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An acceptance and commitment therapy and mindfulness group intervention for the psychological and physical well-being of adults with body mass indexes in the overweight or obese range: The Mind&Life randomized controlled trial

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ABSTRACT

This trial aimed to assess the effect of an acceptance and commitment therapy (ACT) and mindfulness-based intervention on the various psychological and physical issues associated with obesity. A parallel group randomized controlled trial was conducted with 142 adults with body mass indexes in the overweight or obesity range seeking treatment. Participants were assigned either to the ACT and mindfulness-based group intervention (Mind&Life intervention) plus treatment as usual (TAU) or the TAU-only condition. Individuals receiving the Mind&Life intervention with TAU showed more adherence to the Mediterranean diet, and greater decrease in external eating, weight, and visceral fat both at posttreatment and at 6-month follow-up. Moreover, they displayed a greater reduction in total protein and animal protein intake and GPT enzymes level. By 6-month follow-up, the Mind&Life group experienced a lower impact of weight on quality of life than TAU participants. However, Mind&Life intervention completers showed greater restrained eating levels at follow-up. Overall, this study suggests that an ACT and mindfulness-based group intervention could produce improvements in the impact of weight on quality of life, some eating behaviors, dietary habits, and weight and body composition parameters of people facing weight-related challenges.

1. Introduction

Excess body fat accumulation has significantly increased in prevalence in recent decades, affecting approximately 13% of the global population (World Health Organization, 2021). This condition can have several consequences for the individual as it is a well-documented risk factor for numerous medical problems (Safaei et al., 2021), while it is associated with poorer mental health and maladaptive eating behaviors (Chu et al., 2019). The prevailing social stigma associated with weight is key to understanding such negative effects, as it is linked to psychological distress (Emmer et al., 2020) and those experiencing weight stigma have poorer dietary patterns, lower physical activity levels and worse physiological health than people unaffected by such discriminatory attitudes (Rubino et al., 2020). Altogether, this illustrates the negative impact weight can have on the quality of life (i.e., the physical, psychological and social dimensions of health) of individuals with body mass indexes (BMI) classified as overweight or obese (Kolotkin et al., 2001).

This health-related issue has a multifactorial etiology (Safaei et al., 2021). Regarding psychological processes involved in weight management, it is evident that private events such as emotions or cognitions, as well as environmental cues could underpin unhealthy dietary habits affecting bodyweight (Devonport et al., 2019; Vainik et al., 2019). The means that individuals use to cope with private events are also relevant. In particular, maladaptive regulation strategies such as food thought suppression could determine whether an individual adopts unhealthy behaviors (Evers et al., 2010). In this regard, evidence suggests that weight-related experiential avoidance or the tendency to avoid

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unpleasant internal weight-related experiences predicts binging, which is associated with weight gain (Lillis et al., 2011). In addition, cognitive fusion or the tendency to become entangled with thoughts is associated to food cravings and binge eating (Carels et al., 2019; da Rosa-Finger et al., 2020).

Acceptance and commitment therapy (ACT; Hayes et al., 1999) isframed within third-generation therapies and follows a behavioral and contextual approach based on relational frame theory. Instead of attempting to control or eliminate undesirable private events, ACT promotes willingness to experience them while fostering behaviors aligned with personal values (Hayes, 2004). Furthermore, ACT employs six core therapeutic processes to develop psychological flexibility in the face of any form of human suffering (Hayes et al., 1999): acceptance, values work, committed action, self-as-context, defusion, and contact with the present moment.

The literature that jointly examines ACT and mindfulness-based interventions within the weight-management field generally suggests that they produce greater weight losses than controls in the short term, although the effect is small (Roche et al., 2019; Rogers et al., 2017). Moreover, these approaches yield large effects on improving eating behaviors and medium effects on reducing anxiety (Rogers et al., 2017). In particular, evidence suggests that ACT could be beneficial for individuals living in larger bodies wanting to manage their weight and/or experiencing psychological discomfort. A meta-analysis on the effect of third-wave therapies highlights that ACT is more effective than standard behavioral treatment (SBT) and no/minimal intervention, generating greater weight losses at posttreatment or 9-months post-baseline, respectively (Lawlor et al., 2020). Likewise, although the literature is scarce, ACT also appears promising for body image dissatisfaction and weight self-stigma (Griffiths et al., 2018). Moreover, evidence supports ACT for improving eating behaviors and quality of life while promoting a value-driven life and psychological flexibility (Yıldız, 2020).

In parallel, there is a current debate on how the approach to treating obesity can influence weight management outcomes. The predominant approaches developed for this purpose traditionally place weight as the principal determinant of health/disease and, therefore, focus on the person's weight, following a weight-normative view. However, the literature suggests that this approach can be ineffective and counterproductive (Tylka et al., 2014). On the other hand, the weight-inclusive perspective posits a broader understanding of what a person immersed in weight-related issues can be experiencing, which justifies the use of more well-being-centered treatment strategies (Hunger et al., 2020).

In this sense, two approaches to weight management have been developed within ACT (Lillis et al., 2020): acceptance-based behavioral treatment (ABT) and values-based healthy living (VHL). The former follows the traditional view, targeting weight loss as the primary treatment outcome by applying acceptance and clarifying healthy lifestyle-related values. The latter perspective considers that interventions pursuing weight loss as a default goal may paradoxically promote inflexibility (Lillis et al., 2020; Lillis & Kendra, 2014). It heightens the focus on values work, framing health behaviors within what a person genuinely values in life and considers weight loss as a valid goal only if it serves values-consistent living (Lillis et al., 2020). Studies examining VHL for individuals with BMIs in the overweight or obese range have found it to be effective in reducing psychological distress and weight-related stigma, as well as in improving quality of life and eating behaviors in the short term (Lillis et al., 2009; Palmeira et al., 2017). Besides, they have been shown to be effective for immediate weight reduction (Lillis et al., 2009; Palmeira et al., 2017). In this regard, a pilot randomized controlled trial (RCT) examining the efficacy of a treatment combining Health At Every Size® and ACT obtained benefits in terms of improving depression for large-bodied women (Berman et al., 2022). However, more studies examining the effectiveness of ACT-based interventions that move away from weight-normativity are needed.

This study aimed to examine the effect of an ACT and mindfulness-based group intervention aligned with the VHL view (Mind&Life intervention) on the impact of weight on quality of life of people with BMIs classified as overweight or obese post-intervention and at 6-month follow-up. This study also sought to explore its effect on weight self-stigma, general health, eating habits, physical activity, eating behaviors, and anthropometric, body composition, vascular, and biochemical outcomes post-intervention and at 6-month follow-up. In addition, the present trial aimed to analyze the effect of Mind&Life on several process measures. We hypothesized that individuals receiving Mind&Life intervention would show greater improvements in psychological, physical and process outcomes than those given treatment as usual (TAU) post-intervention and at 6-month follow-up.

2. Material and methods

Since a detailed description of the study protocol has already been published (Iturbe et al., 2021), a summary is provided below. This trial has been registered at ClinicalTrials.gov (identifier: NCT03718728), has the approval of the Ethics Committee of the Basque Health Service (protocol code: MAI-MIN-2018-01), and it was conducted according to the guidelines of the Declaration of Helsinki. All participants provided written consent before participating in this study.

2.1. Design and setting

This study is a RCT with two parallel groups. The control group received the TAU, and the experimental group was given the same TAU along with Mind&Life intervention. The study was conducted in four cohorts between 2018 and 2020 in the Faculty of Psychology of the University of the Basque Country (UPV/EHU), located in Donostia-San Sebastian (Spain).

2.2. Participants and procedures

Researchers informed doctors and nurses from the primary care units of Donostia-San Sebastian, of inclusion and exclusion criteria, who, on that basis, informed possible participants about the study. Those interested subsequently contacted researchers by phone who conducted a structured interview to make an initial screening. If they were found eligible, they were invited for a face-to-face interview to ensure they met criteria, including them as participants if they (1) had a BMI in the overweight or obese range, (2) were 18–70 years old, and (3) were looking for a weight management intervention. In contrast, they were excluded if (1) they were diagnosed with an eating disorder; (2) presented a mental illness or cognitive impairment that could preclude their participation; or (3) had a limited understanding of the language in which the intervention was to be delivered. Following an initial screening based on the established criteria, potential participants were invited to the evaluations, which were carried out in two different sessions. Immediately afterwards, participant randomization was conducted using a computerized random sequence generator (www.random.org). The participants were allocated to either condition and received the corresponding intervention for a subsequent 5-month period. To estimate sample size, a priori power analysis was conducted, which is detailed in the study protocol (Iturbe et al., 2021).

