An Open Trial Investigating the Usefulness of Metacognitive Therapy for Patients Diagnosed with Anorexia Nervosa

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Abstract

Anorexia nervosa is considered to be a difficult disorder to treat in adults (Fairburn, 2005). The current study aimed to explore the effectiveness of metacognitive therapy modified for anorexia nervosa as a new intervention approach for individuals struggling with this disorder. In this sequential exploratory study; twelve patients diagnosed with either typical or atypical anorexia nervosa were recruited from the South Island Eating Disorders Clinic to receive adapted metacognitive therapy for anorexia nervosa. The number of therapy sessions that patients received in this study ranged from 11-42 sessions. Data analysis was conducted at the group level and individual level. The results of the study found that patients showed some decreases in their eating disorder symptoms and some showed an increase in BMI following modified MCT. Group data showed that there was also an observed decrease in the groups maladaptive metacognitions, with individual analysis showing promising findings of clinically significant changes of reductions in patients positive beliefs about worry after receiving MCT. However, individual analysis of clinically significant changes revealed that there was little support for improvements in other types maladaptive metacognitions (negative metacognitive beliefs, cognitive confidence, cognitive self-consciousness and need to control thoughts). Results also found that although group data showed a decrease in patients use of worry as a thought control strategy following MCT, individual analysis showed no clinically significant changes in this outcome measure. Moreover, there were no changes observed at either the group or individual level in patients use of punishment as a thought control strategy after MCT. After receiving MCT intervention, patients also showed reductions in depressive symptoms, worries and rumination levels at both the group level and individual level. Overall the current study shows promising results for the use of adapted metacognitive therapy as an intervention for patients with anorexia nervosa.

INTRODUCTION

Anorexia Nervosa

Anorexia nervosa is an eating disorder whereby individuals engage in a wide variety of behaviours to help them lose a significant amount of weight in order to achieve 'thinness' (American Psychiatric Association, 2013). These individuals resort to starvation type diets in which they closely monitor and restrict the amount of calories and types of food they consume; these diets may be accompanied by harmful behaviours such as binging/purging and over exercising to the point of exhaustion (American Psychiatric Association, 2013). The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, outlines specific criteria which need to be met before an individual can be diagnosed with anorexia nervosa.

Firstly, a health professional such as a clinician, psychiatrist or doctor must assess whether the individual's food intake is below the expected daily nutrition requirement, resulting in substantially low body weight. The World Health Organisation uses the Body Mass Index (BMI) to calculate if an individual is underweight (APA, 2013). The BMI is also relied upon to measure the severity of the individual's eating disorder by using the following BMI categories: BMI > 17kg/m (Mild), BMI = 16 -16.99kg/m (Moderate), BMI = 15 – 15.99kg/m (Severe) and BMI < 15kg/m (Extreme). Secondly, in addition to their significantly low body weight, the individual must have an extreme ongoing fear of increased weight or must engage in behaviour which prevents them from gaining any body weight (APA, 2013). Finally, the clinician must make an assessment as to whether the individual has a distorted perception of their body; whether their self-worth is based on how they view their own body image; or whether the individual is ignorant about the health risks associated with being significantly underweight (APA, 2013). If an individual meets these three criteria's, a diagnosis of anorexia nervosa may be appropriate.

Anorexia nervosa is divided up into two different subtypes: restrictive, which occurs when the individual's behaviour is limited to calorie restrictions in order to lose body weight and the binge-eating/purging subtype, whereby within the past 3 months the individual's attempt to restrict food leads to a loss of control through a binge-eating episode followed by the compensatory behaviour of vomiting (purging) after the binge in order to avoid weight gain (APA, 2013). Although the binge-eating/purging subtype seems analogous to another eating disorder called Bulimia Nervosa, in which individuals repeatedly binge and purge in an effort to lose weight, the hallmark feature of anorexia nervosa which distinguishes it from these other eating disorders is that individuals have dangerously low body weight as a result of their dysfunctional eating patterns and behaviours (APA, 2013).

Eating disorders such as anorexia nervosa often develops at a young age, occurring when individuals are in the transition period of child to adulthood (APA, 2013). The journey into adulthood is accompanied by major life transitions, such as high school graduation, starting tertiary education, moving out of home or looking for employment; these events are often stressful and coincide with the development of disorders such as anorexia nervosa (APA, 2013). Individuals living in countries where there is a societal pressure to be 'thin' are also more at risk of developing an eating disorder (APA, 2013; Culbert, Racine & Klump, 2015). It is estimated the gender ratio for this eating disorder is 10 females:1 male (APA, 2013).

Recently it has been found that anorexia nervosa has a 0.3-0.4 prevalence rate and around eight new cases of anorexia nervosa out of 100 000 people are being diagnosed each year (APA, 2013; Hoek & van Hoeken, 2003). Many of these new cases of anorexia nervosa are likely to be adolescents or in the early stages of their adult life (APA, 2013). Despite the low prevalence rates of anorexia nervosa compared to other disorders in the DSM-5, anorexia nervosa is considered to be one of the most dangerous disorders because of its high mortality

rates (Chesney, Goodwin & Fazel, 2014). These high mortality rates are due to the fact that individuals diagnosed with anorexia often experience medical complications as a result of their seriously low body weight (APA, 2013). Individuals who struggle with anorexia often suffer from malnutrition; the lack of nutrition in the body may lead to liver damage, organ failure and weakened bone density, all of which increases the risk of mortality (APA, 2013; Gaudiani, Sabel, Mascolo & Mehler, 2012). Individuals with anorexia nervosa also have a heightened risk of engaging in suicidal behaviours due to psychological distress (APA, 2013). Hence, the literature and research have highlighted the need for an effective form of intervention to treat individuals diagnosed with anorexia nervosa, especially those who have struggled with eating disorder for years as they continue to have recurring episodes of anorexia nervosa throughout their life.

In an effort to gain a better understanding of the issues and difficulties which arise in the treatment of individuals with anorexia nervosa, a review of the different interventions currently being utilised in hospitals, clinics and outpatient treatment centres will be provided in the following sections.

The effectiveness of current interventions utilised in the treatment of individuals diagnosed with anorexia nervosa

The National Institute for Health and Care Excellence (NICE, 2017) has recommended that psychological interventions such as individual eating-disorder-focused cognitive behavioural therapy (CBT-ED), specialist supportive clinical management (SSCM) and Maudsley Anorexia Nervosa Treatment for Adults (MANTRA) should be used to treat anorexia nervosa. The effectiveness of these interventions will be explored below.

The research on finding an effective treatment for individuals with anorexia has used a wide array of different types of interventions, as well as modifying pre-existing

interventions for anorexia in an attempt to improve long term outcomes for this seemingly treatment-resistant disorder. One such study investigated the use of cognitive behavioural therapy (CBT) with virtual reality in treating patients with eating disorders, such as anorexia nervosa, bulimia nervosa and EDNOS (Marco, Perpina & Botella, 2013). In the Marco et al., (2013) study patients received either a standalone standard CBT for Eating Disorders Treatment (SEDT) or SEDT combined with virtual reality (VR) which had several aims one of which was to assist them to become aware of their distorted perceptions of their own body image (SEDTBI). Marco, Perpina & Botella (2013) showed that compared to SEDT, the CBT combined with VR treatment was the more efficacious treatment for eating disorders as patients in this group showed more marked reductions in eating disorder symptoms after treatment was complete and these treatment effects were still present 1 year later. However, out of 34 patients with eating disorders, this study only had 5 patients who were diagnosed with anorexia nervosa (Marco et al., 2013). Furthermore, it was not clear how long these individuals had been struggling with anorexia or whether any of these individuals with AN dropped out from the study. These factors make it hard to conclude whether CBT combined with VR is an effective treatment for anorexia nervosa

In another longitudinal study which looked specifically at CBT intervention for individuals diagnosed with either anorexia nervosa or subthreshold anorexia found that at the 3 year follow up, only 33% of the participants no longer met diagnosis for anorexia nervosa, which is concerning considering some of these participants did not initially meet full criteria for anorexia nervosa (Ricca, Castellini, Sauro, Mannucci, Ravaldi, Rotella & Faravelli, 2010). In contrast, other CBT interventions have been used by researchers in an attempt to treat patients with severe anorexia nervosa who had been struggling with their eating disorder for 7 or more years of their life (Touyz, et al., 2013). The researchers found that both cognitive behavioural therapy which had been specifically adapted to treat anorexia nervosa

(CBT-AN) and specialist supportive clinical management (SSCM) were effective in reducing symptoms of anorexia nervosa (Touyz et al., 2013). Primary measures such as the Eating Disorder quality of Life instrument (EDQOL) was used to measure the quality of life of individuals struggling with anorexia by examining their psychological, physical, cognitive and work life functions. Results showed marked improvements in individual's quality of life after receiving treatment, (Effect size post treatment: 0.73 (CBT); 0.92 (SSCM)). Furthermore, these treatment gains were maintained during a 12 month follow up (Effect size: 0.84 (CBT); 1.11 (SSCM)) (Touyz et al., 2013). However, although patients in this study showed improvements in their eating disorder psychopathology, it is unclear whether patients achieved full remission of their eating disorder.

Other studies which used cognitive behavioural therapy for maintaining the treatment effects for anorexia nervosa, cited that 65% of patients who received CBT had sustained remission (Carter, McFarlane, Bewell, Olmsted, Woodside, Kaplan & Crosby, 2009). However, this study had high attrition rates, as a large proportion of patients did not complete the year long CBT treatment. This was acknowledged by the authors who agreed that the sheer number of participants who did not complete treatment was concerning, thus highlighting a main issue of attrition when it comes to treating patients with anorexia nervosa (Carter et al., 2009).

Apart from CBT, studies have used other forms of intervention for anorexia nervosa such as cognitive remediation therapy and the Maudsley Model of Anorexia Nervosa Treatment for Adults. A study by Lock, Agras, Fitzpatrick, Bryson, Jo & Tchanturia, 2013 used cognitive remediation therapy in an attempt to provide an effective intervention for individuals diagnosed with anorexia nervosa that would minimise the high dropout rates usually observed in anorexia nervosa interventions. This study uses cognitive remediation therapy (CRT) in which patients engage in cognitive exercises which may assist them in their

daily lives by changing the way they think and evaluate themselves. Those diagnosed with anorexia nervosa were placed in one of two conditions where they received either; CRT followed by CBT, or standalone CBT intervention. Although the results of the study initially showed lower drop out rates in the CRT group (13%) than the CBT group (33%) by the time both groups had completed treatment, more patients in the CRT group had dropped out to the point where there was no difference in drop-out rates between treatment groups (Lock et al., 2013).

The Maudsley Model of Anorexia Nervosa Treatment for Adults (MANTRA) has been used to treat patients with anorexia nervosa by addressing maladaptive cognitions and unhealthy social relationships which maintain the disorder (Schimt et al., 2015). Schimt et al., 2015 conducted a randomised controlled trial whereby patients with anorexia nervosa were placed in one of two intervention groups; MANTRA or the Special Supportive Clinical Management (SSCM). Those in the SSCM group received ongoing therapy whereby the therapist provides support and psychoeducation to those with anorexia nervosa. In terms of whether patients received and maintained full remission 12 months after beginning treatment, the Schimt et al., (2015) study showed that only 16.33% of patients who received SSCM and 22.41% of patients who received MANTRA intervention achieved a BMI >18.5 kg/m² as well as an eating disorder examination global score of < 2.77, which indicates that a majority of patients in the study did not maintain a full recovery when they were assessed 12 months after starting treatment. This only demonstrates the difficulties in treating adults with anorexia nervosa and emphasises that anorexia nervosa is a highly treatment-resistant disorder. Furthermore, it should be noted that this study included patients diagnosed with EDNOS whose BMI was 18.5kg/m as part of their trial.

Overall research studies have found limited evidence for an effective way of treating anorexia nervosa in adults. Researchers have encountered many complications when it comes

to treating anorexia nervosa as clinicians have to contend with high levels of patient drop-outs during treatment and low remission rates. Fairburn (2005) conducted a review of randomised controlled trials (RCTs) which compared and contrasted different types of interventions for treatment of anorexia nervosa. In regards to the interventions available for adolescents with anorexia nervosa, Fairburn, (2005) conceded that despite the lack of RCT's conducted in this field, research suggests that family based therapy was effective in treating anorexia nervosa in adolescents. However, his review indicated a lack of efficacious interventions targeting anorexia in adults. It was postulated that this was due to the long-term consolidation of maladaptive processes which maintain eating disorder symptoms in adults, as they are more likely to have experienced longer bouts of symptoms of anorexia than adolescents (Fairburn, 2005).

Recent reviews analysing RCTs such as cognitive behavioural therapy, family therapy, and cognitive analytic therapy used to treat anorexia have found that there is a lack of research demonstrating the effectiveness of these interventions in treating adults who have persistently struggled with anorexia nervosa for years (Hay, Touyz & Sud, 2012). Hence, there has been an increase in the number of open trials being conducted to review new interventions which could be used to treat adults who have an ongoing, recurring diagnosis of anorexia nervosa (Hay et al., 2012). An intervention that may be efficacious in treating adults with anorexia nervosa is metacognitive therapy. However, before evaluating the usefulness of metacognitive therapy (MCT) as an intervention for anorexia nervosa, it is important to draw the distinction between CBT and MCT.

The differences and similarities between Cognitive therapy and Metacognitive therapy

Cognitive behavioural therapy, is based on the notion that an individual's core belief of being 'unlovable' or 'unworthy' causes them to develop assumptions and rules which they

must follow such as "If I ask for help, I'll be seen as incompetent" (Beck, 2011, p. 364) These underlying assumptions or intermediate beliefs impact the way in which the individual views themselves, the world and the future, they give rise to automatic thoughts, which are thoughts that occur spontaneously as the individual navigates their way through life (Beck, 2011). If an individual has an underlying core belief of being 'unworthy', it is most likely that they have negative automatic thoughts occurring in their daily lives, such as "I can't do this" (pg. 151 Beck, 2011).

Cognitive behavioural therapy is based on the assumption that psychological distress is caused by negative maladaptive cognitions and dysfunctional beliefs (Wells, 2009). Cognitive theorists propose that treatment should focus on targeting negative cognitions and changing negative interpretations of a situation into more balanced realistic thoughts (Beck, 2011, Wells 2009); Metacognitive theorists on the other hand believe that changing the particular style of the individual's thinking processes which occurs at the metacognitive stages of higher order processing is what is required (Wells, 2009). Therefore, instead of evaluating negative automatic thoughts by examining the evidence for and against it, which is a technique used by cognitive theorists; metacognitive therapy helps the individual to change their response to their negative automatic thoughts as it is this response rather than the thoughts in itself that cause the psychological distress (Wells, 2009).

The Metacognitive Model

Metacognitions

Metacognition can be thought of as Fisher and Wells (2009) describes more eloquently "cognition applied to cognition" (p. 3), which essentially means to be aware of one's own higher order cognitive processes and how it can influence the way we think about things such as situations or events. Metaphorically, metacognitions are the drivers which

choose which route to take, which in turn determines how our cognitions are interpreted and processed (Wells, 2009).

Self-regulatory Executive Function model

In order to understand the role of metacognition and the different ways it can influence an individual's psychological wellbeing, the Self-Regulatory Executive Function model which underpins MCT will be explained (Fisher & Wells, 2009; Wells, 2009; Wells, 2000). The Self-Regulatory Executive Function model (S-REF) has three distinct levels of cognitive processing. The literature on the S-REF model has different names to describe each of the three levels, for the purpose of simplicity and consistency, the levels proposed in the Wells (2009) S-REF model will be used.

1. *Low-Level Processing*

   The first level is called the Low-level processing stage. This lower-level processes information entering the S-REF automatically, it does not require the conscious awareness of the individual to process stimuli from the outside world (Wells, 2009; Wells, 2000; Wells & Matthews 1996).

2. *Online Conscious Processing/Cognitive Style*

   The second level of information processing within the S-REF, is online controlled processing. At this level stimuli are consciously appraised and strategies are implemented with the "aims to reduce any discrepancy between current status and target status" (Matthews & Wells, 2003, p. 129). When a persistent thinking style 'cognitive attentional syndrome' is implemented this can lead to psychological distress (Wells 2009; Fisher & Wells, 2009)

3. *Meta-system*

> The third level of the S-REF, involves metacognitions and is known as the meta-system. The meta-system contains metacognitive knowledge and contains a model for ongoing cognitive processes occurring at the lower stages of the S-REF system. Thus, metacognitive knowledge is used to guide and monitor the individual's cognitive processing style (Wells, 2009; Wells 2000)

These three levels of the S-REF model interact with each other in various ways as information is being processed. As previously stated, metacognitive knowledge can influence the way in which individuals process and respond to a situation. (Fisher & Wells, 2009; Wells 2000; Wells, 2009). When someone holds theories or information about their thinking this is known as metacognitive knowledge (Wells, 2000; Wells, 2009). Metacognitive knowledge is made up of declarative beliefs and procedural beliefs (Wells 2000; Wells, 2009). Declarative beliefs are also known as explicit beliefs, as individuals are consciously aware of them. For example, an individual may have the belief that "worrying can damage my body" (Wells, 2009 p. 16) (Wells, 2000; Wells 2009). Thus, declarative beliefs are the individual's evaluation of their own thinking (Wells, 2000). Procedural beliefs are implicit as individuals may not be aware of them. These implicit beliefs are plans which assist in the guidance of thinking, (Wells, 2009). These plans involve memory retrieval, allocating attention, and biases (Wells, 2000; Wells, 2009; Wells & Mathews, 1996).

Metacognitive strategies such as suppression or preservation reflect the ways in which an individual tries to suppress or control their own thoughts, often in an effort to reduce psychological distress. Unfortunately, metacognitive strategies such as suppression, worry or distraction are usually ineffective and attempts to control thoughts and may serve to maintain the individual's distress (Wells, 2009). Metacognition is also comprised of metacognitive experiences (Wells, 2000). Metacognitive experiences refers to appraisals, interpretations and feelings about cognitions (Wells, 2009; Wells, 2000). Wells (2009) illustrates that when a

person worries about their worries, or has a 'feeling of knowing' which is a subjective feeling, these are both examples of metacognitive experiences. When cognitions and feelings are negatively judged by individuals, these metacognitive experiences can play a role in the processes of psychological distress (Wells, 2009).

Cognitive Attentional Syndrome

Now that the components which comprise the S-REF model have been explained, it is important to show how within the model, a particular style of thinking called the cognitive attentional syndrome (CAS) can lead to psychological distress in individuals (Wells, 2000). Cognitive attentional syndrome (CAS) is a perseverative style of thinking which is comprised of worry and rumination, maladaptive coping behaviours and fixating attention on threat (Wells, 2009; Wells & Fisher, 2015). Both worry and rumination involves persistent conceptual processing of information. Individuals who worry are focused on any potential future threats, thus they become fixated on answering questions of 'What if?', On the other hand, rumination is usually focused on past events and questions of 'Why me?' (Fisher & Wells, 2009; Wells, 2009). However, failure to find answers to these questions can result in persistent engagement in these ruminating and worry processes which can exacerbate feelings of anxiety and depression (Fisher & Wells, 2009; Matthews & Wells, 2003; Wells, 2009). The processes involved in worrying and ruminating also require the usage of attentional resources, which could instead have been used for more adaptive ways of responding to negative information, such as external based problem solving strategies (Wells, 2009; Wells 2000; Matthews & Wells 2003). Moreover, continued usage of rumination and worrying results in the strengthening of plans to utilise these conceptual processes as response to negative information in the future (Wells, 2000; Wells, 2009).

The CAS also involves the focus of attention on threat through the use of threat monitoring strategies (Wells & Fisher, 2015; Fisher &. Wells, 2009). Individuals may place their attentional focus on stimuli which are threatening, this includes negative thoughts, emotions and sensations in the body (Fisher & Wells, 2009). This threat monitoring strategy is problematic in psychological disorders as Wells & Fisher (2015) states that when those struggling with depression constantly monitors their concentration and bodily sensations for signs of depression, this increases their sense of danger.

Maladaptive coping behaviours are also part of CAS. Individuals may engage in maladaptive coping behaviours such as reassurance seeking, alcohol use, thought suppression or avoidance. For example, individuals with depression may decrease activity levels because they have the metacognitive belief that "I must reduce my work level when feeling sad because my mind can't take it" (Wells, 2009, p. 219). However, these behaviours are unhelpful as avoidance precludes individuals from obtaining information which could disconfirm their beliefs (Wells, 2009). Moreover, as previously stated the use of thought suppression strategies usually produce unsuccessful results (Wells, 2009).

