SINGING YOUR NEGATIVE BODY-RELATED THOUGHTS: A RANDOMIZED CONTROLLED TRIAL OF A NEW COGNITIVE DEFUSION STRATEGY

KEISHA C. GOBIN

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Abstract

The current study aims to extend the literature on cognitive defusion and test its effectiveness in the treatment of body dissatisfaction. In a randomized controlled trial, 122 female restrained eaters either 1) verbally repeated negative body-related thoughts, 2) sang negative body-related thoughts, 3) verbally repeated body-unrelated thoughts (control), or 4) sang body-unrelated thoughts (control) twice daily for one week. The goal of this study was to determine whether singing one's negative body-related thoughts could lead to greater changes in perception of the thought, body image satisfaction, mood, and self-esteem relative to a control condition. The results indicate that all conditions effectively changed appraisals of the thought after one week of practice, improved body image satisfaction, and increased self-esteem. There were also immediate reductions in anxiety and depressive mood. The results are discussed in the context of various forms of cognitive defusion.

Keywords: body dissatisfaction; cognitive defusion; acceptance and commitment therapy; verbal repetition; singing.

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Eating disorders are characterized by intense mental preoccupations with body shape and weight (American Psychiatric Association [APA], 2013). These thoughts can lead to problematic behaviours, such as restrictive eating, eating excessively, and purging (e.g., self-induced vomiting; Fairburn, Cooper, & Shafran, 2003). Consequences of eating disorders include impaired psychological functioning (e.g., comorbid mood disorders; APA, 2013) and social functioning (e.g., emotion dysregulation; Gilboa-Schechtman, Avnon, Zubery, & Jeczmien, 2006), as well as life-threatening medical complications (e.g., sudden cardiac death; Westmoreland, Krantz, & Mehler, 2016). Even in the absence of disordered eating, high levels of body dissatisfaction prospectively predict both depression and low self-esteem in young women (Paxton, Neumark-Sztainer, Hannan, & Eisenberg, 2006). Dissatisfaction with or negative feelings about one's body shape or weight (herein "body dissatisfaction") can lead individuals to engage in disordered eating behaviours (Derenne & Beresin, 2006). While both men and women experience body dissatisfaction, women are more likely to be preoccupied by thoughts about their body shape and weight and more likely to diet or restrict their eating (Dye, 2016). As such, evidence-based interventions to address disordered eating and malleable risk factors such as body image distress are imperative.

Cognitive-behavioural therapy (CBT), the current gold standard for treating eating disorders (Lobe, 2016), aims to change problematic thoughts about body shape and weight by challenging their validity and exposing individuals to disconfirming evidence (e.g., with mirrors or videos; Fairburn, 2008). By targeting the core psychopathology of over-evaluating one's body shape and weight, other symptoms such as dietary restraint, body checking or avoidance, preoccupations with body- or food-related thoughts, and weight control behaviours are also

expected to diminish (Murphy, Straebler, Cooper, & Fairburn, 2010). Unfortunately, CBT treatment is associated with a high dropout rate (50%; Byrne, Fursland, Allen, & Watson, 2011) and limited success (<50%; Wilson & Fairburn, 2007). One problem with CBT for body-related distress may be that it is ineffective at directly addressing "experiential avoidance."

Experiential Avoidance

Experiential avoidance is the tendency to control or repress uncomfortable private experiences, such as one's emotions, thoughts, behavioural predispositions, and bodily sensations (Hayes, Wilson, Gifford, Follette, & Strosahl, 1996). Previous researchers have preferred this term over others, such as 'cognitive avoidance' or 'emotional avoidance,' because it acknowledges the interrelationship between behaviours, thoughts, and emotions. Tracing back to Sigmund Freud (1920/1966), the basis of psychoanalysis was to uncover private experiences that were too threatening to be acknowledged by the conscious mind. While Freud used the term 'repression' to describe this phenomenon, both terms refer to an attempt to avoid unpleasant internal experiences. Therapies other than psychoanalysis, such as client-centered therapy and gestalt therapy, have a similar philosophy. Carl Rogers (1961) emphasized the importance of addressing experiential avoidance by positioning "openness to experience" at the center of successful therapeutic outcomes, and gestalt therapists posit that avoidance of unwanted emotions may underlie many psychological disorders.

The emergence of behaviour and cognitive therapies in the mid-to-late 1950's moved the field of psychology away from such acceptance-based approaches and categorized negative internal experiences as separate entities, namely thoughts and behaviours. The goal of these therapies is to change, rather than accept, the targeted experience. However, according to Hayes and colleagues' (1996), any attempt to change the form or frequency of negative internal

experiences is an act of avoidance, which can paradoxically increase the likelihood of having an unwanted thought. To elaborate, Wegner (1994) explained that in order to suppress an unwanted thought, an individual must simultaneously search for distractors and monitor for the presence of the unwanted thought. As cognitive load increases, the former task becomes more challenging and the easier task –monitoring the thought – is more likely to rise to awareness. As such, attempts to suppress a thought can increase its presence in the mind and perpetuate experiential avoidance.

Individuals with a tendency towards experiential avoidance report greater eating disorder related behaviours (Cowdrey & Park, 2012; Rawal, Park, & Williams, 2010). Among obese individuals, experiential avoidance was found to strengthen the relationship between anxiety sensitivity and emotional eating (Dave, 2016), as well as the relationship between fears of weight-based discrimination and low quality of life (Palmeira, Pinto-Gouveia, & Cunha, 2016). The relationship between experiential avoidance and a low quality of life was even stronger among obese individuals with binge eating symptoms, suggesting that experiential avoidance plays a vital role in the well-being of individuals with eating problems. The propensity towards experiential avoidance may be more damaging for individuals with an eating disorder because it mediates the relationship between body dissatisfaction and disordered eating (Ferreira, Palmeira, Trindade, & Catarino, 2015; Mendes, Ferreira, & Marta-Simões, 2017; Timko, Juarascio, Martin, Faherty, & Kalodner, 2014). Heffner and colleagues (2002) suggest that this relationship may be facilitated by the use of dieting to behaviourally avoid unwanted thoughts, such as “I am fat.” According to restraint theory, dieting can have the paradoxical consequence of prompting binge eating episodes and subsequent purging; thus, increasing disorder severity and perpetuating negative thoughts (Heffner, Sperry, Eifert, & Detweiler, 2002). Alternatively, Della

Longa and De Young (2018) suggest that among people with a tendency towards experiential avoidance, holding the belief that eating reduces negative affect increases binge eating behaviours. This relationship was supported by Hayaki (2009), who found that the risk of bulimic symptoms is greater when both experiential avoidance and expectations of reduced negative affect are present, as compared to either component alone. Regardless of the pathway, it is evident that experiential avoidance has a negative effect on eating disorder attitudes and behaviours.

Acceptance and Commitment Therapy

A therapeutic approach that directly addresses experiential avoidance is Acceptance and Commitment Therapy (ACT; Hayes, 1987). This therapy is based in a tradition of 'functional contextualism,' or the approach of using evidence-based concepts to predict and influence events (Biglan, 1995; Biglan & Hayes, 1996). Studying and applying such concepts and rules can facilitate the achievement of a goal and, similar to a scientific principle, be generalized to related events. Central to this approach is the conceptualization of internal experiences as a collective interaction that is ongoing and contextually meaningful. Therapies that independently examine the psychological symptoms (e.g., thoughts, emotions, and behaviours) without understanding the context in which they occur are inadequate at addressing the problem because they dismiss the unified nature of the problem (Hayes, 2016). As such, ACT can be seen as a response to some of the perceived limitations of CBT.

One way to understand this approach is through Relational Frame Theory (Hayes, Barnes-Holmes, & Roche, 2001), which describes the intrinsic relationship between language and cognition. Humans have the ability to understand the meaning of arbitrary cues in a variety of contexts without additional teaching. For instance, we can learn the name of an object and,

regardless of context, know that the object will always have that name. Hayes and colleagues (2006) commonly use the 'nickel example' to demonstrate that this relationship is mutual, combinatorial, and generalizes to our understanding of related events. Consider giving a child a nickel and explaining that humans have socially constructed the nickel to be worth less than a dime. After learning this information, the child will then know three things: (1) that this relationship is mutual, such that if a nickel is worth less than a dime, a dime must be worth more than a nickel; (2) that it is combinatorial, such that if a penny is worth less than a nickel, it must also be worth less than a dime; and (3) that it alters the function of similar events, including learning that if a nickel can buy a candy, then a dime is preferable. In this way, the label and the object become inseparable. While this is adaptive in most cases, it can be problematic in regard to social constructions about the ideal body shape and weight. Messages from the media, family members, and peers that thinness is more valuable than being "fat", lead individuals to see thinness as preferable and more desirable. And, because language-cognition relationships are solidified with little additional teaching, individuals will appraise larger body shapes and weights as negative. As such, any contextual cues that remind them of their bodies – such as media advertisements, mirrors, picture – will also give rise to thoughts such as "I am fat" or "I am ugly."

Cognitive fusion. The tendency to strongly identify with our thoughts as if they are true representations of reality has been termed *cognitive fusion* (Hayes, 2004). More specifically, it is the subconscious process by which our thoughts, or verbal perceptions, about our environment are fused with our internal understanding of our environment. In turn, we accept our perception of events in our environment as true representations of reality, without acknowledging the role that our thoughts have in these perceptions (Luoma & Hayes, 2009). A fearful person will

perceive their environment as threatening, but act as though danger has been discovered, instead of constructed (Hayes, 2016).

In the case of body dissatisfaction, individuals experience a fusion between, for example, the thought "I am fat" and actually believing and feeling they are fat. It becomes difficult to separate this internal verbal perception from an external and realistic interpretation of their body shape and weight. More importantly, it is equally difficult to separate the thought "I am fat" from the negative connotations that have been socially prescribed to it. Studies show that the outcome of this cognitive fusion can be particularly harmful, as determined by self-report measures of entanglement and literality of thoughts (e.g. Cognitive Fusion Questionaire-28). Among women, cognitive fusion strengthens the relationship between body image dissatisfaction and poor quality of life (Ferreira & Trindade, 2015), greater eating disorder pathology (Trindade & Ferreira, 2014), and greater eating disorder severity (Ferreira, Palmeira, & Trindade, 2014). For women diagnosed with binge eating disorder, greater shame was associated with greater cognitive fusion which, in turn, led to worse binge eating (Duarte & Pinto-Gouveia, 2017), and cognitive fusion mediated the relationship between the tendency to think that others see them negatively and binge eating (Duarte, Pinto-Gouveia, & Ferreira, 2017). These studies exemplify the adverse outcomes of cognitive fusion for individuals with and without an eating disorder.

Thought-shape fusion. An eating disorder-specific manifestation of cognitive fusion is a *thought-shape fusion* (Shafran, Teachman, Kerry, & Rachman, 1999). Similar to thought-action fusion in the obsessive-compulsive disorder literature, this fusion is proposed to have three properties, as measured by the Thought-Shape Fusion Questionnaire (Shafran, Teachman, Kerry, & Rachman, 1999; Coelho et al., 2013). Firstly, simply thinking about eating a "forbidden food" fosters the belief that the person's body shape has changed. Secondly, thinking about eating a

forbidden food is morally equivalent to actually eating the food. Thirdly, thinking about eating a forbidden food induces the emotional distress of feeling fat. Although the individual may rationally know that they cannot gain weight from a thought, the emotional distress associated with weight gain or shape change is present and real to the individual. As such, measures of thought-shape fusion assess how much an individual is emotionally impacted by their food or body-related cognitions.

In non-clinical samples of women, greater thought-shape fusions have been found to correlate with body image dissatisfaction (Coelho et al., 2013; Dubois, Altieri, & Schembri, 2016) and greater eating disorder pathology (Coelho et al., 2013; Coelho et al., 2014; Dubois, Altieri, & Schembri, 2016; Shafran, Teachman, Kerry, & Rachman, 1999; Wyssen, Bryjova, Meyer, & Munsch, 2016). When comparing healthy controls to people with an eating disorder, though-shape fusions are typically greater (Shafran & Robinson, 2004) and more strongly related to thoughts about food in individuals with disordered eating (Coelho et al., 2013). There are even variations within eating disorder subtypes, such that individuals with binge-purge anorexia nervosa demonstrated greater thought-shape fusions than did those with the restrictive subtype or individuals with bulimia nervosa (Coelho et al., 2014). As such, thought-shape fusions appear to play an important role in eating disorder pathology.

ACT techniques. ACT teaches a variety of skills to increase psychological flexibility, or the ability to be present and conscious in a given moment and to alter or withstand one's behaviour when it is contrary to one's values (Hayes, Luoma, Bond, Masuda, & Lillis, 2006). Greater psychological flexibility can be established by teaching people to use six core processes to address human suffering. The first, acceptance of negative internal experiences, moves an individual away from labeling psychological events as bad or good and promotes passive

observation. The next process, cognitive defusion, aims to change one's relationship with their internal experiences and is the focus of this paper (discussed further below). Being present is the third process, which is a technique used to ground the individual in the present and encourage them to take a non-judgmental stance. More specifically, it thwarts efforts to verbally conceptualize the psychological event (e.g., "this happened because…" or "this might happen if…"), and simply become aware of the experience. The next technique re-frames the self as a context, instead of a rigid and unchanging concept. This allows the flexibility to change with circumstance and removes the belief that our experiences must fit with a concrete concept we've created about the self. ACT also teaches the importance of values, the fifth process, so clients can make choices based on their wants and goals, instead of choices that would avoid potential unwanted experiences. The final core process, committed action, emphasizes the importance of pursuing these values to have meaningful experiences, instead of activities governed by fear and avoidance.

Preliminary studies have compared the use of ACT to treatment as usual (TAU) for eating disorders. Juarascio and colleagues (2013) compared intensive TAU at a residential facility to TAU with the addition of ACT in a non-randomized sample of patients. Although both treatments demonstrated decreases in eating pathology, the ACT condition trended towards larger decreases and had a lower rate of hospitalization at a six-month follow-up. Nonetheless, this study was unable to find significant group differences. In extension of this research, Parling and colleagues (2016) conducted a randomized trial to compared ACT to TAU in a hospital program for eating disorders. Similar to the first study, although those in the ACT group were more likely to have better outcomes in terms of body mass index and self-reported eating pathology, there were no significant differences between the two groups on measures of eating

pathology or body dissatisfaction. As such, additional and better designed studies are necessary to examine the efficacy of ACT.

It may be that ACT has specific benefits for certain populations. For instance, Juarascio and colleagues (2013) found ACT to be most beneficial for populations with more severe eating disorder pathology. When comparing TAU to TAU plus ACT, patients in the ACT group fared better than those in TAU if they had more severe baseline symptoms. This was also true for individuals with anorexia nervosa who had very low body weights, and for those who had a history of more hospitalizations. Moreover, in a randomized study, Juarascio and colleagues (2015) demonstrated that specific components of ACT may have unique benefits. For example, they found that cognitive defusion from negative internal experiences was associated with better psychological quality of life. As such, further research on these specific components of ACT are warranted.

Cognitive Defusion

Cognitive defusion aims to change one's *relationship* to their thoughts – as opposed to changing the content, form, or frequency – by reframing internal experiences as less threatening (Hayes, Luoma, Bond, Masuda, & Lillis, 2006). It is the process of detaching the link between one's thoughts and perceptions of reality and acknowledging the role one's thoughts play in their internal events. A number of techniques have been developed to remove the literal quality of such thoughts, including identifying the thinking process (i.e. "I am having the thought that…"), saying or imagining the thought in different voices, rapidly repeating the thought, and, more recently, singing the thought.

