

Responses to an ACT-based intervention according to binge eating severity in women

Respuestas a una intervención basada en ACT de acuerdo con la severidad de la compulsión alimentaria en las mujeres

Respostas a uma intervenção baseada em ACT de acordo com a severidade da compulsão alimentar em mulheres

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ABSTRACT

Evidence indicates that binge eating correlates with weight related psychological symptoms and can interfere in successful weight management interventions. This study aimed to investigate the impact of a brief Acceptance and Commitment Therapy (ACT) based intervention according to binge eating severity in overweight and obese women, analyzing differences on weight related psychological symptoms and weight loss after the intervention. Participants (56) were recruited to take part on a 7-hour workshop intervention based on ACT and assessed at posttest and 3-month follow up. The outcomes were assessed using the following self-report measures: BES, AAQ-W, CFQ, BSQ, MEQ. Different symptom reduction profiles were identified according to binge eating severity. The group with severe symptoms had a larger effect size when compared to other groups. Binge eating symptoms severity seems to influence treatment response in a brief ACT based intervention. Future exploration of the underlying mechanisms of binge eating are warranted.

Keywords: binge eating; acceptance and commitment therapy; obesity; overweight; intervention.

RESUMEN

Evidencias apuntan que la compulsión alimentaria está asociada a síntomas psicológicos relacionados con el peso y puede interferir en las intervenciones para el control de peso. El objetivo de este estudio fue el de investigar el impacto de una intervención breve basada en la Terapia de Aceptación y Compromiso (ACT) de acuerdo con la severidad de la compulsión alimentaria en mujeres con sobrepeso y obesidad, analizando diferencias en síntomas psicológicos asociados al peso y en la pérdida de peso. Las participantes (56) fueron invitadas a participar en una intervención basada en intervenciones ACT con duración de siete horas, en formato *workshop* y fueron evaluadas después de tres meses. Evaluamos los resultados utilizando los instrumentos: BES, AAQ-W, CFQ, BSQ, MEQ. Diferentes perfiles de reducción de síntomas fueron identificados de acuerdo con la severidad de compulsión alimentaria. El grupo con síntomas más severos tuvo un tamaño de efecto mayor en comparación con otros grupos. La severidad de los síntomas de compulsión alimentaria parece influir en respuestas a la intervención. Investigaciones futuras de los mecanismos subyacentes de la compulsión alimentaria son necesarias.

Palabras clave: comer compulsivo; terapia de aceptación y compromiso; obesidad; sobrepeso; intervención.

RESUMO

Evidências apontam que a compulsão alimentar está associada a sintomas psicológicos relacionados ao peso e pode interferir em intervenções para controle de peso. Este estudo objetivou investigar o impacto de uma intervenção breve baseada na Terapia de Aceitação e Compromisso (ACT) de acordo com a severidade da compulsão alimentar em mulheres com sobrepeso e obesidade, analisando diferenças em sintomas psicológicos associados ao peso e na perda de peso. Participantes (56) foram recrutadas a participar de uma intervenção baseada na ACT com duração de sete horas, em formato de *workshop*, e foram avaliadas novamente após 3 meses. Os resultados foram avaliados usando os instrumentos: BES, AAQ-W, CFQ, BSQ, MEQ. Diferentes perfis de redução de sintomas foram identificados de acordo com a severidade da compulsão alimentar. O grupo com sintomas mais severos teve um tamanho de efeito maior quando comparado aos outros grupos. A severidade dos sintomas de compulsão alimentar parece influenciar nas respostas ao tratamento numa intervenção breve baseada em ACT. Investigações futuras dos mecanismos subjacentes da compulsão alimentar são necessárias.

Palavras-chave: compulsão alimentar; terapia de aceitação e compromisso; sobrepeso; obesidade; intervenção.

Overweight and obesity are associated with several weight-related psychological symptoms (Weinberger, Kersting, Riedel-Heller, & Luck-Sikorski, 2016). The difficulty to sustain changes in weight loss might be related to a failure to approach important psychological factors that have a role in

overweight maintenance (Forman & Butryn, 2015). An ability necessary to weight control is the motivation to engage in value committed actions, like physical exercise (Jackson et al., 2016).