2.3. Interventions

2.3.1. Treatment as usual

The usual treatment intervention comprised five 30-min monthly individual sessions. A nutritionist delivered these sessions, based mainly on nutritional recommendations aligned with the Mediterranean diet and physical exercise advice. A non-restrictive approach was followed, as instead of promoting rigid goal setting or focusing on calorie-counting, participants were encouraged to eat a healthy diet of their own choice. All sessions followed a similar structure. First,

anthropometric measurements were taken; next, last month's food record was reviewed; and finally, the professional explained the session's main theme.

2.3.2. Mind&Life intervention

This intervention was based on ACT and mindfulness following a VHL perspective and consisted of 15 sessions, the first ten being weekly and the last five biweekly. Six monthly follow-up telephone calls were made to participants in this condition in the 6 months following the end of treatment to assess the degree to which they had introduced the acquired skills into their daily lives and to support them with any difficulties that may have arisen. Mind&Life sessions were conducted in groups of 12–15 participants by two psychologists trained in ACT and mindfulness. They lasted 2 hrs and followed the same structure: to begin with, a brief individual check of participants was carried out; next, participants did a mindfulness practice; and finally, psychologists focused on the content of the session, using metaphors and experiential exercises. Participants had to complete homework tasks between sessions.

Mind&Life promoted mindfulness practice in a central way, since one or two mindfulness practices were performed per session and participants were sent a mindfulness audio file after each session to practice. It is weight-neutral, as it focuses on promoting a healthy lifestyle based on values, rather than targeting weight loss. However, weight as well as other physical variables were measured in the study, with the aim of providing participants a therapeutic space where they could put ACT strategies in practice to manage possible discomfort related to weight fluctuations. The futility of pursuing weight loss if it was a means to experiential avoidance or was not clearly linked to their values was addressed in the first session, in order to shift from rigidly pursuing weight loss to values-based living. If participants referred to weight fluctuations during the intervention, attention was redirected to the level of congruence they had had with their values in getting to that outcome. Some deviations from protocol occurred, as two activities (i.e., 'throwing cards' exercise and 'computer screen' metaphor) could not be carried out due to lack of time. Further information about session components is provided in Table 5 in Appendix A.

2.4. Data collection

Assessments were performed at baseline, after treatment, and at 6-month follow-up. A nutritionist was in charge of measuring and collecting dietary-nutritional, anthropometric, and vascular parameters; and one of the psychologists was responsible for the evaluation of psychological variables. Biochemical data were analyzed at participants' primary care units. More detailed information concerning outcomes and measures can be found elsewhere (Iturbe et al., 2021), and an overview is displayed below. Some deviations from the protocol exist in relation to the assessments and measured variables. Certain variables that were not specified for evaluation have been measured in the study (e.g., muscle mass and visceral fat), while a variable that was planned to be assessed, finally could not be measured (i.e., insulin sensitivity). Likewise, it was decided to establish the impact of weight on quality of life as the only primary outcome, giving centrality to this variable. It should also be noted that due to the pandemic caused by the COVID-19, the 6-month follow-up assessment of the third cohort and the post-intervention and 6-month follow-up assessments of the fourth cohort could not be carried out in person but they were done from home.

2.4.1. Sociodemographic and obesity-related information

Information was collected on participants' gender, age, place of residence, average annual income of their neighborhood, obesity-related health complications, the existence or not of discomfort about their weight.

2.4.2. Primary outcomes and measures

Impact of weight on quality of life was measured using the Spanish version of the Impact of Weight on Quality of Life-Lite Questionnaire (IWQOL-Lite; Andrés et al., 2012) at the three assessments. It consists of 31 items that measure the impact of weight in different areas of life: physical function, self-esteem, sexual life, public distress and work; higher values indicating greater impact. Cronbach's Alpha values of 0.96 for the total score and 0.92, 0.94, 0.93, 0.91 and 0.77 for physical function, self-esteem, sexual life, public distress and work subscales respectively were obtained in this sample.

2.4.3. Secondary outcomes and measures

Self-devaluation and fear of enacted stigma components of weight self-stigma were measured with the Spanish version of the Weight Self-Stigma Questionnaire (S-WSSQ; Magallares et al., 2022) and general health status was measured using the Spanish version of the General Health Questionnaire-28 (GHQ-28; Lobo et al., 1986) at the three assessments. Eating habits were assessed by the 24-h recalls implemented at baseline and post-intervention and with the 14-item Mediterranean Diet Assessment Tool (Martínez-González et al., 2012) at the three assessment points. In addition, both the type and frequency of physical activity were measured using the Spanish short-form of the International Physical Activity Questionnaire (IPAQ; Craig et al., 2003), and emotional, external, and restrictive eating behaviors were evaluated using the Spanish version of the Dutch Eating Behavior Questionnaire (DEBQ; Cebolla et al., 2014) at each assessment point. Cronbach's Alphas of S-WSSQ-Self-Devaluation, S-WSSQ-Fear of Enacted Stigma, GHQ-28, DEBQ-Emotional Eating, DEBQ-External Eating, DEBQ-Restrained Eating scores in this sample were 0.77, 0.83, 0.93, 0.97, 0.85, and 0.85, respectively. Body mass index, body fat percentage, muscle mass, and visceral fat were estimated using the bioelectrical impedance analysis technique with a Tanita body composition monitor (Tanita Corporation, Tokyo, Japan) in all the evaluation sessions. Likewise, both before and after treatment and at 6-month follow-up, waist, and hip circumference were measured with an inelastic tape (Holtain, Crymych, UK). Blood pressure was obtained via a sphygmomanometer (Geratherm, Geschwenda, Germany). In addition, blood tests were administered before and after treatment to determine blood glucose level, lipid profile (i.e., total cholesterol, HDL cholesterol, LDL cholesterol, and triglycerides), and levels of gamma-glutamyl transferase (GGT), glutamic-oxaloacetic transaminase (GOT), and glutamate pyruvate transaminase (GPT) enzymes.

2.4.4. Process outcomes and measures

All process variables were measured at the three evaluation times. Experiential avoidance was measured using the Spanish version of the Acceptance and Action Questionnaire-II (AAQ-II; Ruiz et al., 2013), and weight-related experiential avoidance was assessed using the Spanish Acceptance and Action Questionnaire for Weight-Related Difficulties-Revised (AAQW-R; Iturbe et al., 2023). Mindfulness skills and self-compassion were estimated using the Spanish versions of the Five Facets Mindfulness Questionnaire (FFMQ; Cebolla et al., 2012) and the Self-Compassion Scale (SCS; García-Campayo et al., 2014), respectively. Finally, the fit between participants' values and actions was measured with the Spanish adaptation of the Valued Living Questionnaire (VLQ; Wilson & Groom, 2002), while the Spanish version of the Cognitive Fusion Questionnaire (CFQ; Romero-Moreno et al., 2014) was used to measure the participants' level of cognitive fusion. Cronbach's Alphas of AAQ-II, AAQW-R, FFMQ, SCS, CFQ scores in this sample were, 0.95, 0.88, 0.88, 0.87, and 0.96, respectively.

2.5. Data analysis

Analyses were performed with IBM SPSS Statistics (version 26.0). Skewness and kurtosis of the data were analyzed, revealing that the distribution was positively skewed and leptokurtic for some of the

variables. Outliers were detected by calculating standardized scores. Since they were not because of measurement or data entry errors, they were kept for the analyses, while sensitivity analyses were performed to assess their influence in estimates. ANOVAs and chi-square tests were conducted for quantitative and qualitative outcomes to analyze the equivalence of the groups at baseline. To compare the groups at post-treatment and at 6-month follow-up, completer and intent to treat analyses were conducted, using the multiple imputation method to handle missing data. An analysis of covariance (ANCOVA) was performed introducing as covariates those variables in which the groups differed at pretreatment and confounding variables such as gender, age, and annual income of the neighborhood where the participants lived, as they may influence the development of obesity or the associated consequences (Chu et al., 2019; Lakerveld et al., 2015). In addition, as some follow-up assessments coincided with the COVID-19 pandemic, the stage of the pandemic in which the measurements were taken was statistically controlled. Since the assumption of normality was violated for some of the variables, the bootstrapping method was used to conduct ANCOVA analyses to gain statistical control, as it decreases Type I error (Parra-Frutos, 2014). Partial eta squared was calculated for estimating effect sizes, where values of 0.01, 0.06, and 0.14 or higher indicated small, medium, and large effect sizes, respectively (Cohen, 1988). Statistical significance was established at $p < 0.05$.