When individuals become locked into the CAS style of thinking they are engaging in a persistent form of prolonged processing of negative intrusions which leads to distress; those with psychological disorders may find it difficult to switch out of this problematic thinking style which highlights the lack of control over flexibility of responses (Wells, 2009).

The role of metacognitive beliefs in developing and maintaining the CAS cycle

Many people have negative thoughts or beliefs about themselves, however, not everyone experiences psychological distress due to these negative cognitions (Wells & Fisher, 2015). Individuals who are able to respond flexibly to negative cognitions experience only brief periods of aversive emotions (Wells & Fisher, 2015; Wells, 2009). Whereas,

individuals who engage in maladaptive thought processing styles such as rumination, worrying, threat awareness and avoidance become trapped in an inflexible prolonged maladaptive style of thinking which leads to psychological distress (Fisher & Wells, 2009).

Wells (2009) identified two different types of metacognitions; positive and negative. Positive metacognitive beliefs refer to the belief an individual has that their maladaptive cognitive processes of rumination/worry, threat awareness and avoidance are helpful coping strategies (Fisher & Wells, 2009). Therefore, positive metacognitive beliefs such as "Thinking about the causes of sadness will help me prevent it" (Wells, 2009, p. 200) only serve to develop and perpetuate the negative style of thinking (CAS) which creates ongoing psychological distress (Fisher & Wells, 2009; Wells, 2009).

Negative metacognitive beliefs also play a role in the development of CAS, as individuals may start to believe that their thoughts are somehow dangerous and uncontrollable (Fisher & Wells, 2009; Wells, 2009). For instance, beliefs such as; "my thinking has changed; I'm no longer in control" (Wells & Fisher, 2015, p. 138) further perpetuates the CAS as individuals view worrying and rumination processes as uncontrollable, they regard these processes as a symptom of their psychological disorder as opposed to viewing them as voluntary strategies (Wells & Fisher, 2015; Wells, 2009).

Metacognitive Therapy

Metacognitive Therapy was developed by Adrian Wells as an intervention to treat those who were struggling with emotional disorders. It is used to alleviate psychological distress in individuals by modifying maladaptive metacognitive beliefs and targeting CAS. It was theorised that once the metacognitive beliefs were effectively challenged, CAS is removed and individuals are taught to adopt more adaptive flexible ways of responding to

negative information, this will lead to a reduction in psychological distress (Fisher & Wells, 2009; Wells, 2009). The basic components of MCT will briefly be outlined below.

Before working on implementing MCT intervention strategies in collaboration with the client, the therapist must first evaluate and identify which specific maladaptive cognitive processes are being used to maintain the client's psychological distress (Wells, 2009). Once the therapist identifies whether the client engages in worrying or rumination processes, the client is made aware of the mechanisms which maintain their disorder and how MCT works to change them (socialisation). Throughout the MCT therapy sessions, the therapist uses socratic dialogue to identify the client's own metacognitive beliefs and how the client interacts or responds to their own cognitions (Wells, 2009).

One of the main components of MCT intervention is helping the client shift to a metacognitive mode of perceiving, where they are able to view their thoughts as a separate entity from themselves through the processes such as detached mindfulness tasks (Fisher & Wells, 2009). A variety of strategies are implemented to break the CAS cycle and reduce maladaptive metacognitive processes. These include attention training techniques, detached mindfulness tasks, worry/rumination postponement and challenging positive and negative metacognitions which all aim to teach patients different more flexible ways of responding to thoughts rather than using worrying or rumination (Wells, 2009). The positive and negative metacognitive beliefs of the client are modified through the use of therapy techniques such as verbal reattribution and behavioural experiments. (Wells, 2009). For example, a therapist may use verbal reattribution to help the patient to re-examine their belief that worrying or rumination is helpful for problem solving and seeking answers. A therapist will also challenge the patient's belief that worrying or rumination is dangerous or uncontrollable through the use of behavioural experiments. For example, the patient is told to worry as much as possible for a period of time to prove that worrying will not cause hallucinations, nor is it

physically harmful (Wells, 2009). As a final step, relapse prevention strategies are put into place in order to prevent clients from engaging in maladaptive perseverative thinking styles in the future (Wells, 2009).

The efficacy of MCT as an intervention for treating psychological disorders

Previous research indicates that MCT can be a useful intervention for various psychological disorders such as generalised anxiety disorder, obsessive compulsive disorder, depression and other anxiety disorders (Johnson, Hoffart, Nordahl & Wampold, 2017; van der Heiden, Muris & van der Molen, 2012; van der Heiden, Rossen, Dekker, Damstra & Deen, 2016; Wells et al., 2012). For example, Wells et al., (2012) conducted a trial which evaluated the effectiveness of MCT for patients suffering from treatment-resistant depression. In this trial, patients who had unsuccessfully attempted to treat their depression, either through some form of therapy or antidepressant, were recruited for MCT intervention. These patients received a brief MCT intervention (8 sessions) with a qualified clinician. The results found that depending on the recovery criteria more than half of the patients who finished the treatment program achieved recovery (Beck Depression Inventory (BDI) ES: 1.65). Furthermore, these improvements were maintained at the 1 year follow up (BDI ES: 2.29) (Wells et al., 2012). Hence this study demonstrates that when it comes to treating persistent cases of depression MCT may be a useful intervention.

Research studies have also utilised randomised controlled methodology to examine whether MCT is as efficacious as other standardised interventions such as cognitive behavioural therapy in treating anxiety disorders (Johnson, Hoffart, Nordahl & Wampold, 2017). Patients who were diagnosed with social phobia, post-traumatic stress disorder, or panic disorder with or without agoraphobia were recruited for this study. Furthermore, the majority of patients in this study not only had a primary diagnosis of an anxiety disorder but

they also met criteria for a secondary DSM-IV disorder. These patients had also previously received some sort of psychological treatment for their anxiety disorders, but were unresponsive to these interventions. Once patients agreed to participate in this study, they were randomly placed in one of the two intervention groups, CBT or MCT treatment group. Patients in each intervention group received individual therapy sessions with either a clinical psychologist or psychiatrist. The findings indicated that patients in the MCT group recovered faster than those in the CBT group after treatment (Beck anxiety inventory ES: $d = 1.0$; Penn State Worry Questionnaire ES: $d = 0.83$). In the months after treatment completion, patients in the CBT group showed greater recovery rates but at the 12 month follow up there were no differences in the efficacy of treatment between the MCT and CBT group (Johnson, Hoffart, Nordahl & Wampold, 2017). It is important to note that although patients from both intervention groups received a similar number of therapy sessions, those in the CBT group had longer individual sessions of 70 minutes compared to patients in the MCT group who received 50 minute sessions. Therefore, it appears that MCT is a more efficient form of treatment for patients with comorbid anxiety disorders as they received shorter therapy sessions and had faster recovery rates than those receiving CBT intervention (Johnson et al., 2017). Furthermore, it appears that MCT is a suitable transdiagnostic treatment for those diagnosed with 2 or more psychological disorders.

Another study examined the utility of MCT as a transdiagnostic treatment for individuals diagnosed with comorbid depression (Hjemdal et al., 2017). This study was an open trial in which patients with a primary diagnosis of major depression and a secondary comorbid disorder (anxiety disorders or avoidant personality disorder) received MCT intervention. The MCT intervention used to treat patients in this trial was specifically designed to target depression symptoms. Due to the nature of an open trial, only 10 patients were recruited for the study. Patients received one-to-one MCT intervention with an

experienced clinician. By the end of the intervention, 9 patients met the threshold for recovery based on their improved BDI outcomes (BDI: Hedges $g = 2.89$). Furthermore, at the 6 month follow-up period, seven out of ten patients met the recovery criteria (BDI: Hedges $g = 2.40$). Despite the small sample size, the findings of this open trial indicated that MCT is a highly efficacious treatment for comorbid depression (Hjemdal et al., 2017).

Further studies evaluated the efficacy of MCT in treating generalised anxiety disorder against the efficacy of other interventions such as the intolerance of uncertainty therapy (van der Heiden, Muris & van der Molen, 2012). This study recruited patients diagnosed with generalised anxiety disorder and placed them in one of three treatment groups: MCT group, intolerance of uncertainty therapy (IUT) group or delayed treatment (DT) group. The delayed treatment group served as a control for the other two interventions. Patients in the MCT and IUT intervention group received individual therapy sessions with a psychologist. It was found that patients who received MCT had higher remission rates (91%) than patients receiving IUT intervention (80%), Patients from both therapy groups continued to improve after post-treatment, as 93% of patients who received MCT and 90% of those who received IUT were in remission (van der Heiden, Muris & van der Molen, 2012). Hence, results of this study indicate that compared to IUT intervention, MCT had quicker improvements in patients with GAD and was more efficacious than IUT in treating GAD (van der Heiden, Muris & van der Molen, 2012).

Overall these studies indicate that MCT is an effective intervention for treating different psychological disorders, as it produces faster recovery in patients with psychological distress and can also be used transdiagnostically as an intervention for individuals struggling with comorbid psychological disorders. Hence, MCT may be a promising form of intervention for individuals diagnosed with anorexia nervosa, which has proven to be a difficult disorder to treat.

Worry, rumination and eating disorders

Previous research has found that in undergraduate female students, worry can predict the 'drive for thinness' which is associated with a person's drive for weight loss (Sala & Levinson, 2016). In terms of the clinical population, studies have indicated that in patients diagnosed with an eating disorder who have previously received treatment, worry can predict patients' eating disorder symptomology after treatment (Fewell, Levinson & Stark, 2017). Moreover, research has found that patients with eating disorders (anorexia nervosa and bulimia) have higher levels of worry compared to those without an eating disorder (Sassaroli et al., 2005). Studies examining the content of worry for individuals with eating disorders have found that their initial worries focused on themes of weight and shape concerns (weight gain), purging behaviours and fear of relapse (course of illness), but as individuals continued to catastrophise these worries evolved into content related to interpersonal relationships, experience of negative emotion and negative perception of self (Sternheim et al., 2012).

Past research indicates that not only do patients with anorexia nervosa have raised levels of worry and rumination, but that even after taking into account anxiety and depression, these repetitive negative thinking styles predicted patients' eating disorder symptomology (Startup et al., 2013). Interestingly, Sternheim et al., (2012) found that there were no significant differences in worry between individuals with eating disorders and controls when depression was taken into account. However, these two studies have quite different clinical samples. When Sternheim et al., (2012) recruited patients with eating disorders, they purposely excluded individuals who had a comorbid clinical diagnosis of depression or anxiety. Whereas, Startup et al., (2013) included individuals with anorexia nervosa who also had comorbid anxiety or depression in their clinical sample. Hence, these differences in their results may be due in part to their clinical sample.

Studies have also indicated that in patients diagnosed with an eating disorder, increased repetitive negative thinking (rumination/worry) was found to be predictive of increased eating disorder behaviours as patients were likely to weigh themselves more often (Sala, Brosof & Levinson, 2019). Research has shown that when patients with eating disorders were exposed to a sad video clip they engaged in more maladaptive emotional regulation strategies such as rumination and suppression compared to those without eating disorders (control group) (Naumann, Tuschen-Caffier, Voderholzer & Svaldi, 2016). Moreover, both rumination and suppression strategies were predictors of eating disorder symptomology (Naumann et al., 2016). Studies have also found that when individuals with eating disorders were purposefully exposed to images of thin models and were subsequently told to engage in rumination or acceptance based strategies to regulate their emotions, those who utilised rumination as an emotional regulation strategy experienced a rise in body-dissatisfaction levels (Naumann, Tuschen-Caffier, Voderholzer, Schafer & Svaldi, 2016).

Previous research compared the use of other emotion regulation strategies such as distraction and rumination in patients with eating disorders (Naumann, Tuschen-Caffier, Volderholzer, Caffier & Svaldi, 2015). This study found that after inducing emotions of sadness in patients, the use of rumination as a strategy to regulate emotions increased desire to abstain from eating in patients with anorexia nervosa, whereas no such increase in the desire to abstain from eating was observed in patients with anorexia who utilised distraction strategies (Naumann et al., 2015).

Metacognitive beliefs of individuals with eating disorders

Vann, Strodl & Anderson (2013) proposed a transdiagnostic metacognitive model of eating disorders, based on Wells' own metacognitive model. Through the use of qualitative research Vann et al., (2013) developed the metacognitive model to show how eating disorder

psychopathology is developed and maintained, with the practical implication that this can inform future research investigating the use of metacognitive therapy as treatment for eating disorders. In Vann et al., (2013) qualitative study, researchers interviewed individuals who were diagnosed with an eating disorder, with questions about their metacognitions, coping behaviours and attentional focus. In Vann's et al's (2013) study, participants endorsed positive metacognitive beliefs such as; "I need to focus and perseverate on my negative thoughts to protect me from losing control of my eating, because if I lose control of my eating I will become fat and worthless" (Vann et al., 2013 p.5). These positive metacognitive beliefs lead to activation of the CAS where perseverative negative thinking (worry/rumination) and attentional bias about body image/food/eating occurs. Negative metacognitive beliefs are also activated. In the Vann et al., (2013) study three types of negative metacognitive beliefs emerged; "Strong emotions and negative thoughts are uncontrollable and awful" (Vann et al., 2013, p.6) , "Strong emotions are confusing – I don't know what I am feeling or what to do about the feeling" (Vann et al., 2013, p.6) and "All negative thoughts are bad, wrong or abnormal and need to be addressed" (Vann et al., 2013, p.6). Positive metacognitive beliefs about coping strategies are also activated. Individuals engage in maladaptive coping strategies to deal with their distress; these coping strategies include suppression/avoidance of negative emotions or thoughts, restricting food intake in an attempt to control ruminations/worries and negative emotions, binge eating to distract from negative thoughts/emotions, purging and social avoidance.

Previous research studies have also found that those diagnosed with AN have underlying negative metacognitions (McDermott & Rushford, 2011). McDermott and Rushford (2011) reported that the CAS cycle was present in patients with anorexia nervosa as seen reflected in their MCQ-30 subscale scores, where those with AN have shown more negative metacognitions (uncontrollability of worry), high cognitive self-consciousness, low

cognitive confidence and held more beliefs about the importance of controlling one's thoughts compared to controls.

Other studies have also reported similar findings where patients' with eating disorders had a greater degree of maladaptive metacognitions compared to controls (Olstad, Solem, Hjemdal & Hagen, 2015). Moreover, it was found that dysfunctional metacognitions was correlated with eating disorder symptomology. In particular the metacognitions of 'need to control thoughts' MCQ-30 subscale was highlighted as one of the predictors of eating disorder symptoms. It was proposed that coping behaviours such as eating disorder behaviours may be utilised as a way of controlling ruminations or worries (Olstad et al., 2015). Studies have found that metacognitive beliefs such as the need to control thoughts and positive beliefs about worry predicted patients' drive for thinness in individuals with anorexia nervosa, whereas negative beliefs about worry predicted the drive to be thin in patients with atypical anorexia nervosa (Davenport et al., 2015).

Overall, there is a great deal of evidence that metacognitive processes are relevant to eating disorders, thus the present study explores the usefulness of adapted MCT for patients struggling with anorexia nervosa.

Present Study

The present study aims to explore the effectiveness of modified MCT for patients diagnosed with either anorexia nervosa or atypical anorexia nervosa. This modified MCT trial for those diagnosed with anorexia nervosa or atypical anorexia nervosa was conducted at the South Island Eating Disorders Service (SIEDS) by clinical psychologists. The MCT utilised in this open trial originally used to treat major depressive disorder (MDD); however, modifications were made to target the symptoms of anorexia nervosa. As previously discussed, studies have shown that individuals with anorexia have underlying maladaptive

metacognitions about themselves (McDermott & Rushford, 2011). When it came to modifying MCT treatment for MDD into an intervention which can be utilised to treat patients with anorexia nervosa, clinical psychologists at the SIEDS first provided patients with psychoeducation about the consequences of having an eating disorder and how it not only affects mental well-being but it also causes internal damage to the body's system. Moreover, patients learnt the importance of eating regular meals. They also received information about how their thoughts and behaviours contributed to the maintenance of their eating disorders. Aside from psychoeducation, MCT for anorexia nervosa also involved monitoring of food intake and weekly weigh ins to keep track of changes in body weight. Patients were also referred to a dietician if they required further nutritional advice.

The aim of this study was to explore whether patients receiving MCT experience a positive change in their metacognitions, weight/body mass index, thought control strategies and anorexia nervosa (AN) symptoms from pre-treatment to post-treatment.

It is hypothesised that:

1. Modified MCT can be successfully used to treat patients with AN. This will be evidenced through the following changes:
    A. Patients with AN will have a significant increase in weight and decrease in eating disorder symptoms after receiving MCT.
    B. use of modified MCT will result in patients with AN experiencing a decrease in their maladaptive metacognitions and unhealthy thought control strategies.
    C. The use of MCT would result in a decrease in worrying and rumination and depressive symptoms.

Method

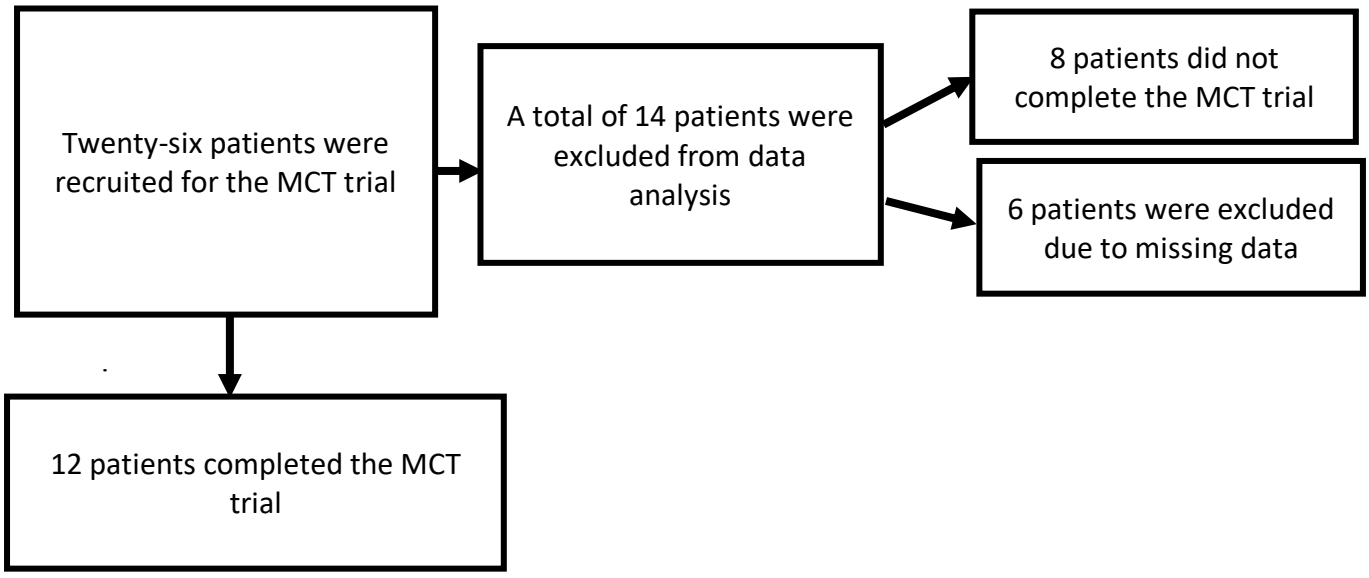
Participants

Patients were recruited through sequential referrals from general practitioners and other mental health services to the South Island Eating Disorder Services (SIEDS) for AN treatment. Patients recruited for the trial were aged 16 years or older, with a current, primary DSM-V diagnosis of Anorexia Nervosa or Atypical Anorexia Nervosa (patient meets criteria for AN, however they are in a normal weight range). Patients who were suicidal, bipolar 1, psychotic, substance dependent or had a BMI < 14 were excluded from participating, as these patients required inpatient services rather than outpatient treatment.

A total of twenty-six patients consented to this study and agreed to undergo 10-20 weekly sessions of metacognitive therapy with a clinician at the SIEDS. However, the data from only 12 patients will be included in this study due to patient drop outs and incomplete outcome measures. This is shown by the flowchart (Figure 1)

Figure 1

Flowchart of patients with anorexia nervosa who received MCT



Procedure

Patients in this open-trial study received metacognitive therapy previously utilised for treating major depressive disorder (MDD) which was adapted to target and treat eating disorder psychopathology. The instructions for administering MCT were based on the guidelines developed by Adrian Wells to treat MDD (Wells, 2009). Patients who were sequentially referred to the SIEDS clinic and upon clinical assessment met the requisite criteria for inclusion in the study were invited to be a part of the open MCT outpatient trial. Patients who agreed to take part in the trial were provided information about the study and were asked to sign a consent form (Appendix A and Appendix B). Patients were assigned to the clinician trained in MCT who had previously assessed them at intake. There were four therapists who carried out the MCT intervention. Therapists were all clinical psychologists who were experienced in working with patients with eating disorders. Each therapist received training in MCT and were provided with therapy supervision throughout the study. Ethical approval was granted for this study (Appendix C).