One characteristic that can hinder the efforts to weight control and is highly associated with

overweight and obesity is binge eating symptoms (Hudson, Hiripi, Kessler, & Pope, 2007; Melo, Peixoto, & Silveira, 2015). Heatherton and Baumeister (1991) developed the escape theory to explain the maintenance of the binge eating behavior. According to escape theory, binge eating narrows the awareness, reducing the salience of negative emotions. This can work as a form of reduction of the inhibitions allowing the individual to binge without further reflection of long term consequences.

In accord with escape theory, the Acceptance and Commitment Therapy (ACT) psychopathology model conceptualizes binge eating as an experiential avoidance strategy (Hayaki, 2009; Masuda, Hill, Melcher, Morgan, & Twohig, 2014). The function of the binge behavior works to prevent, suppress, or alter the exposure to aversive private events, focusing on its short-term benefits. Evidence suggest that acceptance based techniques might be more effective than avoidance to deal with food cravings (Forman et al., 2007; Hooper, Sandoz, Ashton, Clarke, & McHugh, 2012). It is important to address symptoms of binge eating, as these are associated with impulsive behaviors, negative urgency, lack of distress tolerance, anxiety and depression symptoms, and problem behaviors related to eating, body image and weight, therefore interfering with interventions that aim at weight loss or weight related difficulties (Davis, 2015; Hudson, Hiripiri, Kessler, & Pope, 2007; Kelly, Cotter & Mazzeo, 2014).

ACT approach focuses on clarification of personal values, intrinsically leading to reinforcing life directions, actions and goals. To achieve goals related to personal values, an individual must have strategies to deal with emotional avoidance and cognitive fusion (Lillis, Thomas, Niemeier, &

Wing, 2017; Lillis & Kendra, 2014; Manlick, Cochran, & Koon, 2013). Over the last decade, researches of brief interventions based on ACT for eating disorders increased suggesting decreases in eating pathology (Juarascio et al., 2013; Juarascio, Schumacher, Shaw, Forman, & Herbert, 2015). There is evidence that ACT is effective for weight control (Lillis, Hayes, Bunting, & Masuda, 2009) and prevention of weight gain (Katterman, Goldstein, Butryn, Forman, & Lowe, 2014). Results of ACT interventions also indicate significant improvements in weight-related conditions, such as body image dissatisfaction (Pearson, Follette & Hayes, 2012), motivation to engage in physical activity (Butryn, Forman, Hoffman, & Juarascio, 2011) and food cravings (Forman et al., 2007). In addition, evidence of case series study shows that ACT can have a positive impact on binge eating (Masuda et al., 2014). Evidence also indicates that an acceptance based behavioral intervention that included components of ACT improved experiential acceptance and decreased overall eating pathology in individuals with Binge Eating Disorder (Juarascio, 2017).

Additional research on binge symptoms severity and the response to acceptance based interventions are warranted. In addition, there is an important gap of ACT interventions in Brazilian overweight and obese individuals. The present study aimed to evaluate the impact of a brief ACT-based intervention to promote psychological flexibility. The effects of the intervention were investigated according to binge eating severity in overweight and obese women, analyzing differences on experiential avoidance, cognitive defusion, binge eating symptoms, body dissatisfaction, weight loss, mindful eating and physical activity after the intervention.

METHODS

Participants

An open call advertisement in local newspapers invited women interested in participating in a psychological intervention to weight-related difficulties. The participants that contacted the researchers went through a in person screening to assess inclusion and exclusion criteria and signed an informed consent. Inclusion criteria was (i) females, (ii) adults, age between 18 and 59 years, (iii) overweight or obese with a BMI over 25 and (iv) with at least eight years of education. Participants

with Major Depressive Episode, Manic Episode, or Hypomanic, Borderline Personality Disorder or Substance Use Disorders were excluded from the study based on criteria assessed by the Structured Clinical Interview for DSM Disorders (APA, 2014). Fifty-six women who met inclusion criteria were admitted to the study ($n = 56$).

Due to the high number of absences in follow-up face-to-face interviews, follow up assessment was online in the Qualtrics® software. Thirty-one participants completed the in person follow up interviews and 25 completed online assessments. Figure 1 describes participants flow chart.

