Increasing Body Image Flexibility in a Residential Eating Disorder Facility:

Correlates with Symptom Improvement

Eating disorders – including anorexia nervosa (AN) and bulimia nervosa (BN) – are characterized by emotional and behavioral disturbances centered on eating patterns and weight that lead to significant distress and/or functional impairment (American Psychiatric Association [APA], 2013). AN describes an intense fear of gaining weight and refusal to maintain a healthy body weight, whereas BN is marked by recurrent episodes of binge eating, with loss of control over food intake while binging, and associated compensatory behaviors (APA, 2013). Eating disorders, including AN and BN, are associated with a compromised quality of life relative to population norms (Padierna, Quintana, Arostegui, Gonzalez, & Horcajo, 2000), elevated mortality rates (Smink, Van Hoeken, & Hoek, 2012), non-suicidal self-injury, as well as suicidal ideation (Eichen et al., 2015).

High prevalence of psychopathological comorbidity ranging from 55 to 95% has also been observed in eating disorders among adolescents and adults with commonly co-occurring conditions including anxiety disorders, mood disorders, and substance use disorders (Godart et al., 2015; Hudson, Hiripi, Pope, & Kessler, 2007; Rojo-Moreno et al., 2015; Swanson, Crow, Le Grange, Swendsen, & Merikangas, 2011). In other words, eating disorders rarely present in isolation or are the sole focus of intervention efforts. In addition, some evidence indicates that comorbid symptoms may influence each other in reciprocal ways. For example, Olatunji, Tart, Shewmaker, Wall, and Smits (2010) found that decreases in obsessive-compulsive disorder (OCD) symptoms explained decreases in eating disorder symptoms, and vice versa, suggesting a synergistic, bidirectional association between the two forms of pathology. Thus, it is imperative that treatment for eating disorders target multiple coexisting conditions, potentially by focusing on transdiagnostic mechanisms underlying the differential symptom presentations, rather than the topography of the various symptoms.

For example, in one study, 83% of those in an inpatient treatment facility had a comorbid diagnosis with mood, anxiety, and substance use being the most common (Delinsky et al., 2010). Similarly, another study at a residential facility found 78% had comorbid mood, 44% generalized anxiety disorder, and 23% substance abuse or dependence (Juarascio et al, 2013). A previous study used a naturalistic design to evaluate the effectiveness of a residential eating disorder program among 250 females diagnosed with AN, BN, or eating disorder not otherwise specified (ED-NOS; Twohig et al., 2016). Consistent with reports of high comorbidity among individuals with eating disorders, the sample also presented with moderate to severe levels of anxiety and depression. Therapeutic elements used in the program included cognitive behavioral therapy, dialectical behavior therapy, acceptance and commitment therapy, experiential interventions, and a behavioral system in which increasing privileges were earned. Significant main effects were found from time of admission to time of discharge for core symptom measures (body mass index scores, drive for thinness, eating disorder risk, bulimia), as well as secondary indices (depression, anxiety, quality of life, physical health, and mental health), indicating overall improvement over the treatment period (Twohig et al., 2016). In addition, 49 to 100% of participants demonstrated clinically significant change on eating disorder severity measures, whereas 41 to 75% exhibited clinically significant change on secondary measures.

A transdiagnostic factor that has been found to be implicated in eating disorders is psychological flexibility (e.g., Hill, Masuda, & Latzman, 2013; Moore, Masuda, Hill, & Goodnight, 2014), which refers to the ability to be connected with the present moment without avoidance or evaluation, while persisting or changing behavior in a way that is consistent with personally meaningful values (Hayes, Luoma, Bond, Masuda, & Lillis, 2006). Kashdan & Rottenberg (2010) argue that psychological flexibility is a foundational piece of mental and emotional wellbeing. Moreover, psychological flexibility appears to play a mediational role in anxiety disorders (Bluett, Homan, Morrison, Levin, & Twohig, 2014; Webb, Beard, Kertz, Hsu, & Björgvinsson, 2016), including OCD (Twohig, Vilardaga, Levin, & Hayes, 2015). Results on the role of psychological flexibility in depression are mixed, however. Forman, Herbert, Moitra, Yeomans, and Geller (2007) found that psychological flexibility was linked to better outcomes in an acceptance and commitment therapy– a cognitive behavioral intervention targeting psychological flexibility – condition among college students with depressive and anxiety disorders. Conversely, Webb et al. (2016) reported that behavioral activation strategies – but not psychological flexibility – predicted depressive symptom improvement in their sample.

