis. If this effect is true, it would explain the significantly higher levels of depression in the BED group over that of the control group in the current study (Figure 11.). Peterson et al. (2012) used weight-matched groups (i.e., the control group and clinical groups were both similar in their mean body weights) and compared the presentation of anxiety and depression symptoms between the groups. They report that, even when groups were similarly obese, the group with people diagnosed with BED were found to have higher symptoms of depression and anxiety than those who were not diagnosed with BED even though they had similar body weights. Specifically, the authors

reported that depression and anxiety interacted synergistically with a BED diagnosis to influence food intake. These authors also reported that internalizing the symptoms of BED accounted for a portion of their caloric intake during a binge (Peterson et al., 2012). Internalizing symptoms could be interpreted as a form of cognitive fusion, in which case the clients would be viewing the symptoms of BED as overarching truths about themselves. If these results hold true, it could help us understand the finding that higher depression endorsement by the clinical group in the current study was predictive of binge behaviours, however the results from Peterson et al. (2012) suggest that anxiety should be predictive given their synergistic interaction with BED diagnosis and this was not seen in the current study. It has been observed in other literature that anxiety can be predictive of binge eating behaviour (Pintado-Cucarella & Rodríguez-Salgado, 2016) and it is possible that replication of the current study may find that anxiety might be predictive of binge eating.

While no significant results involving the predictors of therapy drop out were discovered, it was encouraging to find predictors of binge eating behaviours among the screening tests. This information can be valuable to clinicians in the treatment of eating disorders in gauging the severity of a client's problem and how much they may be expected to improve in a course of CBT. This could aid a clinician in the in-take process for group CBT in terms of deciding if a person would benefit from a group setting or if a more intensive form of treatment is warranted.

Binge Occurrences Over the Course of Treatment

The current study showed that more weeks spent in treatment would be related to fewer binge-eating times and days which agrees with the initial hypotheses. It was hypothesized that, by the end of treatment, the clinical group's binge eating frequency would more closely resemble

that of the control group. These results agree with literature that suggests the binge eating can be reduced by CBT (Lammers et al., 2022; Wilfley et al., 2000), and there is also literature reporting that, not only do patients see improvements in eating disorder symptomology during CBT, but they may be expected to see a sudden gain in improvement defined by Cavallini & Spangler (2013) as a 12-point decrease on the Change in Eating Disorder Scale between sessions. Other studies have examined elements of binge eating episodes as a predictor of treatment outcome (Mason et al., 2021) and it is believed that this study is unique in examining binge occurrences as a function of weeks spent in treatment. Other research makes use of weekly data collection when studying CBT efficacy in the treatment of OCD (Schubert et al., 2022), depression (Frederick et al., 2022; Fuhr et al., 2022), PTSD (Kleim et al., 2013) and rumination in PTSD (Schumm et al., 2022). Given this, future studies of eating disorder symptomology may be improved by implementing more frequent measures of symptom changes in participants.

As with the predictors of binge eating behaviour, the finding that there is a relationship between time spent in treatment and the degree to which a person can recover from an eating disorder is encouraging. If a clinician is concerned that a client is considering leaving treatment before progress in recovery is made, it would be helpful for that clinician to cite research that supports a relationship between the time spent in treatment and the reduction of symptoms. This might help increase treatment efficacy and a client's sense of hope for recovery. If a client sees evidence in the literature as well as see their own gains in therapy, they may be more likely to be more motivated to stay with the treatment much like the athlete measuring their sprinting time or the dieter measuring their waistline. For this to be possible, these results would have to be replicated using similar methodology in future studies.

Future Directions and Limitations

Data were limited to the tests being chosen by clinicians prior to the involvement of the researchers. It is possible that if other measures, such as more detailed demographics, personality tests, and personal health questionnaires, were administered at different times before and during treatment, therapy dropout may have been predicted. For example, tracking clients weekly as opposed to at the beginning and end, and screening for personality disorder such as borderline personality disorder (Mahon, 2000) may have been predictive (Schindler et al., 2013). Indeed, Linardon et al. (2017a) observed that the presence of early changes in symptoms, as defined as 65% to 70% reductions in binge eating behaviours by the fourth week of treatment, was a mediator of treatment outcome. It is possible that those who dropped out of treatment early were not seeing symptom improvement early enough in treatment for their satisfaction. For this reason, understanding when the observed significant changes, such as sudden gains (Cavallini & Spangler, 2013) started to occur during treatment in this study may have been a useful variable as there may have been a significant difference in when symptom change occurred between those who did and did not complete treatment. Several studies investigating CBT and eating disorders make use of qualitative interviews with clients with advantages such addressing clients' specific needs as they relate to other mental disorders such as autism (Babb et al., 2022), giving the clients the opportunity to reflect on the content and format of treatment (Hamadi et al., 2022) and treatment feasibility in the workplace as opposed to a clinical setting (Toro et al., 2022). Further, the results that binge occurrences reduce as a function of time spent in treatment may be justification for tracking psychometric data weekly rather than just before and after treatment. If binge eating occurrences reduced as a function of time, it is possible that other symptoms such as depression as measured by the BDI-II, eating concerns as measured by the EDE-Q, and stress

coping strategies as measured by the CISS-A may have also changed as a function of time spent in treatment.

In keeping with the theme of different tests, having more specific demographic information about the clinical group may have revealed some predictors such as living situations (Craven & Fekete, 2019), and drug use (van Emmerik-van Oortmerssen et al., 2020). Specifically, the living situation data might be useful given that social embedding appears to reduce dropout (Vroling et al., 2016) and the drug use data could help us understand if clients are engaging in behaviours that have been shown to negatively affect treatment outcomes (Fairburn et al., 2003). The researchers were limited by confidentiality of Health Sciences North to secondary data and, as such, patient records were not examined for further demographic information. Being aware of what information should be sought ahead of time would better inform applications to examine patient records and or demographics questionnaires.