In healthy populations, cognitive defusion has been demonstrated to be as effective as other well-established therapeutic techniques for addressing problematic thoughts. Within these

studies, participants were given a number of cognitive defusion techniques and were allowed to practice whichever one they wanted. In a randomized trial comparing cognitive restructuring and cognitive defusion, the two treatments were found to be equivalent at reducing the distress associated with a negative autobiographical event (Yovel, Mor, & Shakarov, 2014). Moreover, some studies suggest that cognitive defusion is equivalent to thought suppression at reducing discomfort with negative thoughts (Fernández-Marcos & Calero-Elvira, 2015) and reducing arousal after watching a film clip that elicits negative emotions (Pilecki & McKay, 2012). Other studies have found that cognitive defusion is superior to thought suppression at reducing learned helplessness (Hooper & McHugh, 2013). Cognitive defusion has been found to decrease discomfort and increase willingness to engage with a negative thought (Healy et al., 2008).

The use of cognitive defusion is also involved in a number of therapeutic protocols. Among clinical populations, cognitive defusion has been found to mediate reductions in depressive symptoms as part of ACT (Arch, Wolitzky-Taylor, Eifert, & Craske, 2012; Forman et al., 2012; Zettle, Rains, & Hayes, 2011) and cognitive therapy (Forman et al., 2012). It also mediated improvements in quality of life, as well as reductions in worry and behavioural avoidance when used in ACT and cognitive-behavioural therapy (Arch et al., 2012). Finally, among individuals recently exposed to a potentially traumatic event, cognitive defusion was found to mediate reductions in anxiety sensitivity, posttraumatic stress symptoms, and negative affect in a mindfulness training intervention (Nitzan-Assayag et al., 2017). Cognitive defusion also has specific effects on predicting symptom reduction six months following an acceptance-based treatment for chronic tinnitus (Hesser, Westin, Hayes, & Andersson, 2009), as well as reducing distress and depression in an ACT protocol (Bramwell & Richardson, 2017).

Specific to eating-related behaviours, cognitive defusion has been explored in randomized trials to examine food cravings. When compared with thought suppression, individuals who used the defusion strategy "I'm having the thought that…" were able to eat less chocolate in a "taste test" (i.e. an immediate measure of food consumption), but consumed equivalent amounts over the course of a week (Hooper, Sandoz, Ashton, Clarke, & McHugh, 2012). This suggests an immediate, rather than sustained, utility of cognitive defusion for chocolate cravings. To further probe this relationship, cognitive defusion was compared to guided imagery in its ability to reduce chocolate cravings. While there were no differences in consumption, the results showed that those in the cognitive defusion condition, who used the strategy "I'm having the thought that…", reported fewer intrusive thoughts, less vivid imagery, and lower intensity of cravings (Schumacher, Kemps, & Tiggemann, 2017). This relationship was found in both healthy populations and chocolate cravers. Finally, when compared to cognitive restructuring, providing participants with a toolkit of cognitive defusion techniques to choose from led to greater improvement in eating behaviours and lower chocolate consumption – especially for people with higher baseline levels of distress (Moffitt, Brinkworth, Noakes, & Mohr, 2012). Importantly, people in the cognitive defusion condition reported that these techniques were easier to use than did those in the restructuring condition.

Verbal Repetition

The oldest and, arguably, most popular technique is called *verbal repetition*, which was first introduced by Titchener (1916) in one of psychology's earliest textbooks. He suggested that if a word is repeated aloud over and over, the literal meaning of the word will be removed. That is, the sound and meaning of a word would become separate. Verbal repetition has been found to reduce the emotional discomfort and believability of negative self-related thoughts in a number

of studies of healthy participants (De Young, Lavender, Washington, Looby, & Anderson, 2010; Masuda, Hayes, Sackett, & Twohig, 2004; Masuda et al., 2010). Among individuals with high levels of anxiety, verbal repetition produced immediate reductions in the believability, meaningfulness, and distress of an unwanted thoughts (Watson, Burley, & Purdon, 2010). When the technique was practiced for one week, the effects were maintained. Moreover, when compared to cognitive restructuring, verbal repetition had an equivalent effect on reducing discomfort in socially anxious individuals (Barrera, Szafranski, Ratcliff, Garnaat, & Norton, 2016).

Further research supports the use of verbal repetition with negative body-related thoughts. Specifically, Mandavia and colleagues (2015) found that verbally repeating a one-word version of an unwanted thought as quickly as possible for 30 seconds reduced discomfort, attachment, and believability of the negative thought better than distraction techniques in a sample of undergraduate students. Similar effects were also found by Deacon, Fawzy, Lickel, & Wolitzky-Taylor (2011), who examined the efficacy of verbal repetition for individuals with notable body image concerns. After critically examining their bodies in a mirror, participants were assigned to practice either verbal repetition (rapidly repeating a one-word version of a self-referential thought, such as “fat”, for 60 seconds) or cognitive restructuring for one week, whenever they experienced body-related distress. The researchers found comparable improvements in body image concerns between the two groups, but noted superiority for cognitive defusion in regard to immediate reductions in distress and perceived accuracy of the negative thought, and persisting reductions in the importance of the thought. As such, verbal repetition appears to be a viable treatment option for negative body-related thoughts, especially when practiced regularly.

Singing Negative Thoughts

Recently, the cognitive defusion strategy of singing, rather than simply repeating, unwanted negative thoughts has gained recognition. This strategy involves singing the words of the negative thought to the tune of a silly or benign song (e.g., "happy birthday" or "twinkle, twinkle"). It has been described in ACT manuals (Read, 2013) and is being increasingly used by clinicians. Specifically, when anxious clients sang their worrisome thoughts, clinicians reported greater defusion from the thought and momentary increases in positive affect (Khazan, 2016). Dr. Sally Winston reports that clients often break out in laughter due to the unusual nature of the technique (personal communications, July 8, 2016). Given its use in therapeutic settings, it is imperative that the efficacy of singing as a cognitive defusion strategy be demonstrated through objective means.

A number of studies have supported the use of singing as part of a toolkit of cognitive defusion techniques. In a healthy sample, Larsson, Hooper, Osborne, Bennett, and McHugh (2016) randomized participants to a cognitive defusion, cognitive restructuring, or a no-intervention control condition, practiced over a week, on coping with negative thoughts. Participants in the cognitive defusion condition were free to choose from three techniques, with one being singing the negative thought to the tune of "happy birthday." Results demonstrated the superiority of cognitive defusion condition at reducing discomfort and believability of the thought, as well as increasing their willingness to have the thought. Moreover, participants in this condition reported less frequent negative thoughts than the other two conditions.

Similar findings have been demonstrated in undergraduate students reporting low self-esteem, distress, and dysphoria. Hinton and Gaynor (2010) compared cognitive defusion to a waitlist control, as well as archival data of a supportive therapy. In this protocol, participants

were randomly assigned to attended one-hour sessions of cognitive defusion, once a week, for three weeks or to a waitlist condition. In the first week, participants received the rationale for cognitive defusion and were asked to practice verbal repetition for homework. In the second and third sessions, they learned additional defusion techniques such as vocalizing the thought slowly, in a different voice, as a story, or singing it. They could then choose to use whichever technique they preferred during and after treatment. The results demonstrated greater reductions in depressive symptoms and distress and increases in self-esteem for those in the cognitive defusion condition. These participants also reported greater detachment from thoughts and increased psychological flexibility. Such findings were replicated by the waitlist group when they received the cognitive defusion therapy. Moreover, the effects were greater than those found in the supportive therapy and were maintained at one-month follow up. Singing, as part of a toolkit of cognitive defusion techniques, has also been found effective at reducing food craving. A study by Jenkins and Tapper (2014) compared the efficacy of cognitive defusion, acceptance, and relaxation techniques, practiced over a week, at reducing chocolate consumption. Cognitive defusion techniques offered to participants included telling the thought "who is in charge," repeating the thought in different accents, and singing the thought. The researchers found that those in the cognitive defusion condition ate less chocolate than the acceptance and relaxation conditions by making the eating process less automatic.

An important limitation of the previous studies is the provision of multiple strategies to participants in the cognitive defusion conditions. This practice assumes that all strategies are equal in their effects and that the participants' ability to choose their preferred strategy will not influence outcomes. As such, it remains unknown the independent effects of singing as a cognitive defusion strategy. Only one study examined the immediate effects of singing on the

attachment and appraisals of an unwanted thought in a sample of high worriers (Gobin, Koerner, & Ovanessian, 2017). In a randomized, controlled study examining cognitive defusion, Gobin et al. (2017) assigned 59 participants high in worry to either: (1) listen to their negative thought in the form of a song, created with a mobile application called *Songify*, for one minute (experimental condition) or (2) sit in silence for five minutes (control condition), following a worry induction task. The findings suggest that listening to one's worry as a song reduced the believability and attachment to the thought, over-and-above the effects of sitting in silence. While this study highlights the potential utility of singing as a cognitive defusion strategy, it is limited by its design and duration. Although sitting in silence is an appropriate control condition for an initial test of singing as a cognitive defusion technique, future studies should control for the act of singing any thought out loud (regardless of body-related content) to determine whether it is the act of singing or the defusion from a body-related thought through singing that reduces distress. Another limit of the design is that the songs in the Gobin et al. (2017) study were produced through the use of a mobile application. It is not yet known whether the act of singing negative thoughts, as the recommended format in ACT manuals (Read, 2013), is an effective cognitive defusion strategy on its own. In regard to duration, the previous study can only demonstrate the immediate effects of this technique. This is problematic given that previous research designs suggest that practicing the technique over the course of a week improves outcomes (Watson et al., 2010; Deacon et al., 2011; Hooper et al., 2012; Barrera et al., 2016). As such, the current study will examine this strategy with two visits spread out over the course of one week. The first part will aim to replicate immediate effects, by examining the utility of defusion with body-related thoughts following a body dissatisfaction induction (see the procedure below for more information), and the second part will examine the effects of defusion

when practiced over the course of one week. Finally, the Gobin and colleagues (2017) study is limited by its application to individuals high in trait worry. The results can only be generalized to this population and, as such, it remains unknown whether singing as a defusion strategy will be applicable to people with high body image distress. Given the important role of experiential avoidance in individuals with eating disorders, it is imperative that the efficacy of this technique be examined with body-dissatisfied populations.

The Current Study

The current study aimed to examine whether singing one's negative body-related thoughts leads to positive changes in perception of the thought, body image satisfaction, mood, and self-esteem when practiced twice daily for one week. This two-part study assessed whether singing is a useful cognitive defusion strategy to change one's appraisals of body-related thoughts so they are less threatening to the individual. It also examined whether this technique can change the appraisals of one's body, such as improving weight, appearance, and body image satisfaction, as well as mood and self-esteem. A secondary objective was to determine whether the activity of either singing or verbally repeating a negative body-related thought showed any advantage as a cognitive defusion strategy. To achieve this goal, participants were randomly assigned to either sing body-related thoughts (experimental), verbally repeat body-related thoughts (experimental), sing body-unrelated thoughts (control), or verbally repeat body-unrelated thoughts (control). Intervention (experimental: body-related thought vs. control: body-unrelated thought) was fully crossed with activity (singing vs. verbal repetition) to produce four between-subject conditions.

The participants were limited to women, given the aforementioned propensity towards disordered eating and drive for thinness among women (Dye, 2016). Furthermore, we recruited

female restrained eaters, who are likely to experience chronic attempts at dieting, thoughts of guilt after overeating, and body dissatisfaction. Restrained eaters are more preoccupied with food and body related thoughts and are more likely to evaluate themselves based on their body shape and weight than unrestrained eaters (Mills, Weinheimer, Polivy, & Herman, 2018; Morris, Goldsmith, Roll, & Smith, 2001), therefore sharing much of the core psychopathology of eating disorders (APA, 2013). Moreover, restrained eaters experience greater body dissatisfaction than unrestrained eaters (Lautenbacher et al., 1992), and at a level similar to eating disorder patients. As such, restrained eaters are both a population of interest to determine whether the aforementioned cognitive defusion strategies can reducing their distress and a suitable analogous sample for eating disorder patients – for whom this intervention will be used for in clinical practice.

The primary hypothesis was that the experimental conditions, namely singing and verbal repetition, would foster greater detachment (i.e. defusion) from negative body-related thoughts and change thought appraisals such that these thoughts are less believable and less negative, and the individual is more willing, less likely to avoid, and less uncomfortable when engaging with these thoughts than the control conditions (singing and verbal repeating neutral thoughts) after one week of practice. Secondary hypotheses proposed that these experimental defusion techniques would reduce negative body-related cognitions such as weight dissatisfaction, appearance dissatisfaction, and body image distress to a greater extent than the control conditions. Moreover, practicing these techniques with negative body-related thoughts was expected to be superior in reducing negative mood, increasing positive mood, and improving self-esteem than practicing with neutral thoughts. Finally, better outcomes were expected from those in the experimental defusion conditions who practiced the technique as instructed (i.e.

better homework adherence). Due to the novelty of this intervention, no specific hypotheses were made regarding whether singing would be equal or differ from verbal repetition on the aforementioned outcome measures.

Given the previous literature, this study also examined whether defusion techniques would be particularly beneficial for individuals with high thought-shape fusion. Due to the exploratory nature of applying defusion techniques with individuals with thought-shape fusion, no specific hypotheses were made around changes in the perception of the thought, cognitive defusion, body image satisfaction, mood, self-esteem within this population.

Methods

Trial Design

This was a single-center, parallel-group study with balanced randomization of participants into one of four conditions. Condition (experimental: body-related thoughts vs control: neutral thoughts) was fully crossed with technique (singing vs verbal repetition) . This was a non-inferiority study to primarily examine whether singing is as effective as verbal repetition as a cognitive defusion strategy for body image distress.

Participants

N = 133 adult females, ages 17 years and older, were recruited from the Undergraduate Research Participant Pool of students enrolled in Introduction to Psychology at York University. Participants were individuals who reported restrained eating behaviours and attitudes as determined by an eligibility screener conducted online at the start of the academic year. Specifically, eligible participants endorsed 'often' or 'always' to both dieting and having feelings of guilt after over eating (adapted from the Revised Restraint Scale; Polivy, Herman, & Howard, 1988).

Sample size estimation. Twenty-eight participants per condition (*N* = 112) would provide sufficient power (0.8) to detect a moderate effect size (.25) at a significance level of alpha .05 in a mixed ANOVA according to a power analysis using GPower 3.1. A sample size of 135 was sought in order to provide 28 participants per condition and allowing for 20% attrition.

Participant characteristics. A total of 122 female participants' data were included in the final sample. Introduction to Psychology students (*N* = 2,920) completed the eligibility screener. Of these individuals, 133 met inclusion criteria and volunteered to participate in the study. Eleven participants did not return for Part 2 and were excluded from the analyses. See Figure 2

for details of inclusion. There were no significant differences on any demographic characteristics between participants who were included and excluded from the analyses. An examination of the prescreen results demonstrated that 95% of the sample had RRS scores at or above 15 (M = 20.99, SD = 3.94), which is indicative of restrained eating status (Polivy, Herman, & Howard, 1988). A univariate ANOVA revealed a significant difference in RRS scores among conditions, $F(3,115) = 4.72$, $p < .05$. Post hoc analyses demonstrated that those in the singing experimental condition had lower restrained eating (M = 19.51, SD = 4.20) than those in the verbal repetition control condition (M = 22.98, SD = 3.76). This difference is attributed to random factors, because assignment to conditions was completely random. There were no other significant between group difference on restrained eating scores. Body mass index (BMI) ranged from 18 to 46 (M = 25.6, SD = 5.69). The final sample ranged in age from 17 to 52 years old (M = 20.96, SD = 5.26). Participants self-identified as White (32.8%), Arab/West Asian (22.7%), South Asian (11.8%), East Asian (6.7%), Mixed (5.9%), Black (5.0%), “Other” (5.0%), South East Asian (4.2%), or Latin American (3.4%). There were no significant baseline differences on any demographic characteristics between conditions. See Table 1 for a breakdown of participant characteristics as a function of condition.

