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BEHAVIORAL INTERVENTION BASED ON ACCEPTANCE AND COMMITMENT THERAPY FOR OVERWEIGHT AND OBESITY: A PILOT STUDY

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Abstract

Current behavioral interventions for weight loss in overweight and obesity present problems in maintaining long-term weight loss results. Acceptance and commitment therapy (ACT) could be a suitable approach to promote long-term weight loss. The aim of this pilot study is to evaluate the efficacy of an ACT-based intervention on body weight change at the end of the intervention and after a 9-month follow-up, in addition to analyzing the effects of the intervention on several variables of interest. Nine women (M_{age}= 44.11 years; *SD*= 5.82) attended a group intervention of 10 weekly sessions, addressing contents of eating habits, physical activity, and ACT. At the end of the intervention, the average weight loss was 2.8%, and after a 9-month follow-up, it was 3.9%. Based on the results, it can be concluded that the study provides evidence in favor of the suitability of ACT to help promote weight loss.

KEY WORDS: *obesity, overweight, intervention, acceptance and commitment therapy*.

Resumen

En la actualidad, las intervenciones conductuales para pérdida de peso en sobrepeso y obesidad presentan problemas para mantener los resultados de pérdida de peso a largo plazo. La terapia de aceptación y compromiso (ACT) podría ser un enfoque adecuado para favorecer la pérdida de peso a largo plazo. El objetivo de este estudio piloto es evaluar la eficacia de una intervención basada en ACT en el cambio del peso corporal al finalizar la intervención y en el seguimiento a los 9 meses, además de analizar los efectos de la intervención en diversas variables de interés. Nueve mujeres (edad: *M*= 44,11 años; *DT*= 5,82) participaron en una intervención grupal de 10 diez sesiones semanales, abordando contenidos de hábitos alimentarios, actividad física y ACT. Al finalizar la intervención, la pérdida de peso promedio fue de 2,8%, y en el seguimiento a los 9 meses, fue de 3,9%. A tenor de los resultados, podemos afirmar que el estudio ofrece datos a favor de ACT en las intervenciones de pérdida de peso.

PALABRAS CLAVE: *obesidad, sobrepeso, intervención, terapia de aceptación y compromiso.*

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Introduction

Currently, obesity is the most common nutritional disorder in developed countries, being declared in 1998 as a problem of pandemic proportions by the World Health Organization (WHO, 2021). In Spain, using the data from 2019 y 2020 given by the European Health Survey (Ministry of Health and National Institute of Statistics, 2020). This data showed high rates of overweight (37.6%) and obesity (16.0%) in people over the age of 15.

In addition to being directly related to health problems caused by excessive weight, overweight and obesity are associated with a wide range of comorbidities, such as diabetes mellitus, hyperlipidemia, and in recent years have also been linked to an increased risk of several types of cancer (Lecube et al., 2016).

The main cause for the appearance of overweight and obesity is the imbalance between caloric intake due to high amounts of food ingestion and the reduction of energy expenditure due to sedentary lifestyles. Although there are biological and genetic factors that contribute to weight gain, obesity is explained by multiple causes, hence a rapid increase in obesity rates in recent decades responds to a change in our environment, currently considered to be an obesogenic environment (Hill et al., 2003).

Regarding the influence of psychological factors on obesity, it appears to be bidirectionally and consistently related to depression, as well as moderately related to anxiety (Rajan & Menon, 2017). People with obesity have greater body dissatisfaction than normal-weight individuals, which leads to lower self-esteem, lower mood, and a greater chance of developing an eating disorder (Weinberger et al., 2016). In addition, obesity is related to disordered eating behavior, being very frequent the occurrence of binge eating episodes, or even the possibility of presenting comorbidity with binge eating disorder or bulimia (Balantekin et al., 2021). Emotional eating, i.e., emotional regulation through food, is another relevant behavioral factor. Emotional eating is one of the possible explanatory variables of the increase in BMI as its frequency is higher in overweight and obese people than in normal-weight individuals (Péneau et al., 2013).

The psychological dimension is considered essential for addressing obesity, as weight loss is inextricably associated with behavioral changes, in this case, related to food and physical activity (Baile, 2019). Cognitive-behavioral therapy has been established as the first line of treatment for overweight and obesity (Jensen et al., 2014). In these interventions, the monitoring of healthy eating habits, increased physical activity, and psychological strategies are combined into therapeutic tools to help support adherence to healthy habits.

