



Facultad de Estudios Superiores  
**IZTACALA**

# Psychological Emotion-Based Interventions for the Treatment Of Eating Behaviors in Obesity: State of the Art and Future Directions.

## *Intervenciones psicológicas basadas en la emoción para el tratamiento de las conductas alimentarias en la obesidad: estado del arte y direcciones futuras.*

Erin Yaqueline Tovar Garza<sup>1,2</sup>, Felipe de Jesús Díaz Reséndiz<sup>1,2</sup>, Elba Mirella Arredondo Urtiz<sup>1,2</sup>,  
Vanessa Monserrat Vázquez Vázquez<sup>1</sup>

<sup>1</sup> Doctorado en Psicología con Orientación en Calidad de Vida y Salud; Departamento de Promoción, Preservación y Desarrollo de la Salud; Centro Universitario de Sur; Universidad de Guadalajara,

<sup>2</sup> Laboratorio de Análisis Conductual; Departamento de Promoción, Preservación y Desarrollo de la Salud; Centro Universitario de Sur; Universidad de Guadalajara

**Recibido:** 2022-04-12

**Revisado:** 2022-05-22

**Aceptado:** 2022-08-11

**Corresponding author:** felipe.resendiz@cusur.udg.mx (F.J. Díaz-Reséndiz)

**Acknowledgments:** The first author of this work was supported by the Postgraduate Scholarship Program of CONACyT Scholarship No. 858258

**Disclosure of interest:** The authors reported no potential conflict of interest.

**Abstract** The link between obesity and the emotional factor has been widely studied, however, obesity treatment, including psychological, keep focusing on weight loss when it should be focusing on psychological factors like emotional regulation. Literature regarding psychological emotion-based interventions for obesity keeps growing exponentially and getting difficult to handle so it's convenient for students, professionals, and researchers in the field to have the relevant literature summarized. For that reason, this literature review compiles the main emotion-based interventions in obesity over the last 10 years. The information from 21 articles is synthetically presented, analyzed, and discussed on the

basis of 3 topics: 1) Intervention approaches, 2) Outcome variables and 3) Future lines of research. Seven main intervention approaches were identified. Regarding the outcome variables, it is shown that changes occur mainly in eating behaviors and not in weight loss. For future lines of research, the authors suggested implementing experimental designs, as well as improving the clarity of the construct, measurements, and follow-up mechanisms.

**Key Words:** psychological interventions, emotional factors, eating behaviors, obesity.

**Resumen** El vínculo entre la obesidad y los factores emocionales ha sido ampliamente estudiado, sin embargo, los tratamientos para esta condición, incluyendo el psicológico, siguen centrándose en la pérdida de peso cuando en cambio debería centrarse en factores psicológicos como la regulación emocional. La literatura sobre las intervenciones psicológicas basadas en la emoción para la obesidad sigue creciendo exponencialmente y se vuelve difícil de manejar, por lo que es conveniente para los estudiantes, profesionales e investigadores en el campo contar con una síntesis de literatura al respecto. Por ello, esta revisión bibliográfica recopila las principales intervenciones basadas en emociones en obesidad de los últimos 10 años. La información de 21 artículos se presenta, analiza y discute sintéticamente a partir de 3 temas: 1) Enfoques de intervención, 2) Variables de resultado y 3) Líneas futuras de investigación. Se identificaron siete enfoques principales de intervención. En cuanto a las variables de resultado se muestra que los cambios ocurren principalmente en las conductas alimentarias y no en la pérdida de peso. Para futuras líneas de investigación, los autores sugirieron implementar diseños experimentales, así como mejorar la claridad del constructo, las medidas y los mecanismos de seguimiento.

**Palabras clave:** intervenciones psicológicas, factores emocionales, conducta alimentaria, obesidad.

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## Introduction

The obesity treatment has mostly focused on restricting consumed calories and increasing the number of calories burned. The effectiveness of this type of treatment is quite controversial and past authors have already spoken against them showing that since almost a century ago it could be inferred that restricting calories can cause overconsumption. For instance, papers like the Letter on Corpulence from Banting (1863) mentioned that restrictive diets and intense physical exercise can increase appetite; experiments like the Minnesota starvation study in 1945 (Kalm & Semba, 2005) showed the dangers of restricting calories and how it causes loss of appetite control and extreme overeating.