Psychological flexibility in the context of body- or weight-related thoughts and feelings or body image flexibility can be measured with the Body Image-Acceptance and Action Questionnaire (BI-AAQ), which includes items such as: “Worrying about my weight makes it difficult for me to live a life that I value” (Sandoz, Wilson, Merwin, & Kellum, 2013). Because body image flexibility explains unique variance in disordered eating behavior above and beyond psychological flexibility (Moore et al., 2014), psychological flexibility in the context of eating disorder behaviors may be more appropriately captured by a measure of body image flexibility.

 Wendell, Masuda, and Le (2012) found that body image flexibility partially mediated the relationship between disordered eating cognitions and overall pathology, whereas Mancuso (2016) found that body image flexibility fully mediated the relationship between negative body image evaluation and maladaptive responses to body image threats. These findings indicate that body image inflexibility may be a key mechanism in the development of unhealthy eating patterns. In addition, body image flexibility may be a protective factor that weakens the association between disordered eating cognitions and disordered eating behavior (Moore et al., 2014). In other words, individuals with higher body image flexibility may act in adaptive ways with regard to eating in the continued presence of unhelpful disordered eating cognitions. Thus, previous research suggests that body image flexibility may be a useful process of change to target in eating disorder treatment. In fact, among individuals with AN, BN, or eating disorder not otherwise specified receiving residential treatment, increase in body image flexibility from pre- to post-treatment was significantly associated with decrease in eating disorder symptomatology at the end of treatment (Butryn et al., 2013). Furthermore, acceptance and commitment therapy by itself or in conjunction with other cognitive behavioral techniques appears to be effective in the treatment of eating disorders (Berman, Boutelle, & Crow, 2009; Juarascio et al., 2013).

Given the potential role of psychological flexibility/body image flexibility as a mechanism of change in the improvement of symptoms of eating disorders as well as commonly co-occurring conditions, focusing on body image flexibility in the context of eating disorder treatment may be an efficient way to improve global functioning and address multiple pathological presentations. Yet, little research has been done on the specific effect of body image flexibility on a range of outcomes among individuals with eating disorders. Hence, the present study aimed to determine if change in body image flexibility from pre- to post-treatment uniquely predicted outcomes across various domains, including quality of life, obsessive-compulsive symptoms, anxiety, and depression, using data from Twohig et al.’s (2016) study on female individuals receiving treatment at a residential eating disorder center. We hypothesized that changes in body image flexibility would be significantly and uniquely associated with changes in eating disorder risk, quality of life, physical health, mental health, obsessive-compulsive symptoms, anxiety, and depression, controlling for body mass index (BMI).

**Method**

**Setting**

Data were collected from Avalon Hills Eating Disorders Program, a for-profit residential treatment facility located in the Western United States. The facility specializes in treatment of female adolescents and adults with eating disorders. Treatment is multi-faceted, utilizing cognitive behavioral therapy, acceptance and commitment therapy, dialectical behavior therapy, and applied neuroscience as well as supplemental therapeutic activities. Moreover, treatment consists of a reinforcement program that rewards treatment progress with access to greater privileges. The treatment schedule includes daily groups, individual therapy at least twice per week, and family therapy sessions at least once per week. Length of stay is based on treatment progress and therefore varies greatly among patients.

**Participants and Procedure**

 The study was approved by a university institutional review board. Participants for this study consisted of 103 female adolescents (54.4%, n = 56) and adults (45.6%, n = 47) who completed pre- and post-treatment assessments. The sample was largely White (91.3%) with a mean age of 19.0 (SD = 5.68, Range = 12 to 45). The average treatment length was 153.8 days (SD = 64.95, Range = 37 to 287). All participants were diagnosed with an eating disorder as defined by the DSM-IV (American Psychiatric Association [APA], 2013), including anorexia nervosa (46.6%, n = 48), bulimia nervosa (19.4%, n = 20), and eating disorder not otherwise specified (34.0%, n = 35).