Interventions that meet these standards can decrease their total weight by 7-10% (Butryn et al., 2011). However, despite being an effective way to reduce weight in the short term, half of the participants in these programs regain all the weight previously lost within five years (Wadden & Butryn, 2003). A meta-analysis found that psychosocial interventions produced a change in eating and weight loss behaviors in the short term, but the effects were smaller in the long-term follow-up

(Moldovan & David, 2011). The current challenge in this research area is to increase adherence to treatment and maintain long-term results. Considering this situation, new third-wave psychological therapies, such as Acceptance and Commitment Therapy (ACT), are emerging as an effective approach to overcome these limitations (Lillis & Kendra, 2014).

ACT is regarded as a third wave therapy, which represents a paradigm shift from previous psychological therapies - instead of focusing on altering psychological events, it seeks to change the function of these events through techniques such as acceptance, defusion and mindfulness based on the psychological flexibility model (Hayes et al., 2006).

There are several reasons why the use of ACT in overweight and obesity should be more promoted. Regarding its efficacy, there have been several studies in which ACT appears as an effective approach in different areas of Clinical and Health Psychology, among which is the approach to obesity. Currently, ACT has more than 150 structured reviews and meta-analyses that demonstrate the interest and efficacy of this model (Hayes et al., 2021).

The key ACT variable, psychological flexibility, is being used as a mediator variable for the effect of overweight and obesity interventions on weight loss. Food-related psychological flexibility is reported in the literature as a predictor of weight loss (Ong et al., 2019) and is associated with successful weight maintenance after participating in these interventions (Phelan et al., 2020).

With respect to specific domains of psychological flexibility, we need to first highlight acceptance-based strategies, which aim to increase the ability to handle aversive internal experiences. In weight control they are required to endure internal experiences such as hunger, negative affect or fatigue derived from physical exercise. This makes them different from traditional cognitive-behavioral therapy methods, which focus on controlling and reducing unpleasant internal states. The use of acceptance-based strategies seems to lead to less food cravings (Forman, Hoffman, et al., 2013).

Another interesting feature that makes ACT an interesting approach is the use of mindfulness, which aims to increase the awareness of automatic or unconscious eating behaviors (Forman et al., 2009). There is evidence that mindfulness-based strategies are useful for reducing total food consumption and aid in making healthier food choices (Godsey, 2013). The practice of mindfulness is associated with reductions in impulsive and emotional eating, and the frequency of binge eating episodes (Ruffault et al., 2017).

Finally, the strategies for identifying values and life directions are intended to create a lasting commitment to the goals that have been set. (Lillis & Kendra, 2014). Personal values can provide purpose, direction, and meaning to behavior. Promoting the realization of value-based behaviors allows us to modify the relationship individuals have with the discomfort they may experience in a behavioral change process such as weight loss, leading to greater commitment to their new habits (Dahl, 2015).

The efficacy of ACT has been primarily studied using Acceptance-based Behavioral Treatment (ABT) in group formats. This approach is slightly different from ACT, as the latter focuses on tolerating unpleasant experiences, whereas ABT focuses on accepting short-term reduction in pleasure (Forman et al., 2015). In the first two pilot studies, participants achieved a loss of 6.6% in their total weight after 12 weekly sessions (Forman et al., 2009) and 13.5% after 24 weekly sessions (Niemeier et al., 2012).

Since then, several studies have been conducted comparing ABT with standard behavioral treatment (SBT) in randomized controlled trials (Forman, Butryn, et al., 2013; Forman et al., 2016; Forman et al., 2019). Greater weight loss was found in ABT (10.9%) than SBT (8.7%), although this was not statistically significant, and no differences were found during a follow-up. However, individuals who showed higher emotional eating or depression scores benefited more from ABT than those with low scores. In addition, the greater effect of ABT appeared to be mediated by food-craving acceptance, and ABT participants were twice as likely to maintain weight loss after 36 months compared to SBT.

From the ACT perspective, a randomized controlled trial comparing ACT with SBT was conducted (Lillis et al., 2017), in which a weight loss of 4.2% was found in ACT versus 2.4% in SBT, with no statistically significant differences. At a 24-month follow-up, individuals participating in the ACT condition regained less weight than participants in the SBT condition, showing preliminary data supporting its usefulness for long-term maintenance of weight loss.