Table 1
Participant Characteristics by Condition

Variable	SE (n = 33)	VRE (n = 27)	SC (n = 31)	VRC (n = 31)	χ^2	*df*	*p*
Marital Status (%)					4.44	6	.62
Married/ Common law	3(30.0%)	3(30.0%)	3(30.0%)	1(10.0%)			
Single	30(27.0%)	24(21.6%)	27(24.3%)	30(27.0%)			
Divorced/ Widowed	0(0.0%)	0(0.0%)	1(100.0%)	0(0.0%)			
Ethnocultural Background (%)					20.11	24	.69
White	11(33.3%)	7(26.9%)	12(40.0%)	10(33.3%)			
Arab/ West Asian	12(36.4%)	5(19.2%)	5(16.7%)	5(16.7%)			
South Asian	3(9.1%)	4(15.4%)	5(16.7%)	2(6.7%)			
East Asian	3(33.3%)	2(7.7%)	2(6.7%)	2(6.7%)			
Black	2(6.1%)	2(7.7%)	0(0.0%)	2(6.7%)			
Mixed	1(3.0%)	2(7.7%)	1(3.3%)	4(13.3%)			
Latin American	0(0.0%)	2(7.7%)	1(3.3%)	1(3.3%)			
South East Asian	0(0.0%)	2(7.7%)	2(6.7%)	1(3.3%)			
Other	1(3.0%)	0(0.0%)	2(6.7%)	3(10.0%)			
Decline to Answer	0(0.0%)	1(3.8%)	1(3.3%)	1(3.3%)			
Employment Status (%)					5.12	6	.53
Not Working	16(48.5%)	9(33.3%)	13(41.9%)	8(25.8%)			
Employed Part-time	15(45.5%)	17(63.0%)	17(64.5%)	20(64.5%)			
Employed Full-time	2(6.1%)	1(3.7%)	1(9.7%)	3(9.7%)			

Note. SE = Singing experimental; VRE = Verbal Repetition Experimental; SC = Singing Control; VRC = Verbal Repetition Control

Measures

Thought appraisals. Five visual analogue scales were created to measure the participant's perception of a targeted unwanted thought (e.g., "I am fat"), modeled after a questionnaire created by Larsson and colleagues (2016). Visual analogue scales are especially appropriate for assessing pre-post differences and minimize response recall bias (Heinberg & Thompson, 1995). Participants were asked to draw an 'x' anywhere on a 10 cm horizontal line anchored by 0 ("not at all") to 100 ("extremely"). The items assessed the believability of the thought, the negativity or "badness" of the thought, the level of discomfort the individual feels when having the thought, their willingness to engage with the thought, and their desire to avoid the thought. These appraisals were designed for their representation of cognitive defusion – that is, they capture a change in the relationship with the thought and any reduction in negative internal experiences. It was administered at the start of Part 1, at the end of Part 1, and during Part 2.

Cognitive defusion. The Cognitive Fusion Questionnaire (CFQ; Gillanders et al., 2014) is a 7-item self-report measure of one's response to their thoughts. Participants rate items on a 7-item Likert scale, with higher scores indicating greater entanglement and attachment to one's thoughts. It has good reliability and test-retest reliability (Gillanders et al., 2014). This measure was used to determine level of cognitive fusion and was administered at the end of Part 1 and during Part 2. The alpha reliability estimate for the CFQ was .94 at Time 1 and .96 at Time 2.

Restrained eating. The Revised Restraint Scale (RRS; Polivy, Herman, & Howard, 1988) is a 10-item measure of restrained eating behaviours and attitudes. Participants rate statements about themselves on a Likert scale ranging from 0 to 3 or 0 to 4. Higher scores are indicative of chronic dieting, typically in the absence of sustained weight loss (Polivy, 1996).

Psychometric reports indicate good internal consistency and test-retest reliability (Allison, Kalinsky, & Gorman, 1992). The entire RRS was administered at the start of the academic year. Two items were used to screen for eligibility in the study: (1) 'how often are you dieting?' and (2) 'do you have feelings of guilt after overeating?'. These items were used because they load strongly onto total score and they fit within restrictions on the number of screening items allowed by the online experiment management system.

State body image. The Body Image State Scale (BISS; Cash, Fleming, Alindogan, Steadman, & Whitehead, 2002) is a 6-item self-report measure that was used to assess body image, including evaluations of one's shape, size, and weight, their physical appearance and attractiveness, and comparisons of their current appearance to how they usually look and to the average person. Participants rated statements on a 9-point scale for a possible total score of 54, with higher scores indicating greater body image satisfaction (i.e. positive body image). This measure has good internal consistency and test-retest reliability (Cash et al., 2002). It is suitable for pre-post examination and was administered at the start of Part 1, at the end of Part 1, and during Part 2. The alpha reliability estimate for the BISS was .80 at Time 1, .83 at Time 2, and .89 at Time 3.

State mood and body dissatisfaction. A series of visual analogue scales were used to assess current mood and body dissatisfaction. As noted above, these types of scales are commonly used to measure subtle changes in psychological states (Heinberg & Thompson, 1995) because participants cannot recall their exact previous response. Participants were asked to indicate their current feelings by drawing an 'x' anywhere on a horizontal scale that ranges from 0, "none," to 100, "very much," on seven adjectives, including anxiety, depression, happiness, anger, confidence, weight dissatisfaction, and appearance dissatisfaction. This questionnaire was

adapted from Tiggemann and McGill (2004) and was administered at the start of Part 1, at the end of Part 1, and during Part 2.

Self-esteem. The State Self-Esteem Scale (SSES; Heatherton & Polivy, 1991) is a 20-item measure that was used to assess state self-esteem, rated on a 5-point Likert scale. This scale includes three factors of self-esteem: performance, social, and appearance. However, only the total score was analyzed within this study. Higher scores indicate higher self-esteem. This measure has demonstrated good construct validity and internal consistency (Heatherton & Polivy, 1991). It was administered at the end of Part 1 and during Part 2. The alpha reliability estimate for the SSES was .91 at Time 1 and .94 at Time 2.

Thought-shape fusion. Thought-shape fusion was assessed by the long form (TSF-LF; Shafran, Teachman, Kerry, & Rachman, 1999); a 34-item measure that asks participants to rate how well an item describes them on a Likert scale from 0, "not at all," to 4, "totally." The measure has two parts: (1) 17 items intended to assess the conceptual importance of the thoughts, and (2) 17 items to measure the individual's interpretation of these thoughts. Each subscale is scored out of 68 and the total measure is scored out of 136. However, only the total score was analyzed within this study. Higher scores are indicative of greater fusion to body- or food-related thoughts. Good convergent validity and high internal consistency has been demonstrated for this measure (Shafran et al., 1999). It was administered during Part 2. The alpha reliability estimate for the TSF-SF was .97.

Demographics and BMI. Participants completed a demographics questionnaire to assess age, marital status, ethnicity/race, and employment status for descriptive and exploratory purposes at the end of Part 1. BMI (kg/m^2) was calculated by weighing and measuring the participant on a balance beam scale at the end of Part 2.

Manipulation check. Two visual analogue scales measured body dissatisfaction following the induction task. Participants were asked to indicate their level of body dissatisfaction and discomfort with the induction task by drawing an 'x' anywhere on a horizontal scale that ranges from 0, "not at all," to 100, "extremely." This questionnaire was adapted from Deacon, Fawzy, Lickel, and Wolitzky-Taylor (2011).

Credibility questionnaire. A visual analogue scale assessed how credible participants believed the cognitive defusion technique to be. Participants were asked to draw an 'x' anywhere on a 10 cm horizontal line anchored by 0 ("not at all credible") to 100 ("very credible"). This questionnaire was adapted from Watson, Burley and Purdon (2010) and was administered following the delivery of the cognitive defusion rationale in Part 1.

Homework completion. Participants were given a log to record whether they've completed their defusion activity and for how long each session. They also completed a visual analogue scale to measure body dissatisfaction over the course of the week. As previously mentioned, these types of scales are commonly used to measure subtle fluctuations in psychological states (Heinberg & Thompson, 1995). Participants were asked to draw an 'x' anywhere on a 10 cm horizontal line anchored by 0 ("not at all") to 100 ("extremely") after every homework practice session of their assigned strategy.

A homework adherence questionnaire was also used to measure the frequency and duration of defusion practice. Participants were asked to report how many times they practiced the strategy over the course of the week (open-ended question), and for approximately how long each session (open-ended question). They completed this self-report measure during Part 2.

Materials

Photographs. A digital photograph of each participant was taken using a 9.7-inch Apple iPad Air2. All photographs were taken in portrait mode from a distance of five feet. These photographs depicted the full body; starting above the participant's head and ending at her shoes. The purpose of this photograph was to induce body dissatisfaction in the participant after instructing her to pay attention to "bothersome" parts or areas of the body. Previous research has shown that women typically perceive themselves as looking heavier than usual in photos and experience a worsening of body image and appearance self-esteem (Mills, Shikatani, Tiggemann, & Hollitt, 2014).

Procedure

Ethics approval was received from the York University Human Participants Review Committee. Eligible participants (i.e. individuals who endorsed restrained eating attitudes and behaviours) gained access to this study through the university undergraduate research participant pool's online portal. Individuals who signed up to participate in the study made two visits to the lab at York University. The visits were one-week apart; Part 1 was approximately 60 minutes long and Part 2 was approximately 30 minutes long. After providing written informed consent, Part 1 began with participants completing the visual analogue scale for mood and body dissatisfaction (see Appendix A) and measures of state body image (BISS). Next, participants underwent a body dissatisfaction induction task whereby they were asked to evaluate, for two minutes, the photograph the researcher took of them, paying particular attention to "bothersome" parts. After the body dissatisfaction induction task, participants completed the dissatisfaction induction measure to ensure all conditions were equally activated by this task (see Appendix B). A target thought was determined by asking the participant "what is a negative self-statement that

comes to mind when you think about your body?" Participants then completed the thought evaluation in response to that target thought (see Appendix C). Next, participants were randomly assigned to an experimental condition, following simple randomization procedures (computer generated randomization lists from randomizer.org; Urbaniak & Plous, 2017). The randomization schedule was generated by a researcher otherwise uninvolved in the trial. Participants were assigned to one of four conditions: (1) verbally repeating out loud negative body-related thoughts (experimental), (2) singing negative body-related thoughts (experimental), (3) verbally repeating out loud body-unrelated thoughts (control), or (4) singing body-unrelated thoughts (control). Each participant's randomized assignment was unknown to the investigator until this point in the procedure and participants were not informed of which conditions were experimental or control until the debriefing at the end of Part 2 so as to minimize demand characteristics. Participants in all conditions were then given a rationale on cognitive defusion (adapted from Masuada et al., 2004; see Appendix D), underwent a training session with a neutral word (i.e. silk), and were asked to rate the credibility of the rationale (see Appendix E).

As a training session in cognitive defusion, those in the experimental conditions repeated the technique saying or singing their negative body-related target thought. Those in the experimental verbal repetition condition repeated the thought out loud and as quickly as possible for 60 seconds. Those in the experimental singing condition sang the thought to the tune of 'twinkle, twinkle, little star' for 60 seconds. Those in the control conditions followed the same procedures for a non-body related thought (i.e. "I am talking" in the verbal repetition condition and "I am singing" in the singing condition) that should not evoke thoughts about their body. After this training, participants once again completed measures of mood and body dissatisfaction, thought appraisals (i.e. believability, negativity, discomfort, willingness, and

avoidance), and state body image, as well as measures of self-esteem, cognitive defusion (CFQ) and demographics.

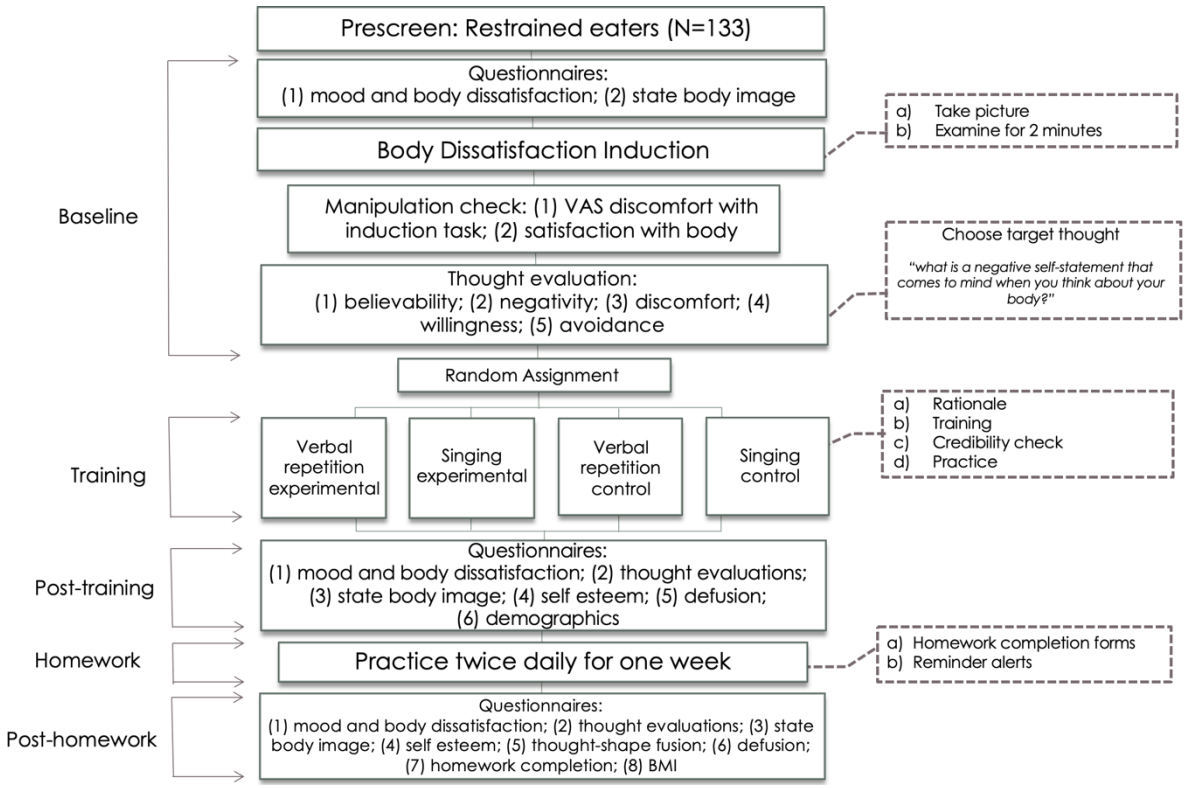
All participants were asked to practice their assigned strategy as homework two times per day for one week and to complete the body satisfaction measure after each practice session (see Appendix F). They returned to the lab for Part 2 exactly one week after Part 1, where they completed measures of mood and body dissatisfaction, thought appraisals, state body image, state self-esteem, thought-shape fusion (TSF-LF), cognitive defusion, and a self-report measure of homework adherence (see Appendix G). Height and weight were measured with participants standing backwards on the scale. Finally, participants received an oral and written debriefing that outlined the purpose of the study and contact information if they have any additional questions following the study and/or the findings of the study upon completion. They were offered the opportunity to ask any questions and given a list of resources for support of students' mental health. See Figure 1 for a visual schematic of the procedure.

Data Analysis

A 2 (Intervention: experimental, control) × 2 (Activity: singing, verbal repetition) × 3 (Time: baseline, post-intervention, follow-up) mixed ANOVA was used for most measures, with a paired sample t-tests with a Bonferroni correction to probe significant findings. For the CFQ and SSES, a 2 (Intervention: experimental, control) × 2 (Activity: singing, verbal repetition) × 2 (Time: post-intervention, follow-up) mixed ANOVA was used with a paired sample t-tests with a Bonferroni correction for significant findings. A mediation analysis was used to examine the effects of homework compliance, indicated by the total number of seconds of defusion practiced over the course of the week, on each outcome measure. Finally, a moderation analysis was used to examine the effects of thought-shape fusion on each outcome measure.