Metacognitive therapy for anorexia nervosa

As part of the modification to Well's (2009) MCT, patients at the SIEDS received psychoeducation about the impact their eating disorder has on their physical and psychological health. They received psychoeducation about the importance of regular eating and were provided nutritional guidance. A dietician was also available for those who needed further advice about food diet. Patients also learnt about the various perpetuating factors which maintain their eating disorders. Patients were also required to monitor their food, eating proper meals regularly each day. Their weight was monitored with weekly weigh-in's during their sessions with a clinical psychologist. The goal at the start of treatment was to

establish regular eating patterns for the individual to help them gain weight. Clinicians incorporated MCT techniques alongside these eating disorder therapy techniques.

Metacognitive therapy consisted of eight distinct stages, each of which are essential in MCT (Wells, 2009). In the first stage of treatment each clinician formed a case conceptualisation of their patient (Wells, 2009). Patients were asked to describe a recent time where they felt self-conscious about their body-image or their weight. Patients then described what sort of thoughts were going through their mind at that time and how long they spent ruminating or worrying. A case formulation was developed which included, internal triggers, rumination/worrying response, impact of rumination/worrying on emotions, positive metacognitive beliefs, negative metacognitive beliefs, maladaptive coping behaviours, eating disorder related behaviours. Through the process of socialisation (Wells, 2009), clinicians began to explain the case formulation to their patient, helping them understand how metacognitive processes caused and maintained their eating disorder psychopathology. This included helping patients understand how their ruminations/worries, metacognitive beliefs, resulting self-regulatory behaviours and their attempts to suppress their thoughts plays a role in maintaining their current state of eating psychopathology.

Once the patients had an understanding of how metacognitive processes maintain their eating disorder they are then taught techniques such as attention training techniques, detached mindfulness and rumination/worry postponement exercises that would help them exert control and disengage with their worrying/rumination processes (Wells, 2009) (this includes worrying/ruminating about their eating, shape and weight). The aim of attention training techniques is to increase attentional flexibility meaning that individuals can exercise control over their attention, so that they do not become tied up into perseverative conceptual thinking patterns such as worrying or ruminating (Wells, 2009). Detached mindfulness exercises are also implemented to teach patients a different way of relating to their thoughts;

in detached mindfulness exercises, patients are taught to detach themselves from inner events (thoughts) and becoming a passive observer of these inner events; thus, when a negative thought or trigger enters their mind they are told to refrain from conceptually analysing (rumination/worrying) the thought (Wells, 2009). Detached mindfulness exercises can be used alongside rumination/worrying postponement where patients are then taught to refrain from ruminating or worrying about a trigger until a specific time later in the day (Wells, 2009).

The next stage of therapy consisted of further challenging patients' negative metacognitive belief that their rumination or worry are uncontrollable (Wells, 2009). Clinicians used verbal strategies to provide evidence against the idea that rumination/worry were uncontrollable or dangerous (Wells, 2009). Experiments were also conducted to challenge the patients beliefs that they cannot control their ruminating or worrying. Clinicians used strategies such as advantages-disadvantages analysis, questioning the evidence and rumination/worrying experiments to challenge the patients' belief that ruminating/worrying about an issue will help them solve the problem (Wells, 2009). Instead of relying on the use of worrying or ruminating which leads to distress, clinicians helped the patients explore adaptive ways of acquiring positive outcomes. Patients were taught to utilise skills of problem solving, preparing and planning as opposed to engaging in worrying or ruminating, they were also taught to reflect instead of ruminate on issues.

As part of relapse prevention, patients were required to continue to practice their newly learnt strategies to control their rumination/worrying processes (Wells, 2009). In order to avoid relapses, new processing plans were put into place whereby patients identified triggers of rumination and worrying and helpful responses (thinking style, behaviours, attentional focus) for dealing with these triggers (Wells, 2009).

Measures

Demographic measures

Information regarding patient's age, sex and age of onset when first diagnosed with AN was collected by a member of the clinical team from those who agreed to participate in the SIEDS study. Information regarding the patient's ethnicity and marital status was also collected by a clinical team member. The patients' ethnicity was categorised by 1 = *NZ European*, 2 = *Maori*, 3 = *Samoan*, 4 = *Cook Island*, 5 = *Tongan*, 6 = *Nieuean*, 7 = *Chinese*, 8 = *Indian* and 9 = *other*. The patient's marital status was also categorised by 1 = *married or living together 1+years*, 2 = *separated,* 3 = *divorced*, 4 = *widowed* and 5 = *never married.*

Outcome measures

The following measures were collected at pre-treatment, post treatment and 3-months after treatment was completed (3-month follow up);

1. Patients weight in kilograms (kgs) is measured by therapists prior to each session to track specific changes in the individual's weight during treatment.
2. Patients height in metres (m) was measured prior to the start of treatment.

From these measures (weight and height) each patient's Body Mass Index (BMI) was calculated. The BMI takes into account height and weight of a patient and provides a score which determines whether they are in a healthy weight range based on their height. Individuals with a BMI range of 18.5 – 24.9 are considered to be in the healthy weight range based on the norm population. Whereas, according to the DSM-V, individuals with a BMI equal to or below 17 kg/m^2 may be diagnosed with anorexia provided that other criteria' of the eating disorder are met.

Self report measures

Self-report measures were also used to collect information about the severity of patients anorexia nervosa and its associated features both prior to and after treatment;

Eating disorder symptoms

Eating Disorder Examination Questionnaire – 6th Edition (EDEQ-VI) (Fairburn & Beglin, 1994; Fairburn & Beglin, 2008).

The EDEQ-VI was used to measure changes in patients eating disorder psychopathology before and after treatment. The self-reported EDEQ-VI is comprised of questions which measures the frequency of eating disorder behaviours which the patient has engaged in over the past 28 days to assess the severity of their eating disorder (Fairburn & Beglin, 2008). The EDE-Q also breaks down the questions into four subscales used to measure the severity of each patient's eating disorder by taking into account their eating restraint behaviours, shape concern, eating concern and weight concerns (Fairburn & Beglin, 2008; Fairburn, Cooper & O'Connor, 2008). Finally, patients were also required to answer additional questions regarding their height, weight, number of missed menstrual periods and whether they were currently taking the contraceptive pill. The EDEQ has been shown to have good internal consistency ranging from α = 0.96-0.81 (Cronbach's alpha) and re-test reliability (r = 0.77-0.92) (Phillips, Jennings & Gregas, 2018; Rose, Vaewsorn, Rosselli-Navarra, Wilson & Weissman, 2013)

Metacognitions

Metacognitions questionnaire-30 (MCQ-30) (Wells & Cartwright-Hatton, 2004).

Patients also completed the MCQ-30, a shortened self-reported questionnaire which was adapted from the Metacognitive Questionnaire (MCQ). This shortened MCQ-30

has been shown to have good internal consistency (Cronbach's α = 0.72 - 0.93) (Wells & Cartwright-Hatton, 2004). The MCQ-30 is comprised of 30 questions used to assess the patient's beliefs about their own cognitions (Wells & Cartwright-Hatton, 2004). For each question patients were required to circle one of the four options 1 = *Do Not Agree*, 2 = *Agree Slightly*, 3 = *Agree Moderately* or 4 = *Agree Very Much* (Wells & Cartwright-Hatton, 2004). The MCQ-30 (Wells & Cartwright-Hatton, 2004) is divided up into five subscales which measures patients'; lack of cognitive confidence, cognitive self-consciousness, positive beliefs that worrying is beneficial, negative beliefs that thoughts are uncontrollable and dangerous and beliefs concerning the need to control thoughts. Therefore, the higher the scores in any of these five subscale areas is indicative of more maladaptive metacognitions (Hjemdal et al., 2017)

Thought control

Thought Control Questionnaire (TCQ) (Wells & Davies, 1994)

The TCQ (Wells & Davies, 1994) is a self-reported psychometric measure comprised of 30 questions which is used to measure patients' strategies for controlling unpleasant thoughts. For each question patients were required to choose one of four responses; 1 = *Never,* 2 = *Sometimes*, 3 = *Often* or 4 = *Almost Always*. Their responses are indicative of how often they utilise a different types of thought control strategies such as; distracting oneself from negative thoughts, social control, worrying, punishing oneself and reappraisal of the thought. These five categories of thought control (Distraction, social control, worry, punishment and re-appraisal) have been found to have good internal consistency ranging from α = 0.64-0.79 (Cronbach's alpha) and re-test reliability r = 0.67- 0.83 (Wells & Davies, 1994). In regards to

adaptiveness of these thought control tools, strategies such as punishment and worry were proposed to lead to psychological distress (Wells & Davies, 1994).

Depression

Beck Depression Inventory Second Edition (BDI-II) (Beck, Steer & Brown, 1996). The BDI-II is used to measure whether an individual endorses symptoms of depression through a self-report form. Once the individual completes all 21 questions, the items are scored and totalled. The BDI-II has 4 categories for its total scores corresponding to depression symptom severity: 0-13 (minimal), 14-19 (mild); 20-28 (moderate); 29-63 (severe). The BDI-II has an 0.93 alpha coefficient and re-test correlation (Beck et al., 1996)

Worry

Penn State Worry Questionnaire (PSWQ) (Meyer, Miller, Metzger & Borkovec, 1990)

The PSWQ is a self-report questionnaire that is made up of 16 items used to assess worry. It has been demonstrated to have good internal consistency (α = 0.91- 0.95) and re-test reliability (Meyer et al., 1990).

Rumination

Rumination subscale of the Rumination-Reflection Questionnaire (RRQ) (Trapnell & Campbell 1999).

The rumination subscale of the RRQ consists of 12 items used to measure the construct of rumination in individuals. Items such as “I often find myself revaluating something I’ve done” (Trapnell & Campbell, 1999, p. 293) are rated from (1) strongly

disagree, (2) disagree, (3) neutral, (4) agree or (5) strongly agree. The rumination subscale has good internal consistency ($\alpha = 0.90$) (Trapnell & Campbell, 1999)

Clinician measures

The following global outcome measures were collected by clinicians at the SIEDS for each participant at both pre-treatment and post-treatment:

1) *Global rating of clinical state of eating disorder (Mcintosh et al., 2016)*

   Clinicians used this to measure the number of eating disorder symptoms and whether the patient can be diagnosed with anorexia nervosa under the DSM-IV criteria. Clinicians utilise their clinical judgement to assess the extent of each patient's eating disorder psychopathology. The following ratings (Mcintosh et al., 2016) were assigned to each patient; 1 = *No significant features of eating disorder*, 2 = *A few features of eating disorder*, 3 = *Not full criteria for eating disorder but a number of features of eating disorder*, 4 = *Meets full criteria for an eating disorder*. Patients who received a score of 4 (meets full criteria for an eating disorder) by the clinician were admitted into the trial provided that they did not meet any of the exclusionary criteria set out above.

2) *Global assessment of functioning-eating disorders (GAF-ED) (DSM-VI cited in Mcintosh et al., 2016)*

   Clinicians used this to measure the severity of patients' eating disorder by taking into account how their eating disorder impacts their current occupational, social and psychological well-being. The GAF-ED scoring system ranges from 1-100, which are broken up into ten separate categories. For example, patients who received a total score ranging from 1-10 were considered to be extremely impaired in their daily functioning, as they were in "persistent danger of severely hurting self or others . . . or

persistent inability to maintain minimal personal hygiene" (APA, 1994, p.32). Conversely, patients who received a total score between 91-100, are functionally healthy (APA, 1994).

Analysis

Group Data

Due to the small sample size of the present study (n = 12), a statistical approach which calculates and compares the inferential confidence intervals (CI) of two means (***M***) to ascertain statistical significant difference was performed. This method of statistical analysis is outlined in Tryon (2001).

According to Tryon (2001), by calculating the inferential CI of two dependent means and comparing whether there is any overlap between the two CI's, allows us to determine whether or not the means are statistically different. If the two dependent mean CI's overlap, this indicates that the two means are not statistically different; whereas if there is no overlap present between the two CI's we can accept that the two dependent means are statistically different from one another (Tryon, 2001).

To determine whether there is a statistical difference between outcome measures before and after MCT intervention, the inferential CIs for the dependent means (pre-treatment, post-treatment) of each outcome measure was calculated using the following formulae given in Tryon (2001):

$$t_x = t_{95} \frac{\sqrt{S_{\bar{Y}_1}^2 + S_{\bar{Y}_2}^2 - 2r_{12}\, S_{\bar{Y}_1}\, S_{\bar{Y}_2}}}{S_{\bar{Y}_1} + S_{\bar{Y}_2}} = E\, t_{95} \qquad (1)$$

In equation (1) *E* is the value by which each CI needs to be reduced, by not only taking into account the standard errors of each mean ($S_{\bar{Y}_1}, S_{\bar{Y}_2}$) but also factoring in the correlation (r) between pre-treatment and post-treatment measure. Once *E* has been

calculated, it is multiplied by the critical t value of the dataset at the 95% confidence level in order to determine whether the two means are statistically different at $p < 0.05$ (t_{95}). The confidence intervals for both means (pre-treatment and post-treatment outcome measure) were then calculated using equation (2).

$$\bar{Y} \pm E\ t_{\alpha/2}\ S_{\bar{Y}} = \bar{Y}\ \pm E\ t_{\alpha/2}\ \frac{S}{\sqrt{N}} \qquad (2)$$

Once significant statistical difference is determined, the next step is to calculate whether or not the two CI's of the mean are statistically equivalent. This is involves calculation by determining whether the lower limit of the CI of the lesser mean and the upper limit of the CI of the greater mean is less than delta (Tryon, 2001). If this is the case, then the two means are said to be statistically equivalent (Tryon, 2001). Delta in the current study was set by as 1 standard deviation of the Pre-treatment mean.

If neither statistical significant difference nor statistical equivalence are found, then the results are said to be statistically indeterminant (Tryon, 2001), whereas, if the results are both statistically different and not statistically equivalent, then there is a statistical difference.

Effect size.

The effect size was calculated using the formulas provided by Cummings (2012) for Cohen's *d*. In this formula the s^2_{pre} is the standard deviation of the pre treatment mean and s^2_{post} is the standard deviation of the post treatment mean. The symbol s_{av} is the standard deviation average and the M_{diff} is the difference between pre treatment and post treatment means. Effect sizes were only calculated for measures with means that were statistically different and not statistically equivalent from pre-treatment to post-treatment. Effect sizes for Cohen's *d* ranged from small = 0.2, medium = 0.5 and large = 0.8 (Cohen, 1988).

$$s_{av} = \sqrt{\frac{s^2_{pre} + s^2_{post}}{2}}$$

$$d = \frac{M_{diff}}{s_{av}}$$

Individual Data

Brinley Plots.

In a modified Brinley plot analysis a scatter plot of each patient's pre-treatment outcome score (x axis) is plotted against their corresponding post-treatment outcome score (x-axis) (Blampied, 2017). A diagonal 45º line is drawn on the scatter plot, this is known as the line where no change has occurred (Blampied, 2017). Patients scores which fall on this line indicates that there was no change in their outcome measure scores from pre-treatment to post-treatment; scores that fall below the line, indicated a decrease in score, while scores above the line indicate an increase in scores (Blampied, 2017; Jacobson & Truax, 1991).

Reliable Change.

To calculate how much change was needed in order for it to be a reliable change, the Reliable Change Index (RCI) was calculated. The RCI can be calculated by using equation 1-3 (Blampied, 2017; Blampied, 2016; Jacobson & Truax, 1991). The standard error of the measure (SE_M) is calculated in equation 1 where S_1 is the standard deviation of a normal population and r_{xx} is reliability for a given measure. The SE_M is then used to calculate the "standard error of the difference scores" (S_{Diff}) (Blampied, 2017, p. 119) (see equation 2). To determine the upper and lower RCI at a significance level of $p < .05$, the S_{Diff} is multiplied by 1.96 (see equation 3). Patients scores which fall within these RCI limits do not represent a reliable change from pre-treatment to post-treatment, as it is possible that due to measurement error similar changes may result (Blampied, 2017; Jacobson & Truax, 19991).

$$SE_M = S_1\sqrt{1 - r_{xx}} \qquad (1)$$

$$S_{Diff} = \sqrt{2(S_E)^2} \qquad (2)$$

$$RCI_{(<.05)} = \pm 1.96 S_{Diff} \qquad (3)$$

Once the RCI has been calculated, the upper and lower limits were plotted as dotted lines running on either side of the diagonal line which indicates no change (Blampied, 2017). Patient scores which fall beyond the RCI are considered to be a reliable change in the patients score (Blampied, 2017). Scores which lie beyond the RCI shows a change (either an increase if above the line, or decrease if below the line) from pre-treatment to post-treatment greater than what can be attributed to measurement error (Blampied, 2017; Jacobson & Truax, 1991)

In order to calculate the RCI, norms were obtained from previous studies which consisted of norms such as those similar to a normal population, or a normal sample with similar to patients in the current study (women) or normal sample who may be more at risk of developing an eating disorder such as college women (Quick & Bryd-Bredbenner, 2013). (EDE-Q: Quick & Byrd-Bredbenner, 2013; TCQ: Wells & Davies, 1994; MCQ-30: Wells, & Cartwright-Hatton, 2004; BMI: Stommel & Schoenborn, 2009; BDI-II: Whisman & Richardson, 2015; PSWQ: Gillis, Haaga & Ford, 1995; Meyer, Miller, Metzger & Borkovec,1990; RRQ: Trapnell & Campbell, 1999.

In terms of the Global Rating of Clinical State of Eating Disorder measure the reliable change index was not able to be calculated. Furthermore, since all patients met the full criteria for an eating disorder at pre-treatment, the lack of variation in their pre-treatment scores for this measure resulted in a .00 SD (pre-treatment) score. Hence, it was decided that a description of the number of patients who showed reductions in their eating disorder symptoms would be provided. Furthermore, due to the lack of suitable norms for the Global Assessment of Functioning – Eating Disorder measure, the reliable change index was not calculated.

Clinically significant change.

Jacobson and Truax (1991) requires two components for clinically significant change to be achieved. Firstly, individuals must achieve a reliable change, that is the change in their scores from pre-treatment to post-treatment is not a result of measurement error. Secondly, patients scores must fall beyond a certain cut off point (Jacobson & Truax, 1991).

Some measures in the current study already had pre-existing clinical cut-off points as set by previous research (Blampied, 2017). For certain measures, (EDEQ-VI, MCQ-30, TCQ, RRQ, PSWQ) without set pre-existing clinical cut off points, the cut-off point was set at a change of 2SD from pre-treatment mean towards the 'direction' of improvement (Jacobson & Truax, 1991). For certain measures such as the EDE-Q restraint subscale measure, it was not possible to use a cut-off point that was 2SD from the pre-treatment mean, as this would result in a cut-off point that was below the lowest possible score for that measure. Therefore, the EDE-Q restraint subscale cut-off point was set at 1.5SD from the pre-treatment mean.

The measures with pre-existing clinical cut-off points determined by previous literature are described below.

The BMI measure's cut-off point was set as follows: if patient's score moved into the healthy weight range (BMI=18.5 to 24.9) as determined by the World Health Organisation (WHO, n.d.). In terms of the BDI-II measure, the cut-off point was defined by the guidelines set out in the BDI-II manual, where if patients experienced a reduction in the severity of their depression symptoms at post-treatment such that if they moved into the lowest severity index ($\leq$ 13 minimal depressive symptoms) they were defined as having met the clinical cut off point criteria (Beck, Steer & Brown, 1996). If patients were already in the lowest severity index (minimal depressive symptoms), they would only meet the cut-off point criteria if they showed no depressive symptoms at post-treatment as defined by the BDI-II manual (Beck, Steer & Brown, 1996).

A cut off point for the GAF-ED score of ≥ 71 was used as the sole criteria to determine clinically significant change. The GAF-ED measure defines patients whose scores are equal to or greater than 71 as having 'transient' or no symptoms with none or minor 'impairment' of functioning in daily 'activities' (APA, 1994, p32).

RESULTS

Demographics

A total of 12 patients diagnosed with anorexia nervosa completed a minimum of 11 MCT sessions with a clinician which was the minimum number of sessions required to be included for analysis in the present study. The number of sessions each patient in the present study received ranged from 11 to 42 sessions as the number of sessions received was dependent on their therapist's clinical judgement of how much therapy was needed. The majority of patients who completed the study were NZ European (n = 10). The two patients who identified themselves as being from another ethnicity group but did not specify which. Patients in the present study ranged from 18 to 35 years of age (***M*** = 22.17), with 18.33 years being the mean age of onset for their current eating disorder (see Table 1).