Research in this field is currently in its early stages. Areas in which more information should be gathered, as outlined in the literature (Forman et al., 2015) would include replication of studies in which ABT and ACT have been tested, and a better understanding of the mechanisms involved in the treatment. In this sense, the aim of this paper is to evaluate the efficacy of an ACT-based intervention on body weight loss at the end of the intervention and after a 9-month follow-up, as well as to analyze the effects of the intervention on several variables of interest. For this purpose, a pilot study was carried out to test the feasibility and acceptability of the intervention by the participants. We hypothesized that the intervention would be useful in reducing the BMI of the participants. In addition, we predict the intervention will increase food-related acceptance, clarity and progress in personal values, physical activity, decrease emotional eating, occurrence of obesogenic eating habits, body dissatisfaction, and the number of binge eating episodes in the participants.

Method

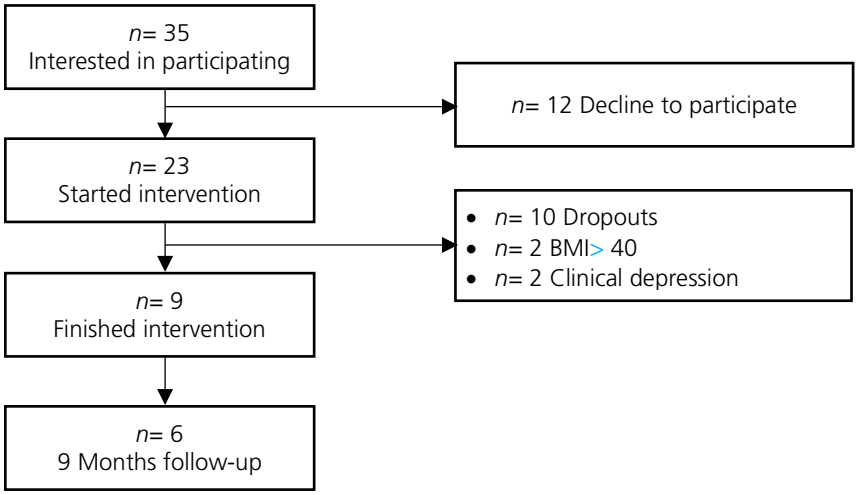
Participants

Thirty-five people initially showed interest in the intervention and were invited to participate. Of these, 9 women completed the intervention (age: *M*= 44.11 years; *SD*= 5.82). Regarding the sociodemographic characteristics, one of them was single,

six reported being married, and two of them were divorced. As for their educational level, three of them completed high school, one of them completed university studies, while five of them had postgraduate or doctoral studies. Eight of them reported that they were not on a diet to control weight, and seven reported that they did not engage in physical activity before starting the program. Figure 1 shows the flowchart of the intervention participants.

Figure 1

Flowchart of the participants in the intervention



Note: BMI= Body Mass Index.

Instruments

a) *Medical scale with height rod and measuring tape*. Weight (kg) and height (m) were assessed with a medical scale with height rod, as well as waist circumference (m) and hip circumference (m) with a measuring tape. These measurements were obtained on a weekly basis. The BMI of the participants was calculated following the kg/m2 formula, and the Waist-to-hip ratio (WHR) was obtained from the quotient of the waist circumference between the hip circumference.

b) *Short Form-36 Health Survey* (SF-36; Ware & Sherbourne, 1992), Spanish version by Alonso et al. (1995). The SF-36 consists of 36 items to assess positive and negative states of physical and mental health, forming eight factors in which a global score is obtained. For this study, we have used the two dimensions that indicate physical and mental quality of life. The score can range from 0 to 100. A higher score suggests a better quality of life. The internal consistency of its subscales is between α= .78 and α= .96.

c) *Obesogenic Habits Questionnaire* (Pardo et al., 2004). This instrument is used for assessing habits and behaviors related to weight management. It consists of 22 items scored on a 5-point Likert-type scale. It comprises five subscales, of which three were used for this study, referring to the calorie content, eating in relation to emotional well-being, and the concern for healthy eating. Higher scores suggest a healthier diet. The questionnaire showed adequate internal consistency (α= .87).

