

Assessment of the outcomes of an intervention combining cognitive behavioral therapy techniques and hypnosis for the therapy of obesity

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Abstract

Background. Cognitive behavioral therapy (CBT) is a first-line intervention in the psychological treatment of obesity and eating disorders. Hypnosis, on the other hand, has the potential to enhance the effects of CBT, but this combination has not been sufficiently explored in previous studies.

Aims. The aim of the present study is to investigate the effectiveness of a CBT intervention combined with hypnosis in reducing BMI (Body Mass Index) and improving some psychological factors associated with obesity.

Methods. The intervention was applied to a group of 50 overweight or presenting various degrees of obesity (BMI>26) people and consisted of 12 sessions conducted online. The intervention group was evaluated before the intervention, after the intervention and at 6 months. The DASS-21R, TFEQ (Three Factor Eating Questionnaire) and EDI-3 low self-esteem scale were used.

Results. The results of the study showed that the outcome of the intervention was a reduction in BMI, uncontrolled eating, depression and low self-esteem. There were also decreases in emotional eating, stress and anxiety, which were close to the statistical significance threshold.

Conclusion. The present study thus supports the effectiveness of the applied intervention, combining CBT with hypnosis, in improving BMI and partly associated psychological factors.

Keywords: Overweight, obesity, CBT, Hypnosis, uncontrolled eating, emotional eating, self-esteem, depression, anxiety, stress.

Introduction

Obesity is a real phenomenon, whose prevalence has gradually increased in recent decades, to the effect that today it is considered a severe problem, with major implications for health, the socio-medical and economic systems (Blüher, 2019). It is one of the greatest challenges of the 21st century, affecting both men and women, of all races and ages, and several experts classify it among “the most common and most costly chronic disorders worldwide” (Schwartz et al., 2017).

Obesity is a health problem with a complex etiopathogenesis, of which the following factors can be mentioned: first of all, the consumption of high-calorie-density foods rich in sugars and fats associated with sedentary lifestyles (Hall, 2016; Yang et al., 2021), then a series of genetic factors (Ichihara & Yamada, 2008; Moleres et al., 2013; Tirthani et al., 2023), environmental

factors (Yadav & Jawahar, 2024; Niedermayer et al., 2022), epigenetic factors (Mahmoud et al., 2022; Mattei, et al, 2012), hormonal factors (Butera, 2010; Porada et al., 2023) and behavioral, psycho-emotional factors (Robinson et al., 2020; Fuentes et al., 2020).

Given the complex action of these factors, often their effects are interlinked as shown in the UK Government’s Foresight Programme report (1), the need to develop multidisciplinary strategies and interventions to address the myriad of aetiological factors becomes evident (Nuțu et al., 2023).

In the management of obesity, among the main directions of intervention such as nutritional selection, caloric restriction and exercise, pharmacological treatment or bariatric surgery, psychological treatments can be frequently found.

Psychological interventions are integrated into weight management programs aimed at removing psychological

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barriers to weight loss and promoting sustainable lifestyle changes (Kim, 2022; Barana et al., 2022). These interventions propose the creation of effective change mechanisms which should act on the complex relationships between the psycho-emotional picture (with all that it entails in relation to the individual reality, in terms of personality traits, personal history, cognitions and emotions) on the one hand and the eating behaviors on the other.

Among the best known psychological constructs regarding eating behaviors are emotional eating, uncontrolled eating and cognitive restriction, as found in the Three Factor Eating Questionnaire (Karlsson et al., 2000; Cappelleri et al.) Thus, efforts to conceptualize obesity address the relationship between dysfunctional eating behaviors (the above-mentioned ones) and body weight imbalance, as well as the psycho-emotional causes which predispose and maintain these behaviors.

Emotional eating, i.e. coping with negative emotions through acts of overeating (“binge eating”) or eating in the absence of feeling hungry, can lead to a vicious cycle of perpetuating unhealthy food consumption and weight gain (Dakanalis et al., 2023; Treasure et al., 2022). Emotional eating is a way of coping, although this behavior has negative effects, contrary to the original role of food in ensuring an individual’s health status (Evers et al., 2018; Christensen, 2019).