Psychological interventions for obesity should be focusing on psychological factors but recent

literature has shown that most of them are focusing on physiological factors that follow the goal of losing weight (e.g., healthy weight, dietary goals). Some interventions have focused on losing weight as a goal and have shown success (e.g., Balciuniene, 2021; Dalle et al., 2020; Sainsbury et al, 2019). However, some others have the same limitations mentioned above not producing significant changes in weight loss and increasing the tendency to overeat (e.g., Lo et al., 2021; Shriver et al., 2021; Wolz et al., 2021; Dochat et al., 2019).

Authors like Shriver et al. (2021), Wolz et al. (2021), and Andrei et al (2018) have discussed the subject that treatments aiming mainly at losing weight can be an oversimplification of a complex problem that have psychological factors that need to be considered. One of them is the emotional factor. A growing body of literature shows that individuals suffering from obesity

tend to exhibit maladaptive eating behaviors related to overeating as a way of dealing with emotions: For example, since 1951 authors like Hamburguer (1951) discovered that most of the overeating in obesity was induced by an underlying emotional need, Kaplan and Kaplan (1957) also showed that overeating was used as a strategy to cope with negative emotions and Schachter (1974) demonstrated that obese people were also hyperemotional and that their levels of physical activation due to emotion were interpreted as hunger. Recently Fernandes et al., (2018) showed that maladaptive eating behaviors tend to be used as a way of emotion avoidance. Devonport et al. (2019) identified the emotions that showed relation with overeating were positive affect, stress, depression and sadness, boredom, shame, aggression/anger, and negative emotions in general. On their part Favieri et al., (2021) confirmed a correlational and predictive association between reduced emotional competencies (e.g., difficulty describing emotions, lack of emotional awareness, and expressive suppression) and maladaptive eating behaviors (i.e., overeating).

Literature related to emotions and eating behaviors in obesity keeps growing exponentially and getting difficult to handle. For example, analyzing the results derived from a search of “emotion” and “eating” in the Web Of Science (WOS) database it can be confirmed that scientific production has tripled in the last 10 years. This evolution can be attributed to four main reasons: 1) The increasing number of books, journals and conferences taking place; 2) The increasing number of articles in journals per year; 3) The increasing number of individual contributions and; 4) The complexity of the investigation increases with time, with its development all science is forced to detail the theories and methods used. Due to the evolution described, the work process of researchers, professionals, and students is increasingly difficult. More time needs to be devoted to researching relevant literature. For this reason, to compensate for the time-consuming consequences of the increase in literature documents organizing and synthesizing the information are needed (Fettke, 2006). In the specific field of psychological interventions for obesity, it is convenient for professionals in clinical practice who

need to know the interventions trends and the evidence shown by them, for students who need to learn in a summarized way about these interventions, and for researchers that need to know a starting point. To have a brief description of the theoretical approaches and the strategies that had been used, the outcome variables and if they showed any changes after the interventions, and the future lines of research that authors have suggested. For that reason, this literature review compiles the main emotion-based interventions in obesity over the last 10 years.

## Method

### *Inclusion and exclusion criteria*

Original empirical articles published in English in peer-reviewed journals were included in the current review if they met all the following criteria: a) studies that involved psychological interventions, emotional-based at least partially. Psychological Emotion-based interventions were defined as those processes that employed strategies designed to foster the acquisition and development of psychological resources like emotion knowledge, emotion regulation, and emotion utilization; b) included as a quantitative outcome variable eating behaviors for which there is evidence of an association with weight gain or obesity: binge eating, emotional eating, external eating, eating in response to food cravings, eating disorder, dietary restraint and unhealthy dietary intake; and c) were realized in adult population. Papers studying the efficacy of pharmacotherapy for eating behaviors management were excluded.

### *Search strategy*

A two-step search strategy was adopted for the current review, the search was conducted from August to September 2021 encompassing literature published up to this date and in the last ten years before when literature in this field grow exponentially coinciding with the introduction of binge eating disorder (a loss of control overeating) in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013). In

order to identify as many relevant articles as possible for this review, the most widely used institutional databases in the behavioral sciences and related to these topics were used: Scopus, PubMed, Taylor and Francis, Wiley, EBSCOhost, Science Direct, SpringerLink, and WOS.