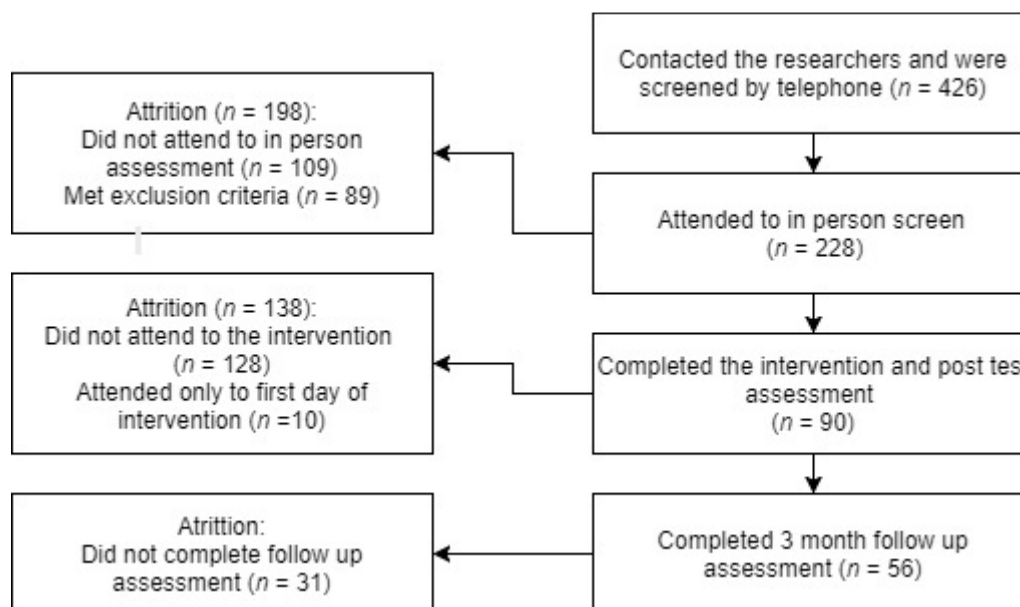


Figure 1. Participants flow chart

Measures

Binge Eating Scale (BES) (Gormally, Black, Daston, & Rardin, 1982). The BES is a 16-item self-report measure that assesses binge eating severity. BES aims to measure behavioral manifestations, feelings and cognitions associated with a binge eating episode. Scores range from 0-46 and higher scores indicate more severe binge eating problems. The BES classifies participants scores into clinical categories: Mild/No Binge Eating (0–17), Moderate

Binge Eating (18–26), and Severe Binge Eating (27–46). The original scale showed moderately high internal consistency $\alpha = 0.85$.

Acceptance and Action Questionnaire for Weight-Related Difficulties (AAQ-W). Developed by Lillis and Hayes (2008) with original good internal consistency ($\alpha=0,88$). The participant is asked to respond a 22-item measure for experiential avoidance related to weight in a Likert type 7-point scale ranging from “not true” to “always true”.

Cronbach alpha for the current study was 0.77. The scale used in this study is a Brazilian version in process of adaptation by Lucena-Santos and colleagues.

Cognitive Fusion Questionnaire (CFQ). Developed by Gillanders et al. (2014) and validated in Brazilian Portuguese by Lucena-Santos et al. (2015), the questionnaire aims to evaluate the process of cognitive fusion through a 7-item scale. Cognitive fusion is the individual's psychological entanglement with the content or form of his thoughts and is part of the six psychological inflexibility processes addressed by Acceptance and Commitment Therapy. The Brazilian version has high internal consistency ($\alpha = 0.93$).

Body Shape Questionnaire (BSQ). Developed by Cooper, Taylor, Cooper and Fairburn (1986) the BSQ assesses body image dissatisfaction. The questionnaire is a 34-item Likert type 6-point scale ranging from "never" to "always". The scores might define body image distortion as normal (up 110 points), mild (111-138), moderate (139-167) and severe (greater than 167). The questionnaire adapted to the Brazilian population showed high internal consistency $\alpha = 0.97$ (Di Pietro & Silveira, 2009).

Mindful Eating Questionnaire (MEQ). Developed by Framson et al. (2009) the MEQ measures 5 domains of mindful eating: Disinhibition, External Cues, Awareness, Emotional Response and Distraction. The questionnaire is a 28 items Likert type 4-point scale that ranges between "never / rarely", "sometimes", "often" and "almost always / always". The original questionnaire has an average internal consistency ($\alpha = 0.64$). The scale used in this study is a Brazilian version in process of adaptation by Lucena-Santos and colleagues.