d) *International Physical Activity Questionnaire* (IPAQ; Craig et al., 2003). It allows us to estimate the amount of weekly physical activity through metabolic equivalent of task (MET), a unit that expresses the energy requirements of an activity. The instrument consists of 7 items that measure the frequency (days/week) and time (minutes/day) of three types of physical activity: vigorous, moderate, and walking. This makes it possible to estimate the total MET and classify the level of physical activity according to the following categories:< 600 MET-minutes/week (low); 600-2999 MET-minutes/week (moderate), and ≥ 3000 MET-minutes/week (high). Data from the original short version validated in 12 countries showed adequate reliability (Craig et al., 2003).

e) *Food Craving Acceptance and Action Questionnaire* (FAAQ; Juarascio et al., 2011), Spanish version by Manchón et al. (2021). It allows for the assessment of food-related psychological flexibility based on two factors: Acceptance and Willingness. For this study, only the 5 items of Acceptance were used. They are scored on a 6-point Likert-type scale. Acceptance reflects the degree to which a person is open to experience craving, emotions, and physiological sensations associated with eating without attempting to control, alter, suppress, or avoid these negative experiences. Higher scores suggest greater acceptance of food craving experiences. This subscale presents adequate internal consistency in its Spanish version (α= .86).

f) *Valuing Questionnaire* (VQ; Smout et al., 2014), Spanish version by Ruiz et al. (2021). It is a measure of personal values, consisting of 10 items distributed in two factors: Progress and Obstruction. Progress represents the implementation of value-driven behaviors as well as the clarity of identifying what is important in life. Higher scores reflect a greater implementation of value-driven behaviors. Obstruction represents disruption of living in accordance with personal values, which may be caused by an avoidance of undesirable experiences, or neglect of personal values in favor of other psychological experiences. Higher scores indicate a greater presence of obstacles. The version used showed adequate internal consistency (α= .84) and evidence supporting construct validity.

g) *Positive-Negative Emotional Eating Scale* (PNEES; Sultson et al., 2017), Spanish version by Manchón et al. (2021). The PNEES consists of 19-item divided in two factors that measure the tendency to eat in response to positive and negative emotions. It is used with a Likert-type scale from 0 to 4. Higher scores indicate greater positive and negative emotional eating. The Spanish version has an excellent internal consistency (α= .94).

h) *Body Image Assessment Scale – Body Dimensions* (BIAS-BD; Gardner et al., 1999), Spanish version by Rodríguez-Campayo et al., 2003). The BIAS-BD consists of 13 silhouettes with different body sizes, from thin to large. Two questions are answered: which figure the person identifies with and which body shape they would like to have. The discrepancy between both answers informs about body dissatisfaction. This scale showed adequate test-retest reliability (*r*= .84).
i) *Binge Eating Subscale from Bulimia Test-Revised* (BULIT-R; Thelen et al., 1991), Spanish version by Mora and Raich (1993). This instrument is used to detect the risk of developing bulimia. However, in this study only the 14 items referred to binge eating were used. The items are answered on a 5-point Likert scale. A higher score in this subscale suggests a higher occurrence of binge eating episodes. Its internal consistency is adequate (α between .92 and .98).
j) *State-Trait Anxiety Inventory* (STAI; Spielberger et al., 1982). This questionnaire consists of two anxiety subscales: state and trait. For this study, only state anxiety was used, consisting of 20 items, with a response scale from 0 (Not at all/Almost never) to 3 (Very much/Almost always). The higher the score, the higher the state anxiety. This instrument has adequate internal consistency (between α= .90 and α= .93 for this subscale).
k) *Beck Depression Inventory-II* (BDI-II; Beck et al., 1996), Spanish version by Sanz et al. (2003). This scale evaluates the severity of depressive symptoms. It consists of 21 items with a Likert scale from 0 to 3. The total score is obtained from the sum of the 21 items, and it allows for the classification of different ranges of depression: Minimal (0-13), Mild (14-19), Moderate (20-28), and Severe (29-63). This questionnaire presents adequate internal consistency (α= .87).
l) *Ad hoc items on treatment satisfaction*. After the end of the intervention, five ad hoc items were administered to assess the participants' satisfaction with the intervention.

Procedure

First, the approval of the study was obtained from the university ethics committee. Next, the sample was recruited by sending a mass email to the administrative and teaching staff of a Spanish university. Those interested were attended through an initial interview in which the purpose of this study was explained to them. If they met the selection criteria, they were given the informed consent form to sign.