Initially, keywords on the search string entered were “emotion” “intervention” “obesity”, in this first search the constant appearance of the latent variable “eating behavior” was observed, so it was decided to submit this term to the search considering that behavior is the psychological factor present in the obesity complex. On a second moment, the search was conducted using the combination of the following terms and boolean operators: (Emotion OR “affective behaviour”) AND (obesity OR overweight OR bariatrics) AND (“Feeding behaviour” OR overeating OR “Eating behaviour”) AND (intervention OR treatment OR psychotherapy). Potential articles were first identified by screening the article title and then by screening the abstract.

Across eight databases a total of 147 articles, excluding duplicates (23) were identified. After screening the titles and abstracts 124 studies remained to be assessed by their full text; 21 of them met eligibility to be included in this review.

## Results and Discussion

The information collected from 21 articles is presented synthetically in Table 1. The main criteria use to organize the information was the utilized approach, this data is shown in the first column; the second column cites each study alphabetized by the first author; the third column lists the strategies used in each intervention. A brief description of outcomes variables is given in the fourth and fifth columns, differentiating those that showed changes after the intervention from those that did not. Finally, the last column presents the future lines suggested by the authors of the articles.

For the purposes of this review the data collected is analyzed and discussed on the basis of 3 topics: 1) Intervention approaches. To synthesize the main

intervention approaches that have been used, a brief description of the seven identified is given as well as their theoretical principles, basic strategies, and objectives that they generally pursue. It is indicated which of these elements were considered in each study. 2) Outcomes variables. To guide decision-making in clinical practice each of the outcome variables that were identified in each study are grouped into three categories: eating behavior, emotional regulation, and weight loss. The changes reported by the authors in these variables are also shown. 3) Future lines of research. To show what could be the starting point for research in this field of study, the limitations that the authors themselves reported in their studies and the topics that they consider having potential for the development of scientific work are listed and discussed.

The main methodological characteristics of the studies are described below. Of the 21 studies, 12 were Random Control Trials, 6 were single groups, 2 were case studies, and 1 was an observational study. Eight studies were conducted in the USA, two in the United Kingdom, Canada, and Brazil, and one in Germany, Italy, Australia, Netherlands, Norway, Portugal, and Switzerland. Participants characteristics were: people with obesity (8 studies), people with overweight (5 studies), people with obesity and an eating disorder (6 studies), and bariatric surgery candidates (2 studies).

### *Intervention Approaches*

#### *Dialectical Behavioral Therapy (DBT)*

This approach is a psychosocial treatment substantiated in the biosocial theory put forth by Linehan (1993 cite in Rizvi et al., 2013) which proposes that some individuals are more vulnerable to experiencing emotions more intensely than the average person, and have difficulty modulating them. This emotion dysregulation develops from the interaction between a biological dysfunction in the emotion regulation system and an invalidating environment. The biological dysfunction is presumed to be a heightened emotional sensitivity, greater emotional reactivity, and slower return to emotional baseline. The invalidating environment is defined as one that invalidates

**Table 1. Variables of interest of the studies included in the review by intervention approach**

Approach	Author	Strategies	Outcome variables		Future lines
			With Change	Without change	
Dialectical Behavioral Therapy	Beaulac et al., 2018	Dialectical behavioral skills training Individual therapy	Emotional eating General distress Mindfulness	Interpersonal relationships	Improvements in the constructs studied Translate to natural environment
	Burton et al., 2020	Dialectical behavioral skills-based group intervention	Binge-eating Depression	N/A	Examine mechanisms of treatment
	Cancian et al., 2019	Dialectical behavioral skills training	Eating disorder Emotion dysregulation	Psychiatric symptoms	Longer follow up period
	Dastan et al., 2020	Mindfulness Emotional regulation Distress tolerance	Weight loss Emotional eating	Body image perception	Examine mechanisms of treatment
	De Souza et al., 2019	Mindfulness Emotional regulation Distress tolerance	Eating disorder	N/A	Identify participants profiles that fit the intervention
	Delparte et al., 2018	Dialectical behavioral skills training	Eating disorder	N/A	Using alternatives to self-report
	Lammers et al., 2020	Emotional regulation Adaptive evaluation of weight and shape	Emotion regulation	Weight loss Eating behavior (binge eating)	Examine mechanisms of treatment
Cognitive Behavioral Therapy	Christaki et al., 2013	Stress management, dietary regime, and diaphragmatic breathing	Emotional eating, external eating, dietary restraint	Weight loss Stress	Using larger samples
	Gade et al., 2014	Awareness and modification of dysfunctional eating in response to emotion	Weight loss Eating disorder Anxiety Depression	N/A	Improve experimental conditions
	Pjanic et al., 2017	Emotion regulation skills, Nutrition counseling, physical activity, realistic weight goals and self-monitoring	Emotion regulation skills, Affective state (shame and guilt) Depression	Weight loss	Improve experimental conditions
	Torres et al., 2020	Explorations of personal history and weight background, obesity myths and beliefs, and obesity stigma	Psychological distress Emotional processing	Weight loss Emotional eating, external eating	Using alternatives to self-report Identify participants profiles that fit the intervention
Mixed Behavioral and Dialectical Behavioral Therapy	Braden et al., 2020	Dialectical behavioral skills training and standard behavioral weight loss strategies	Weight loss Emotional eating Emotion regulation	N/A	Examine mechanisms of treatment