Figure 1

Visual Schematic of Procedure



Results

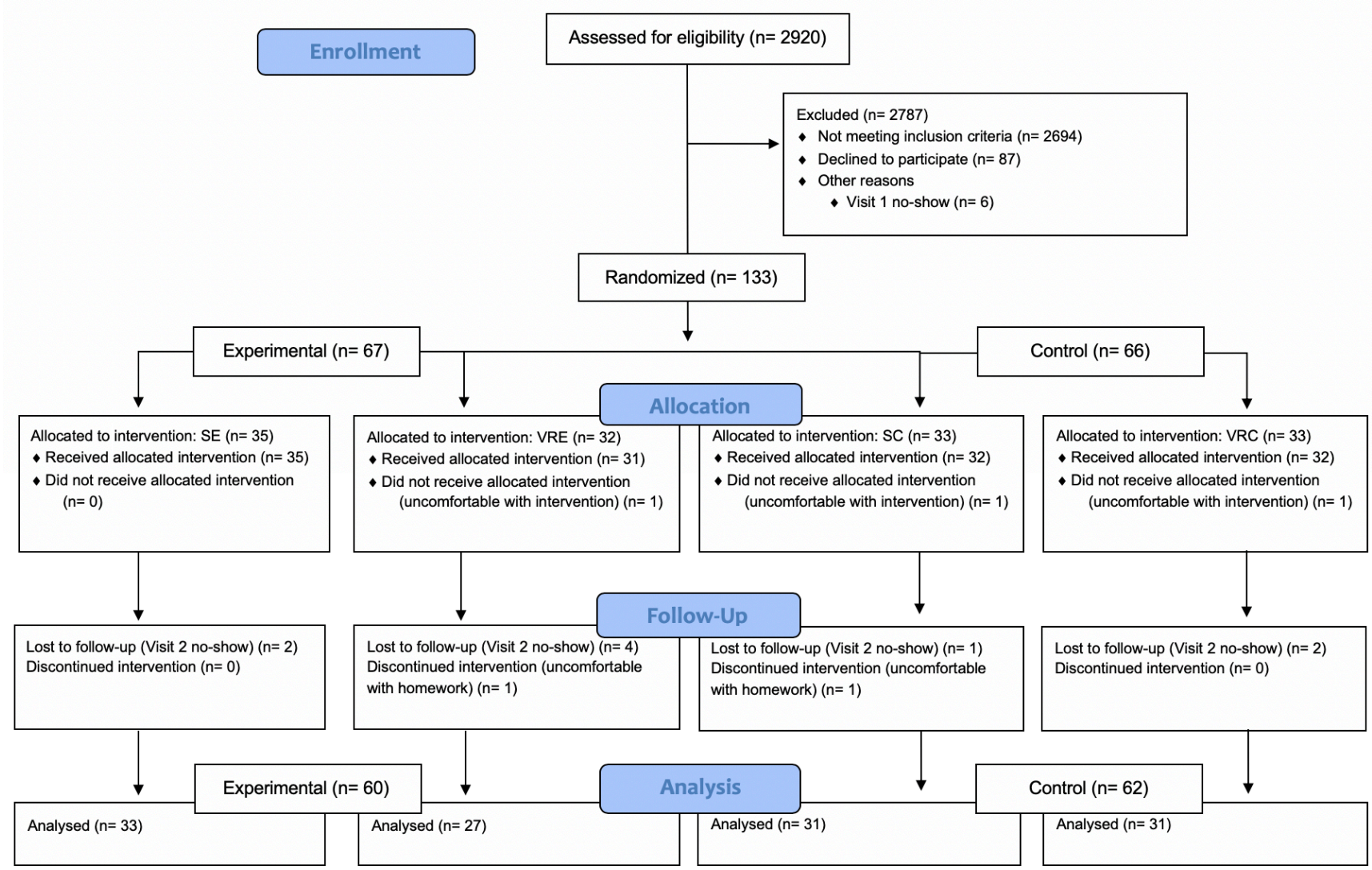
Data Screening

Across the 122 participants, there were no missing cases on any self-report questionnaires. There were, however, 61 missing data cases in the homework log entries due to failure to return the forms, forgetting to fill out the form, or not practicing. As such, 61 participants were included in the mediation analyses (n = 25 from the experimental conditions; n = 36 from the control conditions). Data were checked for outliers and normality prior to analysis. Minimal data points were identified as outliers on the baseline and post-intervention measure of anger, defined as a z- score greater than an absolute value of 3.33 (Tabachnick & Fidell, 2007). Although the anger item is typically included in the set of visual analogue scales we used, it was not relevant to the hypotheses and, given that it was very rarely endorsed by participants, it was dropped from all subsequent analyses.

The data were non-normally distributed across most measures (except for the CFQ, BISS, and SSES) at baseline. It makes sense theoretically that restrained eaters would be negatively skewed on ratings of the believability or negativity of their body-related thoughts and weight dissatisfaction (i.e. have disproportionately high scores). Attempts to transform the dataset normalized the baseline data but skewed the post-intervention and follow-up assessments. Attempts to covary the baseline assessment scores did not produce different skewness results. As such, the author opted to analyze the untransformed scores to maintain the integrity of the data. Moreover, analysis of variance is robust to moderate deviations from normality, especially with large sample sizes (Field, 2013).

Figure 2

Consort Flow Diagram of Participant Inclusion



Body Dissatisfaction Induction Task

To ensure that the body dissatisfaction induction task (i.e. looking at their photo and attending to "bothersome" parts) induced equivalent body dissatisfaction and discomfort in all groups, a 2 (Intervention: experimental, control) × 2 (Activity: singing, verbal repetition) ANOVA was conducted.

There were no significant differences across the four conditions in body dissatisfaction, indicating equivalent negative body image activation by the induction task. Specifically, there was no main effect of Intervention, $F(1,118) = 2.08$, $p > .05$, no main effect of Activity, $F(1,118) = 3.31$, $p > .05$, and no Intervention x Activity interaction, $F(1,118) = 0.03$, $p > .05$. There was, however, an Intervention x Activity interaction for task discomfort, $F(1,118) = 6.50$, $p = .012$. Pairwise compassions indicated that participants in the verbal repetition control condition ($M = 59.10$, $SD = 31.19$) found the body dissatisfaction induction task significantly more uncomfortable than the verbal repetition experimental condition, $p = .06$ ($M = 36.81$, $SD = 31.42$) and singing control condition, $p = .02$ ($M = 34.52$, $SD = 31.89$), but not the singing experimental condition, $p = .21$ ($M = 42.18$, $SD = 34.51$). This difference was attributed to random factors, since the procedure was identical across the conditions. The main analyses were conducted as planned and then repeated with task discomfort as a covariate to examine whether participants' response to the body dissatisfaction induction task impacted the effects of intervention, technique, or time on the variables of interest. However, the same overall pattern of results emerged and so the results are reported below without statistical adjustment for task discomfort.

Pre-existing Group Differences

To examine whether participants in all four conditions were equivalent on baseline measures at the start of the study, a series of 2 (Intervention: experimental, control) × 2 (Activity: singing, verbal repetition) ANOVAs were conducted to compare the four conditions. The findings from these analyses are reported in Table 2. There were no statistically significant differences between conditions on any baseline measure.

Table 2

Baseline Differences on Measures in the Full Sample and Separated by Condition

	Full Sample (N = 122)		SE (n = 33)		VRE (n = 27)		SC (n = 31)		VRC (n = 31)		Intervention			Activity			Interaction		
Measures	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*F*	*df*	*p*	*F*	*df*	*p*	*F*	*df*	*p*
Thought Evaluations																			
Cognitive Fusion	33.44	10.19	32.52	10.59	36.56	9.55	31.52	11.17	33.65	9.03	1.13	1	.29	2.80	1	.10	0.27	1	.61
Believability	78.57	22.99	77.97	25.47	78.33	24.02	74.74	22.42	83.23	19.97	0.04	1	.84	1.11	1	.29	0.94	1	.33
Negativity	72.12	27.97	75.39	28.22	68.96	29.04	71.90	27.67	71.61	28.07	0.01	1	.94	.43	1	.51	.36	1	.55
Discomfort	72.26	29.08	79.97	20.73	63.48	33.62	74.06	28.61	69.90	31.77	.002	1	.96	3.89	1	.05	1.39	1	.24
Willingness	62.50	27.78	61.03	28.05	62.41	30.87	65.74	29.83	60.90	23.29	0.10	1	.75	.12	1	.74	.37	1	.54
Avoidance	52.01	33.75	59.39	35.30	50.63	34.73	44.52	32.93	52.84	31.86	1.07	1	.30	.001	1	.97	1.95	1	.17
Thought-Shape Fusion (LF)	39.28	33.71	43.67	37.70	45.56	39.79	32.77	29.94	35.65	26.18	2.89	1	.09	0.15	1	.70	0.01	1	.94
Body Image																			
Weight Dissatisfaction	66.01	30.73	59.15	31.28	71.22	29.22	66.10	33.09	68.68	29.11	0.16	1	.69	1.72	1	.19	0.72	1	.40
Appearance Dissatisfaction	52.93	32.37	55.18	31.77	58.67	33.63	47.55	31.88	50.90	32.90	1.70	1	.20	0.34	1	.56	.00	1	.99
State Body Image	25.66	8.53	26.64	8.38	25.44	9.12	25.71	8.25	24.74	8.75	0.27	1	.60	0.48	1	.49	0.01	1	.94
Affect																			
Anxiety	47.82	29.08	51.45	31.39	49.15	30.14	37.94	28.87	52.68	24.44	0.91	1	.34	1.41	1	.24	2.65	1	.11
Depression	30.35	28.84	30.76	30.93	27.85	28.52	25.52	25.88	36.94	29.77	0.13	1	.72	0.66	1	.42	1.87	1	.18
Happiness	54.02	23.82	57.85	24.68	54.59	24.10	52.00	25.15	51.45	21.81	1.07	1	.30	0.19	1	.66	0.10	1	.76
Confidence	45.02	26.17	48.91	26.37	40.52	25.38	47.77	29.97	42.03	22.61	.002	1	.97	2.20	1	.14	0.08	1	.78
Self-Esteem	59.80	15.53	62.36	15.60	58.26	15.73	59.65	17.15	58.58	13.90	0.18	1	.67	0.83	1	.36	0.29	1	.59

Note. SE = Singing Experimental; VRE = Verbal Repetition Experimental; SC = Singing Control; VRC = Verbal Repetition Control; LF = Long-Form

Hypothesis 1: Changes in Thought Appraisals

See Table 3 for the means and standard deviations for all outcome measures at baseline, post-intervention, and one-week follow-up, separated by intervention condition.

Believability. It was hypothesized that singing or verbally repeating negative body-related thoughts would lead to greater reductions in the believability of the thought compared to singing or verbally repeating body-unrelated thoughts. Mauchly's test indicated that the assumption of sphericity had been violated, $\chi^2(2) = 12.62$, $p < .05$, therefore the degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity ($\varepsilon = .91$). A 2 (Intervention: experimental, control) × 2 (Activity: singing, verbal repetition) × 3 (Time: baseline, post-intervention, follow-up) mixed ANOVA showed that there was a significant main effect of time, $F(1.82,214.11) = 1.82$, $p < .001$, partial $\eta^2 = 0.35$, such that, on average, participants rated believability higher at baseline ($M = 78.57$, $SD = 22.99$) than at post-intervention ($M = 61.20$, $SD = 28.62$) and follow-up ($M = 49.66$, $SD = 28.56$). Paired sample t-tests showed significant decreases in believability from baseline to post-intervention, $t(121) = 8.22$, $p < .001$, and from post-intervention to follow-up, $t(121) = 4.49$, $p < .001$. There was no main effect of Intervention, $F(1,118) = 0.01$, $p > .05$, and no main effect of Activity, $F(1,118) = 2.02$, $p > .05$. There were also no Intervention x Activity interaction, $F(1,118) = 0.82$, $p > .05$, no Time x Intervention interaction, $F(1.82,214.11) = 0.09$, $p > .05$, no Time x Activity interaction, $F(1.82,214.11) = 0.16$, $p > .05$, and no Time x Intervention x Activity interaction, $F(1.82,214.11) = 0.04$, $p > .05$.

Negativity. It was hypothesized that participants in the experimental conditions would appraise their target thought as less negative, relative to the control conditions. Mauchly's test indicated that the assumption of sphericity had been violated, $\chi^2(2) = 13.89$, $p < .05$, therefore the degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity ($\varepsilon = .90$). A 2 (intervention: experimental, control) × 2 (activity: singing, verbal repetition) × 3 (time: baseline, post-intervention, follow-up) mixed ANOVA showed that there was a significant main effect of time, $F(1.80,212.24) = 15.67$, $p < .001$, partial $\eta^2 = 0.18$, such that, on average, participants rated negativity higher at baseline ($M = 72.12$, $SD = 27.97$) than at post-intervention ($M = 69.67$, $SD = 30.30$) and follow-up ($M = 57.07$, $SD = 33.47$). There was also a significant Time x Intervention interaction, $F(1.80,212.24) = 5.73$, $p = .005$, partial $\eta^2 = 0.05$, whereby participants in the control conditions had significantly lower ratings of negativity at follow-up ($M = 48.16$, $SD = 33.42$) than did participants in the experimental conditions ($M = 66.27$, $SD = 31.50$). Paired sample t-tests with a Bonferroni correction (p value less than 0.025) showed that only participants in the control conditions reported significant decreases in negativity from baseline ($M = 71.76$, $SD = 27.64$) to post-intervention ($M = 62.98$, $SD = 32.53$), $t(61) = 3.18$, $p = .002$, and from post-intervention to follow-up ($M = 48.16$, $SD = 33.42$), $t(61) = 3.62$, $p < .001$. Participants in the experimental conditions reported no significant changes in negativity from baseline to post-intervention, $t(59) = 0.79$, $p > .025$, and from post-intervention to follow-up, $t(59) = 1.04$, $p > .025$. There was no main effect of Intervention, $F(1,118) = 3.25$, $p > .05$, and no main effect of Activity, $F(1,118) = 0.02$, $p > .05$. There was also no Intervention x Activity interaction, $F(1,118) = 0.13$, $p > .05$, no Time x Activity interaction, $F(1.80,212.24) = 1.02$, $p > .05$, and no Time x Intervention x Activity interaction, $F(1.80,212.24) = 0.17$, $p > .05$.

Discomfort. It was hypothesized that participants in the experimental conditions would be less uncomfortable thinking about their target thought than those in the control conditions. Mauchly's test indicated that the assumption of sphericity had been violated, $\chi^2(2) = 7.51$, $p < .05$, therefore the degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity ($\varepsilon = .94$). A 2 (Intervention: experimental, control) × 2 (Activity: singing, verbal repetition) × 3 (Time: baseline, post-intervention, follow-up) mixed ANOVA showed that there was a significant main effect of time, $F(1.88,222.18) = 39.74$, $p < .001$, partial $\eta^2 = 0.25$, such that, on average, participants rated discomfort higher at baseline ($M = 72.98$, $SD = 29.08$) than at post-intervention ($M = 55.65$, $SD = 32.35$) and follow-up ($M = 45.72$, $SD = 32.06$). Paired sample t-tests showed significant decreases in discomfort from baseline to post-intervention, $t(121) = 6.43$, $p < .001$, and from post-intervention to follow-up, $t(121) = 3.30$, $p < .001$. There was no main effect of Intervention, $F(1,118) = 0.54$, $p > .05$, and no main effect of Activity, $F(1,118) = 1.21$, $p > .05$. There was also no Intervention x Activity interaction, $F(1,118) = 0.62$, $p > .05$, no Time x Intervention interaction, $F(1.88,222.18) = 0.74$, $p > .05$, no Time x Activity interaction, $F(1.88,222.18) = 1.23$, $p > .05$, and no Time x Intervention x Activity interaction, $F(1.88,222.18) = 0.30$, $p > .05$.