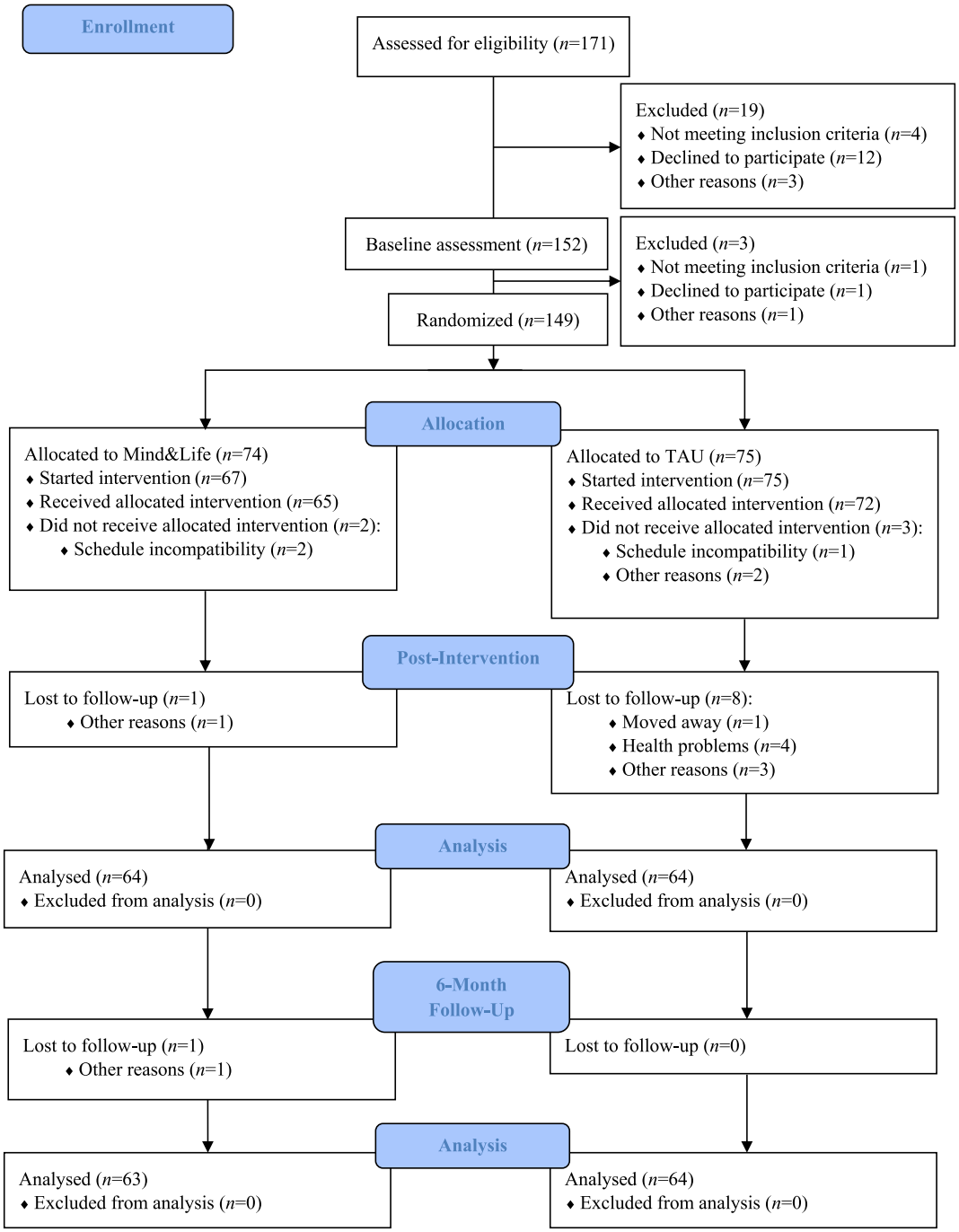

Figure SEQ Figure * ARABIC 1. CONSORT Flow Diagram.

3. Results

3.1. Preliminary analyses

The primary care units contacted 171 people to participate in the project of which 142 eventually began the intervention. While 128 participants completed post-intervention assessments, 127 were evaluated at 6-month follow-up (Fig. 1). No between-group differences were found in attrition [χ^2 (1, 142) = 2.83, p = 0.092]. Overall, participants withdrew from the study because of incompatibility with work schedules, health problems and moving from the city where the study was being conducted. Characteristics of those participants that started the intervention are displayed in Table 1. The lowest percentage of missing values at post-intervention was 9.9%, corresponding to IWQOL-Lite scores, while the highest was 62% related to GOT enzyme levels. At follow-up, the lowest percentage of missing values was 10.6% corresponding to BMI, while the highest was 19.7%, related to IPAQ scores. Information about the missing values of all study variables is presented in Table 6 in Appendix A.

3.2. Adherence

Overall, treatment adherence was very high, with a 92.6% treatment attendance rate for the entire sample. Participants attended 91.1% of the group and individual sessions in the experimental group, while the control group showed 93.9% attendance to the TAU sessions.

3.3. Within-group intervention effects

The effects of treatments within each condition at both evaluation points are shown in Tables 7 and 8 in Appendix A and summarized below.

3.3.1. Mind&Life and TAU

Mind&Life treatment along with TAU reduced the impact of weight on quality of life post-intervention and at 6-month follow-up. Further, they produced benefits on fear of enacted stigma, emotional and external eating, general health status, and adherence to the Mediterranean diet, which were maintained at follow-up. Mind&Life and TAU led to immediate decreases in the energy intake and all the macronutrients, as well as in blood glucose and GGT enzymes. It also generated reductions in BMI, body fat percentage, visceral fat, and waist and hip circumference at posttreatment, being maintained at follow-up. Improvements in all process variables, except for valued living, were observed in participants receiving Mind&Life and TAU at both assessment points. While Mind&Life participants augmented physical activity levels and valued living and decreased self-devaluation after treatment, they were not maintained at follow-up. Also, greater restrictive eating levels and reductions in muscle mass were observed both at posttreatment and at 6-month follow-up in participants from this condition. No change in waist-to-hip ratio, blood pressure, cholesterol, triglycerides, GOT and GPT enzymes were observed.

3.3.2. TAU

The TAU-only group had reductions in the impact of weight on quality of life after treatment and at 6-month follow-up. Participants also showed improvements that were maintained at follow-up in weight self-stigma dimensions, emotional and external eating, adherence to the Mediterranean diet, BMI, body fat percentage, waist and hip circumference, diastolic blood pressure, general experiential avoidance, and weight-related experiential avoidance. While benefits in waist-to-hip ratio, and systolic blood pressure were reported at posttreatment, they were not maintained at follow-up. Conversely, although no changes in general health status, visceral fat, self-compassion and cognitive fusion were observed after treatment, improvements were found at follow-up. Additionally, TAU reduced energy, lipid, carbohydrate, and sugar intake

Table 1
Sample characteristics at baseline (N = 142).