Diet and Exercise Scale (DES). Developed by Lillis, Hayes and Bunting (2007) to assess the frequency

of behaviors related to diet and physical activity in days per week. For the present study, the following five behaviors were selected of the original DES: more than 30 minutes of physical activity, monitored food intake, binge eating, ate out and chose a healthy meal and ate out and chose unhealthy meal.

Procedure

The study received approval from the university ethics committee. All the participants signed an informed consent, answered questionnaires and self-reported height and weight as a baseline measure. The women participated in a 7-hour ACT based intervention. For the analysis, three groups were defined based on binge eating symptom severity categories of the Binge Eating Scale (BES). Acronyms classified each of the categories: "no symptoms of binge eating" (NS), "moderate binge eating symptoms" (MS) and "severe binge eating symptoms" (SS). Participants completed AAQ-W and CFQ at posttest and BSQ, MEQ and DES at 3-month follow up.

Intervention

The intervention protocol was based on the manual "Acceptance and Commitment Therapy for the Treatment of Obesity-related Stigma and Weight Control" (Lillis et al., 2007) translated into Portuguese and adapted for this study. The intervention had three primary objectives: (1) reducing the experiential avoidance of thoughts, emotions, memories, and bodily sensations, especially those related to eating or body image, (2) clarifying values and identifying obstacles, especially linked to health and relationships and (3) promote actions related to values. Unlike the original protocol, which occurred in a single day, the 7-hour intervention occurred in two days, with a maximum interval of 1 day between the meetings.

The intervention aimed to promote psychological flexibility. The following core processes of psychological flexibility are acceptance, defusion, self-as-context, contact with the present moment, values and committed action. These processes are described in detail in the work of Hayes and colleagues (2012). The intervention used creative hopelessness, the problem of control, mindfulness and acceptance, clarification of personal values and committed action to promote psychological flexibility (Pearson, Follette, & Hayes, 2012).

The intervention begun investigating what the client has done to solve their problems, examining whether it worked or not. The possible hopelessness of facing the fails of past trials, can create space to new solutions, a process called “creative hopelessness”. The strategy of creative hopelessness aimed to stimulate the participants to think about the effectiveness of their strategies to deal with their weight-related difficulties and create motivation to change. To demonstrate the deleterious effect of controlling thoughts and feelings participants went through experiential exercises. Finally, participants were invited to choose at least one committed action related their values (Wilson, Sandoz, Kitchens & Roberts, 2010).

RESULTS

Data Analysis

Data was analyzed using SPSS 19.0. For the analysis, three groups were defined based on the categories of Binge Eating Scale: Mild/No Binge Eating, Moderate Binge Eating and Severe Binge Eating. Descriptive analysis used means and standard deviation to describe the sample. Baseline characteristics of each group were compared using ANOVA. The differences between groups across time were compared using a Repeated Measures Analysis and significance level was $p \leq 0.05$. Cohen d size effect was calculated to compare scores at

pretest and 3-month follow-up (Cohen, 1992). The T-Test for independent samples showed no difference between participants who completed the follow-up in person interview and online assessments.

Pre-treatment characteristics

The mean age of participants was 44.7 years ($SD = 11.1$) and the average education in years of study was 14.7 ($SD = 3.7$). The women in the sample were predominantly married (44.8%) or single women (27.6%). Regarding weight, 32,1% of the sample was overweight, 50% obesity grade I, 14,3%, grade II and 3,6% grade III. Most of the participants had binge eating symptoms (67,9%). No significant differences were found between groups on the pretest demographic variables, except for age ($F = 4,89$, $p < 0,05$).

Significant differences between groups were found at baseline in experiential avoidance related to weight (AAQ -W: $F = 19.48$, $p < 0.001$), cognitive fusion (CFQ: $F = 5.37$, $p = 0.008$) body dissatisfaction ($F = 21.80$, $p < 0.001$). At baseline, a significant difference in adaptive eating behaviors were also found as the levels of mindful eating differ between groups ($F = 13.64$, $p < 0.001$); Disinhibition and Emotional Response subscales also presented significant differences (Disinhibition: $F = 13.11$, $p < 0.001$; Emotional Response: $F = 31.02$, $p < 0.001$). Regarding binge eating, the group with severe binge eating symptoms, as expected, showed significantly higher frequency ($p < 0.05$) than the other groups at baseline. No significant differences were found between groups at baseline in physical activity and BMI.