Willingness. It was hypothesized that participants in the experimental conditions would demonstrate an increased willingness to engage with the target thought, relative to the control conditions. Mauchly's test indicated that the assumption of sphericity had been violated, $\chi^2(2) = 9.04$, $p < .05$, therefore the degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity ($\varepsilon = .93$). A 2 (Intervention: experimental, control) × 2 (Activity: singing, verbal repetition) × 3 (Time: baseline, post-intervention, follow-up) mixed ANOVA showed that there was a significant main effect of time, $F(1.86,219.66) = 12.27$, $p < .001$, partial $\eta^2 = 0.09$,

such that, on average, participants rated willingness higher at baseline (M = 62.50, SD = 26.65) than at post-intervention (M = 54.88, SD = 30.01) and follow-up (M = 49.79, SD = 30.26). Paired sample t-tests showed significant decreases in willingness from baseline to post-intervention, $t(121) = 3.38$, $p < .001$, but not from post-intervention to follow-up, $t(121) = 1.95$, $p = .053$. There was no main effect of Intervention, $F(1,118) = 0.54$, $p > .05$, and no main effect of Activity, $F(1,118) = 1.21$, $p > .05$. There was also no Intervention x Activity interaction, $F(1,118) = 0.62$, $p > .05$, no Time x Intervention interaction, $F(1.86,219.66) = 1.51$, $p > .05$, no Time x Activity interaction, $F(1.86,219.66) = 0.63$, $p > .05$, and no Time x Intervention x Activity interaction, $F(1.86,219.66) = 0.97$, $p > .05$.

Avoidance. It was hypothesized that participants in the experimental conditions would avoid the target thought less than those in the control conditions. Mauchly's test indicated that the assumption of sphericity had been violated, $\chi^2(2) = 19.83$, $p < .05$, therefore the degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity ($\varepsilon = .87$). A 2 (Intervention: experimental, control) × 2 (Activity: singing, verbal repetition) × 3 (Time: baseline, post-intervention, follow-up) mixed ANOVA showed that there was a significant main effect of time, $F(1.73,204.17) = 4.95$, $p < .01$, partial $\eta^2 = 0.04$, such that, on average, participants rated avoidance higher at baseline (M = 52.01, SD = 33.75) than at post-intervention (M = 49.35, SD = 33.94) and follow-up (M = 42.56, SD = 33.17). Paired sample t-tests showed significant reductions only from post-intervention to follow-up, $t(121) = 2.18$, $p < .05$, but not from baseline to post-intervention, $t(121) = 1.02$, $p > .05$. There was no main effect of Intervention, $F(1,118) = 2.78$, $p > .05$, and no main effect of Activity, $F(1,118) = 0.50$, $p > .05$. There was also no Intervention x Activity interaction, $F(1,118) = 1.41$, $p > .05$, no Time x Intervention interaction, $F(1.73,204.17) = 0.34$, $p > .05$, no Time x Activity interaction,

$F(1.73,204.17) = 1.12$, $p > .05$, and no Time x Intervention x Activity interaction, $F(1.73,204.17) = 1.15$, $p > .05$.

Cognitive defusion. It was hypothesized that those in the experimental conditions would demonstrate greater cognitive defusion than those in the control conditions. A 2 (Intervention: experimental, control) × 2 (Activity: singing, verbal repetition) × 2 (Time: post-intervention, follow-up) mixed ANOVA showed that there was no significant main effect of time, $F(1,118) = 2.89$, $p > .05$, no main effect of Intervention, $F(1,118) = 0.01$, $p > .05$, and no main effect of Activity, $F(1,118) = 2.02$, $p > .05$. There was also no Intervention x Activity interaction, $F(1,118) = 0.82$, $p > .05$, no Time x Intervention interaction, $F(1,118) = .01$, $p > .05$, no Time x Activity interaction, $F(1,118) = 1.02$, $p > .05$, and no Time x Intervention x Activity interaction, $F(1,118) = 1.99$, $p > .05$.

Hypothesis 2: Changes in Body-Related Cognitions

Weight dissatisfaction. It was hypothesized that participants in the experimental conditions would have less weight dissatisfaction, relative to the control conditions. A 2 (Intervention: experimental, control) × 2 (Activity: singing, verbal repetition) × 3 (Time: baseline, post-intervention, follow-up) mixed ANOVA showed that there was a significant main effect of time, $F(2,236) = 19.58$, $p < .001$, partial $\eta^2 = 0.14$, such that, on average, participants rated weight dissatisfaction higher at baseline ($M = 66.01$, $SD = 30.73$) than at post-intervention ($M = 55.63$, $SD = 30.85$) and follow-up ($M = 49.48$, $SD = 28.94$). Paired sample t-tests showed significant decreases in weight dissatisfaction from baseline to post-intervention, $t(121) = 4.13$, $p < .001$, and from post-intervention to follow-up, $t(121) = 2.30$, $p < .05$. There was no main effect of Intervention, $F(1,118) = 0.06$, $p > .05$, and no main effect of Activity, $F(1,118) = 2.34$, $p >$

.05. There was also no Intervention x Activity interaction, $F(1,118) = 0.14$, $p > .05$, no Time x Intervention interaction, $F(2,236) = 0.59$, $p > .05$, no Time x Activity interaction, $F(2,236) = 0.47$, $p > .05$, and no Time x Intervention x Activity interaction, $F(2,236) = 0.56$, $p > .05$.

Appearance dissatisfaction. It was hypothesized that participants in the experimental conditions would have less appearance dissatisfaction, relative to the control conditions. A 2 (Intervention: experimental, control) × 2 (Activity: singing, verbal repetition) × 3 (Time: baseline, post-intervention, follow-up) mixed ANOVA showed that there was a significant main effect of time, $F(2,236) = 7.52$, $p < .001$, partial $\eta^2 = 0.06$, such that, on average, participants rated appearance dissatisfaction higher at baseline ($M = 52.93$, $SD = 32.37$) than at post-intervention ($M = 52.32$, $SD = 30.31$) and follow-up ($M = 44.42$, $SD = 27.93$). Paired sample t-tests showed no significant decreases in appearance dissatisfaction from baseline to post-intervention, , $t(121) = 0.24$, $p > .05$, but significant decreases from post-intervention to follow-up, $t(121) = 3.29$, $p < .001$. There was no main effect of Intervention, $F(1,118) = 2.01$, $p > .05$, and no main effect of Activity, $F(1,118) = 0.45$, $p > .05$. There was also no Intervention x Activity interaction, $F(1,118) = 0.09$, $p > .05$, no Time x Intervention interaction, $F(2,236) = 0.51$, $p > .05$, no Time x Activity interaction, $F(2,236) = 0.03$, $p > .05$, and no Time x Intervention x Activity interaction, $F(2,236) = 2.10$, $p > .05$.

State body image. It was hypothesized that participants in the experimental conditions would have more state body image satisfaction, relative to the control conditions. A 2 (Intervention: experimental, control) × 2 (Activity: singing, verbal repetition) × 3 (Time: baseline, post-intervention, follow-up) mixed ANOVA showed that there was a significant main effect of time, $F(2,178) = 12.55$, $p < .001$, partial $\eta^2 = 0.12$, such that, on average, participants

rated body image satisfaction lower at baseline (M = 26.78, SD = 8.38) than at post-intervention (M = 27.67, SD = 8.07) and follow-up (M = 30.39, SD = 9.16). Paired sample t-tests showed significant increases in body image satisfaction from baseline to post-intervention, $t(121) = -2.29$, $p < .05$, and from post-intervention to follow-up, $t(121) = -3.87$, $p < .001$. There was no main effect of Intervention, $F(1,89) = 0.40$, $p > .05$, and no main effect of Activity, $F(1,89) = 0.98$, $p > .05$. There was also no Intervention x Activity interaction, $F(1,89) = 0.05$, $p > .05$, no Time x Intervention interaction, $F(2,178) = 1.59$, $p > .05$, no Time x Activity interaction, $F(2,178) = 0.19$, $p > .05$, and no Time x Intervention x Activity interaction, $F(2,178) = 0.69$, $p > .05$.

Hypothesis 3: Changes in Mood and Self-Esteem

Anxiety. It was hypothesized that individuals in the experimental conditions would show greater decreases in anxious mood compared to the control conditions. Mauchly's test indicated that the assumption of sphericity had been violated, $\chi^2(2) = 9.58$, $p < .05$, therefore the degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity ($\varepsilon = .91$). A 2 (Intervention: experimental, control) × 2 (Activity: singing, verbal repetition) × 3 (Time: baseline, post-intervention, follow-up) mixed ANOVA showed that there was a significant main effect of time, $F(1.81,161.35) = 16.00$, $p < .001$, partial $\eta^2 = 0.15$, such that, on average, participants rated anxious mood higher at baseline (M = 47.25, SD = 30.12) than at post-intervention (M = 36.63, SD = 28.85) and follow-up (M = 34.84, SD = 27.73). Paired sample t-tests showed significant decreases in anxiety from baseline to post-intervention, $t(121) = 6.47$, $p < .001$, but not from post-intervention to follow-up, , $t(121) = 0.34$, $p > .05$. There was no main effect of Intervention, $F(1,89) = 0.55$, $p > .05$, and no main effect of Activity, $F(1,89) = 2.29$, $p >$

.05. There was also no Intervention x Activity interaction, $F(1,89) = 3.65$, $p > .05$, no Time x Intervention interaction, $F(1.81,161.35) = 0.32$, $p > .05$, no Time x Activity interaction, $F(1.81,161.35) = 0.53$, $p > .05$, and no Time x Intervention x Activity interaction, $F(1.81,161.35) = 0.67$, $p > .05$.

Depression. It was hypothesized that individuals in the experimental conditions would show greater decreases in depressive mood compared to the control conditions. Mauchly's test indicated that the assumption of sphericity had been violated, $\chi^2(2) = 18.88$, $p < .05$, therefore the degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity ($\varepsilon = .79$). A 2 (Intervention: experimental, control) × 2 (Activity: singing, verbal repetition) × 3 (Time: baseline, post-intervention, follow-up) mixed ANOVA showed that there was a significant main effect of time, $F(1.59,101.67) = 9.31$, $p < .001$, partial $\eta^2 = 0.13$, such that, on average, participants rated depressive mood higher at baseline ($M = 31.97$, $SD = 29.81$) than at post-intervention ($M = 21.10$, $SD = 26.37$) and follow-up ($M = 25.72$, $SD = 27.52$). Paired sample t-tests showed significant decreases in depressive mood from baseline to post-intervention, $t(121) = 4.82$, $p < .001$, but no significant decreases from post-intervention to follow-up, $t(121) = -0.98$, $p > .05$. There was no main effect of Intervention, $F(1,64) = 1.26$, $p > .05$, and no main effect of Activity, $F(1,64) = 1.00$, $p > .05$. There was also no Intervention x Activity interaction, $F(1,64) = 2.66$, $p > .05$, no Time x Intervention interaction, $F(1.59,101.67) = 0.68$, $p > .05$, no Time x Activity interaction, $F(1.59,101.67) = 1.90$, $p > .05$, and no Time x Intervention x Activity interaction, $F(1.59,101.67) = 0.16$, $p > .05$.

Happiness. It was hypothesized that those in the experimental conditions would demonstrate greater increases in happiness than those in the control conditions. Mauchly's test

indicated that the assumption of sphericity had been violated, $\chi^2(2) = 17.71$, $p < .05$, therefore the degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity ($\varepsilon = .80$). A 2 (Intervention: experimental, control) × 2 (Activity: singing, verbal repetition) × 3 (Time: baseline, post-intervention, follow-up) mixed ANOVA showed that there was no significant main effect of time, $F(1.61,102.80) = 0.23$, $p > .05$, no main effect of Intervention, $F(1,64) = 1.93$, $p > .05$, and no main effect of Activity, $F(1,64) = 0.90$, $p > .05$. There was also no Intervention x Activity interaction, $F(1,64) = 0.02$, $p > .05$, no Time x Intervention interaction, $F(1.61,102.80) = 2.83$, $p > .05$, no Time x Activity interaction, $F(1.61,102.80) = 0.19$, $p > .05$, and no Time x Intervention x Activity interaction, $F(1.61,102.80) = 1.63$, $p > .05$.

Confidence. It was hypothesized that those in the experimental conditions would demonstrate greater increases in confidence than those in the control conditions. A 2 (Intervention: experimental, control) × 2 (Activity: singing, verbal repetition) × 3 (Time: baseline, post-intervention, follow-up) mixed ANOVA showed that there was no significant main effect of time, $F(2,128) = 0.58$, $p > .05$, no main effect of Intervention, $F(1,64) = 0.18$, $p > .05$, and no main effect of Activity, $F(1,64) = 1.92$, $p > .05$. There was also no Intervention x Activity interaction, $F(1,64) = 0.005$, $p > .05$, no Time x Intervention interaction, $F(2,128) = 1.63$, $p > .05$, no Time x Activity interaction, $F(2,128) = 0.96$, $p > .05$, and no Time x Intervention x Activity interaction, $F(2,128) = 0.14$, $p > .05$.

State Self-Esteem. It was hypothesized that individuals in the experimental conditions would show greater increases in self-esteem compared to the control conditions. A 2 (Intervention: experimental, control) × 2 (Activity: singing, verbal repetition) × 2 (Time: post-intervention, follow-up) mixed ANOVA showed that there was a significant main effect of time,

$F(1,64) = 7.84$, $p < .05$, partial $\eta^2 = 0.11$, such that, on average, participants reported lower state self-esteem at post-intervention ($M = 60.44$, $SD = 13.19$) than at follow-up ($M = 64.37$, $SD = 14.26$). Paired sample t-tests showed significant increases in self-esteem from post-intervention to follow-up, $t(121) = -4.21$, $p < .001$. There was no main effect of Intervention, $F(1,64) = 0.80$, $p > .05$, and no main effect of Activity, $F(1,64) = 0.58$, $p > .05$. There was also no Intervention x Activity interaction, $F(1,64) = 0.14$, $p > .05$, no Time x Intervention interaction, $F(1,64) = 2.07$, $p > .05$, no Time x Activity interaction, $F(1,64) = 0.15$, $p > .05$, and no Time x Intervention x Activity interaction, $F(1,64) = 0.44$, $p > .05$.