Negative emotions play an important role in initiating and maintaining an overeating behavior, and depression, anxiety and stress are often recognized as possible triggers for emotional eating. Thus, current research increasingly addresses the connection between obesity and a dysfunctional emotional background (Van Strien, 2018; Snowden-Carr, 2018) as a possible lever for change.

Psychological factors associated with obesity and overweight

The constant availability of high-calorie foods (with no nutritional intake but a high calorie load, the so-called junk food), often more accessible in terms of prevalence and price than healthy alternatives (Drewonowski & Darmon, 2005), and the aggressive advertising dedicated to these junk foods, foster dysfunctional, unhealthy overeating behaviors and weight gain (Harris et al., 2009; Hagan et al., 2020).

However, this ambivalence of the act of eating would not be possible, despite the above-mentioned socio-economic context, were it not based on the existence of emotional coping mechanisms which accompany overeating and favor obesity. Complex biological mechanisms such as feelings of hunger or satiety (regulated by the balance of hormones such as ghrelin and leptin) are often disrupted by emotional factors (van Strien, 2018).

Depression, anxiety and stress

Depression, anxiety and stress are among the most common factors recognized to have a high psychological impact in relation to body weight, and a bidirectional relationship is evident, as they can be both predisposing factors for obesity and psychological consequences of its presence in the lives of people affected by obesity.

The literature reflects this bidirectional relationship

between obesity and psychopathology (Weiss et al., 2020), and several studies demonstrate that psychosocial and psychopathological factors contribute to the development and maintenance of obesity (Weiss et al., 2020; Asch et al., 2022).

From the manifestations of stress (insomnia, fatigue or difficulty concentrating and mobilizing resources) to the symptoms of depressive disorders themselves, with manifestations such as anhedonia, lack of ability to act and lack of energy, all these are found in more and more studies and research in relation to obesity (Milaneschi et al., 2017; Ibrahim et al., 2016; Frank et al., 2022; Fu et al., 2023). Efforts are thus being made to better illustrate the common mechanisms (genetic, hormonal and psychological) that could explain the relationship between stress/depression and obesity, the symptoms associated with the two conditions and last but not least the mediating effects between them.

Moreover, people with obesity and overweight are more likely to report low self-esteem, body image disorders, decreased quality of life, food addiction, stress-related conditions, mood disorders (Chu et al., 2019; Vasiliu, 2022) and impaired emotional processing (Steward et al., 2016).

Obesity poses a threat to important biological mechanisms (generating dysfunctions such as inflammation, insulin resistance, leptin resistance), and these immuno-metabolic disturbances will affect neural pathways related to the emotional states and dispositions of the affected person, which will ultimately increase the incidence of depression and anxiety (Fulton et al., 2022).

Thus, the need for psychological interventions in the treatment of obesity and the need to address aspects of psychological support aimed at alleviating depressive or anxious mood tendencies and equipping individuals affected by obesity with the psycho-emotional resources necessary to support weight management efforts becomes obvious.

The motivation for developing an intervention based on CBT and Hypnosis techniques to address obesity

As we have shown, psychological interventions are today among the scientifically validated methods of obesity treatment. In the present study we have chosen Cognitive Behavioral Therapy (CBT) for weight loss and Hypnosis as the main directions of action in this regard.

CBT intervenes in the regulation of cognitions and of the psycho-emotional background, thus favouring mood change and the self-regulation of eating behaviors (Jacob et al., 2018).

Emotional eating is understood as a tendency to react behaviorally through eating (in the absence of biological necessity) in response to experiencing negative emotions, a reaction aiming to achieve a state of calm or distraction from the initial negative emotions that acted as a trigger (Marks, 2015).

Starting from this mechanism, we can understand that the role of CBT is to restructure dysfunctional cognitions, improve emotional status and reduce depression, stress and anxiety, and thus achieve its stated main goals (Dalle Grave et al., 2020), namely: to help patients achieve, accept, and

adopt healthy weight loss; to adopt a lifestyle appropriate to weight loss; to develop a way to control weight, and maintain the long-term outcomes.