The data utilized in the study are a result of the treatment facility’s standard intake and discharge procedure, therefore, there are no inclusion or exclusion criteria. Data are collected for both clinical and research purposes from all patients at the treatment facility. The electronic assessment batteries are completed on a computer or tablet when entering and leaving the program. In addition, all participants are assessed by a mental health professional when entering the program. This includes obtaining informed consent, gathering BMI and health information, and giving a diagnosis. The clinical staff who gather this information are separate from the research staff. Data were collected from December 2009 through September 2013. Over this time period, pre-treatment data were gathered from 142 patients. Of those, 23 did not complete a post-treatment assessment and 18 had significant levels of missing data in their pre- and/or post-treatment assessment. These patients were therefore not included in the current study, resulting in 103 total participants.

**Measures**

**Acceptance and Action Questionnaire–II** (AAQ-II; Bond et al., 2011). The AAQ-II is a 7-item measure of psychological flexibility. Items are rated on a 7-point Likert-type scale (1 = *never true* to 7 = *always true*). Item scores are summed to a total score (7–49), with higher scores indicating greater levels of psychological inflexibility. Scores above the range of 24 to 28 are considered to be clinically significant and have been shown to be related to a wide range of clinically relevant symptoms. Psychometrically, the AAQ-II has demonstrated good internal consistency, reliability, and validity. Moreover, these properties have been shown in clinical eating disorder samples (Fulton et al., 2012; Juarascio et al., 2013). The AAQ-II displayed good internal reliability in the current study (*α* = .87).

**Beck Anxiety Inventory** (BAI; Beck et al., 1988). The BAI is a commonly used, 21-item self-report measure of various anxiety symptoms. These include physical (e.g., feeling numb, dizzy, or shaky) and cognitive (e.g., fear of losing control or dying, nervousness) symptoms. Items are rated on a 4-point Likert-type scale (0 = *Not at all* to 3 = *Severely*). Item scores are summed to a total score (0–63), with higher scores indicating greater levels of anxiety. Symptom severity is rated on the following criteria: minimal anxiety (0–7), mild anxiety (8–15), moderate anxiety (16–25), and severe anxiety (26–63). The psychometric properties of the BAI are well established (Bardhoshi, Duncan, & Erford, 2016; Beck et al., 1988). The BAI displayed excellent internal reliability in the current study (*α* = .93).

**Beck Depression Inventory-II** (BDI-II; Beck, Steer & Brown, 1996). The BDI-II is a commonly used, 21-item self-report measure of depression. Items consist of short statements related to depressive symptoms that are rated from 0 to 3. A total score (0–63) is calculated by summing item scores, with higher scores indicating greater levels of depression. Symptom severity is rated on the following criteria: minimal depression (0–13), mild depression (14–19), moderate depression (20–28), severe depression (29–63). The psychometric properties of the BAI are well established (Beck, Steer, & Brown, 1996; Wang & Gorenstein, 2013) and have been demonstrated in clinical eating disorder samples (Pulos, 1996; Udo, McKee, & Grilo, 2015). The BDI-II displayed excellent internal reliability in the current study (*α* = .93).

**Body Image Acceptance and Action Questionnaire** (BI-AAQ; Sandoz et al., 2013). The BI-AAQ is a self-report measure of body image flexibility. The full measure includes 12 items, however, a recent validation effort indicated that an 11-item version, removing item 6, is more reliable in clinical populations (Lee, Smith, Twohig, Lensegrav-Benson, & Quakenbush-Roberts, 2016). Thus, the 11-item version was used. Items are rated on a 7-point Likert-type scale (1 = *never true* to 7 = *always true*), with higher scores indicating greater levels of psychological inflexibility. The BI-AAQ has shown good psychometric properties in nonclinical samples and clinical samples (Lee et al., 2013; Sandoz et al., 2013). The BI-AAQ displayed excellent internal reliability in the current study (*α* = .92).