Means, standard deviations and interaction effects

The results are described in Table 1.

Table 1
Means, Standard Deviations and Interaction Effects (Time*Binge Eating Symptoms Intensity)

Measures		Mild/No Binge Eating	Moderate Binge Eating	Severe Binge Eating	Interaction Effects
					¥
Weight (kg)	T1	84.28 (8.74)	86.96 (13.9)	83.25 (8.49)	0,09
	T3	82.99 (11.47)	85.03 (13.75)*	82.92 (9.47)	
BMI (kg/m ²)	T1	32.16 (3.76)	32.38 (4.47)	30.19 (2.65)	0,797
	T3	31.48 (4.10)	31.74 (4.35)*	29.84 (3.21)	
Acceptance and Action Questionnaire-Weight	T1	81.78 (12.77)	99.75 (17.06)	116.55 (12.3)	0,008*
	T3	75.17 (18.20)	85.2 (17.32)*	87.66 (14.64)*	
Cognitive Fusion Questionnaire	T1	21.56 (10.70)	24.96 (9.70)	33.67 (9.06)	0,051*
	T3	22.06 (10.21)	25.64 (10.74)	26.66 (12.09)*	
Body Shape Questionnaire	T1	101.20 (16.95)	128.48 (19.54)	161.78 (32.88)	0,001*
	T3	91.65 (23.25)	119.71 (25.79)*	128.72 (29.31)*	
Mindful Eating Questionnaire	T1	2.74 (0.28)	2.37 (0.35)	2.01 (0.37)	0,026*
	T3	2.78 (0.30)*	2.58 (0.38)*	2.34 (0.45)*	
Disinhibition subscale	T1	2.63 (0.48)	1.99 (0.64)	1.61 (0.43)	0,08
	T3	2.84 (0.55)	2.40 (0.72)*	2.21 (0.65)*	
Emotional Response subscale	T1	3.06 (0.51)	2.21 (0.64)	1.50 (0.28)	0,032*
	T3	3.22 (0.51)	2.69 (0.72)*	2.32 (0.8)*	
Physical Activity +30min (days/week)	T1	2.56 (2.33)	2.46 (1.96)	1.42 (1.31)	0,011*
	T3	2.50 (2.15)	2.56 (2.16)	3.66 (1.72)*	
Binge Eating (days/week)	T1	1.39 (2.03)	2.77 (1.80)	4.92 (1.88)	0,042*
	T3	0.53 (0.72)	1.84 (1.74)*	2.08 (1.38)*	

Note. T1: Baseline, T3: Follow up (3 months)
Repeated Measures Analysis (Two Way) – Post Hoc Tukey
Analysis of Variance (One Way) – Post Hoc Bonferroni
Mean (SD)
*p<0.05

ANOVA results showed an interaction effect for experiential avoidance between groups of binge eating symptoms and time (¥ = 0.008), however

only the moderate and severe binge eating symptoms groups showed significant difference between baseline and follow up assessments. The

difference found had a large effect size for moderate ($d = 0.846$) and severe binge eating symptoms ($d = 2.127$). The present results showed that the difficulties with weight-related thoughts, feelings, and actions reduced in all three groups at follow up, but the size of the reduction was larger in the groups with more severe binge eating symptoms, as shown in Figure 2.

The results also showed that groups with more severe binge eating symptoms decreased the dissatisfaction with body image. Over time, the groups with moderate and severe binge eating symptoms showed a significant reduction in body image dissatisfaction, with a large effect size in the severe binge eating symptom group ($d = 1.068$). In

addition, the results of moderate and severe binge eating groups regarding disinhibition and emotional response demonstrate significant differences between baseline and follow up, presenting large effect sizes in the severe binge eating group: disinhibition ($d = -1.092$) and emotional response ($d = -1.409$). All groups showed a significant increase in mindful eating over time.