Aside from being diagnosed with anorexia nervosa, nine out of the twelve patients in the study also had other co-occurring disorders such as major depressive disorder or an anxiety disorders. The number of patients who have other specific co-occurring disorders are outlined in Table 2. Furthermore, before starting the MCT trial nine patients sought treatment for their eating disorder (ED) and six patients had sought treatment for other problems as shown in Table 3.

Table 1

Demographics of patients with anorexia nervosa

	Demographics		
	N	*M*	*SD*
Current Age	12	22.17	5.17
	Clinical Demographics		
	N	*M*	*SD*
Age of onset of any ED	11	16.45	2.95
Age of onset of first ED	12	17.75	5.61
Age of onset of current ED	12	18.33	5.55

Table 2

Number of patients with other co-occurring disorders

Other Co-occurring Disorders	N
Post-traumatic Stress Disorder (PTSD)	1
Subthreshold PTSD	1
Generalised Anxiety Disorder (GAD)	5
Obsessive-Compulsive Personality Disorder (OCPD)	2
Major Depressive Disorder (MDD)	2
Social Anxiety Disorder	2
Borderline Personality Behaviours	1

Note: Some patients had multiple comorbid disorders.

Table 3

Number of patients who have sought other forms of treatment

	Other Treatments
	N
Previous treatment for ED or weight problems	9
Previous treatment for other problems	6

Missing Data

Due to missing data, only patients with both pre-treatment and post treatment outcome measures were analysed for statistical, clinical significance and reliable change. Therefore, some measures only had nine participants (PSWQ) while others had 12 participants (BMI) in the analysis.

Outcome

Group Data.

Body Mass Index (BMI)

There was statistical difference in the average BMI of patients from pre-treatment to post-treatment, as the CI's of both means do not overlap (see Table 4), with a medium effect size ($d = 0.7826$). Furthermore, the two BMI means were not statistically equivalent. Hence, there was a mean increase in patients group BMI from pre-treatment to post-treatment.

Table 4

Patients Body Mass Index (BMI) before and after MCT intervention

Time	N	M	SD	SEM	*r*	95% CI	R_g	Different	Equivalent	Cohen's *d*
Pre Treatment	12	17.833	1.9289^	0.5568		17.3966 -18.2694				
Post Treatment	12	19.460	2.2192	0.6406	0.755	18.9579-19.9621	2.5655	*	ns	-0.7826

Note.
r = Pearson's Correlation, ^ = delta interval, R_g = maximum mean difference, * = statistically significant at .05, ns = not statistically significant at .05

Eating disorder symptoms.

Total symptoms (Eating Disorder Examination Questionnaire*).*

There was a decrease in the patients group mean EDEQ-VI global score after receiving MCT and the difference in EDEQ-VI mean scores from pre-treatment to post-treatment was statistically different. Furthermore, they were not statistically equivalent (see Table 5).

Table 5

Patients EDEQ-VI Global score before and after MCT intervention

Time	N	M	SD	SEM	*r*	95% CI	R_g	Different	Equivalent	Cohen's *d*
Pre Treatment	10	3.819	1.4175^	.4483		3.1696-4.4684				
Post Treatment	10	.852	.6893	.2180	.340	0.5362-1.1678	3.9322	*	ns	2.6621

Note.
r = Pearson's Correlation, ^ = delta interval, R_g = maximum mean difference, * = statistically significant at .05, ns = not statistically significant at .05

Restraint, eating, shape and weight concern.

There was a decrease in the mean scores of the restraint subscale, eating concern subscale, shape concern subscale, weight concern subscale measures from pre-treatment to post-treatment (see Table 6). Statistical difference was observed for each subscale measure from pre-treatment to post-treatment. Furthermore these subscale scores were not statistically equivalent from pre-treatment to post-treatment. Large effect sizes were also observed across all subscales (d = 2.2158-2.7560).

Table 6

Patients EDEQ-VI subscale scores before and after MCT intervention

Time	N	M	SD	SEM	*r*	95% CI	R_g	Different	Equivalent	Cohen's *d*
Restraint										
Pre Treatment	10	3.700	1.9669^	.6220		2.6920-4.7080				
Post Treatment	10	.520	.5007	.1583	.505	0.2635-0.7765	4.4445	*	ns	2.2158
Eating Concern										
Pre Treatment	10	3.700	1.1284^	.3568		3.2911-4.1089				
Post Treatment	10	.760	1.0013	.3166	.492	0.3972-1.1228	3.7117	*	ns	2.7560
Shape Concern										
Pre Treatment	10	4.175	1.3947^	.4410		3.5393-4.8107				
Post Treatment	10	1.287	1.0818	.3421	.207	0.7938-1.7802	4.0169	*	ns	2.3139
Weight Concern										
Pre Treatment	10	3.700	1.7544^	.5548		2.8058-4.5942				
Post Treatment	10	.840	.4881	.1543	.446	0.5913-1.0887	4.0029	*	ns	2.2211

Note.
r = Pearson's Correlation, ^ = delta interval, R_g = maximum mean difference, * = statistically significant at .05, ns = not statistically significant at .05

Global Rating of Clinical State of Eating Disorder.

Due to the type of numerical data collected for the Global Rating of Clinical State of Eating Disorder (ED) outcome measure, where patients were given a numerical rating of 1, 2, 3 or 4 depending on the severity of their eating disorder symptomology at pre-treatment and post-treatment, the measure r which is used in Tryon's formula to analyse whether a statistical difference was observed could not be determined. However, the descriptive statistics of the raw data (Table 7), suggest that there was a decrease in the mean of the Global Rating of Clinical State of ED from pre-treatment to post-treatment.

Table 7

Patients Global Rating of Clinical State of ED score before and after MCT

Time	N	M	SD	Range
Pre Treatment	11	4.00	.00	0
Post Treatment	11	2.55	1.128	3

Global functioning (Global Assessment of Functioning – Eating Disorders (GAF-ED)).

The GAF-ED mean scores increased from pre-treatment to post-treatment, and were both statistically different and not statistically equivalent (see Table 8), with a large effect size being observed (d = 1.6019).

Table 8

Patients GAF-ED score before and after MCT intervention

Time	N	M	SD	SEM	*r*	95% CI	R_g	Different	Equivalent	Cohen's *d*
Pre Treatment	11	46.45	7.776^	2.345		42.8403-50.0597				
Post Treatment	11	64.45	13.859	4.179	0.135	58.0173-70.8827	28.0424	*	ns	-1.6019

Note.
r = Pearson's Correlation, ^ = delta interval, R_g = maximum mean difference, * = statistically significant at .05, ns = not statistically significant at .05

Metacognitions (Metacognitions Questionnaire-30 (MCQ-30)).

Total Metacognitions.

The MCQ-30 total mean scores decreased from pre-treatment to post-treatment and were statistically different and not statistically equivalent from pre-treatment to post-treatment, (Table 9), with a large effect size (*d* = 1.8164).

Table 9

Patients MCQ-30 Total Score before and after MCT intervention

Time	N	M	SD	SEM	*r*	95% CI	R_g	Different	Equivalent	Cohen's *d*
Pre Treatment	11	81.09	17.941^	5.410		72.6358-89.54428				
Post Treatment	11	52.27	13.477	4.063	0.037	45.9207-58.6193	43.6235	*	ns	1.8164

Note.
r = Pearson's Correlation, ^ = delta interval, R_g = maximum mean difference, * = statistically significant at .05, ns = not statistically significant at .05

Positive and negative metacognitions.

For each of the following MCQ-30 subscales (positive beliefs, uncontrollability and danger, need to control thoughts and cognitive self-consciousness) there was a decrease in group mean scores after patients received MCT intervention (Table 10). For each of these subscales the scores were statistically different and not statistically equivalent from pre-treatment to post-treatment.

For the cognitive confidence subscale, the scores were not statistically different and not statistically equivalent between pre-treatment to post-treatment, hence the results for this subscale was statistically indeterminate and not conclusions can be drawn. These results indicates that apart from the cognitive confidence subscale, MCT intervention was helpful in reducing other maladaptive metacognitions in patients, with medium to large effect sizes (Table 10).

Table 10

Patients MCQ-30 subscale scores before and after MCT intervention

Time	N	M	SD	SEM	*r*	95% CI	R_g	Different	Equivalent	Cohen's *d*
Positive Beliefs										
Pre Treatment	11	16.55	4.367^	1.317		14.5039-18.5961				
Post Treatment	11	9.55	2.945	0.888	0.068	8.1704-10.9296	10.4257	*	ns	1.8794
Uncontrollability and Danger										
Pre Treatment	11	18.36	5.104^	1.539		15.5630-21.1570				
Post Treatment	11	9.82	2.401	0.724	-0.231	8.5042-11.1358	12.6528	*	ns	2.1412
Cognitive Confidence										
Pre Treatment	11	15.00	4.712^	1.421		13.1270-16.8730				
Post Treatment	11	11.18	5.997	1.808	0.319	8.7969-13.5631	8.0761	ns	ns	
Need to Control Thoughts										
Pre Treatment	11	15.18	5.456^	1.645		12.4470-17.9130				
Post Treatment	11	9.00	2.828	0.853	-.013	7.5828-10.4172	10.3302	*	ns	1.4222
Cognitive Self-Conciousness										
Pre Treatment	11	16.00	2.933^	0.884		14.6706-17.3294				
Post Treatment	11	12.73	2.370	0.715	0.101	11.6547-13.8053	5.6747	*	ns	1.2264

Note.
r = Pearson's Correlation, ^ = delta interval, R_g = maximum mean difference * = statistically significant at .05, ns = not statistically significant at .05

Thought Control (TCQ).

TCQ Total

The TCQ total mean scores was not statistically different between pre-treatment to post-treatment and were statistically equivalent (Table 11). This suggests that there was no statistical difference in patients overall use of thought control strategies after receiving MCT intervention.

Table 11

Patients TCQ Total score before and after MCT intervention

Time	N	M	SD	SEM	*r*	95% CI	R_g	Different	Equivalent	Cohen's *d*
Pre Treatment	11	62.64	10.072^	3.037		59.0667-66.2133				
Post Treatment	11	63.91	6.410^	1.933	0.517	61.6356-66.1844	7.1177	ns	*	-0.1504

Note.
r = Pearson's Correlation, ^ = delta interval, R_g = maximum mean difference, * = statistically significant at .05, ns = not statistically significant at .05

Thought Control Questionnaire subscales (worry and punishment).

The TCQ worry subscale mean scores decreased from pre-treatment to post treatment and the scores were both statistically different and were not statistically equivalent, with a large effect size (*d* = 1.1449). However, the TCQ punishment subscale mean scores from pre-treatment to post- treatment were both statistically different and statistically equivalent (Table 12). This means that no conclusions can be drawn about the TCQ punishment subscale as the results were statistically indeterminant.

Table 12

Patients TCQ subscale scores before and after MCT intervention

Time	N	M	SD	SEM	*r*	95% CI	R_g	Different	Equivalent	Cohen's *d*
TCQ Worry										
Pre Treatment	11	13.55	4.228^	1.275		12.0203-15.0797				
Post Treatment	11	9.64	2.335	0.704	0.549	8.7953-10.4847	6.2844	*	ns	1.1449
TCQ Punishment										
Pre Treatment	11	10.64	3.443^	1.038		9.7931-11.4869				
Post Treatment	11	9.00	2.569	0.775	0.769	8.3677-9.6323	3.1192	*	*	

Note.
r = Pearson's Correlation, ^ = delta interval, R_g = maximum mean difference, * = statistically significant at .05, ns = not statistically significant at .05

Depression

There was a reduction in the group mean scores on the BDI-II from pre-treatment to post treatment, the scores were statistically different and were not statistically equivalent. Moreover, as seen in Table 13 the decrease in BDI-II mean score also had a large effect size (d = 1.6808).

Table 13

Patients BDI-II score before and after MCT intervention

Time	N	M	SD	SEM	*r*	95% CI	R_g	Different	Equivalent	Cohen's *d*
Pre Treatment	9	26.67	14.318^	4.773		19.2184-34.1216				
Post Treatment	9	7.44	7.535	2.512	.199	3.5183 -11.3617	30.6033	*	ns	1.6808

Note.
r = Pearson's Correlation, ^ = delta interval, R_g = maximum mean difference, * = statistically significant at .05, ns = not statistically significant at .05

Rumination

There was a decrease in the RRQ-rumination mean score from pre-treatment to post-treatment and the scores were both statistically different and statistically not equivalent (see Table 14), with a large effect size (d = 1.9630).

Table 14

Patients RRQ rumination subscale score before and after MCT intervention

Time	N	M	SD	SEM	*r*	95% CI	R_g	Different	Equivalent	Cohen's *d*
Pre Treatment	11	50.82	6.809^	2.053		48.1847-53.4552				
Post Treatment	11	38.18	6.047	1.823	0.341	35.8400-40.5200	17.6152	*	ns	1.9630

Note.
r = Pearson's Correlation, ^ = delta interval, R_g = maximum mean difference, * = statistically significant at .05, ns = not statistically significant at .05

Worry

There was a decrease in the PSWQ mean score from pre-treatment to post-treatment and the scores were both statistically different and statistically not equivalent (see Table 15), with a large effect size (*d* = 1.8715).

Table 15

Patients PSWQ score before and after MCT intervention

Time	N	M	SD	SEM	*r*	95% CI	R_g	Different	Equivalent	Cohen's *d*
Pre Treatment	9	64.11	11.483^	3.828		58.7305-69.4895				
Post Treatment	9	43.56	10.454	3.485	0.260	38.6625-48.4575	30.827	*	ns	1.8715

Note.
r = Pearson's Correlation, ^ = delta interval, R_g = maximum mean difference, * = statistically significant at .05, ns = not statistically significant at .05

Summary of group results

It was hypothesised that patients receiving MCT modified for anorexia nervosa would show a significant increase in their body weight and a decrease in their eating disorder symptoms.

Based on the overall group mean scores, patients mean BMI scores showed a statistical increase after receiving MCT for their anorexia nervosa, with a medium effect size of $d = 0.7826$. This result provided support for the hypothesis that patients receiving modified MCT for their anorexia nervosa would experience weight gain.

Patients mean EDEQ-VI global score and associated subscales (restraint, eating concern, shape concern, weight concern) scores also displayed a statistical decrease from pre-treatment to post-treatment, indicating a reduction in the groups eating disorder symptomology. Further, large effect sizes were observed across all EDEQ-VI global and subscale scores, ranging from $d = 2.2158$ to $d = 2.7560$.

This apparent reduction in patients' eating disorder symptoms was further supported by the increase in their GAF-ED mean scores, which was statistically different from pre-treatment to post-treatment. This suggests improvements in eating disorder severity after receiving MCT intervention. This improvement in patients GAF-ED scores was also associated with a large effect size of $d = 1.6019$.

There was a decrease in the patients mean Global Rating of Clinical State of ED score from pre-treatment to post treatment, indicating a reduction in the severity of patients eating disorder symptoms, which had a large effect size ($d = 1.8179$). However due to the nature of the data set, it was not possible to analyse if the pre-treatment and post-treatment scores were statistically different.

It was also hypothesised that modified MCT would reduce patients maladaptive metacognitions and thought control strategies. Statistical analyses showed a decrease in the group's mean metacognitions scores (MCQ-30 total score) from pre-treatment to post-treatment, which was statistically different and has a large effect size of $d = 1.8164$. This indicates an improvement in groups maladaptive metacognitions after undergoing MCT intervention. Upon closer analysis of the MCQ-30 subscales measure, the results showed that after receiving MCT intervention there was a decrease in the groups following MCQ-30 subscale scores, which were all statistically different with large effect sizes; Positive Beliefs ($d = 1.8794$), Uncontrollability and Danger ($d = 2.1412$), Need to Control Thoughts ($d = 1.4222$) and Cognitive Self-consciousness ($d = 1.2264$). However, for the MCQ-30 subscale of cognitive confidence, the results were statistically indeterminate, thus no conclusions can be drawn about this subscale.

The results showed that there was no difference in patients overall use of thought control strategies (TCQ total) when comparing pre-treatment to post treatment group means. Which suggests that there was no change in their use of thought control strategies after MCT intervention based on the total TCQ score. Analysis of the groups TCQ punishment subscale scores from pre-treatment to post-treatment revealed statistically indeterminate results, thus no significant conclusions can be drawn for subscale. However, there was a decrease in the TCQ worry subscale mean scores from pre-treatment to post treatment, which was statistically different, with a large effect size of $d = 1.1449$. This indicates that patients reduced their use of worry as a thought control strategy after receiving MCT.

It was also predicted that modified MCT for anorexia nervosa would result in a decrease of rumination, depressive and worry symptoms. The results showed that there was a reduction in the patients BDI-II scores, level of rumination (RRQ-rumination subscale), and worry from pre-treatment to post-treatment. All three measures had mean scores that were

statistically different from pre-treatment to post-treatment. Further, all these changes had a large effect size (d = 1.6808 to d = 1.9630).

Individual Data

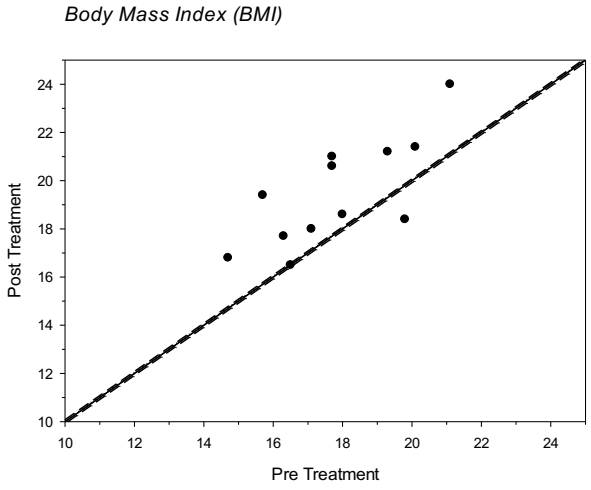
Reliable Change Index and Modified Brinley Plots.

The reliable change index was calculated and displayed on Brinley plots for the following measures in the study below. It should be noted that for the Brinley plots, the dotted lines running on both sides of the diagonal line which indicates no change are the reliable change index boundaries (lower and upper), (Blampied, 2017).

Body Mass Index (BMI).

The majority of patients (10 out of 12) showed a reliable improvements (i.e. an increase) in their BMI scores from pre-treatment to post-treatment. However, one patient had a reliable decrease in their BMI from pre-treatment to post-treatment (Figure 2).

Figure 2

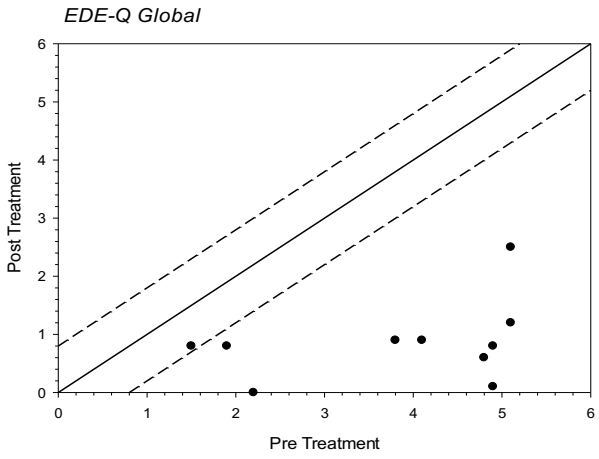


Note.. Brinley plot of patients pre and post-treatment BMI. RCI (+/- 0.08).

Eating Disorder Symptoms.

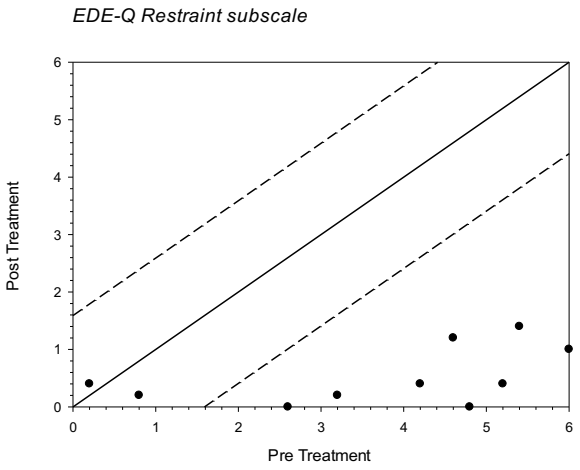
A total of 10 out of the 12 patients in the study completed the EDEQ-VI questionnaire. Nine of these 10 patients had a positive reliable change (a decrease in score) in their EDE-Q global scores from pre-treatment to post-treatment (Figure 3). Further analysis of the EDE-Q subscales revealed that eight out of the 10 patients had reliable improvements (decrease in score) in their EDE-Q restraint subscale scores after intervention (see Figure 4). Moreover, nine out of 10 patients also had reliable improvements (decrease in score) in their EDE-Q eating concern subscale scores (see Figure 5). Additionally, eight patients had a positive reliable reduction in their EDE-Q shape concern subscale scores from pre-treatment to post-treatment (Figure 6). Further, on the EDE-Q weight concern subscale measure seven out of the 10 patients had reliable improvement (decrease in score) after undergoing MCT intervention (See Figure 7).