Variable	%/M	SD
Sociodemographic		
Female	69.7	–
Health prob.	88	–
Age	50.6	10.8
Income	24590.4	4165.9
Primary		
Impact of weight on quality of life		
IWQOL-T	75.1	24.3
Secondary		
Weight self-stigma		
S-WSSQ-SD	20.1	4.6
S-WSSQ-FES	14.8	4.7
General health		
GHQ-T	24.2	13.3
Dietary variables		
Mediterranean diet	7.5	2.1
Energy	1934.0	686.1
Proteins-T	91.1	33.8
A. proteins	66.7	30.7
V. proteins	23.9	10.4
Lipids	92.3	41.9
SFA	25.7	13.1
MFA	42.6	18.2
PFA	16.2	12.5
CH-T	174.8	71.5
Sugar	79.4	38.0
Physical activity		
IPAQ-T	2137.9	2631.4
Eating behaviors		
DEBQ-Em	40.3	14.5
DEBQ-Ext	32.2	6.9
DEBQ-Res	26.3	6.6
Anthropometric variables		
BMI	37.3	6.8
Waist	116.1	14.6
Hip	121.5	13.8
WHR	0.958	0.087
Body composition variables		
BF %	39.1	6.1
MM	58.7	11.9
VF	13.7	5.4
Vascular variables		
SBP	138.0	20.7
DBP	83.4	9.9
Biochemical variables		
Glc	109.6	28.5
TC	206.6	46.4
HDL-C	53.2	13.7
LDL-C	127.8	39.7
TR	137.0	83.1
GGT	35.9	41.6
GOT	22.8	11.1
GPT	29.8	23.2
Processes		
Experiential avoidance		
AAQ-II	24.1	10.7
Weight-related experiential avoidance		
AAQW-R-T	38.5	12.1
Mindfulness		
FFMQ-T	127.1	17.5
Self-compassion		
SCS-T	35.6	9.5
Valued living		
VLQ	53.2	15.9
Cognitive fusion		
CFQ	25.5	10.0

Note. AAQ-II = Acceptance and Action Questionnaire-II; AAQW-R-T = Acceptance and Action Questionnaire for Weight-related Difficulties-Revised-total; A. proteins = animal proteins; BF % = body fat percentage; BMI = body mass index; CFQ = Cognitive Fusion Questionnaire; CH-T = carbohydrates-total; DBP = diastolic blood pressure; DEBQ-Em = Dutch Eating Behavior Questionnaire-Emotional Eating; DEBQ-Ex = Dutch Eating Behavior Questionnaire-External Eating; DEBQ-Res = Dutch Eating Behavior Questionnaire-Restrictive Eating; FFMQ-T Five Facet Mindfulness Questionnaire-total; GGT = gamma-glutamyl

transferase; GHQ-T = General Health Questionnaire-total; Glc = glucose; GOT = glutamic-oxaloacetic transaminase; GPT = glutamate pyruvate transaminase; HDL-C = high-density lipoprotein cholesterol; Health prob. = health problems; IPAQ-T = International Physical Activity Questionnaire-total; IWQOL-T = Impact of Weight on Quality of Life-total; LDL-C = low-density lipoprotein cholesterol; MFA = monounsaturated fatty acids; MM = muscle mass; PFA = polyunsaturated fatty acids; SBP = systolic blood pressure; SCS-T = Self-Compassion Scale-total; SFA = saturated fatty acids; S-WSSQ-FES = Spanish version of the Weight Self-Stigma Questionnaire-Fear of Enacted Stigma; S-WSSQ-SD = Spanish version of the Weight Self-Stigma Questionnaire-Self-Devaluation; TC = total cholesterol; TR = triglycerides; VF = visceral fat; VLQ = Valued Living Questionnaire-total; V. proteins = vegetal proteins; WHR = waist-to-hip ratio. Bold values denote statistical significance at the $p < 0.05$ level.

at posttreatment. Whilst restrictive eating increased at both assessment points, no differences in physical activity, muscle mass, protein intake, biochemical variables, mindfulness skills, and valued life were noted in the TAU group.

3.4. Between-group intervention effects

3.4.1. Completer analyses

Treatment effects based on the completer principle and comparisons between groups at posttreatment and 6-month follow-up are detailed and displayed in Tables 2, 3 and 4.

Differences at posttreatment and follow-up. Mind&Life produced greater adherence to the Mediterranean diet and decreased external eating more than TAU at post-intervention and 6-month follow-up. Participants in the Mind&Life group showed greater decreases in BMI and visceral fat and greater weight loss percentages than the TAU group at both assessment points. Compared to TAU, the Mind&Life group obtained lower total scores on the total weight-related experiential avoidance scale at posttreatment and at 6-month follow-up.

Differences only at posttreatment. The Mind&Life group showed less total and animal protein intake and lower GPT enzyme levels than TAU after receiving treatment, while no follow-up assessment was conducted. Further, immediately after intervention, the Mind&Life participants showed greater mindfulness, self-compassion, and valued living levels than their TAU counterparts, whereas no differences were observed at 6-months.

Differences only at follow-up. Whilst there were no between-group differences at posttreatment, individuals receiving Mind&Life intervention showed less impact of weight on their quality of life and more restrictive eating at 6-month follow-up compared to the TAU group.

No differences. No between-group differences were observed in weight self-stigma dimensions, general health status, physical activity and emotional eating, remaining dietary variables, body fat percentage, muscle mass, waist and hip circumference, waist-to-hip ratio, vascular and remaining biochemical outcomes at both assessments. Likewise, general experiential avoidance and cognitive fusion levels did not differ among groups at any assessment point.

3.4.2. Intent to treat analyses

Intent to treat based analyses results are displayed in Table 9 in Appendix A and summarized below.

Intent to treat analyses showed similar results to those of completer with a few exceptions. Unlike completer analyses, intent to treat reported greater increases in self-compassion scores in the Mind&Life group at follow-up, while no differences between groups in total and animal protein intake and visceral fat at post-intervention and restrictive eating at follow-up.

3.5. Sensitivity analyses

Overall, similar results were found after excluding outliers. However, no differences between conditions in BMI were found at follow-up when extreme cases were removed [$F\,(1, 101) = 4.14$, $p = 0.069$, $\eta_p^2 = 0.039$], whereas greater decreases in this variable were reported in Mind&Life participants if outliers were included in the analyses.

4. Discussion

This study sought to examine the effectiveness of a group intervention based on ACT and mindfulness for individuals with BMIs categorized as overweight or obese. The Mind&Life intervention together with TAU generated greater improvements than the TAU in some key outcomes at post-intervention and follow-up. Specifically, the combined treatment was shown to be more effective than the TAU in the promotion of healthy dietary habits and the reduction of external eating, as well as maintaining these benefits throughout time. Besides, Mind&Life intervention was found to be effective for weight and visceral fat reduction over time. These findings may be related to the improvements that individuals who received the comprehensive treatment got in certain process variables. Concretely, weight-related experiential avoidance reduction might have contributed to weight decrease and maintenance, while this process in conjunction with immediate mindfulness and self-compassion improvements could have influenced eating behavior modification (Palmeira et al., 2019). However, it is noteworthy that effect sizes were reduced slightly at follow-up, so it is deemed

Table 2
Means, standard deviations, and one-way analyses of covariance in primary variables at baseline, post-intervention and 6-month follow-up.

Variable	Baseline					Post-intervention					6-month follow-up				
	M&L (n = 67)	TAU (n = 75)	F (df)	p	η^2	M&L (n = 64)	TAU (n = 64)	F (df)	p	η_p^2	M&L (n = 63)	TAU (n = 64)	F (df)	p	η_p^2
	M (SD)	M (SD)				M (SD)	M (SD)				M (SD)	M (SD)			
Impact of weight on quality of life															
IWQOL-T	80.2 (23.8)	70.6 (24.0)	**5.63 (140)**	**0.019**	**0.039**	60.8 (21.1)	65.2 (18.5)	2.34 (109)	0.172	0.021	59.2 (23.9)	68.1 (21.2)	**9.57 (108)**	**0.006**	**0.081**
IWQOL-PF	31.5 (9.5)	28.8 (9.9)	2.68 (140)	0.104	0.019	23.9 (8.6)	26.2 (8.3)	2.46 (109)	0.127	0.022	24.0 (9.8)	27.5 (9.0)	**8.14 (108)**	**0.033**	**0.049**
IWQOL-SE	21.7 (7.8)	19.1 (7.9)	**3.93 (140)**	**0.049**	**0.027**	15.6 (6.2)	17.1 (6.3)	2.33 (109)	0.212	0.021	15.3 (6.6)	17.5 (6.9)	**4.63 (108)**	**0.048**	**0.041**
IWQOL-SL	9.3 (4.6)	8.7 (4.7)	0.58 (140)	0.449	0.004	7.4 (3.7)	7.8 (3.5)	0.50 (109)	0.523	0.005	6.5 (4.1)	8.3 (3.7)	**7.02 (108)**	**0.016**	**0.061**
IWQOL-PD	10.6 (5.1)	7.9 (4.0)	**11.86 (140)**	**<0.001**	**0.078**	8.1 (4.3)	8.2 (2.9)	0.03 (109)	0.957	<0.001	8.0 (4.4)	8.0 (3.1)	0.02 (108)	0.973	<0.001
IWQOL-W	7.1 (3.2)	6.1 (3.0)	**4.07 (140)**	**0.046**	**0.028**	5.8 (3.0)	5.9 (1.9)	0.05 (109)	0.846	<0.001	5.7 (3.0)	5.5 (1.6)	0.31 (108)	0.642	0.003

Note. IWQOL-PD = Impact of Weight on Quality of Life-Public Distress; IWQOL-PF = Impact of Weight on Quality of Life-Physical Function; IWQOL-SE = Impact of Weight on Quality of Life-Self-Esteem; IWQOL-SL = Impact of Weight on Quality of Life-Sexual Life; IWQOL-T = Impact of Weight on Quality of Life-total; IWQOL-W = Impact of Weight on Quality of Life-Work; M&L = Mind&Life intervention; TAU = treatment as usual. Bold values denote statistical significance at the $p < 0.05$ level.