The group with moderate binge eating symptoms was the only one that showed significant reduction in weight and BMI over time (weight: $p < 0.001$ BMI: $p < 0.01$) and the severe binge eating group was the only one that presented significant physical activity increase over time ($p < 0.01$), with a large effect size ($d = -1.469$).

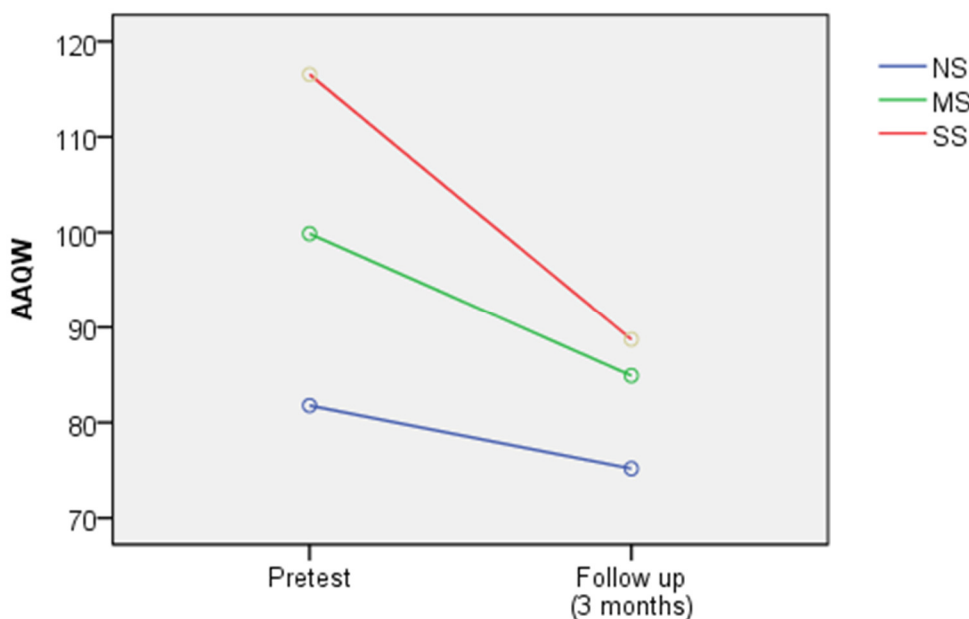


Figure 2. Experiential avoidance group trajectories. (NS: Mild/ No symptoms of binge eating; MS: Moderate binge eating symptoms; SS: Severe binge eating symptoms)

DISCUSSION

The present study evaluated the impact of a brief ACT-based intervention according to binge eating severity in overweight and obese women, analyzing differences on weight related and weight loss variables. The groups defined by binge eating

symptoms intensity showed different responses to treatment for body dissatisfaction, experiential avoidance, mindful eating, engaging in physical activity and frequency of binge eating. Among ACT brief interventions for obesity and overweight, no studies were found aiming to analyze specific

differences between groups with distinct patterns of binge eating intensity.

Groups presenting moderate and severe symptoms of binge eating showed significant reduction of binge eating frequency over time, respectively with moderate and large effect sizes. This result is in accordance with the findings of Masuda and colleagues (2014) that found that binge eating frequency decreased from 5.7 times a week in the pretreatment to 2.5 times post treatment after a brief ACT intervention. After three months, binge-eating frequency was one episode per week (Masuda et al., 2014).

The present results found in binge eating are related with experiential avoidance as these variables had significant interactions between them at all times of assessments. It might be because a reduction of experiential avoidance may have generated changes in control strategies of private events, therefore decreasing the frequency of binge eating by engaging the individual in long term actions and improving contact with the present moment. The results appear to be in line with theory that conceptualizes binge eating as a form of experiential avoidance (Hayaki, 2009). Previous evidence supports that experiential avoidance related to weight predicts binge eating self-reports (Lillis, Hayes & Levin, 2011). These present findings also showed that changes in the magnitude of the effect size of experiential avoidance related to weight are in association with the magnitude of the effect of binge eating reduction.

The severe binge eating symptoms group had larger effect sizes in significant differences found in experiential avoidance measures, dissatisfaction with body image and cognitive fusion. One possible theoretical explanation is that as the participants learned how to separate themselves from their thoughts, they manage to reduce experiential

avoidance related to aversive private events, which might have promoted a reduction of the impact of thoughts associated with body image dissatisfaction (Pearson, Heffner, & Follette, 2010; Lillis, Hayes, Bunting, & Masuda, 2009).