**Eating Disorder Inventory 3rd Edition** (EDI-3; Garner, 2004). The EDI-3 is a 91-item self-report assessment developed to measure a wide range of eating disorder-related pathology. Items are rated on a 7-point Likert-type scale (0 = *never* to 6 = *always*). The EDI-3 is an extensive measure that includes many subscales and composite scales. The current study utilized the Eating Disorders Risk Composite (EDRC), a global measure of eating and weight concerns that has been shown to successfully predict eating disturbances and the development of eating disorders (Garner, 2004). The EDRC is composed of the Drive for Thinness, Bulimia, and Body Dissatisfaction scales of the EDI-3.

**Eating Disorder Quality of Life** (EDQOL; Engel et al., 2006). The EDQOL is an eating disorder population-specific, 25-item self-report measure of health related quality of life. Items are rated on a 5-point Likert-type scale (0 = *never* to 4 = *always*) with lowers scores indicating greater quality of life. The measure has demonstrated high test-retest reliability and good construct validity in clinical samples (Engel et al., 2006). The EDQOL displayed excellent internal reliability in the current study (*α* = .93).

**Obsessive-Compulsive Inventory-Revised** (OCI-R; Foa et al., 2002). The OCI-R is an 18-item self-report measure of OCD. Items are rated on a 5-point Likert-type scale (0 = *not at all* to 4 = *extremely*). A total score (0–72) is calculated by summing item scores, with higher scores indicating greater levels of OCD severity. The OCI-R includes six subscales related to different types of obsessive and compulsive behavior: checking, ordering, obsessing, washing, neutralising, and hoarding. A total score of 21 is considered the optimal cutoff to distinguish those with OCD from nonanxious individuals (Foa et al., 2002). The measure has demonstrated good psychometric properties, including test-retest reliability, and construct validity (Abramowitz & Deacon, 2006; Hajcak, Huppert, Simons, & Foa, 2004). The OCI-R displayed excellent internal reliability in the current study (*α* = .92).

**Short Form 36 Health Survey** (SF-36; Ware, & Shebourne, 1992;; McHorney, Ware, Lu, & Sherbourne, 1994). The SF-36 is a widely used, 36-item self-report measure of general physical and mental health (Rand Corporation, 2017). It consists of eight subscales: physical functioning, bodily pain, general health perceptions, physical role functioning, emotional role functioning, social role functioning, mental health, and vitality. Scores on these subscales are each transformed to a 0–100 scale, with higher scores indicating greater levels of functioning. Two broad composite scores, physical and mental, can then be calculated, each utilizing four of the subscale scores. The SF-36 has demonstrated good psychometric properties in general population and clinical samples (McHorney, Ware, & Raczek, 1993). The measrue displayed good to excellent internal reliability in the current study (*α* = .93 physical, .94 mental).

A**nalytic Strategy**

 Data were analyzed using SPSS 23 software. Pearson product moment correlation coefficients were calculated between change scores from pre- to post-treatment for each of the variables. Next any significantly correlated variables were entered into hierarchical multiple regressions to determine if BI-AAQ change scores remained associated with each of the significantly correlated dependent variables after controlling for changes in depression, anxiety, body mass index, and psychological flexibility. Each of the regression models entered BDI-II, BAI, and BMI changes scores in the first step of the analysis. The second step added the AAQ-II change score to assess for the impact of general psychological flexibility. Finally, the third step added the BI-AAQ to assess for potential incremental validity of body image specific psychological flexibility.

**Data Inspection**

Overall, the data met required assumptions for these types of analyses, including linearity, independence of residuals, homoscedasticity, multicollinearity, and normality. Additionally, no outliers were detected. Linearity was assessed through partial regression plots and a plot of studentized residuals against the predicted values. There was independence of residuals for each of the dependent variables, as assessed by Durbin-Watson statistics (SF36 Mental = 1.53; OCI-R = 1.94; EDQOL = 2.27; EDRC = 2.30). Homoscedasticity was assessed by visual inspection of a plot of studentized residuals versus unstandardized predicted values. There was no evidence of multicollinearity, as assessed by tolerance values greater than 0.1. All variables met assumptions of normality, except for EDQOL, which was slightly positively skewed. We opted to not transform this variable to clarify results, as multiple regression is robust to slight normality deviations.