Table 3
Means, standard deviations, and one-way analyses of covariance in secondary variables at baseline, post-intervention and 6-month follow-up.

Variable	Baseline					Post-intervention					6-month follow-up				
	M&L ($n = 67$)	TAU ($n = 75$)	F (df)	p	η^2	M&L ($n = 64$)	TAU ($n = 64$)	F (df)	p	η_p^2	M&Life ($n = 63$)	TAU ($n = 64$)	F (df)	p	η_p^2
	M (SD)	M (SD)				M (SD)	M (SD)				M (SD)	M (SD)			
Weight self-stigma															
S-WSSQ-SD	19.6 (4.7)	20.6 (4.4)	1.48 (140)	0.226	0.010	17.5 (4.3)	18.9 (4.8)	2.24 (109)	0.180	0.020	18.1 (4.7)	19.6 (4.5)	2.84 (108)	0.081	0.026
S-WSSQ-FES	15.5 (4.9)	14.1 (4.5)	3.18 (140)	0.077	0.022	13.2 (4.2)	13.5 (4.5)	0.15 (109)	0.775	0.001	13.1 (4.5)	13.1 (4.5)	0.00 (108)	0.975	<0.001
General health															
GHQ-T	27.5 (14.5)	21.3 (11.5)	**8.10 (140)**	**0.005**	**0.055**	14.1 (10.1)	18.8 (11.4)	4.06 (109)	0.072	0.036	19.2 (14.6)	22.1 (11.8)	1.39 (108)	0.222	0.013
GHQ-SS	7.5 (5.1)	5.5 (3.5)	**7.40 (140)**	**0.007**	**0.050**	4.4 (4.1)	4.2 (3.9)	0.05 (109)	0.853	<0.001	5.4 (5.2)	5.8 (4.0)	0.27 (108)	0.605	0.002
GHQ-AI	7.8 (5.0)	6.5 (4.3)	3.06 (140)	0.083	0.021	4.4 (3.9)	5.8 (4.8)	2.33 (109)	0.181	0.021	5.4 (4.8)	6.2 (4.5)	0.81 (108)	0.383	0.007
GHQ-SoDys	9.0 (3.5)	7.6 (2.9)	**7.37 (140)**	**0.007**	**0.050**	4.7 (3.0)	7.5 (3.3)	**14.90 (109)**	**<0.001**	**0.120**	7.4 (4.3)	8.2 (3.5)	1.05 (108)	0.322	0.010
GHQ-SeDep	3.2 (4.1)	1.8 (3.6)	**4.84 (140)**	**0.030**	**0.033**	0.6 (1.8)	1.3 (2.2)	3.63 (109)	0.272	0.023	1.1 (2.9)	1.9 (2.5)	2.61 (108)	0.129	0.024
Dietary variables															
Mediterranean diet	7.5 (2.1)	7.4 (2.1)	0.04 (140)	0.839	0.000	9.3 (1.8)	7.8 (2.2)	**11.68 (109)**	**0.003**	**0.097**	9.3 (2.0)	7.9 (1.8)	**10.03 (108)**	**0.007**	**0.085**
Energy	1951.7 (720.0)	1918.1 (658.9)	0.08 (140)	0.772	0.001	1529.0 (456.5)	1619.9 (415.9)	1.01 (109)	0.325	0.009	–	–	–	–	–
Proteins-T	91.6 (31.5)	90.6 (36.0)	0.03 (140)	0.864	0.000	75.5 (23.5)	87.7 (25.0)	**5.73 (109)**	**0.025**	**0.050**	–	–	–	–	–
A. proteins	67.0 (27.6)	66.5 (33.4)	0.01 (140)	0.912	0.000	53.4 (22.2)	65.5 (25.0)	**5.46 (109)**	**0.014**	**0.048**	–	–	–	–	–
V. proteins	23.9 (10.8)	24.0 (10.0)	0.02 (140)	0.961	0.000	21.2 (8.3)	21.9 (8.9)	0.17 (109)	0.675	0.002	–	–	–	–	–
Lipids	97.1 (47.7)	88.0 (35.8)	1.67 (140)	0.198	0.012	70.3 (27.4)	77.1 (29.9)	1.42 (109)	0.255	0.013	–	–	–	–	–
SFA	25.4 (13.2)	25.9 (13.1)	0.05 (140)	0.831	0.000	17.3 (7.0)	19.4 (7.7)	1.70 (109)	0.222	0.015	–	–	–	–	–
MFA	44.5 (19.5)	40.9 (16.9)	1.39 (140)	0.241	0.010	33.8 (14.7)	37.2 (16.6)	1.18 (109)	0.333	0.011	–	–	–	–	–
PFA	18.9 (16.1)	13.8 (7.3)	**6.10 (140)**	**0.015**	**0.042**	12.8 (9.2)	13.9 (7.6)	0.39 (109)	0.523	0.004	–	–	–	–	–
CH-T	170.8 (73.6)	178.3 (69.9)	0.39 (140)	0.534	0.003	140.7 (45.3)	138.3 (39.4)	0.06 (109)	0.809	0.001	–	–	–	–	–
Sugar	78.3 (37.1)	80.4 (39.0)	0.11 (140)	0.743	0.001	69.7 (24.9)	62.1 (26.3)	1.63 (109)	0.237	0.015	–	–	–	–	–
Physical activity															
IPAQ-T	2068.6 (2734.6)	2199.7 (2552.7)	0.09 (140)	0.768	0.001	3244.7 (3419.5)	2697.1 (2890.9)	0.51 (109)	0.539	0.005	2514.3 (2802.1)	2755.7 (2643.4)	0.16 (108)	0.500	0.001
IPAQ-V	552.8 (1482.9)	382.0 (925.1)	0.69 (140)	0.406	0.005	1078.7 (2087.0)	1151.5 (1732.4)	0.03 (109)	0.889	<0.001	691.1 (1320.2)	704.4 (1340.3)	0.00 (108)	0.969	<0.001
IPAQ-M	610.7 (1274.1)	437.2 (902.9)	0.89 (140)	0.347	0.006	739.0 (1436.8)	573.6 (1359.6)	0.25 (109)	0.704	0.002	646.6 (1557.6)	739.1 (1041.1)	0.11 (108)	0.741	0.001
IPAQ-W	926.0 (974.4)	1362.0 (1812.4)	3.08 (140)	0.081	0.022	1425.4 (1448.7)	1002.0 (1488.0)	1.55 (109)	0.157	0.014	1180.3 (1212.6)	1303.2 (1814.9)	0.13 (108)	0.776	0.001
IPAQ-S	2608.5 (1639.5)	2296.2 (1620.2)	1.30 (140)	0.256	0.009	2304.0 (1447.2)	2147.9 (1712.8)	0.19 (109)	0.626	0.002	1967.8 (1449.2)	1967.5 (1084.9)	0.00 (108)	0.998	<0.001
Eating behaviors															
DEBQ-Em	43.8 (14.1)	37.2 (14.1)	**7.66 (140)**	**0.006**	**0.052**	30.8 (11.6)	35.0 (12.1)	4.03 (109)	0.109	0.036	34.5 (12.0)	36.4 (12.9)	0.91 (108)	0.399	0.008
DEBQ-Ext	32.9 (7.0)	31.5 (6.9)	1.63 (140)	0.204	0.011	25.1 (6.3)	28.8 (5.5)	**9.88 (109)**	**0.009**	**0.083**	27.7 (6.4)	30.2 (6.1)	**4.04 (108)**	**0.048**	**0.036**
DEBQ-Res	26.8 (6.1)	25.7 (7.0)	0.99 (140)	0.322	0.007	31.0 (6.5)	28.4 (5.6)	3.75 (109)	0.097	0.033	30.2 (6.7)	27.2 (5.9)	**5.06 (108)**	**0.021**	**0.045**
Anthropometric variables															
BMI	39.3 (7.5)	35.6 (5.7)	**11.20 (140)**	**0.001**	**0.074**	34.9 (7.7)	36.1 (5.4)	**5.23 (109)**	**0.016**	**0.046**	35.2 (8.4)	36.5 (5.5)	**5.65 (108)**	**0.027**	**0.050**
Weight change %	–	–	–	–	–	−6.7 (5.3)	−3.4 (5.2)	**7.56 (109)**	**0.012**	**0.065**	−5.5 (7.6)	−1.9 (5.1)	**6.48 (108)**	**0.019**	**0.057**
Waist	120.2 (15.0)	112.6 (13.2)	**10.30 (140)**	**0.002**	**0.069**	109.2 (16.6)	110.6 (15.1)	0.59 (109)	0.423	0.005	112.1 (16.5)	114.1 (14.5)	1.59 (108)	0.227	0.015
Hip	125.0 (15.2)	118.4 (11.7)	**8.56 (140)**	**0.004**	**0.058**	116.0 (10.9)	117.0 (10.8)	0.64 (109)	0.311	0.006	118.9 (16.3)	119.7 (10.5)	0.52 (108)	0.447	0.005
WHR	0.964 (0.081)	0.953 (0.092)	0.57 (140)	0.451	0.004	0.946 (0.104)	0.945 (0.098)	0.03 (109)	0.959	<0.001	0.946 (0.088)	0.953 (0.087)	0.27 (108)	0.608	0.002
Body composition variables															
BF %	40.6 (5.5)	37.7 (6.2)	**8.61 (140)**	**0.004**	**0.058**	35.8 (6.8)	37.3 (7.7)	1.92 (109)	0.124	0.017	36.3 (6.6)	37.5 (6.5)	2.78 (108)	0.105	0.025
MM	60.1 (11.6)	57.4 (12.2)	1.81 (140)	0.181	0.013	57.4 (11.0)	58.6 (12.8)	1.26 (109)	0.249	0.011	57.6 (11.6)	58.6 (12.5)	1.49 (108)	0.260	0.014