A potential limitation of the current study is having to rely solely on quantitative measures. Using qualitative interviews when treatment ended and or when clients decide to remove themselves from treatment would potentially be useful in understanding drop out motivations. Fairburn et al. (2013) note that patients in their study withdrew from treatment for “clinical reasons” or simply stopped attending. It would be difficult to capture what the exact reason(s) a client might have for simply ceasing to attend sessions with quantitative measures alone. Being able to conduct exit interviews with clients may provide valuable insight and literature using this method appears limited and should be further investigated. There is some literature suggesting that using a method like an interview can increase engagement in the treatment of eating disorders. Gowers and Smyth (2004) found that using a motivational assessment interview increased self-reported motivation in the treatment of anorexia nervosa.

Some of the clients could have dropped out for reasons that go beyond personality factors such as sudden illness, work schedule changes, or other life circumstances and the current study only dealt with factors that are in a client's control and relate to their personality. Adding a qualitative element such as a "motivational assessment interview" or, more importantly, an exit interview to future studies could address these external factors of the clients' lives.

Another limitation is the sample size of the clinical group. As noted by the power analysis, the sample was too small to detect an effect in terms of the regression and the generalizability of the findings are be limited. The current study disagrees with the literature in some respects and agrees with it in others. This is one of the disadvantages of having a smaller sample size such as in the current study and replication with a larger sample size is warranted.

An aim of future studies could include longitudinal elements. Many studies track the long-term effects of treatment. Because this study relied on secondary data that protected the identities of the respondents from the researchers, long-term effects and potential relapses will not be known. It would be useful for clinicians, and hope-instilling for clients to know how long the effects of treatment might be expected to last on average. Reporting on the longitudinal effects of CBT is common for studies on the efficacy of treatments on eating disorders (Charpentier et al., 2003; Lammers et al., 2022; Paul et al., 2022).

A last consideration for future work would be to seek a more gender inclusive sample. This is a limitation of the current study as the control group was comprised of mostly women. This is to be expected since women comprise a greater percentage of university student enrolments than men (Christofides et al., 2010). Fortunately for the current study, the clinical and control groups were comprised of a similar ratio of men to women to non-binary individuals and therefore comparisons would be valid. The limitation for the current study is its generalizability

to the greater population. Future studies should seek to have greater representation of other gender identifications for more valid generalizability. As stated in a previous section, there is literature suggesting that eating disorder research could benefit from recruiting more men for studies. While it is true that BED affects women at rates two to three times higher than men (APA, 2022), understanding how BED affects men is no less important. Further, it has been suggested that those in the LGBTQ2+ community are more likely to experience disordered eating (Goldhammer et al., 2019; Parker & Harriger, 2020) and only one participant in the current study identified as non-binary in terms of gender. Increasing participation to include men and sexual minorities would increase the generalizability of the results.

Regarding the limitations of CBT itself, it has been argued that a holistic CBT approach may be overcomplicating matters. Gaudiano (2008) highlights some criticisms of CBT including research by Jacobson et al. (1996). These latter authors note that addressing only the behavioural elements *or* the cognitive elements can be just as effective as addressing both as in CBT (Jacobson et al., 1996). Relating to BED, it has been reported in an earlier section of this study that treatment of BED can emphasize either the disordered eating (the behavioural elements) (Södersten et al. 2017) or the negative self-images regarding eating habits held by sufferers (the cognitive elements) (Palmeira et al., 2018). Depending on the needs of the client and the presentation of the disorder, an approach with a narrow scope may be indicated.

V. CONCLUSIONS

This study revealed several notable findings. Although the main research question involving predictors of therapy drop out yielded inconclusive results, it agrees with the position that literature on this subject is very mixed, and that alternative methods should be used to better

answer this question. It could be possible that looking for answers about therapy drop out using rigorous testing may be overcomplicating the matter. There are several factors that may only be answered using interview-based qualitative measures such as the relationship between patient and clinician, life circumstances, personal needs in therapy, biases about the therapeutic process itself, the suitability for a particular patient for CBT treatment etc. In conclusion of this idea, rather than give someone a psychometric test to see if they are going to leave treatment, it may be better to simply ask them.

Other research questions were satisfactorily answered. It was shown that patients seeking CBT treatment for eating disorders might manage stressful situations in an emotional rather than a pragmatic way, and CBT can change this. It can also help patients make better use of social connections during times of stress. Not only do the patients increase in these healthier coping strategies, but they also become similar to a non-clinical population in terms of their ability to cope with stress, suggesting that CBT can help return a person to a subclinical presentation. More generally, it was shown that people seeking CBT treatment for binge eating disorder improve and become comparable to non-clinical populations in terms of their binge eating occurrences, and general eating disorder and depressive symptomology. Finally, it was shown that there is a direct relationship between the amount of time spent in treatment and the degree to which a person can expect to recover from BED.

It is believed this study is unique in this respect, and it highlights an important aspect of treatment that mental health practitioners should bear in mind when delivering treatment; this being the regular tracking of weekly symptom changes over the course of treatment. This is a recommended practice in most CBT programs and takes the form of homework and weekly thought records and mood journals. Further, the discovery of this relationship means that future

studies should attempt to replicate these findings so that clinicians can make use of the information when talking to clients. This study adds to the evidence for the utility of practices such as homework and weekly symptom monitoring. On the flip side, these results also highlight the importance of therapy retention and practitioners should take special care to foster positive relationships with their clients, troubleshoot problems in therapy and monitor patients' progress. As has been stated, the best method for this could be found in qualitative methods, which ought to be integrated into future research in this area.

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