CBT can be seen as a “theoretical-methodological and scientifically based combination of behavioral therapy with cognitive therapy, with application in pathology and health” (David, 2017), thus having a preventive and educational character as well (optimizing but also promoting health).

However, there are also somewhat more reserved views on this issue and relatively recent reviews showing that although CBT is a “first line” treatment (Castelnuovo et al., 2017) in terms of the psychological approach to obesity, it does not produce significant weight loss (Cooper et al., 2010).

Hypnosis

In recent years there has been a growing interest in the (re)introduction, alongside CBT and other therapeutic methods, of a method of psychological intervention with a long, but not necessarily linear history, namely hypnosis.

Hypnosis helps to reduce stress, increase self-esteem (Palsson et al., 2023), assists in the preparation for surgery, is particularly effective in addressing pain and anxiety management, facilitates mindfulness experiences and can be applied in labour and birth.

Regarding the use of hypnosis for the treatment of obesity, the most common association is between hypnosis and CBT (or other forms of cognitive therapy, behavioral therapy, etc.).

Hypnotherapy includes the therapeutic application of hypnosis, defined as “the use of hypnosis in the treatment of a medical or psychological disorder of concern” (Elkins et al., 2015).

According to the American Psychological Association (APA), hypnosis “involves the application of a procedure whereby it is explained to the subject by the hypnotist that certain suggestions will be administered to help him or her experience a series of imaginative experiences” (Holdevici & Crăciun, 2017). The role of these suggestions is to create subjective experiences that target perceptions, emotions, thoughts, and behaviors, thus leading to an improvement of the state of the person concerned.

Starting from one of the possible definitions of hypnosis, as “a state of consciousness involving focused attention and reduced peripheral awareness, characterized by an increased capacity to respond to suggestion” (Elkins et al., 2015), we thus explain why hypnosis is a method which helps us increase the effects obtained through CBT.

In an attempt to simplify the potential of this method, we can say that hypnosis, through its mechanism of focusing the subject’s attention on the self and at the same time opening up to therapeutically oriented suggestions, helps to support the attitudinal and emotional changes that we implement through cognitive and behavioral restructuring (CBT) techniques.

Moreover, these restructured attitudes and emotions will be “lived” or actually felt at the time of experiencing hypnosis (according to the “as if real” / “as real” principle), thus acquiring a “phenomenological” character, which, if repeatedly used (by replaying the hypnotic experience in interventions), can reinforce the targeted changes.

The “as real” principle, based on the use of visualization and suggestion techniques (direct and indirect) involves creating a mental experience that simulates reality. The recipients of such an experience often report, according to Oakley and Halligan (2013), that they do not perceive the situation as imaginary, but as real. Moreover, it has been shown that suggested changes in perception or behavior are also associated with corresponding brain changes (Oakley & Halligan, 2013). In the context of obesity, this principle helps participants imagine a healthier body and experience the emotions and behaviors associated with that body, leading to real changes in eating behaviors and self-perception.

Another study, conducted to determine the effectiveness of hypnotherapy in weight control, which was conducted on a sample of 32 participants with a BMI ≥ 30 , demonstrated that after 10 weeks of hypnotherapy, in addition to decreasing BMI, biochemical analyses showed a decrease in serum leptin levels and an increase in adiponectin (ADP) levels, which supported the conclusion that hypnotherapy works, being easy to apply and lacking potential side effects (Erşan & Erşan, 2020).

The effect of improving biochemical parameters, along with other aspects, could be an additional explanation for the increased effectiveness of CBT when accompanied by hypnosis. Thus, at least in part, the vicious circle of the obesity conceptualization model can be reversed. Specifically, against a disordered background of emotions and eating behaviors, repeated episodes of overeating occur, leading to obesity and disrupting the body’s metabolic functions and biochemistry over time; this will lead, as we have shown by citing from the literature on this topic, to the disruption of emotional dispositions, stress, depression and anxiety, which in turn leads to moments of overeating. Thus, the vicious circle is self-maintained and makes the situation more difficult to be solved.

Objectives

The present study investigates the effectiveness of a psychological intervention developed by combining and applying cognitive behavioral therapy and hypnosis techniques. The intervention was optimized and adapted to the group of subjects included in the research.