(*continued on next page*)

Table 3 (*continued*)

Variable	Baseline					Post-intervention					6-month follow-up				
	M&L ($n = 67$)	TAU ($n = 75$)	*F* (df)	*p*	η^2	M&L ($n = 64$)	TAU ($n = 64$)	*F* (df)	*p*	η_p^2	M&Life ($n = 63$)	TAU ($n = 64$)	*F* (df)	*p*	η_p^2
	M (SD)	M (SD)				M (SD)	M (SD)				M (SD)	M (SD)			
VF	14.3 (5.6)	13.2 (5.1)	1.49 (140)	0.224	0.011	11.9 (5.2)	13.4 (5.7)	**5.48 (109)**	**0.015**	**0.048**	12.2 (5.8)	13.5 (5.3)	**7.00 (108)**	**0.021**	**0.061**
Vascular variables															
SBP	136.2 (21.3)	139.6 (20.2)	0.98 (140)	0.324	0.007	129.2 (17.1)	127.3 (19.6)	0.25 (109)	0.566	0.002	133.7 (22.6)	136.6 (20.0)	0.41 (108)	0.498	0.004
DBP	81.7 (10.3)	85.0 (9.3)	**4.16 (140)**	**0.043**	**0.029**	80.4 (11.2)	78.8 (13.8)	0.40 (109)	0.466	0.004	82.1 (10.8)	80.6 (10.5)	0.49 (108)	0.506	0.004
Biochemical variables															
Glc	111.3 (22.1)	108.0 (33.2)	0.47 (140)	0.493	0.003	102.3 (18.6)	112.4 (45.9)	1.46 (109)	0.215	0.013	–	–	–	–	–
TC	211.2 (46.0)	202.5 (46.7)	1.25 (140)	0.266	0.009	199.7 (51.1)	214.1 (66.9)	1.17 (109)	0.275	0.011	–	–	–	–	–
HDL-C	52.9 (13.8)	53.5 (13.7)	0.08 (140)	0.783	0.001	54.9 (14.5)	54.6 (17.1)	0.01 (109)	0.938	<0.001	–	–	–	–	–
LDL-C	121.7 (39.0)	133.2 (39.7)	3.00 (140)	0.085	0.021	120.5 (46.7)	130.5 (56.3)	0.70 (109)	0.372	0.006	–	–	–	–	–
TR	144.9 (76.4)	130.0 (88.6)	1.27 (140)	0.290	0.008	123.4 (73.8)	127.4 (63.5)	0.07 (109)	0.773	0.001	–	–	–	–	–
GGT	37.4 (47.0)	34.4 (36.3)	0.18 (140)	0.670	0.001	26.2 (31.7)	36.8 (32.0)	2.14 (109)	0.174	0.019	–	–	–	–	–
GOT	22.7 (12.1)	22.9 (10.3)	0.02 (140)	0.897	0.000	24.5 (14.1)	27.3 (21.2)	0.55 (109)	0.474	0.005	–	–	–	–	–
GPT	30.3 (22.4)	29.5 (24.0)	0.04 (140)	0.837	0.000	21.2 (18.7)	33.3 (22.6)	**7.11 (109)**	**0.023**	**0.061**	–	–	–	–	–

Note. A. proteins = animal proteins; BF % = body fat percentage; BMI = body mass index; CH-T = carbohydrates-total; DBP = diastolic blood pressure; DEBQ-Em = Dutch Eating Behavior Questionnaire-Emotional Eating; DEBQ-Ex = Dutch Eating Behavior Questionnaire-External Eating; DEBQ-Res = Dutch Eating Behavior Questionnaire-Restrictive Eating; GGT = gamma-glutamyl transferase; GHQ-AI = General Health Questionnaire-Anxiety and Insomnia; GHQ-SeDep = General Health Questionnaire-Severe Depression; GHQ-SoDys = General Health Questionnaire-Social Dysfunction; GHQ-SS = General Health Questionnaire-Somatic Symptoms; GHQ-T = General Health Questionnaire-total; Glc = glucose; GOT = glutamic-oxaloacetic transaminase; GPT = glutamate pyruvate transaminase; HDL-C = high-density lipoprotein cholesterol; IPAQ-M = International Physical Activity Questionnaire-moderate; IPAQ-S = International Physical Activity Questionnaire-sitting; IPAQ-T = International Physical Activity Questionnaire-total; IPAQ-V = International Physical Activity Questionnaire-vigorous; IPAQ-W= International Physical Activity Questionnaire-walking; LDL-C = low-density lipoprotein cholesterol; MFA = monounsaturated fatty acids; MM = muscle mass; M&L = Mind&Life intervention; PFA = polyunsaturated fatty acids; SBP = systolic blood pressure; SFA = saturated fatty acids; S-WSSQ-FES = Spanish version of the Weight Self-Stigma Questionnaire-Fear of Enacted Stigma; S-WSSQ-SD = Spanish version of the Weight Self-Stigma Questionnaire-Self-Devaluation; TAU = treatment as usual; TC = total cholesterol; TR = triglycerides; VF = visceral fat; V. proteins = vegetal proteins; WHR = waist-to-hip ratio. Bold values denote statistical significance at the $p < 0.05$ level.

important to assess the trend of these outcomes over time.