Table 3
Means and Standard Deviations for Outcome Measures Separated by Condition

	Experimental (*n* = 60) Mean (*SD*)	Control (*n* = 62) Mean (*SD*)
Thought Evaluations		
Believability		
Baseline	78.13(24.62)	78.98(21.48)
Post-Intervention	61.87(28.53)	60.56(28.92)
Follow-up	49.72(30.53)	49.60(26.76)
Negativity		
Baseline	72.50(28.53)	71.76(27.64)
Post-Intervention	69.67(30.30)	62.98(32.53)
Follow-up	66.28(32.20)	48.16(33.42)
Discomfort		
Baseline	72.55(28.28)	71.98(30.06)
Post-Intervention	57.43(32.50)	53.92(32.36)
Follow-up	49.38(32.16)	42.18(31.82)
Willingness		
Baseline	61.65(29.11)	63.32(26.65)
Post-Intervention	53.73(31.05)	55.98(29.17)
Follow-up	52.93(30.55)	46.74(29.90)
Avoidance		
Baseline	55.45(35.02)	48.68(32.40)
Post-Intervention	52.83(35.11)	45.95(32.69)
Follow-up	48.63(33.52)	36.68(32.00)
Cognitive Fusion		
Baseline	34.33(10.25)	32.58(10.13)
Follow-up	33.08(10.75)	31.31(10.41)
Thought-Shape Fusion (LF)	44.52(38.33)	34.21(27.93)
Body Image		
Weight Dissatisfaction		
Baseline	64.58(30.72)	67.39(30.94)
Post-Intervention	56.48(29.25)	54.81(32.54)
Follow-up	51.08(29.42)	47.92(28.61)

Appearance Dissatisfaction		
Baseline	56.75(32.39)	49.23(32.17)
Post-Intervention	54.13(29.78)	50.56(30.96)
Follow-up	48.95(28.61)	40.03(26.76)
State Body Image		
Baseline	26.10(8.67)	25.23(8.45)
Post-Intervention	27.18(9.41)	27.06(8.26)
Follow-up	28.70(10.51)	30.55(9.00)
Affect		
Anxiety		
Baseline	50.42(30.60)	45.31(27.55)
Post-Intervention	38.65(29.53)	33.66(28.25)
Follow-up	38.72(28.21)	32.18(29.97)
Depression		
Baseline	29.45(29.66)	31.23(28.25)
Post-Intervention	24.67(28.11)	21.69(25.01)
Follow-up	26.43(28.61)	23.69(23.77)
Happiness		
Baseline	56.38(24.27)	51.73(23.35)
Post-Intervention	51.72(28.75)	56.71(27.46)
Follow-up	49.92(27.92)	52.21(24.09)
Confidence		
Baseline	45.13(26.05)	44.90(26.49)
Post-Intervention	39.95(28.81)	48.82(29.48)
Follow-up	45.50(25.84)	48.82(27.41)
Self-Esteem		
Baseline	60.52(15.66)	59.11(15.49)
Follow-up	63.37(15.29)	64.27(15.79)

Note. LF = Long Form

Hypothesis 4: Homework Compliance

It was hypothesized that participants who more closely adhered to the homework instructions would have better outcomes. Homework adherence was determined by the total

number of seconds spent practicing the defusion technique over the course of the week. Many homework log entries were missing due to failure to return the forms, forgetting to fill out the form, or not practicing. As such, 61 of 122 participants provided enough data to be included in this homework compliance analysis, with 25 from the experimental conditions and 36 from the control conditions. All mediation analyses were conducted using the PROCESS SPSS macro version 3.2 (Hayes, 2018). We tested model 4, which includes one outcome variable, one predictor, one mediator, and room for covariates.

First, we examined the mediational effect of homework adherence on the relationship between intervention and each outcome measure. Within the intervention conditions, average practice times for each defusion session ranged from approximately 26 to 59 seconds (M = 31.16, SD = 5.82) in the experimental conditions and from approximately 26 to 55 seconds (M = 31.16, SD = 4.75) in the control conditions. There were no significant differences in the average time spent practicing between the two intervention conditions, $F(1,60) = .000$, $p > .05$. Homework adherence did not mediate any relationships between intervention condition and outcome measures. See Table 4 for a summary of findings.

Next, we examined the mediational effect of homework adherence on the relationship between activity and each outcome measure. Within the intervention conditions, average practice times for each activity session ranged from approximately 26 to 59 seconds (M = 31.02, SD = 5.56) in the singing conditions and from approximately 26 to 55 seconds (M = 31.27, SD = 4.9) in the verbal repetition conditions. There were no significant differences in the average time spent practicing between the two activities, $F(1,60) = .035$, $p > .05$. Homework adherence did

not mediate any relationships between activity condition and outcome measures. See Table 5 for a summary of findings.

Hypothesis 5: Moderation by Thought-Shape Fusion

Thought-shape fusion was examined as a potential moderator of the relationship between intervention condition and outcome measures. All moderation analyses were conducted using the PROCESS SPSS macro version 3.2 (Hayes, 2018). We tested model 1, which includes one outcome variable, one predictor, and one moderator. As shown in Table 6, intervention condition was significantly related to state self-esteem and degree of thought-shape fusion significantly moderated that relationship, $F(3,118) = 33.04$, $p < .001$, $R^2 = 0.44$. This interaction is illustrated in Figure 3. The interaction was probed by testing the conditional effects of condition at three levels of thought-shape fusion, one standard deviation below the mean, at the mean, and one standard deviation above the mean. Intervention condition was significantly related to self-esteem when thought-shape fusion was one standard deviation above the mean, $b = 6.46$, $t(118) = 2.35$, $p < .05$, but not at or below the mean. The Johnson-Neyman technique showed that the relationship was significantly moderated when thought-shape fusion scores were greater than 57, but not significant with lower degrees of thought-shape fusion. No other outcome measure was moderated by thought-shape fusion scores.

Figure 3

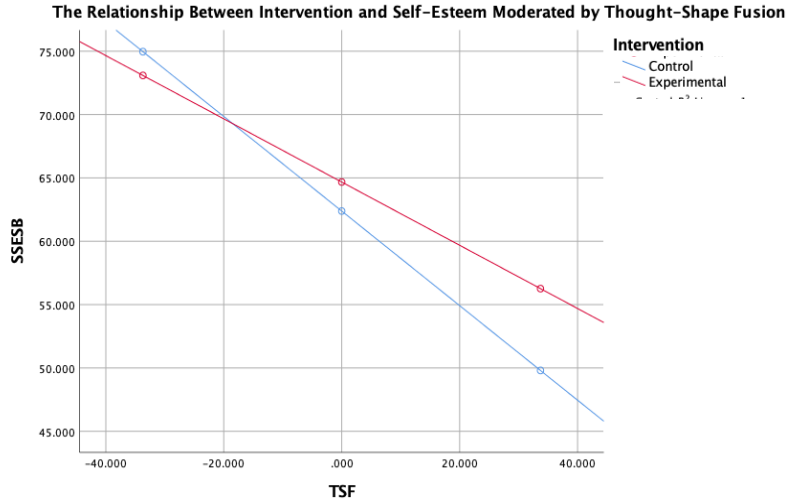


Table 4

Direct and Indirect Effects of Homework Adherence on the Relationship between Intervention and Outcome Variables, N = 61

Regression paths	*b*	95% CI
Believability		
Mediation *a* path (Intervention on homework adherence)	.002	[-2.71, 2.72]
Mediation *b* path (Homework adherence on believability)	-.68	[-1.99, .63]
Direct effect, *c'* (Intervention on believability)	-1.77	[-15.43, 11.88]
Indirect effect with 95% CI	-.002	[-2.35, 2.03]
Negativity		
Mediation *a* path (Intervention on homework adherence)	.002	[-2.71, 2.72]
Mediation *b* path (Homework adherence on negativity)	-.51	[-2.11, 1.10]
Direct effect, *c'* (Intervention on negativity)	-12.79	[-29.56, 3.99]
Indirect effect with 95% CI	-.001	[-1.93, 2.83]
Discomfort		
Mediation *a* path (Intervention on homework adherence)	.002	[-2.71, 2.72]
Mediation *b* path (Homework adherence on discomfort)	0.26	[-1.36, 1.87]
Direct effect, *c'* (Intervention on discomfort)	-4.00	[-20.84, 12.85]
Indirect effect with 95% CI	.0006	[-2.14, 3.82]
Willingness		
Mediation *a* path (Intervention on homework adherence)	.002	[-2.71, 2.72]
Mediation *b* path (Homework adherence on willingness)	-.03	[-1.57, 1.52]
Direct effect, *c'* (Intervention on willingness)	-11.28	[-27.41, 4.85]
Indirect effect with 95% CI	-.0001	[-2.17, .80]
Avoidance		
Mediation *a* path (Intervention on homework adherence)	.002	[-2.71, 2.72]
Mediation *b* path (Homework adherence on avoidance)	.83	[-.80, 2.47]
Direct effect, *c'* (Intervention on avoidance)	1.27	[-15.78, 18.32]
Indirect effect with 95% CI	.002	[-2.07, 4.12]
Cognitive Fusion		
Mediation *a* path (Intervention on homework adherence)	.002	[-2.71, 2.72]
Mediation *b* path (Homework adherence on cognitive fusion)	.52	[-.03, 1.07]
Direct effect, *c'* (Intervention on cognitive fusion)	-1.60	[-7.36, 4.17]
Indirect effect with 95% CI	.001	[-1.28, 1.77]
Weight Dissatisfaction		
Mediation *a* path (Intervention on homework adherence)	.002	[-2.71, 2.72]
Mediation *b* path (Homework adherence on weight dissatisfaction)	-.99	[-2.41, .43]
Direct effect, *c'* (Intervention on weight dissatisfaction)	-12.76	[-27.58, 2.07]
Indirect effect with 95% CI	-.002	[-3.50, 2.60]

Appearance Dissatisfaction		
Mediation *a* path (Intervention on homework adherence)	.002	[-2.71, 2.72]
Mediation *b* path (Homework adherence on appearance dissatisfaction)	.04	[-1.31, 1.40]
Direct effect, *c'* (Intervention on appearance dissatisfaction)	-14.28*	[-28.41, -.15]
Indirect effect with 95% CI	.0001	[-1.48, 2.02]
State Body Image		
Mediation *a* path (Intervention on homework adherence)	.002	[-2.71, 2.72]
Mediation *b* path (Homework adherence on state body image)	-.06	[-.52, .40]
Direct effect, *c'* (Intervention on state body image)	2.73	[-2.06, 7.52]
Indirect effect with 95% CI	-.0001	[-.36, .59]
Anxiety		
Mediation *a* path (Intervention on homework adherence)	.002	[-2.71, 2.72]
Mediation *b* path (Homework adherence on anxiety)	-.82	[-2.22, .58]
Direct effect, *c'* (Intervention on anxiety)	-10.96	[-25.59, 3.67]
Indirect effect with 95% CI	-.002	[-2.60, 2.79]
Depression		
Mediation *a* path (Intervention on homework adherence)	.002	[-2.71, 2.72]
Mediation *b* path (Homework adherence on depression)	-.37	[-.1.86, 1.12]
Direct effect, *c'* (Intervention on depression)	-10.46	[-25.98, 5.06]
Indirect effect with 95% CI	-.0009	[-1.87, 2.14]
Happiness		
Mediation *a* path (Intervention on homework adherence)	.002	[-2.71, 2.72]
Mediation *b* path (Homework adherence on happiness)	-.84	[-2.04, .36]
Direct effect, *c'* (Intervention on happiness)	4.44	[-8.05, 16.93]
Indirect effect with 95% CI	-.002	[-2.45, 2.61]
Confidence		
Mediation *a* path (Intervention on homework adherence)	.002	[-2.71, 2.72]
Mediation *b* path (Homework adherence on confidence)	-.87	[-2.10, .36]
Direct effect, *c'* (Intervention on confidence)	7.68	[-5.13, 20.50]
Indirect effect with 95% CI	-.002	[-3.18, 2.19]
Self-Esteem		
Mediation *a* path (Intervention on homework adherence)	.002	[-2.71, 2.72]
Mediation *b* path (Homework adherence on self-esteem)	-.03	[-.80, .74]
Direct effect, *c'* (Intervention on self-esteem)	1.64	[-6.39, 9.67]
Indirect effect with 95% CI	-.001	[-.57, .53]

*$p < .05$.

Table 5

Direct and Indirect Effects of Homework Adherence on the Relationship between Activity and Outcome Variables, N = 61

Regression paths	*b*	95% CI
Believability		
Mediation *a* path (Activity on homework adherence)	.25	[-2.43, 2.93]
Mediation *b* path (Homework adherence on believability)	-.68	[-1.99, .62]
Direct effect, *c'* (Activity on believability)	2.60	[-10.87, 16.07]
Indirect effect with 95% CI	-.17	[-2.69, 1.73]
Negativity		
Mediation *a* path (Activity on homework adherence)	.25	[-2.43, 2.93]
Mediation *b* path (Homework adherence on negativity)	-.51	[-2.15, 1.13]
Direct effect, *c'* (Activity on negativity)	1.78	[-15.11, 18.66]
Indirect effect with 95% CI	-.13	[-2.46, 2.66]
Discomfort		
Mediation *a* path (Activity on homework adherence)	.25	[-2.43, 2.93]
Mediation *b* path (Homework adherence on discomfort)	.27	[-1.36, 1.87]
Direct effect, *c'* (Activity on discomfort)	-4.40	[-20.84, 12.85]
Indirect effect with 95% CI	.07	[-1.66, 5.09]
Willingness		
Mediation *a* path (Activity on homework adherence)	.25	[-2.43, 2.93]
Mediation *b* path (Homework adherence on willingness)	-.03	[-1.60, 1.55]
Direct effect, *c'* (Activity on willingness)	-2.15	[-18.33, 14.03]
Indirect effect with 95% CI	-.006	[-3.35, .23]
Avoidance		
Mediation *a* path (Activity on homework adherence)	.25	[-2.43, 2.93]
Mediation *b* path (Homework adherence on avoidance)	.84	[-.79, 2.47]
Direct effect, *c'* (Activity on avoidance)	-5.12	[-21.89, 11.67]
Indirect effect with 95% CI	.21	[-1.37, 5.59]
Cognitive Fusion		
Mediation *a* path (Activity on homework adherence)	.25	[-2.43, 2.93]
Mediation *b* path (Homework adherence on cognitive fusion)	.51	[-.04, 1.06]
Direct effect, *c'* (Activity on cognitive fusion)	3.69	[-1.94, 9.31]
Indirect effect with 95% CI	.13	[-1.19, 1.70]
Weight Dissatisfaction		
Mediation *a* path (Activity on homework adherence)	.25	[-2.43, 2.93]
Mediation *b* path (Homework adherence on weight dissatisfaction)	-.99	[-2.45, .46]
Direct effect, *c'* (Activity on weight dissatisfaction)	1.48	[-13.52, 16.48]
Indirect effect with 95% CI	-.25	[-4.40, 1.93]

Appearance Dissatisfaction		
Mediation *a* path (Activity on homework adherence)	.25	[-2.43, 2.93]
Mediation *b* path (Homework adherence on appearance dissatisfaction)	.02	[-1.31, 1.40]
Direct effect, *c'* (Activity on appearance dissatisfaction)	8.44	[-5.83, 22.70]
Indirect effect with 95% CI	.006	[-2.32, 1.55]
State Body Image		
Mediation *a* path (Activity on homework adherence)	.25	[-2.43, 2.93]
Mediation *b* path (Homework adherence on state body image)	-.06	[-.52, .40]
Direct effect, *c'* (Activity on state body image)	-2.40	[-7.14, 2.34]
Indirect effect with 95% CI	-.01	[-.34, .81]
Anxiety		
Mediation *a* path (Activity on homework adherence)	.25	[-2.43, 2.93]
Mediation *b* path (Homework adherence on anxiety)	-.85	[-2.25, .55]
Direct effect, *c'* (Activity on anxiety)	11.26	[-3.16, 25.68]
Indirect effect with 95% CI	-.21	[-4.15, 1.64]
Depression		
Mediation *a* path (Activity on homework adherence)	.25	[-2.43, 2.93]
Mediation *b* path (Homework adherence on depression)	-.39	[-.1.89, 1.10]
Direct effect, *c'* (Activity on depression)	8.68	[-6.72, 24.07]
Indirect effect with 95% CI	-.10	[-2.70, 1.69]
Happiness		
Mediation *a* path (Activity on homework adherence)	.25	[-2.43, 2.93]
Mediation *b* path (Homework adherence on happiness)	-.81	[-1.98, .35]
Direct effect, *c'* (Activity on happiness)	-11.85	[-23.83, .14]
Indirect effect with 95% CI	-.20	[-2.16, 2.77]
Confidence		
Mediation *a* path (Activity on homework adherence)	.25	[-2.43, 2.93]
Mediation *b* path (Homework adherence on confidence)	-.85	[-2.08, .38]
Direct effect, *c'* (Activity on confidence)	-8.03	[-20.66, 4.59]
Indirect effect with 95% CI	-.21	[-2.93, 2.33]
Self-Esteem		
Mediation *a* path (Activity on homework adherence)	.25	[-2.43, 2.93]
Mediation *b* path (Homework adherence on self-esteem)	-.01	[-.76, .74]
Direct effect, *c'* (Activity on self-esteem)	-7.51	[-15.19, .18]
Indirect effect with 95% CI	-.003	[-.37, .93]

Exploratory Analyses

Credibility. There was an unexpected significant main effect of Intervention on participants' ratings of the credibility of the cognitive defusion rationale, $F(1,118) = 4.84$, $p = .03$, such that the control conditions ($M = 81.55$, $SD = 13.86$), on average, found the rationale to be more credible than the experimental conditions ($M = 74.92$, $SD = 21.18$). This difference was attributed to random factors, since the two conditions received the same rationale.