Hypothesis

We have put forward the following hypotheses:

- A psychological intervention based on a combination of Cognitive Behavioral Therapy and Hypnosis will result in lower BMI.
- A psychological intervention based on the combination of Cognitive Behavioral Therapy and Hypnosis will lead to a decrease in the following parameters: Depression, Anxiety, Stress, Emotional Eating, Uncontrolled Eating, Cognitive Restriction and Low Self-Esteem.

Material and methods

The research represents the design of an optimized intervention to reduce BMI and the behavioral and psycho-emotional variable scores in the intervention group. The research was conducted online and did not require the use of drugs or invasive medical procedures. The entire

programme was conducted in accordance with the ethical guidelines recommended by the World Medical Association (Helsinki) (2).

Research protocol

a) Period and place of the research

The research took place online, over a period of 3 months (June 2013-September 2023).

b) Subject and groups - Study setting

The participants were recruited through online advertisements and selected according to the inclusion criteria. The first 50 people who showed interest and met the inclusion criteria were allocated to the intervention group. The next 60 people who expressed interest in participating in the study were allocated to the control group. The intervention group consisted of 46 (92%) women and 4 (8%) men, and the control group consisted of 48 (80%) women and 12 (20%) men. In terms of BMI, in the intervention group, 34 people have the BMI above 30 (68%) and 16 (32%) have the BMI between 25 and 30, whereas in the control group we have the same number of people with the BMI below 25, between 25 and 30 and above 30, respectively 20 (33.3%).

- *Inclusion criteria*: obesity of primary, not secondary, nature; BMI greater than or equal to 26; absence of specific etiological conditions; willingness and interest in sustained, weekly intervention for a minimum of 12 weeks; informed consent from subjects.

- *Exclusion criteria*: existence of tumor-related conditions, administration of medication with side effects on body weight; severe psychological disorders or psychiatric conditions, psychosis; existence of obesity of secondary causes, such as - genetic, endocrine, medication.

The design of this study is quasi-experimental. The protocol consisted of 12 online sessions, one per week, each lasting approximately 90 minutes, in mixed group and individual formats. The sessions were organised and conducted by the first author of the present study.

c) Used instruments – Applied tests

- *The BMI* was calculated from the self-reported weight and height of the study participants.

Psychometric tests

- *DASS-21R*

The DASS questionnaire is a tool for assessing the negative emotional states of depression, anxiety and stress. The DASS-21R contains 21 questions and represents the version of the instrument adapted and standardised for the Romanian population. The 3 constructs (depression, anxiety, stress) assessed by the instrument can be evidenced both in normal life circumstances and in clinical situations, the difference being given by their severity (Lovibond S.H et al., 2011). Each dimension of the scale is measured through 7 items. The measurement scale used is a 5-unit scale. In the present study, all three dimensions show good internal consistency (Cronbach's alpha ranges from 0.84-0.88).

Previous studies show that the instrument has good psychometric properties for both clinical and non-clinical populations (Brown et al., 1997; Norton, 2007; Osman et al., 2012).

- *TFEQ*

The Three-Factor Eating Questionnaire assesses three

key aspects of the eating behavior: emotional eating, uncontrolled eating and cognitive restriction (Cappelleri et al., 2009; Karlsson et al., 2000). The instrument was translated into Romanian using the back-translation method in a previous study (Nuțu & Zăgrean., 2024). The instrument has 21 items in total, of which 9 items measure uncontrolled eating, 6 items measure emotional eating and 6 items measure cognitive restriction. Items 1-20 are measured on a scale of 1 to 4, and item 21 on a scale of 1 to 8. In the present study, the Cronbach's alpha coefficient value for the uncontrolled eating scale is excellent (.90). The Cronbach's alpha coefficient value for the emotional eating dimension is excellent, equal to .95. For cognitive restriction, the Cronbach's alpha coefficient value is acceptable (0.75).