**Table 1. Continued**

Approach	Author	Strategies	Outcome variables		Future lines
			With Change	Without change	
	Braden & O'Brien, 2021	Emotion regulation skills training and behavioral weight loss treatment (dietary and physical activity goals)	Weight loss Emotional eating Emotion regulation	N/A	Improve experimental conditions Longer follow up period
	Goldbacher et al., 2015	Observing, tolerating, and effectively managing emotions, and behavioral weight loss strategies	Weight loss Emotional eating	N/A	Using alternatives to self-report Using larger samples
Acceptance and Commitment Therapy	Niemeier et al., 2012	Acceptance techniques cognitive defusion skills internal control disinhibition, coping with thoughts and emotions, eating awareness	Weight loss Distress Tolerance Disinhibition	Eating disorder	Longer follow up period Improve experimental conditions
	Preuss, et al., 2017	Skills for emotion-based and food-based inhibitory control abilities	Weight loss	Eating disorder	Use of larger sample Longer follow up period
Interpersonal Therapy	Tanofsky-Kraff, et al., 2016	Identify the connections among their relationships, mood and eating	Loss of control eating	Negative affect	Longer follow up period Capture eating behavior in the natural environment
Mindfulness-Based Cognitive Therapy	Lattimore, 2020	Psycho-educational content and training in mindfulness meditation	Stress	Emotional eating Impulse control	Improve experimental conditions Using alternatives to self-report
Emotion-Focused Therapy	Compare et al., 2013	Description, awareness, and modification of emotional responses	Eating disorder	N/A	Improve experimental conditions

an individual's communication of internal experiences, including emotions so the individual learns that intense emotional expressions are necessary to communicate effectively (Rizvi et al., 2013; Robins & Rosenthal, 2011).

DBT contains four treatment modes: individual therapy, skills training (usually in group form), as-needed consultation between client and therapist outside of session, and therapist consultation team meetings (Rizvi et al., 2013). The skill training mode is currently being administered as standalone treatment across

a variety of clinical settings, serving diverse client populations. It teaches skills to reduce dysfunctional behavior and facilitate the adoption of new behavioral, emotional, and thinking patterns. Consists of four modules: 1) core mindfulness skills, 2) emotion regulation skills, 3) interpersonal effectiveness skills and 4) distress tolerance skills (Valentine, 2014). With these strategies, the goal of this treatment approach is mainly the change in behavior and interactions through the regulations of emotion. Because DBT focuses on emotional regulation it may work through

the mitigation of eating behaviors used to regulate emotions by encouraging alternative emotion regulation skills that do not involve eating (Frayn, 2017; Bankoff et al., 2012).

In this review DBT was the most used approach; seven studies that used it were founded (Beaulac et al., 2018; Burton et al., 2020; Cancian et al., 2019; Dastan et al., 2020; De Souza et al., 2019; Delparte et al., 2018; Lammers et al., 2020); all applied the skill training mode, four in its complete form, two of them applied the mindfulness, emotional regulation and distress tolerance modules and one applied only the emotional regulation module. We could only find one study that added the individual therapy mode (Beaulac, et al., 2018); and one that added the group therapy mode (Burton et al., 2020). Dialectical Behavioral Skills Training (DBST) was the most used strategy. This training was designed to address various problem behaviors associated with emotion dysregulation (Bankoff et al., 2012) consist of teaching skills of distress tolerance, mindfulness, emotion regulation, and interpersonal effectiveness (Cancian et al., 2019). One of the reasons why this type of training is showing so many positive results can be that it integrates most of the different ways other programs (Lammers, et al., 2020; Dastan et al., 2020; Pjanic, et al., 2017; Goldbacher et al., 2015; Gade, et al., 2014; Compare et al., 2013) intervene in the emotional variables (teaching emotional description, awareness, toleration, and modification of maladaptive emotional responses).