To examine whether there was a relationship between credibility ratings of the cognitive defusion rationale and post-intervention outcome variables, a correlational analysis was conducted. Higher credibility ratings were associated with less discomfort with their target thought, $r(120) = -0.19$, $p < .05$, less anxious arousal, $r(120) = -0.18$, $p < .05$, increased happiness, $r(120) = 0.29$, $p < .01$, more confidence, $r(120) = 0.26$, $p < .01$, and higher self-esteem, $r(120) = 0.22$, $p < .05$.

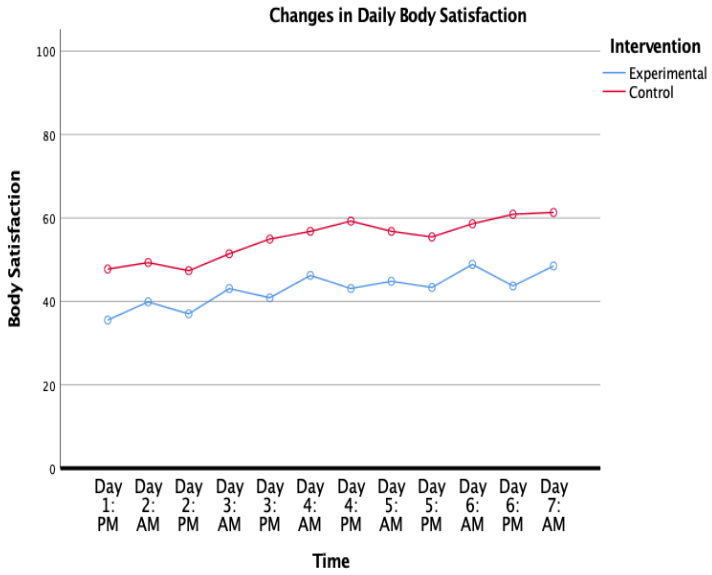
Table 6

The Relationship Between Intervention and Self-Esteem Moderated by Though-Shape Fusion

	Overall				State Self-Esteem				Thought-Shape Fusion				Interaction			
	F	*df*	*p*	R^2	*β*	*t*	*df*	*p*	*β*	*t*	*df*	*p*	*β*	*t*	*df*	*p*
Believability	9.26	3,118	<.001	0.14	2.65	-0.53	118	>.05	0.27	3.19	118	.002	0.22	1.31	118	>.05
Negativity	3.15	3,118	.028	0.08	17.37	2.77	118	.007	0.07	0.54	118	>.05	0.003	-0.01	118	>.05
Discomfort	6.04	3,118	.001	0.12	4.35	0.75	118	>.05	0.27	2.46	118	.015	0.18	0.82	118	>.05
Willingness	0.72	3,118	>.05	0.02	6.68	1.23	118	>.05	0.05	-0.57	118	>.05	0.10	-0.59	118	>.05
Avoidance	5.54	3,118	>.05	0.12	9.20	1.53	118	>.05	0.27	2.44	118	.016	0.13	0.61	118	>.05
Cognitive Fusion	19.21	3,118	<.001	0.31	0.08	0.05	118	>.05	0.18	7.58	118	<.001	0.08	-1.67	118	>.05
Weight Dissatisfaction	9.35	3,118	<.001	0.16	0.51	-0.10	118	>.05	0.36	5.25	118	<.001	0.20	-1.48	118	>.05
Appearance Dissatisfaction	15.33	3,118	<.001	0.23	4.85	1.06	118	>.05	0.40	6.51	118	<.001	0.18	-1.44	118	>.05
State Body Image	28.94	3,118	<.001	0.36	0.02	-0.01	118	>.05	0.18	-8.37	118	<.001	0.02	0.52	118	>.05
Anxiety	0.82	3,118	>.05	0.03	5.60	.083	118	>.05	0.08	0.38	118	>.05	0.07	0.38	118	>.05
Depression	6.44	3,118	<.001	0.17	0.19	-0.04	118	>.05	0.28	3.56	118	<.001	0.20	1.25	118	>.05
Happiness	10.88	3,118	<.001	0.20	1.28	0.29	118	>.05	-0.35	-5.63	118	<.001	0.03	0.25	118	>.05
Confidence	20.86	3,118	<.001	0.27	1.06	0.25	118	>.05	-0.43	-7.38	118	<.001	0.14	1.23	118	>.05
Self-Esteem	33.04	3,118	<.001	0.42	2.29	1.05	118	>.05	-0.31	-9.89	118	<.001	0.12	1.97	118	.05

Changes in daily body satisfaction. A 2 (Intervention: experimental, control) × 2 (Activity: singing, verbal repetition) × 12 (Time: Day 1 PM, Day 2 AM, Day 2 PM, Day 3 AM, Day 3 PM, Day 4 AM, Day 4 PM, Day 5 AM, Day 5 PM, Day 6 AM, Day 6 PM, Day 7 AM) mixed ANOVA determined that a linear model was the best fit for daily changes in body satisfaction over the week of practice (see Figure 4). Mauchly's test indicated that the assumption of sphericity had been violated, $\chi^2(65) = 150.75$, $p < .05$, therefore the degrees of freedom were corrected using Huynh-Feldt estimates of sphericity ($\varepsilon = .76$). There was a significant main effect of time, $F(8.33,441.72) = 6.58$, $p < .001$, partial $\eta^2 = 0.12$, such that, on average, body satisfaction increased over the course of the week. There was also a significant main effect of Intervention, $F(1,53) = 6.54$, $p = .013$, such that participants in the control conditions had more body satisfaction, on average, than those in the experimental conditions. There was no main effect of Activity, $F(1,53) = 2.53$, $p > .05$, no significant Time x Intervention interaction, $F(8.33,441.72) = 0.63$, $p > .05$, and no Time x Activity interaction, $F(8.33,441.72) = 0.83$, $p > .05$.

Figure 4



Discussion

The primary goal of this study was to determine whether singing one's negative body-related thought (e.g., "I am fat") leads to positive changes in terms of one's perception of the thought, body image, mood, and self-esteem in a sample of restrained eaters (i.e. chronic dieters). This intervention was tested against practicing cognitive defusion using verbal repetition and a neutral non-appearance related thought (control condition) for a one-week period. A secondary objective was to determine whether the activity of either singing or verbally repeating a negative body-related thought showed any advantage as a cognitive defusion strategy. Intervention (experimental: negative body-related thought vs. control: neutral thought) was fully crossed with activity (singing vs. verbal repetition) to produce four between-subject conditions. Participants were instructed to practice twice daily for one week.

Findings did not support the hypothesis that participants in the experimental conditions would defuse from their negative body-related thoughts more so than those in the control conditions. The results showed that all participants, whether practicing cognitive defusion with a negative body-related thought or a neutral thought, and whether singing or verbally repeating their thought, evaluated a negative body-related thought as less believable and less uncomfortable both immediately after learning the intervention and at the end of the one-week practice period. That is, all four conditions showed evidence of more positive body-related thought appraisals over the course of the week. However, only the control conditions demonstrated less negativity immediately after the intervention and at one-week follow-up. Of interest, all conditions reported being less willing to engage with that thought immediately after the intervention, but less likely to avoid the thought at the end of the one-week practice period,

suggesting that changing one's relationship to the negative thought may require at least one week of practice.

There was also a lack of support for the hypothesis that practicing defusion techniques with a negative body-related thought for a week would improve body image to a greater extent than would the control conditions. Instead, participants in both the experimental and control conditions reported decreases in weight and appearance dissatisfaction, and increases in body image satisfaction at the end of the week. The findings further indicated that positive changes in appearance dissatisfaction were not immediately apparent after learning the cognitive defusion strategy, but emerged over the course of the week. Changes in body image is especially important given that this was in a sample of restrained eaters. These individuals experience higher levels of body dissatisfaction (Lautenbacher et al., 1992; Mills et al., 2018) and tend to place more emphasis on body shape and weight when evaluating themselves (Mills et al., 2018; Morris et al., 2001), so any significant change is a noteworthy finding.

The third hypothesis that practicing cognitive defusion with a negative body-related thought would be superior to the control conditions in reducing negative mood, increasing positive mood, and improving self-esteem was also not supported. There were equivalent changes for all four conditions such that all participants were less anxious and less depressed after learning the cognitive defusion technique. Notably, these findings were significant only in the short-term (immediately after the initial in-session practice). What did emerge over the course of the week was that all participants reported significant increases in self-esteem, suggesting that all participants benefited in their evaluations of themselves over the practice period. These findings also have important implications for restrained eaters who generally report greater anxiety and depression, as well as lower self-esteem (Mills et al., 2018). There

were no significant changes in happiness or confidence, either immediate after learning or after practicing cognitive defusion for one week.

Given that some changes only emerged after one week of practice (i.e. avoidance and appearance dissatisfaction), the hypothesis for a mediating role of homework adherence was promising. However, the results found that better homework adherence did not mediate any outcome measures. Lastly, thought-shape fusion was examined as a potential moderator of the relationship between assigned condition and outcomes. The results demonstrated partial support for this hypothesis, such the benefit of the intervention on self-esteem emerged for individuals higher on thought-shape fusion. This suggests that cognitive defusion may work best on self-esteem concerns for restrained eaters who are more likely to engage in thought fusions.

In regard to the secondary objective, there was no evidence that singing and verbal repetition differed as independent cognitive defusion strategies. As such, the conflation of defusion techniques in previous studies (Hinton & Gaynor 2010; Jenkins & Tapper, 2014; Larsson et al., 2016) can be interpreted with confidence. This finding is also useful to the practical application of this strategy whereby clients can choose the technique that they prefer without finding different effects.

Because of a preponderance of null findings with respect to any main or interactive effects of either condition or activity, additional exploratory analyses were conducted to examine whether any other theoretically relevant variable could explain the results. Post-hoc analyses revealed that higher credibility ratings of the cognitive defusion rationale was related to less discomfort with the thought, less anxiety, more happiness, more confidence, and greater self-esteem. This suggests that there may be a "buy-in" factor necessary for changes in the significant outcomes such as discomfort, anxiety, and self-esteem. However, these findings should be

interpreted with caution given that participants in the control conditions rated the rationale as more credible than those in the experimental conditions. An additional post-hoc analysis of body satisfaction scores after each homework practice demonstrated that body satisfaction had a slow and steady increase over the week. However, those in the control condition had higher satisfaction scores, on average.

The Role of Cognitive Defusion

One possible explanation for equivalent changes in the conditions across outcome measures may be attributed to the act of cognitive defusion, more generally. In this study, all participants were given a cognitive defusion rationale, training, and were asked to practice verbally repetition or singing a target thought for one week. Accordingly, it may be that the positive changes observed in the outcome measures can be attributed to the learned skill of cognitive defusion in general. Deacon and colleagues (2011) found that cognitive defusion can be generalized to thoughts beyond the target one. By asking participants to rate the importance of synonyms of the word "fat," the researchers found that both the word "fat" and three synonyms decreased in importance after practicing the technique for one week. As such, it may be possible that cognitive defusion works on higher-level processes to change the relationship to thoughts more generally and may explain the main effect of time across experimental and control conditions. This theory is further supported anecdotally in the current study by a report from a participant in the verbal repetition control condition who disclosed to the experimenter at the end of the study that practicing the strategy had made her more aware of other negative thoughts and helped her to understand that "thoughts aren't reality."

The rationale given to all participants at the start of the study may have also functioned as a form of psychoeducation about cognitive fusion. As demonstrated in the *Instructor's Manual*

for Acceptance and Commitment Therapy: Cognitive Defusion with Steven Hayes by Katie Read (2013), a large component of cognitive defusion is education about the topic. Before learning the technique, clients are taught how to look at thoughts from an observational standpoint, to notice the emotions and evaluations that accompany them, to weaken the illusion of literal meaning, and, ultimately, to undermine one's confidence in the mind. In this way, both conditions were given the necessary skills to practice cognitive defusion without being taught to use their own negative thought. Therefore, as was the case for the previously mentioned participant, it is possible that those in the control condition were spontaneously defusing from their negative body-related thought during the week of practice. If this is the case, the findings from this study are encouraging for the positive effects of cognitive defusion as an effective strategy in general and not one that needs to be practiced specifically on each negative body-related thought, such as "I am fat."

In regard to thought evaluations, these cognitive defusion strategies were able to change one's relationship with their thoughts so they were no longer perceived as accurate representations of reality (Luoma & Hayes, 2009) and, therefore, less threatening. This finding is in accordance with previous research which found that cognitive defusion can reduce the believability of a negative thought (De Young et al., 2010; Gobin et al., 2017; Larsson et al., 2016; Masuda et al., 2004; Mandavia et al., 2015; Masuda et al., 2010; Watson et al., 2010), as well as distress (Watson et al., 2010) and discomfort (Barrera et al., 2016; De Young et al., 2010; Fernández-Marcos & Calero-Elvira, 2015; Gobin et al., 2017; Healy et al., 2008; Larsson et al., 2016; Masuda et al., 2004; Masuda et al., 2010) associated with thinking the negative thought. These changes may explain the reductions in avoidance, due to evaluations of the thought as being less distressing or uncomfortable. That all participants showed reductions in avoidance is

an encouraging finding, considering previous reports that experiential avoidance is related to greater eating disorder-related behaviours (Cowdrey & Park, 2012; Rawal et al., 2010). However, the findings that participants were less willing to have the negative body-related thought suggest that, while they didn't avoid the thought, they wouldn't actively invoke the thought. This is contrary to previous findings by Larsson and colleges (2016), who found an increase in willingness to have negative thoughts in the cognitive defusion condition. There is also research demonstrating that cognitive defusion can separate thoughts from their literal meaning (Hayes, Strosahl, & Wilson, 2012; Watson et al., 2010), which may explain the reductions in negativity. Specifically, because thoughts without meaning cannot be assigned a valance (i.e. positive or negative), this technique may have produced lower negativity ratings. This finding was also demonstrated by Gobin, Koerner and Ovanessian (2017), who found that those in a cognitive defusion condition rated their worry as less negative than those who were asked to sit in silence. In this study, those in the control conditions had lower ratings of negativity overtime than the experimental conditions, which may suggest that repeating a neutral thought (i.e. "I am talking/singing") may be an indirect and less threatening way of detaching meaning from the target thought (e.g., "I am fat") and perhaps making it less negative. This further supports the hypothesis that those in the control conditions were generalizing the skill of cognitive defusion to other unwanted thoughts. While these are encouraging findings for negative body-related thoughts that participants are able to articulate having, the absence of significant findings in the cognitive fusion questionnaire suggest that one week of practice is not enough to change one's approach to thoughts more generally. This measure may not pick up on state changes to thought fusions, but a more generally tendency to conflate thoughts and feelings about one's body and the distress that may cause an individual.