Figure 3



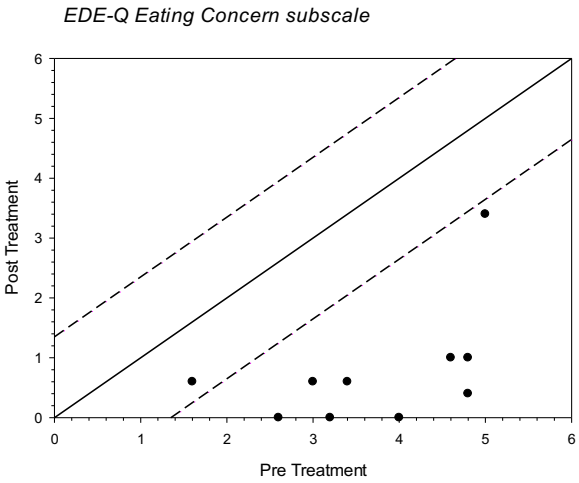
Note. Brinley plot of patients pre and post-treatment EDEQ-VI Global. RCI (+/- 0.80).

Figure 4



Note. Brinley plot of patients pre and post-treatment EDEQ-VI restraint subscale. RCI (+/- 1.59).

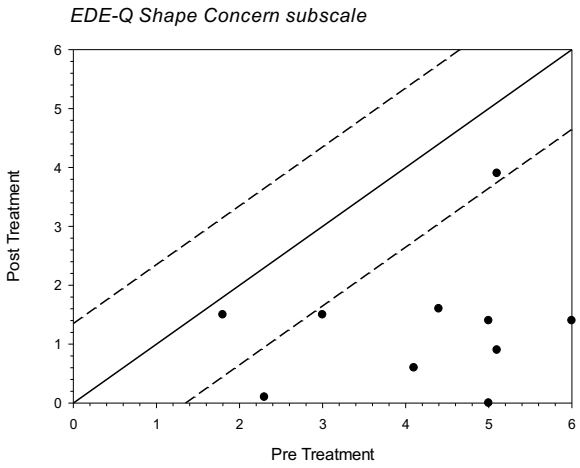
Figure 5



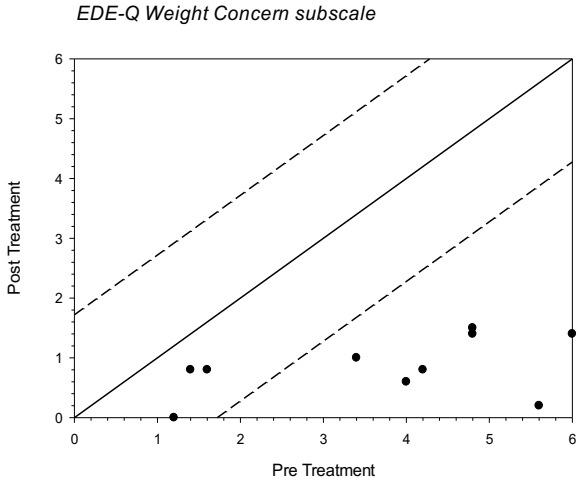
Note. Brinley plot of patients pre and post-treatment EDEQ-VI eating concern subscale. RCI (+/- 1.35).

Figure 6

Figure 7



Note. Brinley plot of patients pre and post-treatment EDEQ-VI shape concern subscale. RCI (+/- 1.35).

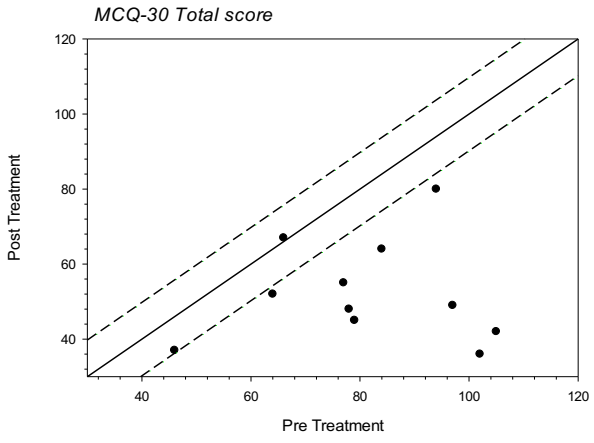


Note. Brinley plot of patients pre and post-treatment EDEQ-VI weight concern subscale. RCI (+/- 1.72).
Note. Two individuals had exactly the same pre-treatment and post-treatment scores, which meant their individual data points overlapped, hence for the purposes of making all the individual data points visible, the post-treatment score for one of the two individual identical data points was slightly altered only for this Figure.

Metacognitions.

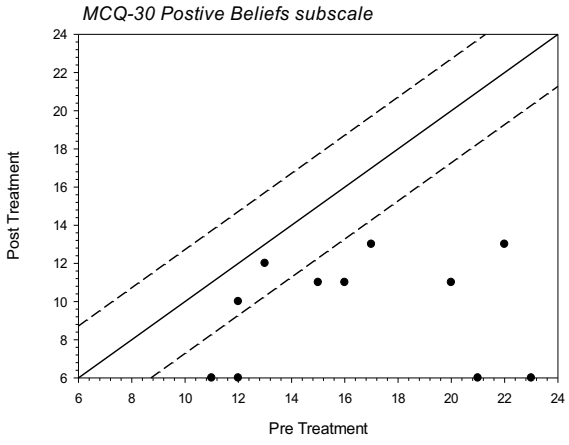
In terms of the MCQ-30 outcome measure, 11 out of the 12 patients completed the questionnaire at both pre-treatment and post-treatment. Nine patients showed reliable improvements (decrease in score) in their MCQ-30 Total score after receiving treatment (Figure 8). Closer analysis of the MCQ-30 subscales also revealed that after MCT intervention, nine patients had reliable improvements (decrease in score) in their positive beliefs subscale scores (see Figure 9). A total of seven patients showed a positive reliable change (decrease in score) in their Uncontrollability and Danger subscale scores after MCT (see Figure 10). Six patients also had reliable improvements (decrease in score) in their cognitive confidence subscale scores after undergoing MCT, while three patients showed a reliable deterioration (increase in score) in this measure after MCT (Figure 11). Reliable improvements (decrease in score) in the MCQ-30 Need to Control thoughts subscale scores from pre-treatment to post-treatment were also observed in seven patients (see Figure 12). Whereas, only five patients displayed reliable improvements (decrease in score) in their Cognitive Self-Consciousness subscale scores after receiving MCT (see Figure 13).

Figure 8



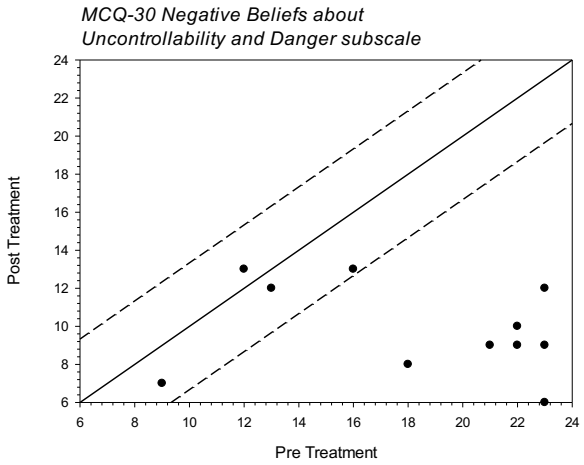
Note.. Brinley plot of patients pre and post-treatment MCQ-30 Total score. RCI (+/- 9.76).

Figure 9



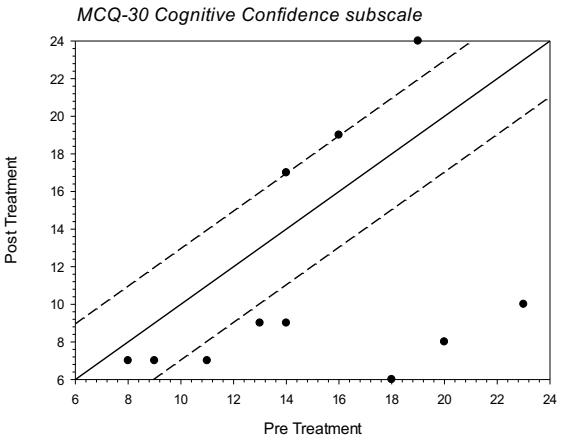
Note. Brinley plot of patients pre and post-treatment MCQ-30 Positive Beliefs subscale. RCI (+/- 2.72).

Figure 10



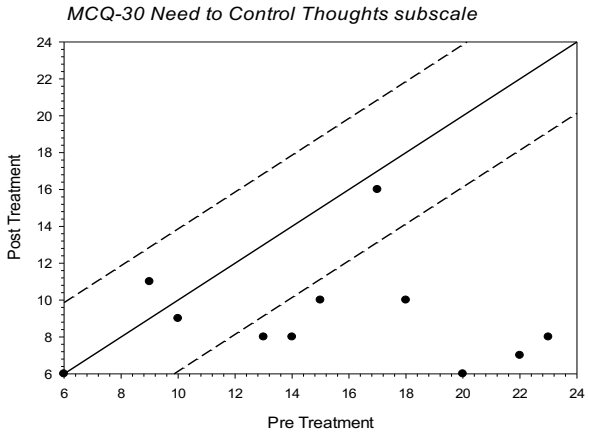
Note. Brinley plot of patients pre and post-treatment MCQ-30 Negative Beliefs about Uncontrollability and Danger subscale. RCI (+/- 3.33).

Figure 11



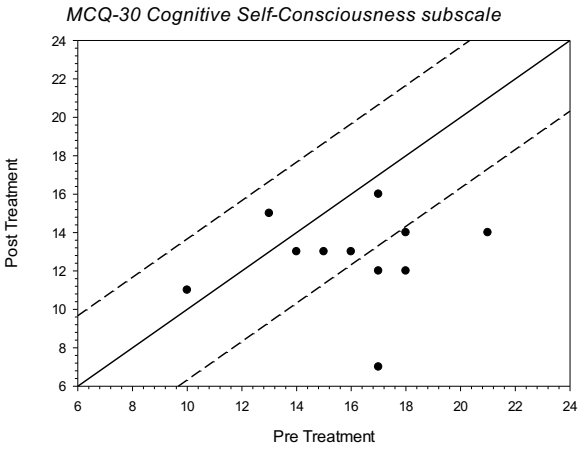
Note. Brinley plot of patients pre and post-treatment MCQ-30 Cognitive Confidence subscale. RCI (+/- 2.96).

Figure 12



Note. Brinley plot of patients pre and post-treatment MCQ-30 Need to Control Thoughts subscale. RCI (+/- 3.86).

Figure 13



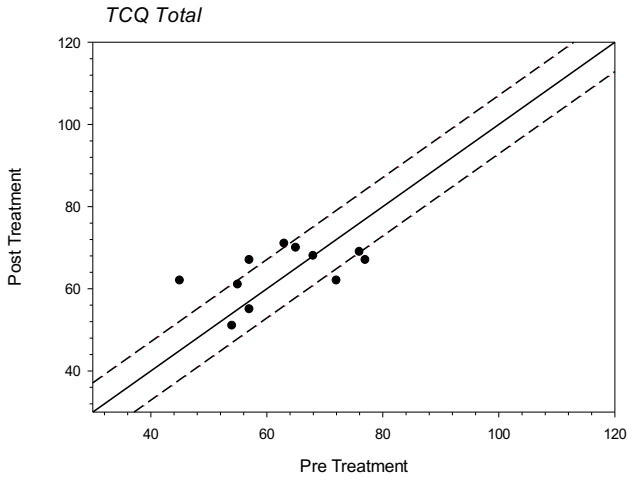
Note. Brinley plot of patients pre and post-treatment MCQ-30 Cognitive Self-Consciousness subscale. RCI (+/- 3.67).

Thought Control.

Eleven patients completed the TCQ pre-treatment and post treatment questionnaire. Analysis of the TCQ Total scores revealed that three out of the 11 patients showed reliable deterioration (increase in score) in their scores for this measure after receiving intervention and only two out of the 11 patients showed reliable improvements (decrease in score) in their TCQ total scores at post-treatment (as seen in Figure 14). Further analysis of the TCQ

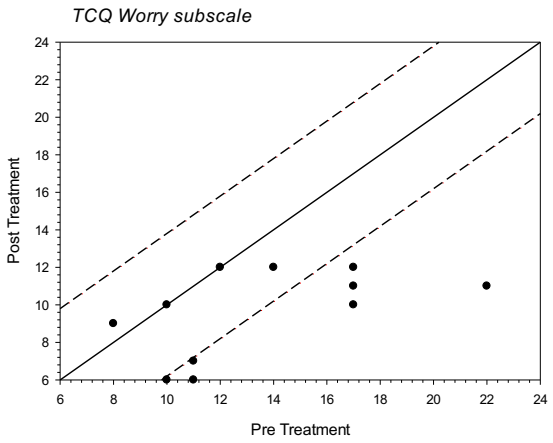
subscales showed that seven out of 11 patients showed reliable improvements (decrease in score) in their TCQ Worry subscale scores after MCT (as seen in Figure 15). Whereas, in the TCQ punishment subscale only a single patient showed reliable improvement (decrease in score) in this measure after intervention (see Figure 16).

Figure 14



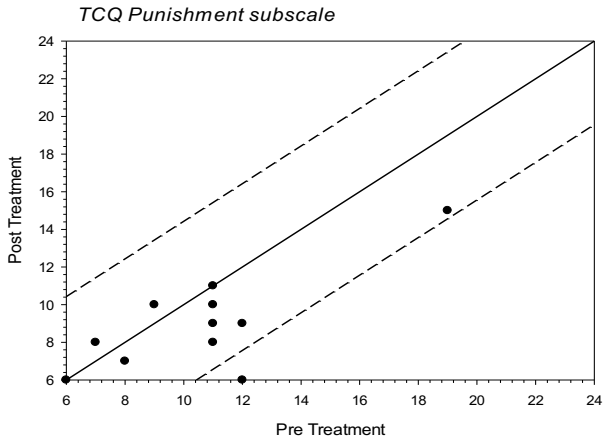
Note.. Scatter plot of patients pre and post-treatment TCQ total score. RCI (+/- 7.10).

Figure 15



Note. Scatter plot of patients pre and post-treatment TCQ worry subscale. RCI (+/- 3.80).

Figure 16

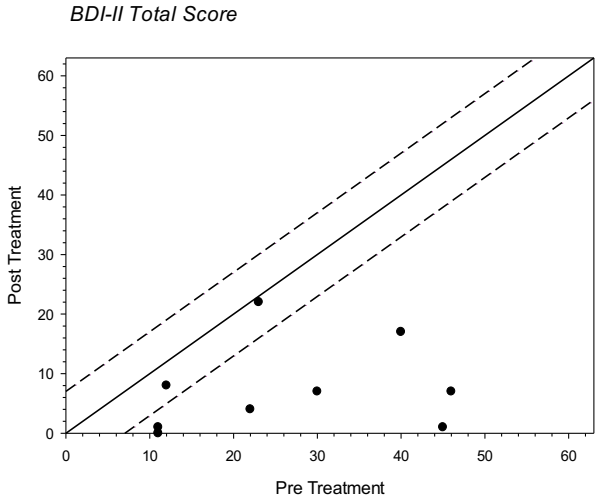


Note. Scatter plot of patients pre and post-treatment TCQ punishment subscale. RCI (+/- 4.43).

Depression.

Nine out of the 12 patients in the study completed the BDI-II measure at both pre-treatment and post-treatment. A total of seven out of these nine patients showed reliable improvements (decrease in score) in their BDI-II Total scores from pre-treatment to post-treatment (See Figure 17).

Figure 17

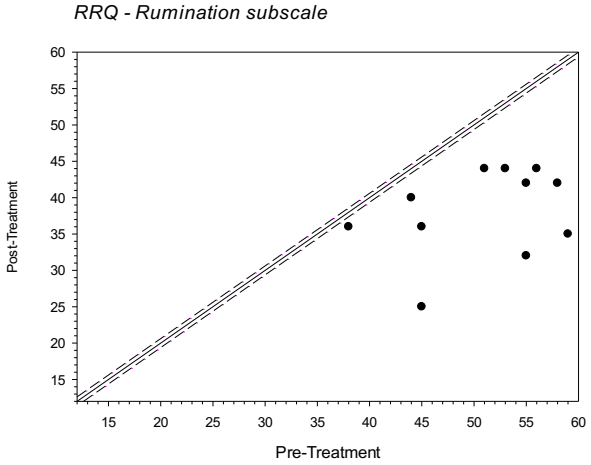


Note. Scatter plot of patients pre and post-treatment BDI-II Total score. RCI (+/-7.03)

Rumination.

Eleven out of the 12 patients completed the RRQ-rumination subscale questionnaire. All 11 patients showed reliable improvements (decrease in score) on the RRQ-rumination after receiving MCT (see Figure 18).

Figure 18

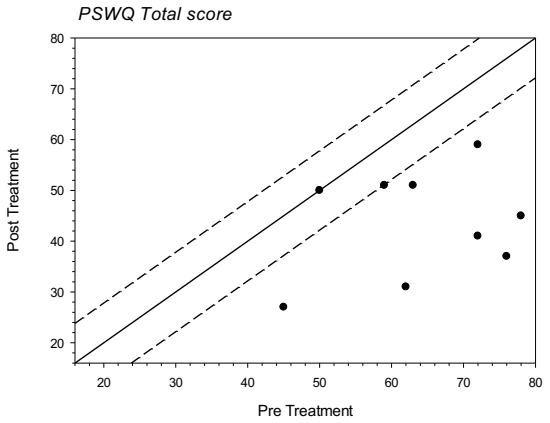


Note. Scatter plot of patients pre and post-treatment RRQ-Rumination subscale. RCI (+/-0.61).

Worry.

In terms of the PSWQ, nine out of the 12 patients completed this questionnaire at pre-treatment and post-treatment. Eight of these nine patients had reliable improvements (decrease in score) on the PSWQ Total scores after MCT (Figure 19).

Figure 19



Note. Scatter plot of patients pre and post-treatment PSWQ Total score. RCI (+/-7.82).

Clinically significant changes.

The following tables below display the individuals who have achieved clinically significant changes across the different measures. As previously stated, clinically significant change is only achieved if a patient shows a) a reliable change in scores and b) their post treatment scores meets the cut off criteria (Jacobson & Truax, 1991). Certain measures had a pre-existing clinical cut off criteria as defined by previous research. Other measures had a cut off criteria of improvement of scores of at least two standard deviations (based on pre-treatment SD) from the pre-treatment mean.

BMI.

Results showed that four out of 12 patients had experienced clinically significant changes of improvements in their BMI scores, as their post-treatment BMI had increased to a healthy weight range and there was also a reliable change (improvement) in their scores (Table 16). One patient had a clinically significant change of deterioration, as they had a reliable deterioration in their BMI scores and their post-treatment BMI had decreased to an unhealthy weight range (see Table 16).

Table 16

Changes in individuals Body Mass Index from pre-treatment to post-treatment.

ID	Pre-treatment	Post-treatment	Reliable Change	Cut off (moved into or away from healthy weight range ≥/≤18.5-24.9)	Clinically Significant
Patient 1	19.8	18.4	Yes (–)	Yes	×
Patient 2	16.5	16.5	No	No	
Patient 3	14.7	16.8	Yes (+)	No	
Patient 4	17.7	20.6	Yes (+)	Yes	*
Patient 5	19.3	21.2	Yes (+)	No	
Patient 6	21.1	24	Yes (+)	No	
Patient 7	20.1	21.4	Yes (+)	No	
Patient 8	17.1	18	Yes (+)	No	
Patient 9	16.3	17.7	Yes (+)	No	
Patient 10	15.7	19.4	Yes (+)	Yes	*
Patient 11	18	18.6	Yes (+)	Yes	*
Patient 12	17.7	21	Yes (+)	Yes	*

Note. * = Clinically significant change (improvement), × = Clinically significant change (deterioration)
+ = reliable change (improvement), – = reliable change (deterioration)

Eating Disorder Symptoms.