Similar results have been found in some other studies examining the effects of ACT either in online or workshop format compared to no intervention, as ACT was effective in producing and maintaining benefits in terms of dietary patterns or weight loss (Levin et al., 2021; Lillis et al., 2021). In this vein, Palmeira et al. (2017) analyzed the effectiveness of a treatment with similar characteristics to Mind&Life relative to TAU and obtained comparable results, although whether these benefits were maintained over time was not examined. To our knowledge, there are no other studies to date that show that ACT both promotes and maintains such beneficial results for healthy dietary habits, eating behavior modification, or weight management compared to usual or behavioral treatments (Afari et al., 2019; Forman et al., 2013; Lillis et al., 2016, 2021), which could be influenced by the brevity of the treatment (Afari et al., 2019; Lillis et al., 2021) or the fact that they had weight loss as the primary target of intervention (Forman et al., 2013; Lillis et al., 2016). Furthermore, although the comprehensive intervention did not immediately stand out over the TAU on some other issues, its greater impact was noticeable over time. While both treatments reduced the impact of weight on quality of life after treatment, the comprehensive approach was more effective than TAU in cushioning weight's potential adverse effects on quality of life at 6-month follow-up. Whereas the instant improvement of all subjects' impact of weight on quality of life might be associated to the weight loss individuals in both conditions experienced during treatment (Kolotkin, Crosby, Williams, et al., 2001), the over-time benefits for individuals receiving ACT might have been influenced by their weight-related experiential avoidance reduction and immediate mindfulness increase, being key processes addressed in ACT that mediate quality of life enhancement of people living in larger bodies (Palmeira et al., 2019). Another study that also explored the effect of an ACT intervention aimed at well-being enhancement obtained comparable results (Weineland et al., 2012). In contrast, two studies did not find such positive results for quality of life, which could be explained by their intervention primary target being either weight loss or eating behavior modification rather than well-being promotion (Afari et al., 2019; Forman et al., 2013).

Additionally, both groups increased restrained eating levels after the intervention, whereas the comprehensive intervention participants showed greater increases throughout time when considering study completers, contrary to expectations. However, analyses simulating real world practice, didn't report such differences in line with previous controlled studies (Afari et al., 2019; Frayn et al., 2020). It is hypothesized that this result is derived from the TAU they all received. Not having explicitly addressed the harm of restriction and having weighted participants might have unintentionally encouraged them to pursue a specific weight, for which they might have resorted to restriction. Considering this, the greater increase in restrained eating among Mind&Life participants at follow-up may reflect its effectiveness in providing participants with strategies to better achieve their goals, although, in this case, restrictive patterns for losing weight were reinforced inadvertently, which may have adverse effects (Wellman et al., 2018). Therefore, future studies should re-examine the effect of the Mind&Life intervention in conjunction with a TAU that does not measure weight and addresses the harm of restriction, while promoting intuitive eating, considering that it is not enough to simply not providing restrictive guidelines, but to actively working on a non-diet, weight--inclusive eating style.

The comprehensive intervention did not provide additional benefits over the TAU in some other outcomes. In particular, both interventions yielded similar improvements in weight self-stigma and general health status. To better understand these findings, it should be noted that some assessments of this trial coincided with the COVID-19 pandemic. Although this unusual situation impacted the entire population to some extent, it may have particularly affected this population, as they were deemed to be vulnerable to suffer health complications due to the coronavirus disease (Singh et al., 2022). Indeed, studies suggest that

Table 4
Means, standard deviations, and one-way analyses of covariance in process variables at baseline, post-intervention and 6-month follow-up.

Variable	Baseline					Post-intervention					6-month follow-up				
	M&L (n = 67)	TAU (n = 75)	F (df)	p	η^2	M&L (n = 64)	TAU (n = 64)	F (df)	p	η^2_p	M&L (n = 63)	TAU (n = 64)	F (df)	p	η^2_p
	M (SD)	M (SD)				M (SD)	M (SD)				M (SD)	M (SD)			
Experiential avoidance															
AAQ-II	26.6 (10.5)	21.9 (10.5)	**7.08 (140)**	**0.009**	**0.048**	19.6 (7.9)	20.8 (9.0)	0.90 (109)	0.304	0.008	18.7 (9.0)	20.0 (10.3)	0.94 (108)	0.311	0.009
Weight-related experiential avoidance															
AAQW-R-T	40.4 (12.2)	36.8 (11.9)	3.28 (141)	0.072	0.023	28.1 (10.6)	33.1 (11.5)	**5.79 (109)**	**0.023**	**0.050**	28.6 (10.3)	33.8 (12.9)	**6.09 (108)**	**0.024**	**0.053**
AAQW-R-FC	14.0 (4.6)	13.4 (4.5)	0.57 (140)	0.451	0.004	8.9 (4.2)	11.3 (4.7)	**7.04 (109)**	**0.030**	**0.061**	9.0 (3.7)	11.1 (5.0)	**6.28 (108)**	**0.030**	**0.055**
AAQW-R-WB	13.5 (4.2)	12.7 (4.4)	1.19 (141)	0.277	0.008	11.0 (4.3)	10.9 (4.2)	0.01 (109)	0.923	<0.001	10.3 (4.2)	12.1 (5.2)	4.06 (108)	0.053	0.036
AAQW-R-WS	13.0 (5.1)	10.7 (5.2)	**6.92 (140)**	**0.009**	**0.047**	8.2 (3.8)	11.0 (4.4)	**12.68 (109)**	**0.004**	**0.104**	9.2 (4.4)	10.6 (5.0)	2.38 (108)	0.166	0.022
Mindfulness															
FFMQ-T	124.5 (17.4)	129.4 (17.4)	2.86 (140)	0.093	0.020	140.2 (19.7)	127.1 (19.6)	**9.89 (109)**	**0.003**	**0.083**	136.0 (21.7)	129.3 (23.9)	2.03 (108)	0.142	0.018
FFMQ-O	24.8 (5.1)	24.7 (4.6)	0.02 (140)	0.877	0.000	28.9 (5.1)	24.4 (4.9)	**16.13 (109)**	**<0.001**	**0.129**	27.9 (5.5)	23.7 (5.8)	**12.71 (108)**	**<0.001**	**0.105**
FFMQ-D	24.7 (4.8)	27.3 (6.3)	0.00 (140)	0.983	0.000	29.9 (6.1)	26.7 (7.0)	**5.10 (109)**	**0.047**	**0.045**	29.4 (6.9)	27.8 (8.0)	1.05 (108)	0.320	0.010
FFMQ-AA	27.2 (6.0)	28.0 (6.6)	0.51 (140)	0.475	0.004	28.7 (5.3)	27.4 (7.6)	1.02 (109)	0.298	0.009	28.1 (6.1)	27.9 (7.3)	0.02 (108)	0.876	<0.001
FFMQ-NJ	25.0 (6.7)	28.6 (5.4)	**11.97 (140)**	**<0.001**	**0.079**	29.2 (6.0)	27.9 (6.3)	1.00 (109)	0.326	0.009	28.2 (5.4)	28.7 (7.1)	0.18 (108)	0.636	0.002
FFMQ-NR	20.1 (4.3)	20.9 (4.3)	1.28 (140)	0.260	0.009	23.6 (4.0)	20.7 (4.6)	**8.44 (109)**	**0.004**	**0.072**	22.4 (4.4)	21.2 (4.7)	1.74 (108)	0.155	0.016
Self-compassion															
SCS-T	32.5 (9.1)	38.4 (9.1)	**15.44 (140)**	**<0.001**	**0.099**	42.4 (7.3)	37.5 (8.6)	**10.70 (109)**	**<0.001**	**0.089**	41.1 (8.2)	38.2 (10.6)	3.04 (108)	0.067	0.027
SCS-SK-SJ	9.8 (3.3)	12.5 (3.6)	**21.52 (140)**	**<0.001**	**0.133**	13.2 (2.7)	11.7 (3.4)	**5.52 (109)**	**0.022**	**0.048**	13.2 (2.7)	11.8 (3.7)	**5.59 (108)**	**0.014**	**0.049**
SCS-CH-I	10.8 (3.3)	12.6 (3.1)	**11.11 (140)**	**0.001**	**0.073**	14.2 (2.7)	12.6 (2.8)	**7.70 (109)**	**0.009**	**0.066**	13.3 (3.8)	12.8 (4.1)	0.48 (108)	0.500	0.004
SCS-M-OI	11.8 (3.6)	13.3 (3.7)	**6.02 (140)**	**0.015**	**0.041**	15.1 (3.1)	13.2 (3.8)	**8.12 (109)**	**0.003**	**0.069**	14.6 (3.3)	13.6 (4.2)	2.22 (108)	0.133	0.020
Valued living															
VLQ	49.5 (15.9)	56.5 (15.2)	**7.18 (140)**	**0.008**	**0.049**	61.0 (15.3)	53.0 (15.9)	**7.85 (109)**	**0.008**	**0.067**	55.4 (19.4)	52.2 (18.1)	0.86 (108)	0.335	0.008
Cognitive fusion															
CFQ	28.1 (9.9)	23.2 (9.7)	**8.80 (140)**	**0.004**	**0.059**	20.6 (7.8)	22.8 (9.9)	1.84 (109)	0.151	0.017	21.5 (7.3)	22.6 (10.7)	0.60 (108)	0.396	0.005