The findings for improvements in body-related cognitions in both conditions were also promising, especially in a sample of restrained eaters. It is possible that engaging cognitive defusion reduced weight dissatisfaction and increased body image satisfaction across conditions, suggesting that negative thoughts about body image may have been detached from the meanings they were once ascribed (i.e. the thought "I am fat" no longer made individuals feel bad about their weight; Luoma & Hayes, 2009). Given the relationship between cognitive fusion and eating disorder pathology (Trindade & Ferreira, 2014), eating disorder severity (Ferreira, Palmeira, & Trindade, 2014), and binge eating (Duarte, Pinto-Gouveia, & Ferreira, 2017), this strategy could be used to intervene upon negative body-related thoughts before engaging in disordered eating behaviours as a long-term skill. This is particularly relevant to restrained eaters who report greater disordered eating (Quick & Byrd-Bredbenner, 2012). While there were no immediate changes in appearance dissatisfaction, improvements emerged after a week of practice. These findings are supported by previous researcher that has found an association between greater cognitive fusion and more body dissatisfaction (Ferreira & Trindade, 2015) and alternatively, reductions with body image concerns after practicing cognitive defusion for one week (Deacon et al., 2011). Changes in body image was not a spurious finding, as indicated by gradual increase in body satisfaction throughout the week of practice. Notably, degree of thought-shape fusion did not mediate the relationship between cognitive fusion and body image dissatisfaction as it has in other studies (Coelho et al., 2013; Dubois et al., 2016), suggesting that those with greater fusion may not benefit more than those with lower fusion in regard to body image distress. Taken together, cognitive defusion may be an effective strategy for improving body image satisfaction in the short- and long-term.

Cognitive defusion may have also played a role in immediate improvements in mood. Similar to previous studies, all participants were less depressed (Arch et al., 2012; Bramwell & Richardson, 2017; Forman et al., 2012; Hinton & Gaynor, 2010; Zettle et al., 2011) and had less negative affect (Nitzan-Assayag et al., 2017), namely anxiety and anger. These findings were only evident immediately after completing the task and not at one-week follow-up, suggesting that cognitive defusion may be effective at reducing the momentary negative affect that is commonly reported by restrained eaters (Mills et al., 2018) and may contribute towards eating disorder behaviours. There were no changes in happiness, indicating that cognitive defusion may work to decrease negative affect but *not* increase positive affect. This was contrary to anecdotal reports by clinicians of clients having momentary increases in positive affect (Khazan, 2016) and observations within this study, whereby participants would laugh through the task. Perhaps individuals are exhibiting a nervous laughter due to the uncomfortable nature of the activity, rather than genuine happiness. While there were no increases in positive affect, practicing cognitive defusion did produce increases in self-esteem, similar to findings by Hinton and Gaynor (2010). The finding that there were no increases in confidence suggest that there are notable differences between these two constructs. When considering the Latin root of each word, esteem refers to an appraisal while confidence refers to trust. So, while participants may have felt better about themselves overall, they may not have felt better about their abilities. It may also reflect the differences in construct validity between a visual analogue scale (which measured confidence) and multiple-item measure (which measured self-esteem).

In consideration of the generalizability effect of cognitive defusion and the importance of psychoeducation, it could be reasonably concluded that all conditions in this study were engaging in cognitive defusion. As such, the changes in thought appraisals, body image, mood,

and self-esteem were in the anticipated directions based on previous research in the field of cognitive defusion (De Young et al., 2010; Deacon et al., 2011; Hinton & Gaynor, 2010; Larsson et al., 2016; Masuda et al., 2004). A condition in which participants were asked to sit in silence and were assigned no homework (i.e. a "do-nothing" condition) would be necessary to truly understand the effects of this intervention. As it stands, it appears that practicing defusing from a negative body-related thought is not necessary to see improvements in evaluations of that thought, body image satisfaction, mood or self-esteem.

Alternative explanations

While it may be true that both conditions were engaging in cognitive defusion, there may also be alternative explanations. For example, discussing body image and practicing the technique may have been a cue to engage in other body-related behaviours such as working out or dieting. This is especially likely considering that the sample was from a population of restrained eaters. In support of this hypothesis, one participant disclosed to the experimenter at the end of the study feeling better after each singing experimental defusion practice, but also that she went to the gym more frequently that week. Another participant, also in the singing experimental condition, reported that the technique made her think more about her food choices and, therefore, found dieting to be easier that week. As a consequence, thoughts like "I am fat" became less believable, negative, and uncomfortable, they felt better about their bodies, they experienced reductions in negative affect, and reported increases in self-esteem. In other words, the technique may have had the unintentional effect of increasing body-altering behaviours rather than the relationship with one's thought. This is useful information for practical applications. Qualitative research would be necessary to fully understand this relationship.

Another possible explanation may be the role of demand characteristics. All participants were aware that this was a body image intervention study but did not know all of the conditions. Participants may have been responding in a way that was in line with the perceived purpose of the experiment (i.e. to improve body image). Given that most findings were in the hypothesized direction, participants may have been engaging in the "good-subject effect" (Nichols & Maner, 2008) whereby they were responding in ways that would confirm their assumed hypotheses (i.e. that whatever technique we taught them would help their body image). While this may have been the case, only two participants correctly guessed the experimental or control conditions, and only one identified which condition they were in when explicitly asked to do so in the debriefing.

Limitations

There are some important limitations to consider when interpreting the results of this study. The first is the absence of a control condition unrelated to cognitive defusion. As previously mentioned, simply practicing a defusion technique and receiving the defusion rationale may have produced cognitive defusion from the target negative body-related thought in the control conditions. Without a control condition in which participants are asked to sit in silence during the intervention period and given no homework during the one week of practice, it is unclear whether cognitive defusion is more effective than doing nothing at all. In addition, although it appears that those in the control conditions were engaging in cognitive defusion, generalization from a neutral thought and psychoeducation *alone* are not within the theoretical scope of cognitive defusion in ACT manuals or research papers. A final limitation is the absence of a longer-term follow-up. Although there were significant effects after one week of cognitive defusion practice, as was the case in previous studies (Larsson et al., 2016; Watson et al., 2010),

the trajectory of change in ratings of daily body dissatisfaction in the current study suggest that a one-month follow-up is most appropriate to understand the persisting effects of this intervention.

Strengths

Despite the noted limitations, there were a number of strengths of this study. One strength was the independent examination of verbal repetition and singing as separate cognitive defusion strategies. Previous studies have combined these strategies in a "toolkit" for participants to choose from that does not demonstrate the independent effects of each technique (Hinton & Gaynor 2010; Jenkins & Tapper, 2014; Larsson et al., 2016). This study was able to examine and confirm equivalent effects between types of defusion activity. Another strength was the act of singing out loud, as opposed to the design in previous studies that used a mobile application to produce a song (Gobin et al., 2017), given that singing out loud to oneself is the format recommended in ACT manuals (Read, 2013). This study was also strengthened by the inclusion of a one-week follow-up. While a one-month follow-up would have provided more information on the trends in daily body image satisfaction, a one-week follow up allowed for examination of immediate versus effects attributable to practice over the course of one week. A final strength was the sample characteristics. This is the first study to examine cognitive defusion techniques in a sample of restrained eaters who are chronically preoccupied with food and negative body-related thoughts and self-evaluations (Morris et al., 2001) and experience greater body dissatisfaction than unrestrained eaters (Mills et al., 2018). In turn, high body dissatisfaction is related to increased eating disorder behaviours among dieters (Boschi et al., 2003), prospectively predicts the use of compensatory behaviours (Jones & Crowther, 2013), and increases the risk of developing AN symptoms (Ana, Sonia, Rosângela, & Kállas, 2011). As such, examining evidence-based interventions for this population is an important research avenue. Furthermore,

almost equal inclusion of White and Arab/West Asian participants made the present findings generalizable to a larger and more diverse population than is common in the body image literature.

Future Directions

Research on cognitive defusion for body image distress is still a new field that needs to be explored further. Understanding which techniques work and for whom is an important future goal to be confirmed by multiple studies in a variety of diverse samples. While this study demonstrated that cognitive defusion from a negative body-related thought and body-unrelated thought can produce significant changes in thought evaluations, body satisfaction, mood, and self-esteem, future research should include a "do-nothing" control condition to rule out alternative explanations for these findings (i.e. body-altering behaviour changes or demand characteristics). Alternative explanations could also be eliminated by the inclusion of a qualitative component and a cover story about the purpose of the study. In this way, future researchers can better explain how cognitive defusion works to change body image distress (i.e. by changing the relationship to the thought or by promoting exercise and dieting) and ensure that the changes were not due to what the participants expected should happen (i.e. changes in body image because it is a body image study). Finally, future studies should include a one-month follow-up, similar to a study by Hinton and Gaynor (2010), to examine if these effects are maintained or continuing and for which conditions.

Conclusions

Cognitive defusion may be an effective treatment strategy for addressing body image distress among restrained eaters. More specifically, it can effectively change appraisals of the thought (i.e. believability and negativity) and one's relationship to the thought (i.e. discomfort and avoidance) after one week of practice. It can also positively improve body image satisfaction and self-esteem which is commonly low in restrained eaters (Mills et al., 2018). Finally, as a short-term strategy, cognitive defusion leads to immediate reductions in anxiety and depressive mood. The equivalent effects on outcome measures across conditions suggest that it may not be necessary to defuse from an unwanted negative body-related thought; the simple act of practicing defusion and receiving the cognitive defusion rationale (i.e. psychoeducation) may be enough to produce significant improvements. Furthermore, this study demonstrated that signing and verbal repetition are equivalent defusion techniques. Clinicians can feel confident using these techniques interchangeably to help clients manage their body dissatisfaction in a simple and cost-efficient way.

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Appendix A

Mood and Body Dissatisfaction Questionnaire

Please rate your current feelings on the following items:

a) **Anxiety**

|----------|

None Very Much

b) **Depression**

|----------|

None Very Much

c) **Happiness**

|----------|

None Very Much

d) **Anger**

|----------|

None Very Much

e) **Confidence**

|----------|

None Very Much

f) **Weight dissatisfaction**

|----------|

None Very Much

g) **Appearance dissatisfaction**

|----------|

None Very Much

Appendix B

Manipulation Check Questionnaire

Please rate:

h) How uncomfortable were you while looking at yourself in the picture?

|----------|

Not at all Extremely

and

i) How satisfied are you with your body right now?

|----------|

Not at all Extremely

Appendix C

Thought Evaluation Questionnaire

Please rate:

a) How believable is this thought?

|----------|

Not at all Extremely

and

b) How negative is this thought?

|----------|

Not at all Extremely

and

c) How uncomfortable do you feel when thinking this thought?

|----------|

Not at all Extremely

and

d) How willing are you to engage with this thought?

|----------|

Not at all Extremely

and

e) How much are you trying to avoid this thought?

|----------|

Not at all Extremely

Appendix D

Cognitive Defusion Rationale

Experimenter (E): As humans, we are uniquely able to communicate with one another by talking. By assigning meaning to words, we are able to label objects and engage in conversation. While this allows us to communicate and interact with one another, it also can have some downfalls. The words we use cannot help but involve evaluation and judgment because we assign meaning to them.
We also can tend to believe that our thoughts are reality, when in fact, they are just thoughts. Have you ever had a thought that is not necessarily true, or it could come and go depending upon your mood? It can be problematic when we believe that our thoughts are literally what they say they are, especially thoughts about scary situations. For example, “I am ugly” or “I am fat.” And we tend to think of our thoughts, of what they say, as reality and indicative of who we are and what is going to happen. However, are you really what your thoughts say you are? Are thoughts necessarily reality? Can you have thoughts that are not true?

What if I say that thoughts are simply what they are (thoughts are just thoughts), rather than what they say they are OR you are not what they say you are. It might be difficult to get this point, so let's do a little exercise.

This exercise sounds silly. But I'm going to ask you to say a word. Then you tell me what comes to mind. I want you to say the word, "Silk".

Participant (P): Silk.
E: Good. Now tell me what comes to mind when you said it?
P: (Fabric that you wear).
E: O.K. what else? What shows up when we say "Silk".
P: (I picture it---shiny and bright).
E: Good what else? Can you see it? Can you feel what it feels like to touch silk fabric? Its smooth to the touch, drapes across our skin, soft…right?
E: O.K. let's see if this fits. What came across your mind was things about actual silk and your experience with it. All that happened is that we made a strange sound — Silk (say it slowly!) --- and lots of those things show up. Notice that there isn't any silk in this room, not at all. But silk was in the room psychologically. You and I were seeing it, tasting it, and feeling it. And yet, only the word was actually here.

Verbal repetition conditions:
E: Now, here is another exercise. The exercise is also a little silly. What I am going to ask you to do is to say the sentence, "I am holding silk" but this time repeated as quickly as possible until I say stop. Like this [the experimenter demonstrates rapidly repeating phrase].
E: Now it’s your turn. Are you ready? O.K., begin!

Singing conditions:
E: Now, here is another exercise. The exercise is also a little silly. What I am going to ask you to do is to say the sentence, "I am holding silk" but this time to the tune of twinkle twinkle little star. Like this [the experimenter demonstrates singing the phrase to this song's tune].
E: Now it's your turn. Are you ready? O.K., begin!

E: Tell me what came to mind when you were [repeating/singing] "I am holding silk"?
P: (e.g., it sounds funny, it was just a sound)
E: Did you notice what happened to the images of silk that were here a few minutes ago?
P: (e.g., they disappeared!)
E: Right, the soft and smooth fabric just goes away. When you said it the first time, it was as if silk was actually here, in the room. But all that really happened was that you just sang that sentence. The first time you said it, it was "psychologically" meaningful, and it was almost solid. But when you listened yourself singing it again and again and again, you began to lose that meaning and the words became just a sound.

What I am suggesting is that… What happens in this exercise may be applied to our personal thoughts. When you say things to yourself about bad things that might happen to you in the future, isn't it true that these thoughts are just thoughts? The thoughts are just smoke, there isn't anything solid in them.

Appendix E

Credibility Questionnaire

How credible is the rationale for this intervention?

|----------|

Not at all credible Very credible

Appendix F

Homework Completion Forms

Time (please circle): AM / PM Day: _____

Think of a time when you felt dissatisfied with your body. Maybe it was after a large meal or after examining your body in a mirror. You may have felt that it was larger or "fatter" than you would like. Remind yourself of some of the negative thoughts you had in that moment.

Now remember that thoughts are simply what they are (thoughts are *just* thoughts), rather than what they say they are or what they say *you* are. Recall the "silk" exercise from our visit.

Singing condition (experimental):
Please use the singing tool to help you with this thought. Sing the target phrase we chose in our session to the tune of twinkle twinkle for 30 seconds.

Verbal repetition (experimental):
Please use the verbal repetition tool to help you with this thought. Repeat the target phrase we chose in our session as quickly as possible for 30 seconds.

Singing condition (control):
Please use the singing tool to help you with this thought. Sing the phrase "I am singing" to the tune of twinkle twinkle for 30 seconds.

Verbal repetition (control):
Please use the verbal repetition tool to help you with this thought. Repeat the phrase "I am talking" as quickly as possible for 30 seconds.

Please complete this task before filling out the questionnaire below. Keep these forms to return on your second visit.

After the homework, please rate the following statement on how you feel in this current moment:

a) How satisfied are you with your body right now?

|----------|

Not at all Extremely

Remember to fill out your log sheet

Appendix G

Homework Adherence Questionnaire

Please answer:

How many days did you practice the strategy this week?

____ days out of 7

How many times did you practice the strategy this week?

____ times out of 14

On average, how many seconds did you spend practicing the strategy each session?

____ seconds out of 60