As previously stated, out of the 12 patients in the present study, only 10 completed the EDE-Q questionnaire at both pre-treatment and post-treatment. Hence, the EDE-Q results of these 10 patients will be analysed below.

Total Symptoms.

After receiving MCT intervention, seven out of the 10 patients showed clinically significant changes of improvements in their EDE-Q global scores, as all seven patients showed reliable improvements in their EDE-Q global scores and met the cut off criteria at post-treatment (see Table 17).

Table 17

Changes in individuals EDEQ-VI Total from pre-treatment to post-treatment.

ID	Pre-Treatment	Post-Treatment	Reliable Change	Cut off criteria (<0.984)	Clinically Significant
Patient 1	5.1	2.5	Yes (+)	No	
Patient 2	4.1	0.9	Yes (+)	Yes	*
Patient 4	2.2	0	Yes (+)	Yes	*
Patient 5	4.9	0.1	Yes (+)	Yes	*
Patient 6	4.8	0.6	Yes (+)	Yes	*
Patient 7	4.9	0.8	Yes (+)	Yes	*
Patient 9	1.5	0.8	No	Yes	
Patient 10	1.9	0.8	Yes (+)	Yes	*
Patient 11	3.8	0.9	Yes (+)	Yes	*
Patient 12	5.1	1.2	Yes (+)	No	

Note. * = Clinically Significant Change (improvement), × = Clinically significant change (deterioration)
+ = reliable change (improvement), – = reliable change (deterioration)

Restraint.

Upon analysis it was found that predetermined cut off criteria (2sd from the pre-treatment mean) for the EDE-Q restraint subscale was unachievable, as it fell below the lowest possible score for this measure (< -0.2338). Hence, it was necessary to adjust the cut off point for this measure to 1.5sd from the pre-treatment mean which makes the new cut off point as (<0.74965). Five patients had both reliable improvement in their EDE-Q restraint subscale scores and had a post-treatment score below the cut off point (see Table 18). Hence, these five patients had clinically significant change of improvements in their EDE-Q restraint scores after receiving MCT intervention.

Table 18

Changes in individuals EDEQ-VI Restraint subscale from pre-treatment to post-treatment.

ID	Pre-Treatment	Post-Treatment	Reliable Change	Cut off point (<0.74965)	Clinically significant
Patient 1	5.4	1.4	Yes (+)	No	
Patient 2	3.2	0.2	Yes (+)	Yes	*
Patient 4	2.6	0	Yes (+)	Yes	*
Patient 5	4.8	0	Yes (+)	Yes	*
Patient 6	5.2	0.4	Yes (+)	Yes	*
Patient 7	4.2	0.4	Yes (+)	Yes	*
Patient 9	0.2	0.4	No	Yes	
Patient 10	0.8	0.2	No	Yes	
Patient 11	4.6	1.2	Yes (+)	No	
Patient 12	6	1	Yes (+)	No	

Note. * = Clinically significant change (improvement), × = Clinically significant change (deterioration)
+ = reliable change (improvement), – = reliable change (deterioration)

Eating Concern.

Eight out of the 10 patients showed clinically significant changes of improvements in their EDE-Q eating concern scores after receiving MCT, with reliable improvements and scores that were below the cut off threshold at post-treatment (see Table 19).

Table 19

Changes in individuals EDEQ-VI Eating Concern subscale from pre-treatment to post-treatment.

ID	Pre-Treatment	Post-Treatment	Reliable Change	Cut off point (<1.4432)	Clinically Significant
Patient 1	5	3.4	Yes (+)	No	
Patient 2	4.8	1	Yes (+)	Yes	*
Patient 4	2.6	0	Yes (+)	Yes	*
Patient 5	4	0	Yes (+)	Yes	*
Patient 6	4.8	0.4	Yes (+)	Yes	*
Patient 7	3.2	0	Yes (+)	Yes	*
Patient 9	1.6	0.6	No	Yes	
Patient 10	3.4	0.6	Yes (+)	Yes	*
Patient 11	3	0.6	Yes (+)	Yes	*
Patient 12	4.6	1	Yes (+)	Yes	*

Note. * = Clinically significant change (improvement), × = Clinically significant change (deterioration)
+ = reliable change (improvement), – = reliable change (deterioration)

Shape Concern.

Four out of 10 patients had reliable improvements in their EDE-Q shape concern scores and had a post-treatment score that was below the cut off point (see Table 20), suggesting clinically significant change of improvements in their EDE-Q shape concern scores.

Table 20

Changes in individuals EDEQ-VI Shape Concern subscale from pre-treatment to post-treatment.

ID	Pre-Treatment	Post-Treatment	Reliable Change	Cut off point (<1.3856)	Clinically Significant
Patient 1	5.1	3.9	No	No	
Patient 2	4.4	1.6	Yes (+)	No	
Patient 4	2.3	0.1	Yes (+)	Yes	*
Patient 5	5	0	Yes (+)	Yes	*
Patient 6	5.1	0.9	Yes (+)	Yes	*
Patient 7	6	1.4	Yes (+)	No	
Patient 9	3	1.5	Yes (+)	No	
Patient 10	1.8	1.5	No	No	
Patient 11	4.1	0.6	Yes (+)	Yes	*
Patient 12	5	1.4	Yes (+)	No	

Note. * = Clinically Significant Change (improvement), × = Clinically significant change (deterioration)
+ = reliable change (improvement), – = reliable change (deterioration)

Weight Concern.

No patients achieved clinically significant changes on the EDE-Q weight concern subscale scores as no patient met the required two-fold criterion of having both a reliable change in scores and meeting the cut off point criteria (see Table 21).

Table 21

Changes in individuals EDEQ-VI Weight Concern subscale from pre-treatment to post-treatment.

ID	Pre-Treatment	Post-Treatment	Reliable Change	Cut off point (<0.1912)	Clinically Significant
Patient 1	4.8	1.4	Yes (+)	No	
Patient 2	4	0.6	Yes (+)	No	
Patient 4	1.2	0	No	Yes	
Patient 5	5.6	0.2	Yes (+)	No	
Patient 6	4.2	0.8	Yes (+)	No	
Patient 7	6	1.4	Yes (+)	No	
Patient 9	1.4	0.8	No	No	
Patient 10	1.6	0.8	No	No	
Patient 11	3.4	1	Yes (+)	No	
Patient 12	4.8	1.4	Yes (+)	No	

Note. * = Clinically Significant change (improvement), × = Clinically significant change (deterioration)
+ = reliable change (improvement), – = reliable change (deterioration)

Global Rating of Clinical State of Eating Disorder.

Out of the 11 patients who completed the Global Rating of Clinical State of Eating Disorder measure at both pre-treatment and post-treatment, at post-treatment three patients had no significant eating disorder symptoms, one patient only had a few eating disorder symptoms present, five patients had some eating disorder symptoms present but no longer met the criteria for an eating disorder, and two patients remained unchanged and still had an eating disorder following intervention (see Table 22).

Table 22

Changes in individuals Global Rating of Clinical State of Eating Disorder from pre-treatment to post-treatment.

ID	Pre-Treatment	Post-Treatment
Patient 1	4	3
Patient 2	4	3
Patient 4	4	1
Patient 5	4	1
Patient 6	4	1
Patient 7	4	3
Patient 8	4	4
Patient 9	4	3
Patient 10	4	3
Patient 11	4	2
Patient 12	4	4

Global Assessment of Functioning-Eating Disorders (GAF-ED).

In regards to the GAF-ED measure, only 11 out of 12 patients in this study received GAF-ED scores at both pre-treatment and post-treatment, hence the results of these 11 patients will be analysed below.

Based on the cut off of GAF-ED post-treatment score ≥ 71, it was found that three patients had experienced improvements in their eating disorder symptoms and daily functioning after receiving MCT (see Table 23).

Table 23

Changes in individuals GAF-ED scores from pre-treatment to post-treatment.

~~ID~~	ID	Pre-Treatment	Post-Treatment	Cut off point (≥71)
~~RH01~~	*Patient 1*	50	60	
~~RH02~~	*Patient 2*	40	55	
~~RH06~~	*Patient 4*	40	80	*
~~RH09~~	*Patient 5*	40	85	*
~~RH11~~	*Patient 6*	51	80	*
~~LJ01~~	*Patient 7*	52	62	
~~LJ03~~	*Patient 8*	40	40	
~~LJ05~~	*Patient 9*	40	49	
~~JV01~~	*Patient 10*	41	68	
~~JV02~~	*Patient 11*	61	70	
~~JV03~~	*Patient 12*	56	60	

Note. * = significant change (improvement), × = significant change (deterioration)

Metacognitions.

As previously mentioned, 11 out of 12 patients in the study completed the MCQ-30 at both pre-treatment and post-treatment, therefore analysis of clinical significant change for the MCQ-30 measure will focus on these 11 patients.

Metacognitions total.

Three out of the 11 patients achieved both reliable improvement and had a post-treatment score below the cut off point for the MCQ-30 total score. Hence, after receiving intervention, three patients had clinically significant change of improvements in their unhelpful metacognitions according the MCQ-30 total measure (see Table 24).

Table 24

Changes in individuals MCQ-30 Total from pre-treatment to post-treatment.

ID	Pre-Treatment	Post-Treatment	Reliable Change	Cut off criteria (<45.208)	Clinically Significant
Patient 1	84	64	Yes (+)	No	
Patient 2	78	48	Yes (+)	No	
Patient 3	94	80	Yes (+)	No	
Patient 4	46	37	No	Yes	
Patient 5	102	36	Yes (+)	Yes	*
Patient 7	97	49	Yes (+)	No	
Patient 8	77	55	Yes (+)	No	
Patient 9	64	52	Yes (+)	No	
Patient 10	105	42	Yes (+)	Yes	*
Patient 11	79	45	Yes (+)	Yes	*
Patient 12	66	67	No	No	

Note. * = Clinically significant change (improvement), × = Clinically significant change (deterioration)
+ = reliable change (improvement), – = reliable change (deterioration)

Positive Beliefs.

A total of four out of 11 patients had clinically significant improvements in the MCQ-30 Positive Beliefs subscale scores after receiving MCT, with both reliable improvements in their MCQ-30 Positive beliefs scores and a post-treatment score below the cut off point (see Table 25).

Table 25

Changes in individuals MCQ-30 Positive Beliefs subscale from pre-treatment to post-treatment.

ID	Pre-Treatment	Post-Treatment	Reliable Change	Cut off point (<7.816)	Clinically Significant
Patient 1	15	11	Yes (+)	No	
Patient 2	11	6	Yes (+)	Yes	*
Patient 3	22	13	Yes (+)	No	
Patient 4	12	6	Yes (+)	Yes	*
Patient 5	23	6	Yes (+)	Yes	*
Patient 7	12	10	No	No	
Patient 8	16	11	Yes (+)	No	
Patient 9	13	12	No	No	
Patient 10	21	6	Yes (+)	Yes	*
Patient 11	20	11	Yes (+)	No	
Patient 12	17	13	Yes (+)	No	

Note. * = Clinically significant change, × = Clinically significant change (deterioration)
+ = reliable change (improvement), – = reliable change (deterioration)

Uncontrollability and Danger.

Two patients out of the 11 patients who completed the MCQ-30 uncontrollability and danger subscale measure had both reliable improvement in their scores and were below the cut off at post-treatment. Hence, only these two patients showed clinically significant changes (reduction) in their negative beliefs of uncontrollability and danger after receiving intervention (see Table 26).

Table 26

Changes in individuals MCQ-30 Uncontrollability and Danger subscale from pre-treatment to post-treatment.

ID	Pre-Treatment	Post-Treatment	Reliable Change	Cut off point (<8.152)	Clinically Significant
Patient 1	18	8	Yes (+)	Yes	*
Patient 2	22	10	Yes (+)	No	
Patient 3	23	12	Yes (+)	No	
Patient 4	9	7	No	Yes	
Patient 5	22	9	Yes (+)	No	
Patient 7	21	9	Yes (+)	No	
Patient 8	16	13	No	No	
Patient 9	13	12	No	No	
Patient 10	23	9	Yes (+)	No	
Patient 11	23	6	Yes (+)	Yes	*
Patient 12	12	13	No	No	

Note. * = Clinically significant change (improvement), × = Clinically significant change (deterioration)
+ = reliable change (improvement), – = reliable change (deterioration)

Cognitive Confidence.

No patients achieved clinically significant changes in their MCQ-30 Cognitive Confidence scores after receiving MCT as no patients had both a reliable improvement and a post-treatment score which reached the cut-off criteria (Table 27). This is unsurprising as the group score for cognitive confidence was statistically indeterminate.

Table 27

Changes in individuals MCQ-30 Cognitive Confidence subscale from pre-treatment to post-treatment.

ID	Pre-Treatment	Post-Treatment	Reliable Change	Cut off point (<5.576)	Clinically Significant
Patient 1	16	19	Yes (–)	No	
Patient 2	14	9	Yes (+)	No	
Patient 3	19	24	Yes (–)	No	
Patient 4	9	7	No	No	
Patient 5	20	8	Yes (+)	No	
Patient 7	23	10	Yes (+)	No	
Patient 8	13	9	Yes (+)	No	
Patient 9	11	7	Yes (+)	No	
Patient 10	18	6	Yes (+)	No	
Patient 11	8	7	No	No	
Patient 12	14	17	Yes (–)	No	

Note. * = Clinically significant change (improvement), × = Clinically significant change (deterioration)
+ = reliable change (improvement), – = reliable change (deterioration)

Need to Control Thoughts.

No patients experienced clinically significant changes in their MCQ-30 Need to control thoughts subscale scores after receiving intervention as no patient had both a reliable improvement and a post-treatment score which reached the cut-off criteria (see Table 28).

Table 28

Changes in individuals MCQ-30 Need to Control thoughts subscale from pre-treatment to post-treatment.

ID	Pre-Treatment	Post-Treatment	Reliable Change	Cut off point (<4.268)	Clinically Significant
Patient 1	18	10	Yes (+)	No	
Patient 2	15	10	Yes (+)	No	
Patient 3	17	16	No	No	
Patient 4	6	6	No	No	
Patient 5	20	6	Yes (+)	No	
Patient 7	23	8	Yes (+)	No	
Patient 8	14	8	Yes (+)	No	
Patient 9	10	9	No	No	
Patient 10	22	7	Yes (+)	No	
Patient 11	13	8	Yes (+)	No	
Patient 12	9	11	No	No	

Note. * = Clinically significant change (improvement), × = Clinically significant change (deterioration)
+ = reliable change (improvement), – = reliable change (deterioration)

Cognitive Self-Consciousness.

Only one out of 11 patients showed clinically significant changes (reduction) on the cognitive self-consciousness MCQ-30 subscale after MCT, with reliable improvements in their scores and a post-treatment score below the cut off point (see Table 29).

Table 29

Changes in individuals MCQ-30 Cognitive Self-Consciousness subscale from pre-treatment to post-treatment.

ID	Pre-Treatment	Post-Treatment	Reliable Change	Cut off point (<10.134)	Clinically Significant
Patient 1	17	16	No	No	
Patient 2	16	13	No	No	
Patient 3	13	15	No	No	
Patient 4	10	11	No	No	
Patient 5	17	7	Yes (+)	Yes	*
Patient 7	18	12	Yes (+)	No	
Patient 8	18	14	Yes (+)	No	
Patient 9	17	12	Yes (+)	No	
Patient 10	21	14	Yes (+)	No	
Patient 11	15	13	No	No	
Patient 12	14	13	No	No	

Note. * = Clinically significant change (improvement), × = Clinically significant change (deterioration)
+ = reliable change (improvement), – = reliable change (deterioration)

Thought Control.

TCQ Total.

The following results were of those who completed the Thought Control Questionnaire at pre-treatment and post-treatment. A total of 11 out of 12 patients completed the Thought Control Questionnaire in this study.

Analysis showed that despite receiving intervention, no patients managed to achieve clinically significant changes in their TCQ total scores (see Table 30).

Table 30

Changes in individuals TCQ Total from pre-treatment to post-treatment.

ID	Pre-Treatment	Post-Treatment	Reliable Change	Cut off point (<42.496)	Clinically Significant
Patient 2	63	71	Yes (–)	No	
Patient 3	55	61	No	No	
Patient 4	57	55	No	No	
Patient 5	57	67	Yes (–)	No	
Patient 6	72	62	Yes (+)	No	
Patient 7	77	67	Yes (+)	No	
Patient 8	68	68	No	No	
Patient 9	54	51	No	No	
Patient 10	76	69	No	No	
Patient 11	45	62	Yes (–)	No	
Patient 12	65	70	No	No	

Note. * = Clinically significant change (improvement), × = Clinically significant change (deterioration)
+ = reliable change (improvement), – = reliable change (deterioration)

TCQ Worry subscale.

No patients had clinically significant changes in the TCQ Worry subscale measure after intervention (Table 31).

Table 31

Changes in individuals TCQ Worry subscale from pre-treatment to post-treatment.

ID	Pre-Treatment	Post-Treatment	Reliable Change	Cut off point (<5.094)	Clinically Significant
Patient 2	22	11	Yes (+)	No	
Patient 3	17	12	Yes (+)	No	
Patient 4	10	6	Yes (+)	No	
Patient 5	11	6	Yes (+)	No	
Patient 6	17	10	Yes (+)	No	
Patient 7	17	11	Yes (+)	No	
Patient 8	12	12	No	No	
Patient 9	11	7	Yes (+)	No	
Patient 10	14	12	No	No	
Patient 11	8	9	No	No	
Patient 12	10	10	No	No	

Note. * = Clinically significant change (improvement), × = Clinically significant change (deterioration)
+ = reliable change (improvement), – = reliable change (deterioration)

TCQ Punishment subscale.

None of the patients in the study had shown clinically significant changes on the TCQ Punishment subscale after MCT (Table 32).

Table 32

Changes in individuals TCQ Punishment subscale scores from pre-treatment to post-treatment.

ID	Pre-Treatment	Post-Treatment	Reliable Change	Cut off point (<3.754)	Clinically Significant
Patient 2	11	8	No	No	
Patient 3	11	10	No	No	
Patient 4	6	6	No	No	
Patient 5	8	7	No	No	
Patient 6	11	11	No	No	
Patient 7	19	15	No	No	
Patient 8	12	9	No	No	
Patient 9	7	8	No	No	
Patient 10	11	9	No	No	
Patient 11	12	6	Yes (+)	No	
Patient 12	9	10	No	No	

Note. * = Clinically significant change (improvement), × = Clinically significant change (deterioration)
+ = reliable change (improvement), – = reliable change (deterioration)

Depression.

As previously stated, patients were considered to have met the clinical cut-off point criteria if they moved into a minimal range of depression symptom severity of ≤ 13 at post-treatment. However, some patients were already in the minimal range of severity for depression,

hence, an additional cut off point was added, where patients in the minimal range had to achieve a score of 0 (showing no depressive symptoms on the BDI-II measure).

A total of five out of nine patients who completed the BDI-II had a clinically significant change of reduction in their BDI-II Total score after MCT, indicating an improvement in their depressive symptoms. These five patients had met the two-fold criteria for clinically significant change by showing reliable improvements in their BDI-II scores and meeting the cut off point at post-treatment (see Table 33).

Table 33

Changes in individuals BDI-II scores from pre-treatment to post-treatment.

ID	Pre-Treatment	Post-Treatment	Reliable Change	Cut off point ≤ 13 or 0	Clinically Significant
Patient 1	23	22	No	No	
Patient 2	46	7	Yes (+)	Yes	*
Patient 4	11	1	Yes (+)	No	
Patient 5	11	0	Yes (+)	Yes	*
Patient 6	40	17	Yes (+)	No	
Patient 7	45	1	Yes (+)	Yes	*
Patient 9	12	8	No	No	
Patient 10	22	4	Yes (+)	Yes	*
Patient 12	30	7	Yes (+)	Yes	*

Note. * = Clinically significant change (improvement), × = Clinically significant change (deterioration)
+ = reliable change (improvement), – = reliable change (deterioration)

Rumination.

Five out of the 11 patients who completed the RRQ-rumination subscale, showed reliable improvements in their scores and had a post-treatment score which fell below the cut off criteria (see Table 34). Hence, these five patients were considered to have shown clinically significant change of improvements in their rumination, experiencing a decrease in their level of rumination after MCT.

Table 34

Changes in individuals RRQ-rumination subscale scores from pre-treatment to post-treatment.