**Results**

 Pre- and post-treatment and change scores for each of the measures are displayed in Table 1. Significant changes were found for all measures from pre- to post-treatment. Table 2 displays Pearson’s correlations between pre- to post-treatment changes scores of each of the measures. Significant correlations were found between the BI-AAQ and each of the hypothesized measures, except for the SF-36 physical composite.

 In order to further examine these relationships, hierarchical multiple regressions were performed between BI-AAQ change scores and each of the measures whose changes scores were significantly correlated with the BI-AAQ. Table 3 displays the results from the four hierarchical multiple regressions.

 The first regression model tested EDRC change scores as the outcome variable. *R* was significantly different from zero after each of the three steps. After step two, in which BMI, BDI-II, BAI, and AAQ-II, changes scores were entered into the equation, the adjusted *R2* indicated that approximately 53 percent of the variation in EDRC changes scores is attributable to these measures, with the changes in AAQ-II scores contributing to approximately 12 percent of this variation. The addition of BI-AAQ scores in step three was statistically significant, indicating that changes in the BI-AAQ contribute to an additional approximately 7 percent of the variation in EDRC change scores above the AAQ-II alone.

 The second model tested EDQOL change scores as the outcome variable. *R* was significantly different from zero after each of the three steps. After step two, in which BMI, BDI-II, BAI, and AAQ-II, changes scores were entered into the equation, the adjusted *R2* indicated that approximately 37 percent of the variation in EDRC changes scores is attributable to these measures, with the changes in AAQ-II scores contributing to approximately 3 percent of this variation. The addition of BI-AAQ scores in step three was statistically significant, indicating that changes in the BI-AAQ contribute to an additional approximately 10 percent of the variation in EDQOL change scores above the AAQ-II alone.

The third model tested OCI-R change scores as the outcome variable. *R* was significantly different from zero after the first and second step. After step two, in which BMI, BDI-II, BAI, and AAQ-II, changes scores were entered into the equation, the adjusted *R2* indicated that approximately 37 percent of the variation in EDRC changes scores is attributable to these measures, with the changes in AAQ-II scores contributing to approximately 6 percent of this variation. The addition of BI-AAQ scores in step three resulted in no significant change to the model, indicating that changes in the BI-AAQ do not contribute to the prediction of OCI-R change scores above the AAQ-II.

The fourth model tested SF-36 Mental change scores as the outcome variable. *R* was significantly different from zero after each of the three steps. After step two, in which BMI, BDI-II, BAI, and AAQ-II, changes scores were entered into the equation, the adjusted *R2* indicated that approximately 68 percent of the variation in SF-36 Mental changes scores is attributable to these measures, with the changes in AAQ-II scores contributing to approximately 4 percent of this variation. The addition of BI-AAQ scores in step three was statistically significant, indicating that changes in the BI-AAQ contribute to an additional approximately 6 percent of the variation in SF-36 Mental change scores above the AAQ-II alone.

**Discussion**

Change in psychological flexibility significantly predicted change in all outcomes tested, controlling for changes in BMI, depression, and anxiety. This finding is consistent with research literature that has linked psychological flexibility to healthier outcomes in general, such as job performance and negative affectivity, independent of diagnosis (Hayes et al., 2006; Kashdan & Rottenberg, 2010). However, once change in body image flexibility was accounted for, psychological flexibility was no longer associated with changes in quality of life or mental health. The one exception was in obsessive-compulsive symptoms; change in psychological flexibility—but not change in body image psychological flexibility—significantly predicted change in obsessive-compulsive symptoms from pre- to post-treatment. This indicates that body image psychological flexibility does not contribute any unique variance over general psychological flexibility alone with regard to obsessive-compulsive symptoms. Nonetheless, our findings suggest that an increase in body image flexibility may be a more powerful predictor of improved outcomes compared to changes in general psychological flexibility in a population with eating disorders.