Regarding body dissatisfaction, the severe binge eating symptoms group went from moderate concern with body image to mild, while mild/ no symptoms and moderate group held on same categories over time, respectively no concern and mild concern with body image. A pilot study showed a significant reduction in body image dissatisfaction two weeks after a brief ACT intervention for women (Pearson et al., 2012). Pearson and colleagues suggested the need of future brief ACT interventions addressed to body image dissatisfaction in specific populations. In this study, the group with severe binge eating symptoms had more expressive changes in body image dissatisfaction compared to moderate and mild/no symptoms group.

This study shows that has been a significant increase in mindful eating, namely in two categories: emotional response and disinhibition, that is eating in response to emotions and having the ability to stop eating once realized that the person is already satisfied. According to Framson et al. (2009), mindful eating can help people not to respond automatically to stimuli such as food advertising, or emotions like anxiety and boredom. As the person learns how to develop an observer perspective of their emotional state and satiety signals, there might be more flexibility to choose alternative strategies regarding eating related choices and behavior. In the present study, these two areas showed differences over time between the moderate and severe groups and both groups also presented a reduction in binge eating frequency. Although the groups with symptoms of binge eating have shown

improvements in other outcomes possibly associated with mindful eating, all groups, including no symptoms group, showed a significant increase in mindful eating over time. Previous evidence indicates that emotional response and disinhibition are the main moderators of the choice of meal size (Beshara, Hutchinson, & Wilson, 2013).

As for engaging in physical activity for at least 30 minutes, results showed a significant increase over time in the severe binge eating symptoms group. Another study found out a significant increase in physical activity compared to control group in a group of women who participated in an intervention based on ACT. This suggests that teaching techniques of cognitive defusion can promote engagement in valued behaviors, such as physical exercise, even if they are associated with uncomfortable thoughts and feelings (Butryn, Forman, Hoffman, Shaw, & Juarascio, 2011). This association between cognitive defusion and physical activity frequency can be observed in the severe binge eating symptoms group, as this group was the only one that showed significant differences both in engaging in physical activity and cognitive defusion. In addition, all groups showed a decrease in the means of weight and BMI, however only the moderate binge eating symptoms group achieved significant reductions. Also, that was a reduction in the percentage of participants classified as obese regardless binge eating intensity.

Given the present findings of this study, we can conclude that the participants with severe binge eating had significant differences and a larger size effect in response to intervention compared to the other groups. The reduction of experiential avoidance and body image dissatisfaction appear to be associated with a decrease in binge eating frequency. It is worth to highlight the association between cognitive defusion and an increase in

engaging in physical activities. Only women with moderate binge eating symptoms experienced significant weight reduction after the intervention. However, participants with severe binge eating symptoms obtained larger significant changes in other measures.

This study has several limitations. The high attrition rates throughout the study, particularly at the 3-month follow up assessment, might have affected the power of statistical analysis. High attrition rates were also common in other programs for the weight loss and maintenance (Yackobovitch-Gavan, Steinberg, Endevelt, & Benyamini, 2015; Michelini et al., 2014; Teixeira et al., 2004). This study was not initially designed to evaluate specific changes in binge eating symptoms; therefore, the Binge Eating Scale only accessed binge-eating symptoms at baseline. The posttest and follow up assessed binge eating in days per week. Also, participant's age ranged from 24 to 59 years and this might have influenced the results of the intervention as the groups presented a significant difference. This pilot study, as any other exploratory study, did not include a control comparison group, and the effects observed might be due to the natural rate of recovery or other unspecified factors. The small sample size might have affected the power of the study and generalizability of the results. Future studies should consider the inclusion of an active control condition and larger samples.

Nevertheless, this exploratory study suggests that a brief ACT intervention developed by Lillis et al. (2007) for weight control and weight-related stigma has significant effect in promoting mindful eating regardless presence of binge eating symptoms. The comparison between the groups with and without binge eating symptoms indicates that the intervention can be particularly effective for people with moderate and severe binge eating intensity.

These results might help to develop new mental health practices for this population. Interventions aiming at a clarification of the processes involved in binge eating reduction, increase in physical activity and weight loss is warranted.

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