ID	Pre-Treatment	Post Treatment	Reliable Change	Cut off point (<37.202)	Clinically Significant
Patient 1	51	44	Yes (+)	No	
Patient 2	59	35	Yes (+)	Yes	*
Patient 3	53	44	Yes (+)	No	
Patient 4	45	25	Yes (+)	Yes	*
Patient 5	55	32	Yes (+)	Yes	*
Patient 7	56	44	Yes (+)	No	
Patient 8	38	36	Yes (+)	Yes	*
Patient 9	55	42	Yes (+)	No	
Patient 10	44	40	Yes (+)	No	
Patient 11	58	42	Yes (+)	No	
Patient 12	45	36	Yes (+)	Yes	*

Note. * = Clinically significant change (improvement), × = Clinically significant change (deterioration)
+ = reliable change (improvement), – = reliable change (deterioration)

Worry.

Four out of nine patients who completed the PSWQ questionnaire had clinically significant changes of improvements in the PSWQ Total scores after undergoing MCT for their eating disorder. These individuals experienced a clinically significant changes of reduction in their worry levels after receiving MCT, with both a reliable improvement in their PSWQ scores and post-treatment scores that were below the cut off point (see Table 35).

Table 35

Changes in individuals PSWQ scores from pre-treatment to post-treatment.

ID	Pre-Treatment	Post-Treatment	Reliable Change	Cut off point (<41.144)	Clinically Significant
Patient 1	63	51	Yes (+)	No	
Patient 2	78	45	Yes (+)	No	
Patient 3	72	59	Yes (+)	No	
Patient 4	45	27	Yes (+)	Yes	*
Patient 5	62	31	Yes (+)	Yes	*
Patient 7	59	51	Yes (+)	No	
Patient 9	50	50	No	No	
Patient 10	72	41	Yes (+)	Yes	*
Patient 11	76	37	Yes (+)	Yes	*

Note. * = Clinically significant change (improvement), × = Clinically significant change (deterioration)
+ = reliable change (improvement), – = reliable change (deterioration)

Summary of clinically significant changes after MCT intervention

It was predicted that patients receiving modified MCT for anorexia nervosa would experience a significant increase in weight and decrease in the severity of their eating disorder symptoms. Analysis revealed that after receiving MCT four out of 12 patients had an increase in their weight which moved their BMI scores into a healthy weight range and this was a clinically significant change. However, one patient also experienced a clinically significant deterioration in weight during the intervention. These results provided some support for the hypothesis that modified MCT may be useful in helping patients with anorexia nervosa increase weight gain.

Additionally, seven out of 10 patients showed a clinically significant change of a decrease in their EDE-Q global scores after MCT. Furthermore, analysis of the EDE-Q subscales found that five patients experienced a decrease in their eating disorder symptoms of restraint (EDE-Q restraint) and a total of eight patients showed decrease in eating concern (EDE-Q eating concern) after receiving MCT intervention, which were all clinically significant changes. Results revealed that at post-treatment four patients experienced a decrease in their concerns about shape (EDE-Q shape concern), which was clinically significant. However, no patients demonstrated any clinically significant changes in their concerns about weight (EDE-Q weight concern) at post-treatment.

In terms of GAF-ED clinician measures, since the reliable change was not calculated for this measure, no conclusions can be made as to whether patients made clinically significant changes. Analysis also revealed that based on the cut-off criteria, three out of 11 patients who received a GAF-ED score at both pre-treatment and post-treatment, showed a increase in their GAF-ED scores after MCT, which meant that they had transient or no eating disorder symptoms present and had improved daily functioning (Mcintosh et al. 2016, APA, 1994). As no individual analysis was conducted for the clinician measure of Global rating of

clinical state of eating disorder, a description of the results will be summarised. Out of the 11 patients who had received clinical ratings of the Global rating of Clinical state of Eating Disorder at both pre-treatment and post-treatment, results showed that nine patients had reduced eating disorder symptoms, with some patients experiencing more reductions in their symptoms than others after undergoing MCT, while two patients eating disorders symptoms remained unchanged and still met eating disorder criteria after MCT.

The results of the EDE-Q outcome measures and clinician measures used to assess if patients experience a reduction in their eating disorder symptoms after MCT, provided mixed findings. Although the EDE-Q global measure showed that the majority of patients experienced a decrease in their eating disorder severity, one of the EDE-Q subscales showed less promising results for the use of modified MCT as an intervention for anorexia nervosa (weight concern). Clinician measures showed that three patients showed improvements in their GAF-ED based on the current study's cut-off point, while the majority of patients showed some improvements in their eating disorder symptom's based on the global rating of clinical state of eating disorder after MCT. In all there seems to be some support for the hypothesis that patients with anorexia nervosa experience improvements in their eating disorder symptoms after receiving MCT.

It was also hypothesised that patients receiving MCT for their anorexia nervosa would experience a reduction in their maladaptive metacognitions and thought control strategies.

The results revealed that three out of 11 patients who completed the MCQ-30 questionnaire had a clinically significant change of a decrease in their unhelpful metacognitions (MCQ-30 total) after receiving intervention. Closer analysis of the MCQ-30 subscales found that after receiving intervention, four patients experienced a decrease in their positive beliefs about worry and two patients showed a decrease in their negative beliefs about uncontrollability and danger, which were all clinically significant changes. Analysis

also revealed that only a single patient showed reductions in their cognitive self-consciousness subscale scores at post-treatment, which was a clinically significant change. Moreover, none of the patients showed any clinically significant changes in their need to control thoughts and cognitive confidence subscale scores after receiving MCT.

None of the patients in the study showed clinically significant changes for the TCQ total score. Further analysis showed that none of the patients in the study showed clinically significant changes for any of the following outcome measures; TCQ punishment subscale and TCQ worry subscale. Altogether these results provided little support for the hypothesis that there would be a reduction in patients' maladaptive metacognitions and thought controls strategies after MCT, although there were some promising findings that one third of patients experienced a decrease in their positive beliefs about worry after receiving MCT.

It was also hypothesised that patients receiving modified MCT for anorexia nervosa would also experience a decrease in their symptoms of ruminations, depression and worry.

Results showed that five out of the nine patients who completed the self-reported BDI-II measure had reductions in their depressive symptoms, which was a clinically significant change, after receiving MCT intervention. Similarly, five out of 11 patients who completed the self-report RRQ-Rumination questionnaire also had clinically significant changes of decreases in their rumination levels after intervention. Analysis of the PSWQ measure also revealed that four out of nine patients who completed this outcome measure, showed decreases in excessive worrying at post-treatment, which were clinically significant changes.

These results provide some support to the hypothesis that there is a decrease patients ruminations, worry and depressive symptoms after receiving modified MCT

Discussion

Previous research studies have found that anorexia nervosa is a difficult disorder to treat, particularly in adults who have a history of struggling with this disorder (Ricca et al., 2010; Fairburn, 2005). The current study explored whether MCT modified for patients with anorexia nervosa could be an effective intervention for this disorder. Specifically, the study examined whether patients diagnosed anorexia nervosa or atypical anorexia nervosa, receiving modified MCT would show improvements in their maladaptive metacognitions, thought control strategies as well as experience a decrease in their depressive symptoms, worry, ruminations and eating disorder symptoms. In the current study, results were analysed at the group level and individual level.

Some support was found for the hypotheses that MCT modified for anorexia nervosa would reduce eating disorder symptoms and increase weight gain when looking at both group data and individual data. Group data showed that after receiving MCT the group had reduced maladaptive metacognitions. However, in individual analysis there was little support of clinically significant changes of improvements occurring in patients' negative metacognitive beliefs, need to control thoughts, cognitive confidence and cognitive self-consciousness after receiving intervention. However, individual analysis did show some support for the clinically significant change of improvement in patients positive metacognitive beliefs about worry after receiving MCT. The results of the current study showed that at the group level, there was a reduction in the use of the thought control strategy of worry after MCT, however there were no changes in the groups use of punishment. Moreover, there were no clinically significant changes observed at the individual level in patients use of worry and punishment as forms of thought control strategies, despite receiving MCT. More promisingly, results of the current study at both the group level and individual level showed some support for the

hypothesis that patients would experience reductions in their worries, ruminations and depressive symptoms.

Eating disorder symptoms

There was a mean decrease in the group eating disorder symptomology, as measured by the EDE-Q (global), following MCT. The group data also showed mean reductions in their eating concerns, restraint behaviours, shape and weight concerns. Further, the individual data showed that the majority of patients (seven patients) experienced clinically significant changes of reductions in their overall eating disorder symptoms and in particular had decreased concerns about eating (eight patients), following MCT. Moreover, after receiving intervention, five patients demonstrated less restriction over their food and four patients had improvements in their shape concerns, all of which were clinically significant changes. The current study found that patients showed no clinically significant changes of improvement in their concerns weight after intervention, however, there is a possible explanation for this finding. Women are often exposed to images of underweight models in the media, a review of the literature found that this can have a negative impact on women's' body image (Grogan, 2016). Hence, it is unsurprising that even in a normative sample population of college students, women show higher levels of concerns in direct measures of weight and shape, compared to concerns about eating or restricting food (Quick & Byrd-Bredbenner, 2013). Taking this into account, alongside the fact that there were clinically significant changes of reduction in the majority of patients overall eating disorder symptoms (EDE-Q global) these findings seem to indicate some support for the hypothesis that MCT modified for anorexia nervosa may be effective in reducing patients eating disorder symptoms. Moreover, as previously stated the current study's group data showed reductions in the groups eating disorder symptoms as measured by the EDE-Q which is in line with previous CBT

intervention studies (Ricca et al., 2009). Indicating that MCT modified for anorexia nervosa may be comparable to CBT interventions for eating disorders. It should be noted however, that no statistical analyses were performed between the current study and CBT study.

There was also an overall increase in the patients' mean BMI after MCT. Individual analysis showed that one third of patient's achieved a healthy weight range by the end of the intervention, which was a clinically significant change. However, a single patient with atypical anorexia nervosa did experience a decrease in BMI after intervention, which resulted in them being underweight. Overall these findings are promising, considering that one third of patients in the study had atypical anorexia nervosa which meant that they were already in a 'healthy BMI range' and could not have achieved the criteria set for clinically significant change on this measure. Furthermore, the overall mean increase in the current study's group BMI after treatment, is in line with improvements in BMI seen in past intervention studies utilising CBT, SSCM or MANTRA as intervention for anorexia nervosa or sub-threshold anorexia nervosa (Ricca et al., 2009; Schimdt et al., 2015).

In regards to the following clinician measures used in the study to assess patients eating disorder symptoms, no claims about clinically significant changes can be made for the individual data, as reliable change was not calculated for these measures. The current study found that after receiving MCT, the patient group demonstrated improvements in their psychosocial functioning, as there was an increase in groups GAF-ED mean scores after MCT. However, analysis of individual data, suggested that only three patients had improvements in their psychological functioning. This could be due to the high cut-off point criteria set out in the current study, as patients needed to have either transient or no eating disorder symptoms with none or minor impairment in psychosocial functioning in order to be considered 'improved' in the current study. If a more lenient cut-off point threshold was used consisting of, "mild symptoms" (APA, 1994, p32) alongside with some psychosocial

difficulties present although "generally functioning pretty well" (APA, 1994. p32), half of the patients in the group would have been considered to have 'improved'.

Other findings in the present study provided support for the hypothesis that MCT modified for anorexia nervosa would reduce eating disorder symptoms. The current study showed that based on clinician ratings, the majority of patients (nine patients) demonstrated a decrease in eating disorder symptoms following MCT intervention. Based on those who received clinician ratings, three patients did not have significant eating disorder symptoms present by the end of the intervention; one patient displayed only a few symptoms of eating disorder and five patients had eating disorder symptoms present but were no longer classified as having a full eating disorder following intervention. Moreover, after receiving modified MCT, only two patients satisfied the criteria of having an eating disorder according to clinician ratings.

Overall, based on clinician and self-report measures, the findings of the current study seem to provide some support that modified MCT can be used to treat eating disorder psychopathology in patients with atypical or typical anorexia nervosa. Also there was some support for the hypothesis that patients would experience weight increase after MCT, as results showed that after MCT some patients experienced an increase in weight which placed them in a healthy BMI weight range.

Metacognitions and thought control strategies

The current study found that in terms of the group data, MCT modified for anorexia nervosa reduced unhelpful metacognitions, which seems to provide support for the hypothesis that patients with anorexia nervosa would experience a decrease in maladaptive metacognitions following MCT. Specifically, the group showed mean decreases in their positive beliefs about worry, negative beliefs about uncontrollability and danger, decreases in

their need to control thoughts and decreased cognitive self-consciousness. The results for cognitive confidence were statistically indeterminate, therefore, no conclusions made about this measure. In all, aside from the lack of conclusions that can be made about the cognitive confidence subscale, the rest of the findings from the group data seem to support the hypothesis that there is a reduction in maladaptive metacognitions in patients with anorexia nervosa after receiving MCT. Moreover, these current results are mostly in line with previous studies which show the effectiveness of MCT in reducing unhelpful metacognitions in individuals struggling with psychological distress (Hjemdal et al., 2017; Wells et al., 2012).

In terms of the current study's individual data, a total of 11 patients completed the MCQ-30 outcome measure, after receiving MCT. Three out of the 11 patients showed clinically significant changes of improvement in their overall maladaptive metacognitions (MCQ-30 total), after MCT. In terms of the MCQ-30 subscales; two patients showed clinically significant changes of improvements in their negative beliefs about uncontrollability and danger and one patient showed improvements (clinically significant change) in their cognitive self-consciousness. Whereas no patients showed clinically significant changes in their cognitive confidence or their need to control thoughts. Hence, the current study showed little evidence of clinically significant changes across these four subscales. Compared to the other subscales of the MCQ, a more promising finding in the current study was that four patients showed improvements in their positive beliefs about worry, which were clinically significant changes following MCT intervention. Previous research also showed mixed findings in terms of clinically significant changes, where in a series of case studies of three individuals with binge eating disorder; two individuals had clinically significant changes of improvements in their negative beliefs about worry, whereas only one patient showed clinically significant changes of improvements in their positive beliefs about worry and cognitive confidence after MCT (Robertson & Strodl, 2020).

Previous research found that no clinically significant changes were observed in the need to control and cognitive self-consciousness subscales in patients with binge eating disorder after MCT (Robertson & Strodl, 2020). Interestingly, in the Robertson & Strodl's (2020) study although only one patient showed clinically significant changes of improvement in their positive beliefs about worry, it was found that every individual (three) in the study had "significant improvements" (Robertson & Strodl, 2020, p.8) in their positive beliefs whereas two individuals had significantly improved in their negative beliefs about worry. Therefore, the authors in the Robertson & Strodl (2020) study thought that in individuals with binge eating disorder MCT effected positive metacognitive beliefs more than negative metacognitive beliefs, which is in line with findings of the current study.

Although the current study's group data did show mean decreases in the groups metacognition for most of the subscales (aside from cognitive confidence) and total scores (MCQ-30) following MCT; individual data analysis showed that only one or two patients showed clinically significant changes of decrease in their cognitive self-consciousness and negative beliefs about uncontrollability and danger scores. Moreover, no clinically significant changes were found for cognitive confidence or need to control thoughts. The most promising finding was that four patients showed clinically significant changes of reduction in their positive beliefs about worry after MCT. It is possible that metacognitive changes may continue to occur in patients even after post-treatment outcome measures were collected. Based on past research, it is also possible that not all eating disorder metacognitions are adequately measured by the MCQ-30, as individuals with eating disorders may have other metacognitions, this is an area which requires more research (Robertson & Strodl, 2020; Vann, Strodl & Anderson, 2014).

Overall, the results from the individual data seemed to provide only partial support for the hypothesis that after receiving MCT for anorexia nervosa patients' would experience a

reduction in their maladaptive metacognitions, with individual analysis providing some support for improvements in patients positive metacognitive beliefs about worry, whereas little support was found for the reduction of other types of maladaptive metacognitions (cognitive confidence, need to control thoughts, negative beliefs about uncontrollability and beliefs about cognitive self-consciousness) after MCT.

In the current study it was hypothesised that after receiving modified MCT patients would experience a decrease in their use of unhelpful thought control strategies. Findings from the group data showed that following MCT, there was a mean decrease in the groups use of worry as a thought control strategy. This is a promising finding as a review of the literature has linked thought control strategies such as worry to psychological distress (Wells & Fisher, 2015). However, aside from the groups decrease in worry as a thought control strategy, other findings in the current study provided little support for the hypothesis that modified MCT reduced maladaptive thought control strategies. Contrary to the prediction that modified MCT would result in a lower use of punishment as a mechanism to control thoughts, findings from group data in the current study indicate that no conclusions can be made as to whether any changes had occurred in the groups use of punishment following MCT, as the results were statistically indeterminant. The current study also found that no clinically significant changes in the use of worry and punishment were observed in any individuals after receiving MCT. Previous research examining the use of MCT for binge eating disorder also showed similar results, where there were no significant reductions in patients use of thought control strategies of worry and punishment after intervention (Robertson & Strodl, 2020). A possibility for the lack of clinically significant changes in patients maladaptive thought control strategies following intervention, may be explained by previous studies which indicate that for individuals diagnosed with eating disorders the thought control questionnaire (TCQ) may not be an entirely suitable measure (Robertson &

Strodl, 2020; Vann et al., 2014). Interestingly though, Vann et al., 2014 did find that the thought control strategy of punishment was increased in clinical populations of eating disorders.

Worrying, rumination and psychological distress

The current study showed some support for the hypothesis there would be a reduction in depressive symptoms, worry and rumination following MCT.

There was a mean reduction in the groups depressive symptoms following MCT. Further, five out of the nine patients who completed the BDI-II had experienced clinically significant changes of decreases in their depressive symptoms. These findings provide support for the hypothesis that patients struggling with eating disorders may experience a reduction in their depressive symptoms after receiving modified MCT. This is consistent with recent research showing a decrease in individuals' depressive symptoms (BDI-II) following MCT for binge eating disorder (Robertson & Strodl, 2020).

Complementary to the findings above, the current study also showed a mean decrease in the groups rumination and worry symptoms following MCT. This supports the current study's hypothesis that there is a decrease in patients worries, ruminations and depressive symptoms following MCT modified for anorexia nervosa. In the current study, five patients showed clinically significant changes of reductions in their rumination levels after receiving MCT. Whereas, four patients showed clinically significant changes of decreases in their worrying levels following MCT. Consistent with previous research which shows that rumination and worries are present in eating disorders (Startup et al., 2013), the current study further shows that individuals with struggling with anorexia nervosa may experience a decrease in their ruminations and worries following MCT. These findings are also consistent with past studies of group data suggesting that MCT decreases ruminations and worries in

patients with anxiety and depressive disorders (Hjemdal et al., 2017; van der Heiden et al., 2012).

Further Implications

This exploratory study was one of the first trials to examine the use of MCT as an intervention for eating disorders. Previous research has combined cognitive therapy with metacognitive therapy to form an intervention for binge eating disorders and bulimia nervosa (Cooper, Todd & Wells, 2008). A recently published study also applied MCT as an intervention for binge eating disorder (Robertson & Strodl, 2020). The current study, however, is one of the first to adapt MCT as a treatment for patients with either anorexia nervosa or atypical anorexia nervosa. The current study shows some support of weight increase in some patients after receiving MCT. The present study provides some support for the hypothesis that that MCT modified for anorexia nervosa may be useful in reducing eating disorder symptoms. As indicated above, overall the patient group data showed improvements in self-reported eating disorder symptoms, consistent with previous CBT studies for eating disorders (Ricca et al., 2009). Moreover, these observed decreases in patients' eating disorder symptoms are also in line with recent research showing reduced binge eating disorder symptoms following MCT (Robertson & Strodl, 2020). The current study is the first to show how adapted MCT may be a new effective form of intervention for adult patients' struggling with typical or atypical anorexia nervosa. Thus, adapted MCT for anorexia nervosa may fill in the gap needed in the form of treatment for adults with anorexia nervosa.

The present study also showed a decrease in patients depressive symptoms after receiving modified MCT, as measured by the BDI-II, which is in consistent with the findings of previous research on MCT for binge eating disorders where patients showed reductions in depressive symptoms (Robertson & Strodl, 2020). Results of the current study also showed

that following adapted MCT for anorexia nervosa some patients experienced reductions in their worry and rumination levels. These reduction in rumination and worry levels observed in patients in the current study from both group data and individual data analysis, provide support for past research theories that rumination and worry processes are present in anorexia nervosa (Sala et al., 2019; Startup et al., 2013).

Moreover, in the current study, the observed decrease in patients' ruminations and worrying levels following MCT adapted for anorexia nervosa, also highlights the transdiagnostic nature of MCT, which is consistent with previous research indicating that MCT can be used to treat depression and comorbid anxiety (Hjemdal et al., 2017). The current study extends upon previous research, as this is the first study to show that individuals receiving MCT modified for anorexia nervosa may not only experience a reduction in symptoms of depression, worry, rumination but also decreases in their eating disorder symptoms. As anorexia nervosa is often comorbid with anxiety and depression (APA, 2013), use of an MCT intervention to treat eating disorder symptoms but also comorbid disorders through the modification of maladaptive metacognitions was proposed by Vann et al., (2014).