### *Cognitive-Behavioral Therapy (CBT)*

This treatment approach is based on the premise that the cognitive process mediates emotional and behavioral responses to various situations implicating them in the development and maintenance of psychological problems (Kazantzis, et al., 2018). CBT states that the content and process of people's thinking can be accessed and that with appropriate training, people can become aware of their own thinking and intentionally modify their response to events around them, becoming more functional by learning to use cognitive strategies systematically in service of their own goals (Dobson and Dobson, 2018). CBT treatment includes two types of strategies: 1) To change thinking patterns: learning to recognize distortions

in the thinking process that are creating problems, and then reevaluate them based on reality; gaining a better understanding of the behavior and motivation of others; using problem-solving skills to cope with difficult situations and learning to develop a greater sense of confidence in one's abilities. 2) Strategies to change behavioral patterns: decreasing avoidance of fears; using role-playing to prepare for potentially problematic interactions and learning to relax (APA Div. 12., 2017). The goal of CBT is to help the person change maladaptive or dysfunctional thoughts that are at the root of their problem. Four studies included in this review used CBT intervention: Torres, et al., 2020; Pjanic, et al., 2017; Gade, et al., 2014; Christaki, et al., 2013. The main strategies used were: stress management; awareness, regulation, and response of emotions; explorations of obesity myths, beliefs, and stigma; self-monitoring of dysfunctional eating habits; defining realistic weight goals; implementing a dietary regime, and improvement of physical activity.

### *Behavioral Therapy (BT)*

This approach derives from experimental psychology and applies the principles of learning, operant conditioning, and classical conditioning to modify problematic behavior patterns. The focus of this therapy is on behavior itself and the contingencies and environmental factors that reinforce it; from a behavioral perspective, terms such as "malappropriate behavior" or "socially maladaptive behavior" are used in preference to "mental disorders" or "abnormal behavior". The behavior is considered maladaptive for a variety of reasons: its particular topography, latency, intensity, frequency unusually high or low, setting events, consequences, or eliciting stimuli; and could include a wide variety of classes of overt behavior, such as behavioral excesses (e.g., anxiety crisis), behavioral deficits (e.g., abulia) and inappropriate stimulus control over behavior (binge eating). The treatment process involves strategies related to the alteration of the person's responses to stimuli including the shaping, development, and strengthening of responses, the weakening and elimination of responses, and the establishment of stimulus control over responses. A wide variety of techniques are used in behavior therapy, such as behavior rehearsal, biofeedback,

modeling, and systematic desensitization. Also called behavioral psychotherapy; conditioning therapy (Bufford, 1981). Three of the studies found in this review used a combination of DBT with BT (Braden & O'Brien, 2021; Braden, et al., 2020). The DBT strategies used were teaching participants the ability to observe, tolerate, and effectively manage their emotions; behavioral strategies used were setting dietary and physical goals.

### *Acceptance and Commitment Therapy (ACT)*

This approach is rooted in the pragmatic philosophy of functional contextualism and conceptualizes psychological events as a set of ongoing interactions between whole organisms and historically and situationally defined contexts. The core components of functional contextualism are (a) focus on the whole event, (b) sensitivity to the role of context in understanding the nature and function of an event, (c) emphasis on a pragmatic truth criterion, and (d) specific scientific goals against which to apply that truth criterion. ACT is based on the premise that cognitive processes alter and amplify the experience of unpleasant emotion, leading the person to engage in problematic behaviors designed to avoid or attenuate those unpleasant emotions. Such avoidant behavior patterns can promote that people place harmful and hinder them from reaching a valued goal. The basic strategies for ACT are accepting techniques that are used to teach participants to notice and tolerate sensations without attempting to change them using tools like mindfulness and tolerating techniques, the identification and internalization of values and life goals, change-focused strategies (e.g., stimulus control), coping with the external (e.g., environment) and internal (e.g., thoughts, emotions), cognitive defusion skills, committed action strategies (behavioral persistence). ACT relies heavily on paradox, metaphors, stories, exercises, behavioral tasks, and experiential processes (Hayes, 2004). The general clinical goal of ACT is that the person identifies their avoidant behavior, verbalize them, and expresses alternative contexts where an adaptive behavior is more likely to occur. ACT introduces verbal formulas that systematically modify ambient contingencies maintaining behaviors. In the present literature review, we found 2

studies (Niemeier et al., 2012; Preuss et al., 2017) that have intervened using strategies for inhibition control, eating focus experiential avoidance, coping with thoughts and emotions, and eating awareness.