Intervention participants had to meet the following selection criteria: being aged between 18 and 65 years old, having BMI between 25 and 40, and not having participated in a weight loss program in the last six months. Exclusion criteria were having clinical symptoms of anxiety and/or depression, being currently taking medication that would cause changes in weight and presenting a medical or psychological condition that prevented them from following the diet and/or physical exercise instructions.

Subsequently, the initial assessment of the variables of interest in the research was carried out. The different variables were measured at four moments: pre-treatment, session 4, session 7, and post-treatment. Weight was recorded in all sessions and nine months after the intervention. The assessors of the different variables were external to the implementation of the intervention. The trial was not blinded to participants and treatment therapists.

INTERVENTION

The group intervention consisted of 10 weekly 90-minute sessions, administered by the first author of this paper. The contents were primarily based on the ACT manual by Hayes et al. (2014), and the Acceptance-based Behavioral Treatment obesity intervention manuals by Forman and Butryn (2016a and 2016b). A detailed description of the contents of the sessions, as well as the objectives to be achieved with each of them, can be found in Appendix.

Data analysis

The SPSS 27 statistical package was used to compute descriptive statistics, as well as the differences in independent samples using the nonparametric Mann-Whitney U test to examine the differences between those participants who dropped out of the intervention and those who completed it. Differences in related samples were analyzed using the nonparametric Wilcoxon Z test to examine the changes in the different variables between pre- and post-treatment measurements, as well as differences in BMI after the end of the intervention and at a 9-month follow-up.

Results

Regarding the baseline assessment of the participants, five of them had low levels of physical activity, below 600 MET/week, while four had moderate levels of physical activity. State anxiety was, on average, close to the 50th percentile, and depressive symptomatology was low. In addition, based on the possible range of scores, we found low positive emotional eating and value obstruction scores, moderate negative emotional eating and physical and mental quality of life scores, and high scores in value progress and body dissatisfaction. Moreover, scores on the obesogenic habits questionnaire informed that participants adequately selected food for a healthy diet. However, they ate to reduce discomfort and as a result might have neglected overall caloric intake. We also performed the Mann-Whitney U test for differences in means between participants who completed the intervention and those who dropped out. Although no statistically significant differences were found in any of the variables studied, clinically relevant differences were found considering the effect sizes. Therefore, the participants who dropped out, showed a greater concern for healthy eating (r= .50), lower state anxiety (r= .34), and more positive emotional eating (r= .31).

The baseline scores on the different variables, as well as the post-treatment scores, mean differences from Wilcoxon's Z, and their respective effect sizes can be found in Table 1. At the end of the intervention, participants lost 2.8% of their baseline weight on average. Regarding the efficacy of the intervention, statistically significant changes were found in increased physical activity, reduced body dissatisfaction, increased food-related acceptance, reduced binge eating scale score, and improved eating habits. However, in terms of clinical relevance, large effect sizes can be observed, in addition to the previous variables, in the reduction of BMI and WHR, as well as a reduction in both positive and negative emotional eating. With respect to physical activity levels, at the end of the intervention, three maintained low levels of physical activity, five had moderate levels, and one participant exceeded 3000 MET/week, a level considered as vigorous physical activity.

Table 1
Descriptive statistics of the different variables of interest and their pre- and post-treatment comparison

Variables	Pre-treatment *M* (*SD*)	Post-treatment *M* (*SD*)	Wilcoxon´s *Z*	*r*
BMI	31.74 (4.66)	30.74 (3.60)	-1.96	.65
WHR	0.84 (0.08)	0.80 (0.06)	-1.72	.57
Physical quality of life	51.70 (5.93)	52.08 (8.20)	-0.30	.10
Mental quality of life	44.09 (8.13)	42.33(14.74)	-0.53	.18
Food:				
Calorie content	19.89 (2.85)	28.56 (4.95)	-2.67**	.89
Emotional well-being	6.67 (2.12)	9.33 (3.57)	-2.12*	.71
Concern	23.11 (2.57)	26.56 (2.74)	-2.26*	.75
Physical activity (MET/week)	779.00 (889.40)	1357.94 (1199.76)	-2.31*	.77
Food-related acceptance	8.78 (2.86)	16.22 (7.79)	-2.55*	.85
Values progress	21.22 (2.91)	21.11 (6.49)	-0.12	.04
Values obstruction	13.22 (6.24)	13.56 (6.17)	-0.24	.08
Positive emotional eating	9.56 (5.94)	5.00 (6.16)	-1.54	.51
Negative emotional eating	28.33 (10.27)	21.22 (12.31)	-1.41	.47
Body dissatisfaction	6.44 (2.40)	4.75 (1.67)	-2.39*	.80
Binge eating	27.67 (6.14)	22.75 (5.47)	-2.37*	.79
Depression	9.22 (4.49)	9.44 (7.06)	-0.30	.10
State anxiety	21.00 (9.73)	21.25 (13.95)	-0.49	.16

Notes: BMI= Body mass index; WHR= Waist-to-hip ratio; MET= Metabolic equivalent of task. *p< .05; **p< .01.