- *Low self-esteem (Edi 3)*

To measure low self-esteem, we used the related subscale of the Eating Disorder Inventory (EDI) 3 (Garner, 2004). The EDI-3 is a self-report instrument consisting of 12 scales measuring clinically relevant constructs for eating disorders. In the present study we used only the 6 items corresponding to the Low Self-Esteem scale. This has a good internal consistency, Cronbach's alpha = 0.88. Previous research shows that the EDI 3 instrument has good psychometric properties in a wide variety of populations (Clausen et al., 2011; Garner, 2004).

- *The CBT Intervention and Hypnosis Protocol*

Throughout the 12 sessions, the fundamental goal of the intervention was oriented towards achieving changes (the reduction of BMI, the improvement of scores of psychological and behavioral variables, as well as stability of results over time).

The intervention took place online, with a total of 12 sessions, in a mixed group and individual format, with a frequency of one meeting per week. The protocol also included training participants in the use of simple self-hypnosis techniques and the use of audio recordings, with the aim of deepening the strategies and changes introduced. Participants were instructed to practice self-hypnosis sessions individually, both during the intervention and after the assisted intervention was completed. With this in mind, a third measurement was conducted at a 6-month interval to assess changes up to the time of the follow-up.

After completing the tests and measurements at T1, the programme started with psychoeducation and information.

The participants were explained the basic concepts regarding the psychological mechanisms involved in obesity and its complex causes. Although the research was carried out on a general sample, without clinical specificity, the information included notions about psychopathology (depressive disorders, anxiety disorders, eating disorders) that may accompany or follow the picture of obesity.

At the same time, the scientific concepts and principles of the two methods used, namely CBT and hypnosis, were introduced and explained. By introducing the information about hypnosis, we raised positive expectations among the participants, as there are studies showing for example that the use of the words - hypnosis, hypnotherapy, etc., in other words the "label" hypnosis, can lead to improved responses of the subjects to the applied techniques (Gandhi & Oakley, 2005).

Also, during the first sessions, the requirement of (daily) self-monitoring regarding the food consumed, the emotional states associated with meals, the frequency of episodes of eating in the absence of feelings of hunger or the frequency of the episodes of overeating was introduced (as a homework assignment, this being a concept used mainly in CBT). These aspects were monitored and repeated throughout the protocol.

With regard to the hypnosis sessions in particular, they also involved the application of hypnotic induction techniques (several variants were used, relying on the escalation effect of the process with each repetition and with a new induction formula used).

At the same time we aimed to increase motivation and implicitly therapeutic compliance, understood as in the eating disorder intervention model where “motivation is the mechanism by which experiential acceptance improves treatment outcomes” (Fairburn, 2014). To elicit intrinsic motivation, we stimulated (through the questioning technique) the individual’s awareness of the deep meaning that the person attributes to “losing” / regaining an optimal body weight. We used the Motivational Interviewing model (Miller & Rollnick, 2002) as an inspiration to help participants understand and resolve the ambivalence expressed about changing their behavior.

Another important part of the intervention was to identify and challenge irrational beliefs, those related to overestimating the importance of body weight and body shape, those related to learned helplessness in relation to eating behavior, problem management training (problem solving). The aim was to stimulate a stable emotional background, undisturbed by crisis situations collateral to the process of weight regulation and the introduction of new, desirable behaviors as alternative sources of response when emotional triggers are activated.

In order to improve the psycho-emotional background and reduce anxiety, depression and perceived stress-related aspects, we aimed to increase experiential acceptance, i.e. “the willingness to tolerate adverse emotional experiences more easily” (Rawal et al., 2010).

In order to improve the lifestyle itself and to implement sustained change in eating and movement behaviors, we have acted through several intervention levers, namely:

- increasing self-confidence and cancelling learned helplessness behaviors, through suggestions administered in hypnosis sessions, suggestions aimed at - strengthening the Self, increasing the capacity of awareness and interrupting the reactive nature of binge eating behavior in moments of emotional distress; awareness of past situations in which they had the capacity of self-control and extending those resources to the present moment and accessing desired behaviors.

- shifting the “locus of control” from external to internal. We started from the theory of attributing our behaviors and choices to factors of an internal or external nature, as in the “locus of control” theory, or the health locus of control, found today in studies on obesity and nutritional choices (Pigsborg et al. 2023; Gruszka et al, 2022).