### *Interpersonal Therapy (IPT)*

IPT is a time-limited psychotherapy initially developed to treat major depression and subsequently adapted for treatment of other conditions, it is based on two major principles: 1) Depression is a medical illness that can be treated. This definition has the effect of defining the problem and excusing the patient from symptomatic self-blame, 2) Mood and life situation are related. IPT frames its therapy around a central interpersonal problem in the patient's life that is disrupting social support and increasing interpersonal stress. The interpersonal problem falls into one of four categories: grief (complicated reaction following the death of a loved one), role transition (an unsettling major life change (e.g., an illness, birth of a child, retirement), role dispute (conflict in an important relationship), or interpersonal deficits (social isolation). By mobilizing and working collaboratively with the patient to resolve (better manage or negotiate) this problem, IPT uses strategies to activate several interpersonal change mechanisms. These include: 1) enhancing social support, 2) decreasing interpersonal stress, 3) facilitating emotional processing, and 4) improving interpersonal skills (Lipsitz, & Markowitz, 2013; Markowitz & Weissman, 2004). One study was found in the present literature (Tanofsky-Kraff, et al.; 2016) that used IPT to intervene on loss of control eating helping participants to identify the connections among their relationships, mood, and eating as intervention strategies.

### *Mindfulness-Based Cognitive Therapy (MBCT)*

MBCT is defined as the process of achieving the awareness that emerges through paying attention on purpose in the present moment and nonjudgmentally to things as they are. Multiple mechanisms underlie these effects, including cultivating awareness of internal experience, disrupting highly conditioned patterns, integrating higher-level processes, decreasing reactivity to stress, and enhancing a sense of control and self-acceptance. Strategies consist of



various formal and informal meditation practices, including guided body scans, sitting, and walking meditations, mindful movement (based on Hatha yoga), 3-minute breathing spaces, and focused awareness on routine daily activities. MBCT also includes elements of cognitive therapy and psychoeducation (Sipe & Eisendrath, 2012). In the present literature review, we found one study using MBCT (Lattimore, 2020) intervening in emotional eating, using mainly psycho-educational content and training in mindfulness meditation as intervention strategies, the results showed that after the intervention eating behavior was more in-tune with internal hunger/satiety signals than to external or emotional cues.

### *Emotion-Focused Therapy (EFT)*

EFT is defined as the practice of therapy informed by an understanding of the role of emotion in psychotherapeutic change. EFT is founded on a close and careful analysis of the meanings and contributions of emotion to human experience and change in psychotherapy. At the most basic level of functioning emotions are an adaptive form of information-processing and action readiness that orient people to their environment and promote their well-being. EFT relies on general principles for enhancing emotion processing that serves as the goals of treatment that are embedded within an overarching framework that emphasizes emotional/social support as important in the promotion of change. In this view, emotion is seen as fundamental in the construction of the self and a key determinant of self-organization. People live in a constant process of making sense of their emotions. Personal meaning emerged through the self-organization and explanation of one's own emotional experience. An optimal adaptation involves the integration of reason and emotion. Thus, the strategies utilized promote the awareness, acceptance, expression, utilization, regulation, and transformation of emotion as well as corrective emotional experience with the therapist. The goals of EFT are to strengthen the self, regulate affect, and create new meaning for people to identify, experience, accept, regulate, explore, make narrative sense of, transform, use, and flexibly manage their emotions. As a result, they become more able to tolerate previously avoided emotions and more adept at

accessing the important information that emotions contain about their core needs, goals, and concerns. (Greenberg, 2006; 2017). The study of Compare et al., (2013) was the only one selected for the present literature review where EFT was used; they use as an intervention strategy teaching emotional description, awareness, and modification of maladaptive emotional responses to the participants.