For the variables in which statistically significant changes were observed, descriptive statistics were analyzed throughout the four measurements made during the intervention, to find out at which moment the changes occurred. In this sense, it seemed that changes occurred between the baseline assessment and session 4 in the dietary variables referred to Calorie content (at baseline, *M*= 19.89, *SD*= 2.85; session 4, *M*= 26.29, *SD*= 5.31; session 7, *M*= 28.5, *SD*= 4.78; post-treatment, *M*=

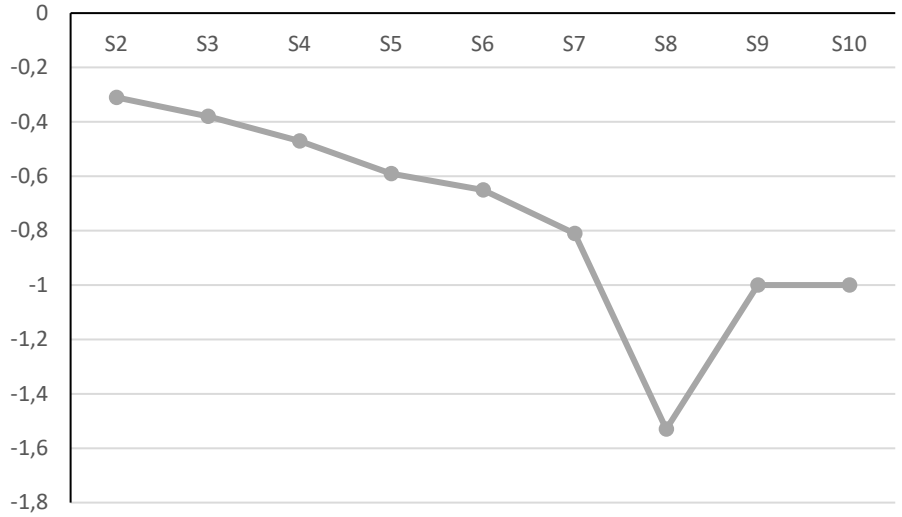
28.56, *SD*= 4.95) and Emotional well-being (at baseline, *M*= 6.67, *SD*= 2.12; session 4, *M*= 8.57, *SD*= 4.08; session 7, *M*= 9.50, *SD*= 3.78; post-treatment, *M*= 9.33, *SD*= 3.57). Regarding the amount of physical activity, the change seemed to be observed from session 7 onwards (at baseline, *M*= 779.00, *SD*= 889.40; session 4, *M*= 657.79, *SD*= 864.48; session 7, *M*= 1307.93, *SD*= 1304.58; post-treatment, *M*= 1357.94, *SD*= 1199.76). Finally, Figure 2 shows the reduction in BMI session by session, where a progressive increase in the difference with the initial BMI can be observed from session 2 onwards.

During a 9-month follow-up, based on data from the participants who completed it (*n*= 6), statistically significant and clinically relevant changes were found in BMI (*Z*= -2.20, *p*< .05, *r*= .90), and only clinically relevant changes in WHR (*Z*= -1.57, *p*> .05, *r*= .64). Mean weight loss was 3.9%.

Regarding treatment satisfaction, participants were asked to rate several aspects of the intervention on a scale of 0 to 10. They considered that the contents of the intervention were useful for them (*M*= 8.67, *SD*= 1.00), they were satisfied with the professional who delivered the intervention (*M*= 9.44, *SD*= 0.73) and satisfied with the program in general (*M*= 8.67, *SD*= 0.87). In addition, they considered the duration of the intervention to be optimal (*M*= 5.22, *SD*= 1.99; 0 meant the program was too short, 5 meant optimal duration, and 10, the program was too long).