Findings from the current study seem to provide some support that MCT may be a practical, efficient method of treating individuals with anorexia nervosa who are also struggling with anxiety and depressive symptoms. Although there is some support for clinically significant changes of improvements in patients' positive beliefs after MCT, it is not possible to conclude that these improvements in unhelpful metacognitions led to decreases in patients eating disorder symptoms. Further statistical analysis would need to be conducted to test this theory, for example past research stated the need for a mediation analysis to analyse processes in their own intervention study (van der Heiden, 2012).

Limitations

The current study had several limitations. Firstly, the study was carried out as a sequential open trial with a small sample size. This small sample size limits the generalisability of the findings, there was also a lack of diversity in the sample as the majority of patients in the current study were NZ Europeans. Secondly, as this was an exploratory study, the number of therapy sessions that each patient received varied largely (11-42 sessions). Moreover, most of the patients in the current study had previously received some form of treatment for their eating disorder, as this was not controlled for in the study. Thirdly, the lack of a randomised controlled trial meant that there was no control group to compare MCT intervention with, the use of an active control group would allow researchers to account for the effects of meeting regularly with a therapist has on patients (Wells, et al., 2012).

Another limitation concerns the statistical analyses that were performed in the current study. Due to the exploratory nature of the current study, a more liberal approach to analysis was applied. Hence, the results found in the current study should be interpreted cautiously. The calculations used to determine statistical significance before and after intervention were based on the assumption that the data was normally distributed, which is unlikely to be the case in this current study due to its small sample size (Tryon, 2001). Moreover, as this trial was conducted as an exploratory study rather than a randomized controlled trial, no corrections were calculated for the multiple analyses performed (Tryon, 2001; Vickerstaff, Omar & Ambler, 2019). Another limitation was in regards to the calculations of the RCI, for the PSWQ measure the standard deviation and Cronbach's alpha were derived from different samples. A further limitation was that there was missing data in many of the outcome measures used in the study, once again this was due to the exploratory uncontrolled sequential nature of the trial.

For outcome measures which did not have pre-existing clinical cut-off points, the current study used a calculated cut-off point (2sd from pre-treatment mean) to determine whether patients had met one of the criteria's needed for clinically significant change. However, the use of this cut-off point (2sd) may not be appropriate at times, as the cut-off points for certain outcome measures was below the lowest possible score for that measure (EDEQ-restraint subscale). It is of note that the cut-off point criteria (2sd from pre-treatment mean) used in the present study is in line with criteria set out by Jacobson & Truax (1991).

Another limitation in the current study was that it was unknown whether dysfunctional and functional populations overlapped with each other in their distributions. Hence, after completion of MCT conclusions cannot be drawn about whether patients had fallen into a functional population group and had recovered. Even if patients achieved a cut-off point of 2sd from pre-treatment mean at post-treatment, as it was unclear whether this improvement of 2sd would place them within the range of a functional population group. Therefore, the clinically significant change definition set by Jacobson & Truax (1991) as moving into a functional population was not realised in the current study; hence in the current study the use of the term clinically significant change did not refer to recovery into healthy functioning (Baer, Lambert & Nielson, 2004; Jacobson & Truax, 1991; Jacobson, Follette & Revenstorf, 1984; Tingey, Lambert, Burlingame & Hansen, 1996).

Future research

In order to address some of the limitations mentioned above, future research studies should examine the efficacy of MCT modified for anorexia nervosa through the use of a randomised controlled trial (RCT) with a large sample size to allow for the generalisability of results. Moreover, an RCT would allow for more controlled measures to be put in place, such as a set number of therapy sessions for all participants and limiting entry into the trial for

participants who have not previously received treatment for the eating disorders (Ricca et al., 2010), in order to control for the effects of previous treatments. It would also be useful to compare MCT modified for anorexia nervosa to other interventions for anorexia nervosa such as CBT (Ricca et al., 2010), to examine which intervention may be more efficacious in the treatment of this particular eating disorder. Future studies could also conduct an intention to treat analysis in order to control for any missing data. Moreover, future studies on MCT modified for anorexia nervosa could also look at using more measures with pre-existing clinical cut-off points based on previous research (Blampied, 2017). Further research on MCT for anorexia nervosa could focus on recruiting patients with typical anorexia nervosa, as the current study included both typical and atypical anorexia nervosa. Thus, research could explore the use of MCT focusing solely patients with anorexia who have a low BMI to examine whether there are any differences in outcomes compared to the current study. Previous research has suggested that metacognitions in eating disorders are transdiagnostic, and interventions should aim to change these unhelpful metacognitions (Vann et al., 2014), thus, further research is needed to see if MCT modified for anorexia nervosa would also be an effective intervention for other types of eating disorders.

Conclusion

Anorexia nervosa is known to be a difficult psychological disorder to treat in adults (Fairburn, 2005). The current exploratory study examined the effectiveness of a new form of treatment, MCT modified for anorexia nervosa, for those struggling with this particular eating disorder. There was some evidence in the current study patients with anorexia nervosa experienced a decrease in eating disorder symptoms and some experienced an increase in BMI after MCT. Findings also showed that although group data indicated a mean decrease in patients maladaptive metacognitions across several subscales after MCT and individual

analysis provided some support for clinically significant changes of reductions in positive beliefs about worry after receiving MCT; there was a little support for clinically significant changes of improvements observed in most of the patients unhelpful metacognitions such as patients need to control thoughts, their cognitive confidence, negative metacognitive beliefs about worry and cognitive self-consciousness following MCT. Hence only partial support was found for the hypothesis that those receiving MCT adapted for anorexia nervosa (atypical and typical) would experience a reduction in their maladaptive metacognitions. The current study also found a mean decrease in the groups use of worry as a thought control strategy after intervention, however as there was a lack of clinically significant findings for this TCQ worry measure, and punishment there is little support for the hypothesis that MCT is a useful treatment for changing patients thought control strategies. Based on the findings from group and individual data, the current study showed that following modified MCT for anorexia nervosa some patients showed reductions in depressive symptoms, worrying and rumination levels. Although the current exploratory study examining MCT for anorexia nervosa has shown some promising findings in the use of this treatment for patients struggling with atypical and typical anorexia nervosa; a more robust randomised controlled trial is needed in order to further examine the efficacy of this intervention for anorexia nervosa.

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APPENDICES

Appendix A

Canterbury District Health Board
Te Poari Hauora ō Waitaha

UC UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Participant Information Sheet

Study title:	**Metacognitive Therapy for Anorexia Nervosa; an open trial in the SIEDS**		
Locality:	**Princess Margaret Hospital South Island Eating Disorders Service**	Ethics committee ref.:	
Central Researcher:	**Dr Janet Carter** **Ms Rachel Lawson**	Contact phone number:	**03 366 7001** **03 3377707**

You are invited to take part in a study evaluating Metacognitive Therapy for Anorexia Nervosa. Whether or not you take part is your choice. If you don't want to take part, you don't have to give a reason, and it won't affect the care you receive in any way. If you do want to take part now, but change your mind later, you can pull out of the study at any time.

This Participant Information Sheet will help you decide if you'd like to take part. It sets out why we are doing the study, what your participation would involve, what the benefits and risks to you might be, and what would happen after the study ends. We will go through this information with you and answer any questions you may have. We expect this will take about 10 minutes. You may also want to talk about the study with other people, such as family, whānau, friends, or healthcare providers. Feel free to do this.

If you agree to take part in this study, you will be asked to sign the Consent Form on the last page of this document and return it to your Clinical Psychologist. You will be given a copy of both the Participant Information Sheet and the Consent Form to keep. This document is 5 pages long, including the Consent Form. Please make sure you have all of the pages.

1. Why are we doing the study?

The main purpose of this study is to evaluate the effectiveness and feasibility of Metacognitive Therapy (MCT) for outpatients at the South Island Eating Disorder Service with Anorexia Nervosa. Metacognitive Therapy is a psychological treatment that focuses on changing the way people respond to their thoughts. Metacognitions, or your thinking about your thoughts, determines whether those thoughts are dismissed or whether they are dwelled upon (worry and rumination). Worry and rumination can lead to prolonged and deeper distress and maintain unhelpful eating behaviours. Studies that have examined the effectiveness of MCT have shown it to be an effective treatment for several types of mental health difficulties such as anxiety and depression. This study is the first to evaluate whether MCT is an effective and acceptable treatment for Anorexia Nervosa.

2. What will your participation involve?

Your participation in this study will involve completing 10-20 sessions of Metacognitive Therapy. MCT sessions involve learning new skills to better manage the unhelpful thinking that occurs in Anorexia nervosa. Your therapist will assist you to understand and apply these skills to your particular problems. MCT is offered as a standard treatment at the South Island Eating Disorder Service, so even if you do not wish to participate in this study you may be eligible to receive this treatment. If you have been prescribed medication then you will continue to take this.

All referrals to the SIEDS are asked to complete questionnaires as part of the normal assessment process. If you choose to participate in this study however you will be asked to complete a number of additional questionnaires at the beginning, middle, end, and 3 months after the end of treatment. The questionnaires will be given to you by your Clinical Psychologist and will ask about eating disorder symptoms, self-esteem, worry, anxiety and body image. The questionnaires will take approximately 60-90 minutes to fill out. If you agree to participate in this study you will be asked if you give consent for the information from your assessment questionnaires to be given to the research team so it can be included with the study questionnaire information. The research team is Rachel Lawson (Clinical Head and Registered Clinical Psychologist at SIEDS) and Janet Carter (Associate Professor at the University of Canterbury and Registered Clinical Psychologist).

3. What are the possible benefits and risks to you of participating?

It is possible that some of the questions within the questionnaires may bring up sensitive issues and cause some distress. Remember though that you are free to withdraw at any time during this study. However, if you feel any distress during the completion of the questionnaires please let your clinical psychologist know. You may also find filling out the questionnaires tiring. It is OK to take breaks when filling out the questionnaires.
If your clinician becomes aware of any factors (i.e. your health declines to a level that means it is no longer appropriate for you to receive MCT) that means you can no longer participate in the study, you will informed as soon as possible.

4. What are the rights of participants in the study?

As a voluntary participant in this study, you are free to decline to participate, or to withdraw from the study at any time and have the information collected from you destroyed.
You have the right to access information that is collected from you in the study and you can choose to receive a report of this study's results at the end of the study. Your privacy will be respected as the information that you provide will be coded and stored separately from the Consent Form with your name on it.
Section 32 of the Accident Compensation Act 2001 sets out the limited circumstances in which there will be ACC cover for 'personal' (physical) injury suffered as a result of treatment provided as part of this intervention study. However given this study is examining a psychological intervention there is very low risk of physical injury.

5. What will happen after the study ends, or if you pull out?

You will be able to continue to receive MCT if you withdraw from the study. All information that is collected from you will be coded and stored in a locked place as well as a password protected computer database, until it is destroyed after 10 years (all paperwork will be shredded and all electronic information deleted). This is the responsibility of the Central Researcher (Dr Janet Carter). Before it is destroyed, members of the research team will have access to this coded information. Your coded information may contribute to an analysis that could be published in a scientific journal. If you choose to receive a report of this study's results at the end of the study, the expected timeframe for receiving this report is six months after the end, which will be December 2015.

Where can you go for more information about the study, or to raise concerns or complaints?

If you have any questions, concerns or complaints about the study at any stage, please feel free to contact any member of the research team:

Janet Carter
University of Canterbury
Phone: 03 3642987 ext. 8090
Email: janet.carter@canterbury.ac.nz

Rachel Lawson
South Island Eating Disorder Service
Phone: 03 3377707
Email: Rachel.Lawson@cdhb.health.nz

Alternatively, if you want to talk to someone who isn't involved with the study, you can contact an independent health and disability advocate on:

Phone: **0800 555 050**

Fax: **0800 2 SUPPORT (0800 2787 7678)**

Email: **advocacy@hdc.org.nz**

You can also contact the ethics committee that reviewed and approved this study on:

Phone: **0800 4 ETHICS**

Email: **hdecs@moh.govt.nz**

If you wish to contact Pukenga Atawhai (Maori Mental Health Service), please contact the South Island Eating Disorders Service at:

Phone: **03 3377707**

Appendix B

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Participant Consent Form

Study title:	**Metacognitive Therapy for Anorexia Nervosa; an open trial in the SIEDS**		
Locality:	**Princess Margaret Hospital South Island Eating Disorders Service**	Ethics committee ref.:	
Central Researcher:	**Janet Carter** **Ms Rachel Lawson**	Contact phone number:	**03 3667001** **03 3377707**

Declaration by participant:

- I have read and I understand the Participant Information Sheet. I have had the opportunity to ask questions and I am satisfied with the answers I have received.
- I freely agree to participate in this study.
- I have been given a copy of the Participant Information Sheet and Consent Form to keep.
- I understand my GP will be informed of my participation in this study. My GP is;
  Name_____
  _____
  Address_____
  _____

- I have been given the opportunity to meet with the Pukenga Atawhai
- I consent to the research team been given a copy of my assessment questionnaires completed at the South Island Eating Disorder Service

Participant's name: _____

Signature: _____ Date: _____

Email or Postal Address: _____

_____

Researcher's signature: Date:

Please indicate whether you would like to receive a report of this study's results: Yes / No

Appendix C

Health and Disability Ethics Committees

Min
istry of Health C/-
MEDSAFE, Level 6, Deloitte
House
10 Brandon Street
PO Box 5013
Wellington
6011

hdecs@moh.govt.nz

10 March 2014

Associate Professor
Janet Carter
Psychology
Department University
of Canterbury
Private Bag 4800
Christchurch 8140

Dear Associate Professor Carter

Re:	**Ethics ref:**	**14/NTB/19**
	Study title:	Metacognitive Therapy for Anorexia Nervosa: An open trial in the South Island Eating Disorder Service

I am pleased to advise that this application has been *approved* by the Northern B Health and Disability Ethics Committee. This decision was made through the HDEC-Full Review pathway.

The main issues considered by the HDEC in giving approval were as follows.

- The Committee thanked Associate Professor Janet Carter for making the time to speak to the Committee.
- The Committee noted the adjustments to the protocol in response to the declined application which has made it a safer study for participants.
- The Committee noted that the application and participant information were clear and easy to understand and thanked Associate Professor Janet Carter for addressing the questions raised in the decline letter.
- The Committee asked for the timing of recruitment. Associate Professor Janet Carter explained that when a referral comes to the South Island Eating Disorder Service (SIEDS) patients fill in questionnaires and are allocated a clinician. These assessments are taken to a clinical team

meeting where a plan is agreed on for a patient, for example, patients may be allocated a therapist, physiotherapist, psychiatrist or dietician. Patients will then agree to this plan.

- Associate Professor Carter noted that metacognitive therapy has been done in SIEDS for some time with individuals and groups and that she wants to collect data on its effectiveness.
- The Committee noted that the researcher wants patients to be on stable medications and noted that dosages might be changed by psychiatrists. Associate Professor Carter explained that while they would prefer patients to be on stable medication, this won't necessarily happen as some patients will have their medication changed. Any changes to medications will be noted.
- Associate Professor Carter confirmed that the planned commencement date of February 2015 was a typo.
- The Committee asked for clarification on the number of weekly sessions. Associate Professor Carter confirmed that the aim will be weekly for at least the first four weeks, with a total of 10 to 20 sessions.
- The Committee asked for the source of the funding of the study as this was not clear in the application (R.5.1). Associate Professor Carter confirmed that there was no external funding and that the study would be funded within the SIEDS's existing budget. She explained that she has an RA who helped with putting an application together and will assist with some of the data input and administration.
- The Committee queried the response to F.1.1 and F.1.2 on how the study would contribute to reducing inequalities between different populations. Associate Professor Carter was unsure if there would be any Māori patients and if the metacognitive therapy would be particularly beneficial to Māori or Pacific people but that it was hoped that it would be.
- Associate Professor Carter confirmed that the New Zealand census question would be used for collecting ethnicity data.
- The Committee requested the following changes to the participant information sheet and consent form:
    - Please tell participants to take medication that is prescribed to them.
    - Please tell participants that they will continue to receive metacognitive therapy if they choose to withdraw from the study.
    - In the consent form, please tell participants that the study team will be telling their GPs that they are taking part in this study.

Conditions of HDEC approval

HDEC approval for this study is subject to the following conditions being met prior to the commencement of the study in New Zealand. It is your responsibility, and that of the study's sponsor, to ensure that these conditions are met. No further review by the Northern B Health and Disability Ethics Committee is required.

Standard conditions:

1. Before the study commences at *any* locality in New Zealand, all relevant regulatory approvals must be obtained.

2. Before the study commences at *any* locality in New Zealand, it must be registered in a WHO-approved clinical trials registry (such as the Australia New Zealand Clinical Trials Registry, www.anzctr.org.au).

3. Before the study commences at *a given* locality in New Zealand, it must be authorised by that locality in Online Forms. Locality authorisation confirms that the locality is suitable for the safe and effective conduct of the study, and that local research governance issues have been addressed.

Non-standard conditions:

- Please amend the PIS and consent form, taking into account the suggestions made by the Committee (*Ethical Guidelines for Intervention Studies, para 6.22).*

Non-Standard conditions must be completed before commencing your study. Please email non-standard conditions to HDECS@moh.govt.nz. Do not submit non-standard conditions as a Post Approval form.

After HDEC review

Please refer to the *Standard Operating Procedures for Health and Disability Ethics Committees* (available on www.ethics.health.govt.nz) for HDEC requirements relating to amendments and other post-approval processes.

Your next progress report is due by 10

March 2015. Participant access to ACC

The Northern B Health and Disability Ethics Committee is satisfied that your study is not a clinical trial that is to be conducted principally for the benefit of the manufacturer or distributor of the medicine or item being trialled. Participants injured as a result of treatment received as part of your study may therefore be eligible for publicly-funded compensation through the Accident Compensation Corporation (ACC).

Please don't hesitate to contact the HDEC secretariat for further information. We wish you all the best for your study.

Yours sincerely,

Mrs
Raewyn
Sporle
Chairpers
on
Northern B Health and Disability Ethics Committee

Encl: appendix A: documents submitted
appendix B: statement of compliance and list of members

Appendix A Documents submitted

Document	*Version*	*Date*	
Declined letter for previous application in respect of the same (or substantially similar) study	1	17 September 2013	
CV for CI	1	15 August 2013	
PIS/CF	2	04 February 2014	
Protocol	1	15 August 2013	
Survey/questionnaire	1	15 August 2013	
Survey/questionnaire	1	15 August 2013	
Survey/questionnaire	1	15 August 2013	
Survey/questionnaire	1	15 August 2013	
Survey/questionnaire	1	15 August 2013	
Survey/questionnaire	1	15 August 2013	
Survey/questionnaire	1	15 August 2013	
Maori Consultation Letter	1	23 August 2013	
Other (No Description Entered)	1	15 August 2013	
Survey/questionnaire	1	15 August 2013	
CVs for other Investigators	1	04 February 2014	
Covering Letter	1	26 January 2014	
Evidence of scientific review	1	12 February 2014	
Survey/questionnaire	1	15 August 2013	
Application			

Appendix B
Statement of compliance and list of members

Statement of compliance

The Northern B Health and Disability Ethics Committee:

- is constituted in accordance with its Terms of Reference
- operates in accordance with the *Standard Operating Procedures for Health and Disability Ethics Committees*, and with the principles of international good clinical practice (GCP)
- is approved by the Health Research Council of New Zealand's Ethics Committee for the purposes of section 25(1)(c) of the Health Research Council Act 1990
- is registered (number 00008715) with the US Department of Health and Human Services' Office for Human Research Protection (OHRP).

List of members

Name	*Category*	*Appointed*	*Term Expires*	*Present on 04/03/2014?*	*Declaration of interest?*	
Mrs Raewyn Sporle	Lay (the law)	01/07/2012	01/07/2015	Yes	No	
Mrs Maliaga Erick	Lay (consumer/community perspectives)	01/07/2012	01/07/2014	No	No	
Mrs Kate O'Connor	Non-lay (other)	01/07/2012	01/07/2015	Yes	No	
Mrs Stephanie Pollard	Non-lay (intervention studies)	01/07/2012	01/07/2015	Yes	No	
Dr Paul Tanser	Non-lay (health/disability service provision)	01/07/2012	01/07/2014	No	No	
Ms Kerin Thompson	Non-lay (intervention studies)	01/07/2012	01/07/2015	Yes	No	
Mrs Helen Walker	Lay (consumer/community perspectives)	01/07/2012	01/07/2015	Yes	No	

http://www.ethics.health.govt.nz