### *Changes in Outcome variables*

#### *Eating Behaviors*

The effect of the intervention was measured through different maladaptive eating behaviors, eating disorder pathology, in general was intervened in 6 studies (Preuss, et al., 2017; Compare et al., 2013, Gade, et al., 2014; Delparte et al., 2018; Cancian et al., 2019; De Souza et al., 2019) emotional eating in 9 studies (Christaki, et al. 2013; Medina, et al., 2015; Goldbacher et al., 2015; Hopkins, et al., 2016, Beaulac, et al., 2018; Lattimore, 2020; Dastan et al., 2020; Braden & O'Brien, 2021; Braden, et al., 2020; Torres, et al., 2020), external eating in 2 studies (Christaki, et al., 2013; Torres, et al., 2020) binge eating 3 studies (Hopkins, et al., 2016; Burton et al., 2020, Lammers, et al., 2020) and loss of control eating (Tanofsky-Kraff, et al., 2016), dietary restraint (Christaki, et al., 2013) and eating focused experience avoidance (Niemeier et al., 2012) were approached by one study each. This variable was the one in which the greatest number of changes were reported and with more consistency as a result of the interventions: binge eating, emotional eating, eating disorder pathology in general on DBT and EFT interventions; restrictive eating, uncontrolled eating, and emotional eating on CBT interventions alone or in combination with BT; and snack consumption on ITP interventions. The ACT approach did not appear to show changes in eating behavior.

#### *Emotional Regulation.*

On variables related to the emotional factor were also reported changes derived from the interventions but less and with less consistency. DBT interventions produced an increase in emotional regulation and mindfulness strategies, and the improvement of depressive symptoms; DBT interventions improved

distress, depression, and emotional dysregulation; CBT interventions impacted emotional factors such as anxiety, depression, and emotion regulation skills. Conversely, IPT interventions showed no changes in depressive affect.

### Weight Loss

On the studies sought to intervene in weight reduction eleven were found. However, the results in this variable are the ones that present the most inconsistencies when analyzed from the intervention approach. DBT interventions achieved a decrease in weight on some occasions (e.g., Dastan et al., 2020) but not on others (e.g., Lammers, et al., 2020); the same goes for CBT interventions. Gade et al., (2014) reported a decrease in body weight, but Christaki et al., (2013), Pjanic et al., (2017) and Torres, et al., (2020), reported that no changes were observed in this variable. The two studies that used ACT (Niemeier et al., 2012; Preuss, et al., 2017) reported consistently decreases in participants' body weight; this consistency is also seen in studies that used a combination of DBT and BT (e.g., Braden, et al., 2020; Braden & O'Brien, 2021; Goldbacher et al., 2015).

### Future directions

We identified seven main directions in which authors have suggested research to continue. 1) The use and improvement of experimental designs, 2) Clarity of construct and mechanisms, 3) Adding follow up measures, 4) Identification of specific profiles, 5) Larger sample sizes, 6) Use of measurements beside self-report, and 7) Observations of a natural environment.

*The Use and Improvement of Experimental Designs:* the literature shows that there is a lack of studies using an experimental design to approach the relationship between the emotional variable and eating behaviors, authors that use other kinds of design tend to mention that including an experimental one can be the most convenient future line for their research to continue, and the ones that had already use an experimental design tend to mention the development of a more rigorous control for the external variables (Lattimore, 2020; Pjanic, et al., 2017; Hopkins, et al. 2016; Gade, et al., 2014; Compare et al., 2013; Niemeier et al.,

2012). Thus, not only is there suggested the realization of more experimental designs, but there is also a need for experimental studies that provide high control over potentially confounding contextual factors and that allow for an objective measure for this purpose laboratory-based studies can be the best option and a line worth pursuing (Reichenberger et al., 2020).

*Clarity of Construct and Mechanisms:* various studies mention that there is a lack of clarity in the construct and the mechanisms involving both the emotional factors (emotional regulation, emotional dysregulation) and the eating behavior ones especially the emotional eating construct (Braden, et al., 2020; Burton et al., 2020; Dastan et al., 2020; Lammers, et al., 2020; Beaulac, et al., 2018) this makes it difficult to measure since there is not a clear definition of what is being measured, and it also makes it difficult to design interventions since there is not a clearly established process by which emotional regulation or dysregulation is taking place. The same goes to the process of emotional eating that has been defined in different ways and with many potential trait and state moderators, making it clear that as Reichenberger et al., (2020) mentioned the need for the consolidation on a theoretical and practical ground of emotional eating.