Consistent with our predictions, an increase in body image flexibility over time was uniquely and significantly associated with lowered eating disorder risk, higher quality of life, and improved mental well-being, after accounting for changes in BMI, anxiety, depression, and general psychological flexibility. For example, BI-AAQ scores explained an additional 7% of variance of eating disorder risk, 10% of variance of quality of life, and 6% of variance of mental health. Changes in body image flexibility did not predict changes in obsessive-compulsive symptoms. These findings demonstrate the incremental utility and specificity of the BI-AAQ in predicting outcomes among individuals to whom body image concerns are relevant, given that change in the BI-AAQ explained variance in outcomes above and beyond changes in general psychopathology as well as psychological flexibility. Of interest, neither change in AAQ-II scores nor change in BI-AAQ scores was correlated with change in physical health. This could be because mean scores on the SF-36 Physical subscale only increased from 49.6 at pretreatment to 53.8 at posttreatment, which suggests little variance in the dependent variable in the first place.

These findings suggest that body image flexibility is a viable treatment target for eating disorders beyond psychological flexibility alone. Treatments that broadly target psychological flexibility might benefit from tailoring treatment more specifically to psychological flexibility in the context of body image concerns. Moreover, it appears changes in body image flexibility are more predictive of treatment outcome than levels of body image flexibility at the start of treatment. A previous analysis of these data found that pre-treatment levels of body image flexibility contributed to only 3% of the variation of eating disorder risk and quality of life at post-treatment (Bluett et al., 2016). The current findings indicate that changes in body image flexibility account for 7% and 10% of the variation in changes of eating disorder risk and quality of life, respectively, over the course of treatment *after* accounting for changes in psychological flexibility, anxiety, depression, and BMI. Therefore, regardless of the level of body image flexibility before seeking treatment, successfully increasing this construct appears to have a meaningful impact on treatment outcome.

With regard to the BI-AAQ as a measure of body image flexibility in clinical populations, it appears to be a better predictor of changes in eating disorder symptoms (EDRC), functioning (EDQOL), and general mental health (SF-36 mental, BAI, BDI-II) than a more general measure of psychological flexibility, such as the AAQ-II. Therefore, as a clinical tool, we recommend the use of the BI-AAQ in clinical eating disorder populations over the AAQ-II. While a measure of body image flexibility specifically developed for a clinical population would be ideal (see Lee, Smith, Twohig, Lensegrav-Benson, & Quakenbush-Roberts, 2016), the current 11-item version of the BI-AAQ appears to be clinically relevant and useful for measuring psychological flexibility in an eating disorder context.

The current study has some limitations. First, due to the nature of the multi-faceted residential treatment setting, the actual treatment that participants received, as well as treatment duration was highly variable. Acceptance and commitment therapy, which specifically targets psychological flexibility, was used extensively throughout treatment in both individual and group settings. However, it is heavily integrated into a broad and multi-faceted treatment program that includes many other factors. Therefore, though we can infer that changes in body image flexibility contribute to treatment outcome, we cannot specify what leads to change in body image flexibility. Second, the sample was relatively homogenous with regard to sex, ethnicity, and socioeconomic status, reducing overall generalizability of our findings. Finally, the lack of a follow-up data limits our understanding of the maintenance of these variables following treatment as well as of the relationships among them over time.

The current findings provide further evidence of the important role that psychological flexibility, and more specifically, body image flexibility has on eating disorder symptoms and overall functioning in a clinical sample. While the results are not causal, they do contribute evidence for the potential utility of psychological flexibility and other trans-diagnostic, process-focused mechanisms of change. Further research is needed that more fully examines this process and whether it is a viable target of treatment in clinical settings. Interventions like acceptance and commitment therapy that target psychological flexibility should more specifically target body image flexibility when utilized in the treatment for eating disorders. Treatment studies that provide information on how to improve body image flexibility would be particularly helpful.

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