Figure 2

Evolution of the BMI differences between pre-treatment and session by session (from session 2 to the end of the intervention)



Note: At the end of the treatment, the difference between the baseline and the final BMI is 1 point. Participants weighted in session 8 were 6.

Discussion

The purpose of this study was to assess the efficacy of an ACT-based intervention for the treatment of overweight and obesity. According to the available data, this is the first time that ACT has been applied for weight loss in Spain. In general terms, it can be stated that the pilot study provides evidence supporting the efficacy of ACT for weight reduction.

First, changes in BMI were detected both at the end of the intervention and during a 9-month follow-up, which may support the hypothesis that the intervention could be useful in reducing one's BMI. It should be noted that the amount of weight lost is low with respect to other interventions, especially those with a larger sample size and in which a randomized clinical trial was conducted (Forman et al., 2013, Forman et al., 2016, Forman et al., 2019). However, the results are in line with those found by Lillis et al. (2017), where the weight loss did not reach 5%. One of the possible underlying explanations is the number of sessions, as the intervention implemented in this study consisted of 10 sessions, while the cited studies were usually in the range of 20 to 30 sessions.

Regarding the effect of the intervention on the variables of interest, health-related quality of life did not increase at post-treatment. Other studies have found an increase in quality of life after a 24-month follow-up (Forman et al., 2019), so it could be that changes can be observed after a long-term period.

However, changes in both eating habits and physical activity were observed. The use of ACT and ABT in weight loss interventions has shown evidence of promoting changes in eating habits (Niemeier et al., 2012), and is an effective approach to increase adherence to physical activity (Manchón et al., 2020), so the results are in line with expectations. In this sense, the results showed an increase in physical activity, as well as a reduction in calorie content, a greater concern for the inclusion of healthy foods in their diet, and a reduced use of food as an emotional regulator. Taken together, these changes in habits may explain the weight reduction achieved in the intervention.

Food-related acceptance increased after the intervention, as we hypothesized. This finding is consistent with previous research (Forman, Butryn, et al., 2013, Forman et al., 2016, Lillis et al., 2017). One of the main goals of these interventions is to increase acceptance of the internal experiences that may appear in the process of losing weight, which would in turn lead to a change in the individual's relationship with their context and food. However, it should be noted that it was not possible to test the mediator role of acceptance due to the low sample size, as analyzed in a previous study (Forman et al., 2019).

In contrast, no changes in personal values were found, contrary to other ACT interventions (Levin et al., 2018). In this regard, we should mention that the participants' initial scores suggested the engagement in behaviors related to the progress of personal values, so the intervention may not have had an effect when starting from high scores.

With respect to emotional eating, body dissatisfaction, and binge eating frequency, in all three cases decreases were found in line with the hypotheses, which reproduced evidence from previous applications of ACT in body dissatisfaction and disordered eating behavior (Pearson et al., 2012). The changes observed in these variables is interesting as the intervention would not only be useful to modify eating and physical activity habits directly related to weight loss but could also address more characteristic aspects of eating disorders.

Another noteworthy aspect is the high dropout rate in the intervention. In our case, 52.6% of participants dropped out of the intervention in the first few sessions, which is in the range of dropout rates observed in similar interventions (Forman et al., 2016, Niemeier et al., 2012). Regarding the characteristics of those who dropped out, they presented higher scores in the occurrence of binge eating. This variable is associated with a higher probability of dropping out of this kind of intervention, as previously reported in the literature (Goode et al., 2016).

This data should be analyzed with caution, as the sample size was very small, comprised only of women, and there was no control group. In the future, a randomized controlled trial should be considered. Considering recent results obtained with this type of design (Forman et al., 2016, Forman et al., 2019), which has provided data on the efficacy of ACT for long-term weight reduction and maintenance, it would also be interesting to perform SMART designs (Sequential Multiple Assignment Randomized Trials) to understand the isolated effects of each component, taking into account personal values and food-related psychological flexibility as mediator variables of the intervention. Examples of this type of design already exist in the literature, such as the study carried out by Carels et al. (2019), in which eight weeks of self-help were administered and subsequently randomized to a condition of eight weeks of ABT group or continue in self-help if they did not reach a 2.5% weight loss. Future studies also should have extended follow-ups, optimally five years to allow comparison of their efficacy with SBT (Moldovan & David, 2011, Wadden & Butryn, 2003). Regarding the inclusion of other therapeutic elements, it could be interesting to consider the use of strategies based on self-compassion, which have already shown their usefulness in previous work on eating disorders (Horcajo et al., 2019).