Note. AAQ-II = Acceptance and Action Questionnaire-II; AAQW-R-FC = Acceptance and Action Questionnaire for Weight-Related Difficulties-Revised-Food as Control; AAQW-R-T = Acceptance and Action Questionnaire for Weight-Related Difficulties-Revised-total; AAQW-R-WB = Acceptance and Action Questionnaire for Weight-Related Difficulties-Revised-Weight as Barrier; AAQW-R-WS = Acceptance and Action Questionnaire for Weight-Related Difficulties-Revised-Weight Stigma; CFQ = Cognitive Fusion Questionnaire; FFMQ-AA = Five Facet Mindfulness Questionnaire-Acting with Awareness; FFMQ-D = Five Facet Mindfulness Questionnaire-Describing; FFMQ-NJ = Five Facet Mindfulness Questionnaire-Non-Judging of Inner Experience; FFMQ-NR = Five Facet Mindfulness Questionnaire-Non-Reactivity to Inner Experience; FFMQ-O = Five Facet Mindfulness Questionnaire-Observing; FFMQ-T = Five Facet Mindfulness Questionnaire-total; M&L = Mind&Life intervention; SCS-CH-I = Self-Compassion Scale-Common Humanity-Isolation; SCS-M-OI = Self-Compassion Scale-mindfulness-Over-Identification; SCS-SK-SJ = Self-Compassion Scale-Self-Kindness-Self-Judgment; SCS-T = Self-Compassion Scale-total; TAU = treatment as usual; VLQ = Valued Living Questionnaire. Bold values denote statistical significance at the $p < 0.05$ level.

people with obesity in the past or present experienced an increase in psychological distress throughout the pandemic (Sisto et al., 2021), which may have been derived from perceiving weight-related stigma increased in the media during this period (Jones et al., 2022). Therefore, it can be inferred that the impact of the pandemic may have indifferently affected participants in both conditions, diluting the potential effect of the treatments received, especially on psychological distress and weight self-stigma. Conversely, the studies conducted so far have supported ACT in this respect (Levin et al., 2021; Palmeira et al., 2017), concluding that, as they were carried out before the pandemic, they captured the potential effect of the treatment in this respect.

Additionally, both treatments generated similar decreases in emotional eating post-intervention and at 6-month follow-up. These results could derive from measurement issues, considering that the items of the Emotional Eating subscale of the DEBQ refer to the desire to eat rather than to acting on it, whereas ACT aims to modify behaviors, regardless of the presence of private events. Therefore, it can be deduced that the instrument may not have been the most suitable for capturing this potential improvement in emotional eating. Other RCTs using the same instrument have obtained consistent findings (Afari et al., 2019; Frayn et al., 2020). Conversely, Palmeira et al. (2017) and Levin et al. (2021) demonstrated the effectiveness of ACT for decreasing emotional eating after treatment. They used the Three-Factor Eating Questionnaire (TFEQ; Stunkard & Messick, 1985), whose emotional eating-related items refer to the action of eating derived from an emotional state, instead of measuring the willingness to eat. Further, neither intervention was effective for physical activity enhancement, in agreement with previous research (Butryn et al., 2017; Levin et al., 2021). This may be

because participants did not receive a treatment that was specifically designed to promote physical activity, rather having addressed this issue transversally.

Overall, the addition of Mind&Life to TAU has proven beneficial in cushioning the impact of weight on quality of life, being crucial given the substantial body of evidence showing the negative impact obesity can have on people's well-being (Sarwer & Steffen, 2015). Likewise, the reduction of the tendency to eat in response to environmental food cues brought by the comprehensive treatment seems essential, as it might contribute on addressing emotional eating and modifying food intake effectively (van Strien et al., 2020), while it is key for weight loss maintenance (Young et al., 2021). Additionally, literature indicates that the improvement on dietary habits and reduction of weight and visceral fat lead by the comprehensive approach could have a protective effect against Type 2 diabetes and metabolic risk factors (Carr et al., 2004; Schröder, 2007). However, considering that the main challenge of obesity treatment is usually the integration of new habits acquired after treatment into daily life and their sustainability throughout time, it is vitally important to analyze whether these results are maintained also in the long term.

4.1. Study limitations and strengths

One of the main limitations of this study may be the baseline differences between the groups in some variables, which, even having controlled statistically, may have influenced the results. Additionally, the fact that multiple tests have been performed is more consistent with exploratory studies than RCTs, considering a limitation of the present study. Further, aiming to be similar to the standard obesity treatment of primary care units in this context, TAU differed in intensity and format to Mind&Life treatment. Thus, regardless of the type of intervention they underwent, having received a treatment with more sessions and longer duration may have positively influenced Mind&Life participants' outcomes. Physical variables such as weight were measured with the intention of providing participants with a safe space to learn how to manage weight stigma-related discomfort. However, there was no specific session that addressed weight stigma from a social perspective, thus running the risk of participants taking responsibility for the discomfort they may experience on an individual level. It is also worth mentioning that having a BMI categorized as overweight and being in search of treatment was established as a criterion for participation in this study, as indicator of weight-related discomfort. However, setting the impact of weight on quality of life as inclusion criterion would have been more specific. Further, the fact that participants were treatment-seeking might indicate that they already had an initial motivation for change that may have favored the results. Finally, some of the posttreatment and follow-up assessments of certain trial cohorts coincided with the COVID-19 pandemic, which may have negatively impacted these participants' outcomes and data collection, especially biochemical data, as they were collected in primary care units, which were swamped at that period.

One of the strengths of the Mind&Life study is that it has addressed the need to assess the effect of ACT following the VHL framework for treating the overall distress experienced by people living in larger bodies, which is promising for tackling weight-related matters (Hunger et al., 2020). In addition, it is important to emphasize the variety of outcomes that have been evaluated, given the multidisciplinary origin and the varied consequences that a problem as complex as obesity can entail. Importantly, it is worth highlighting the ecological validity of this trial, since participants were those who attended primary care units requiring treatment for weight management. In this sense, it is also noteworthy that it has been compared with the usual treatment routinely applied in this context. In addition, regardless the intensity of the intervention, participants' elevated attendance and retention rates are remarkable, which may be an indicator of acceptability by participants. Furthermore, being an intervention delivered in group format, it is beneficial in terms of time and cost-effectiveness.

5. Conclusions

Combining Mind&Life intervention with usual treatment may benefit people with BMIs classified as overweight or obese seeking treatment by bringing about improvements in their psychological and physical well-being. Specifically, combining ACT and mindfulness-based treatment with TAU was beneficial for individuals' weight-related quality of life promotion over time. Also, the comprehensive treatment generated beneficial effects on dietary habits, external eating, and weight and body composition variables post-intervention and at 6-month follow-up. However, Mind&Life intervention completers showed greater restrictive eating patterns throughout time than those receiving standard treatment. Finally, the psychological treatment did not lead to additional benefits for weight self-stigma, emotional eating, and general health status, while it did not result effective for physical activity enhancement. Therefore, despite the fact that the treatment may still bring further benefits and more research is required, this comprehensive proposal could be implemented in primary care units in the future to provide individuals facing obesity-related distress with a multidisciplinary support strategy centered on promoting a more fulfilling and healthier life.

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Idoia Iturbe: Writing – review & editing, Writing – original draft, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Conceptualization. **Iratxe Urkia-Susin:** Writing – review & editing, Investigation, Formal analysis. **Enrique Echeburúa:** Writing – review & editing, Supervision, Resources, Project administration, Funding acquisition, Conceptualization. **Ane Miren Barbón:** Writing – review & editing, Investigation. **Edurne Maiz:** Writing – review & editing, Visualization, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Data curation, Conceptualization.

Declaration of competing interest

None.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jcbs.2024.100827.

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