*Adding Follow up Measures:* One of the main shortcomings in the measurement of outcome variables in the studies is that there was no continuity given to the evaluation of the change presented by the participants to ensure that it was maintained outside the context of the intervention. Earlier research has found that the initial weight loss generated during interventions tend to be poorly maintained during the no-intervention follow-up (e.g., Holzapfel et al., 2013), thus authors suggest that to be sure of the efficacy of the intervention adding follow up measures is necessary for future research (Braden & O'Brien, 2021; Cancian et al., 2019; Preuss, et al., 2017; Tanofsky-Kraff, et al., 2016; Niemeier et al., 2012).

*Identification of Specific Profiles:* one of the reasons that were mentioned by the authors for the lack of change in the variables is the presence of individual

differences that may affect the effectiveness of the intervention, which is why one of the future lines of research suggests identifying specific profiles that can be used to predict who may respond better to the intervention (Torres, et al., 2020; De Souza et al., 2019; Medina, et al., 2015).

*Larger Sample Sizes:* Because of the difficulties related to getting a large randomized clinical population, many of the studies had to use a small sample to conduct their interventions making it harder to extrapolate their results to the general obesity population. One way to provide more representative results should also include larger samples in future investigations (Preuss, et al., 2017; Goldbacher et al., 2015; Christaki, et al., 2013).

*Use of Measurements Besides Self-Report:* in most of the reviewed studies the variables were measured through the use of self-report instruments. Earlier research has proved that self-reported emotional eating suffers from biases (e.g., recall bias) that can rest validity to the results reported (Reichenberger et al., 2020), so the use of measurements besides self-report is suggested as a next step in further investigations (Delparte et al., 2018; Goldbacher et al., 2015; Torres, et al., 2020).

*Observations of a Natural Environment:* the environment in which people eat can greatly affect eating behavior, especially when eating in response to emotions. Self-reported high emotional eaters have been characterized by a generalized learned cue-reactivity in which a variety of cues such as negative and positive emotional states, but also the sight and smell of food can elicit eating behavior (Reichenberger et al., 2020). Regarding this some authors have suggested that future research shift towards a more naturalistic assessment (e.g., Beaulac, et al., 2018; Tanofsky-Kraff, et al., 2016).

## Final comments

Most of the studies reviewed focused on emotional regulation through the improvement of emotional competencies which leads us to agree with Favieri,

Marini, and Casagrande (2021) results that confirmed a correlational and predictive association between reduced emotional competencies (e.g., difficulty describing emotions, lack of emotional awareness, and expressive suppression) and maladaptive eating behaviors of overeating. These results showed as hypothesized a reduction in eating disorder-related psychopathology and an improvement in the quality of life.

Some of the studies decided to approach weight loss by intervening in maladaptive eating behavior through the emotional component since maladaptive eating behaviors related to overeating function as a way of regulating emotions (Tonelli & de Siqueira, 2021). Through our literature review we can see that intervening over this approach showed positive results in weight loss different than when the intervention only focused on reducing calory intake (e.g., Andrei et al., 2018; Shriver et al., 2021; Wolz et al., 2021). The best results on generating weight loss and maladaptive eating behaviors are the ones that added behavioral weight loss strategies to the emotion-based intervention. On the contrary, variables that had a different nature than emotional regulation (i.e., interpersonal relationships, psychiatric symptoms, body image and weight loss) did not show changes, possibly because emotional regulation strategies were not enough to treat issues that are maintained by different variables. As mentioned, the interventions focusing on reducing caloric intake and/or increasing physical activity are quite controversial since studies have shown that it can develop overeating (Dochat et al., 2019; Lo et al., 2021; Shriver et al., 2021; Wolz et al., 2021). Still the studies reviewed for the behavioral and DBT approach also presented changes in the eating behavior (i.e., “emotional eating”) which is typically observed in overeating episodes as a response to a negative emotion. Thus, we can infer that there was no increase in overeating given that the approach not only focused on weight loss but also on the emotional factor, showing better results than interventions centered on one of these two variables.

The current review presented a general overview of the evidence generated in the last 10 years from interventions that approach the role of emotions as a way of reducing maladaptive eating behaviors. Based on

the selected literature we can say that emotion-based interventions are a useful method for changing maladaptive eating behaviors in obesity, especially when they focus on the regulation of the emotions. Still the results generated by the interventions reviewed can be considered inconsistent since each approach seems to use different strategies and work on different variables through different mechanisms, evidencing that there is not a clear theoretical and practical consensus regarding the relationship between the emotional factor and eating behaviors.

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