Finally, it could be interesting to conduct a greater number of sessions to encourage greater weight loss week by week and to reinforce the acquisition of the contents of the intervention. However, the increase in the number of sessions should be combined with strategies that favor long-term adherence, considering the high dropout rate detected in this study. For example, as part of the diet component, a traditional alimentation, typical of the region, could be promoted, since previous studies have shown that similar weight losses can be achieved as with standardized diets, but these can be easier to follow, favoring adherence (Laguna-Camacho & Serrano-Plata, 2021).

Based on the results, we can conclude that the study provides data in favor of ACT in weight loss interventions. Through this study we aim to provide an intervention that can be applied in the Spanish health care setting for the reduction

of body weight in overweight and obese individuals. The pilot study provides positive results regarding the implementation of therapeutic strategies based on ACT in the management of overweight and obesity, leading not only to changes in weight, but also in the relationship that people have with their context and their body, improving their psychosocial adjustment.

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Appendix

Contents of the sessions and objectives to be accomplished

Session	Contents	Objectives/Additional information
1	Overview of the program	To establish group norms, explain what the treatment consists of and what to expect from the treatment.
	Acceptance (control of discomfort, avoidance of suffering, suffering as a normal experience)	To provide context for the program as a different approach to weight loss in lieu of the usual one, explain why previous attempts at weight loss may have failed, address the implications of controlling/avoiding discomfort.
	Obesogenic environment as a challenge and behavioral control	To help distinguish which aspects can be controlled (behaviors) and which should be accepted as they are (obesogenic environment and internal experiences).
	Introduction of self-monitoring of diet and physical exercise	To collect information about the habits of the participants, as well as to minimize underestimates of consumption, minimize overestimates of binge eating and allow them to verify the existence of eating behavior patterns.
2	Introduction of mindfulness practices	To promote mindfulness processes, to increase awareness of bodily sensations. All sessions will begin with these brief exercises.
	Values work (I): Concept introduction and preliminary clarification of values	To question the reasons for wanting to lose weight. To encourage motivation and to link the weight loss goal to their values. Between sessions, participants will complete the values worksheet, indicating in which areas dieting and exercising can be included as value-driven actions.
3	Values work (II): Correction of the values form, delimiting barriers, processes and goals associated with values	To set achievable, realistic, concrete, short- and long-term objectives and goals. To learn the possible barriers for implementing value-driven actions and how to deal with them.
	The role of emotions in habits	To distinguish the components of emotions, detect problematic emotions (either positive or negative) associated with emotional eating or reduced physical activity.
4	Educational content on diet and guidelines for proper nutrition	To offer information on proper nutrition. To promote the change of eating habits, developing them from the work on these values. To design their own diet.
5	Educational content on physical activity (I)	To provide information about the benefits of physical activity, tailoring them to each participant. To promote the change of physical activity habits based on the work on these values.

	Introducing self-as-context: explanation of mental states and the observing-self meditation	To get familiar with the mindfulness processes, promote a defused understanding of the content of the self (especially dealing with the content of the 'fat' self).
6	Strategies to improve adherence to diet: challenges of the environment	To introduce stimulus control as a strategy, discuss possible difficulties (eating out, little time for cooking, family meals or vacations, and so on).
	Review of value-driven actions and their implementation	To check the actions (diet and physical exercise) in which they are getting involved and the problems they are facing. To correct possible errors in the work on values.
7	Educational content on physical activity (II)	To consider different physical exercise modalities (cardiorespiratory, stretching, weight training) to which they can adhere, once their level of physical activity increases.
	Defusion (I): Negative mental language and management of thoughts related to food and physical exercise	To reduce the believability of possible disturbing thoughts that might appear in the process of adhering to diet and physical exercise prescriptions. To understand mental functions.
8	Defusion (II): Body image, obesity stigma	To reduce the believability of certain explanations of actions related to mental schemas, to reduce the association with the concept of obesity and body image.
9	Social skills related to dieting	To understand the effects of social support, or its lack, on adherence to healthy habits. To apply to offers and seek support in their surrounding community.
10	Relapse prevention ("Climbing" and "The mountain path" metaphors) and review of contents	To introduce mistakes and relapses as part of the change process. To recall the intervention contents and reinforce participants' autonomy. To establish weight management guidelines for the maintenance of lost weight.