- we have introduced the idea of control and choice over

the food we eat and encouraged the abandonment of food bans. CBT for eating disorders suggests that compulsive eating is often “largely a product of their (patients’) own tendencies to restrict food intake” and of trying to follow particularly strict rules (Fairburn, 2014).

Here we also mention training participants in the use of simple self-hypnosis techniques and providing them with audio recordings to listen to repeatedly (this task is also integrated as homework, part of the CBT contract).

Out of the need to synthesize, we summarize below some of the techniques applied in extenso during the sessions, as follows: using the principle of resource utilization (Erickson et al., 1992), using metaphors - Happiness Mountain, Suggestions on changing self-image and Eating as an art and recognizing the importance of the accurate sensation of hunger (adapted from Hammond, 1990), Cognitive reframing to increase impulse control (adapted from Spiegel & Spiegel, 2004).

Results

Table I shows the demographic data for the intervention and control groups

Table I
Demographic data.

Indicator		Intervention	Control
Age interval		30-67	22-70
Gender	Men	4 (8%)	12 (20%)
	Women	46 (92 %)	48 (80 %)
BMI (T1)	<25	0 (0 %)	20 (33.3 %)
	25-30	16 (32 %)	20 (33.3 %)
	>30	34 (68 %)	20 (33.3 %)

Table II shows the means and standard deviations for the intervention and control groups at the three measurement time points: pre-intervention (t1), post-intervention (t2) and the 6-month follow-up (t3).

Table III shows the t-tests for the differences between the control group scores at t1 and t2. These comparisons help us to see whether the changes recorded at t2 and t3 in the intervention group are also present in the control group. As we can see there are no statistically significant differences between t1 and t2 in the control group for any of the variables investigated. The only notable difference is that between the depression score t1 and the depression score t2 (p=0.07). We can conclude that at the level of the control group all the variables measured have similar mean values at t1 and t2, with slight, insignificant increases and decreases.

Table III
Control comparison t1-t2.

Dependent variable	t test	p value
BMI	-.70	.49
UE	-.03	.97
EE	.18	.85
CR	1.08	.29
DAS-D	1.86	.07
DAS-A	.77	.44
DAS-S	1.22	.23
LSE	1.35	.18

Table II
Means and standard deviations.

Indicator	BMI	UE	EE	CR	DAS D	DAS A	DAS S	LSE	
Intervention	T1 (n=50)	33.72 (5.71)	23.20 (5.01)	16.20 (4.73)	16.08 (2.66)	5.22 (3.49)	3.98 (3.48)	6.86 (4.45)	17.58 (6.59)
	T2 (n=50)	32.96 (5.62)	19.74 (5.53)	15.16 (4.42)	15.60 (2.89)	3.94 (3.25)	3.54 (3.51)	5.64 (3.75)	15.38 (6.30)
	T1 (n=27)	33.90 (5.26)	23.70 (4.59)	16.77 (5.01)	15.77 (2.56)	5.33 (3.74)	4.48 (6.64)	7.07 (4.37)	17.11 (6.77)
	T2 (n=27)	32.89 (5.25)	21.00 (4.83)	15.88 (3.99)	15.07 (2.93)	3.77 (3.51)	2.77 (3.44)	4.88 (4.06)	15.00 (6.49)
	Follow-up (n=27)	32.41 (4.61)	20.18 (5.96)	15.33 (5.23)	15.44 (3.38)	4.03 (4.03)	3.62 (3.75)	5.51 (4.28)	13.44 (5.62)
	Control	T1 (n=60)	27.78 (5.03)	20.11 (6.40)	13.88 (5.53)	15.01 (3.75)	6.18 (4.80)	5.23 (4.56)	7.01 (5.16)
T1 (n=26)		27.96 (4.11)	20.80 (5.91)	13.61 (5.32)	15.92 (2.82)	5.88 (5.10)	5.46 (4.76)	7.57 (5.57)	15.42 (6.87)
T2 (n=26)		28.15 (4.05)	20.84 (5.50)	13.50 (5.36)	15.46 (3.12)	4.19 (4.10)	4.61 (4.06)	6.19 (3.81)	14.26 (5.48)

Note: BMI-body mass index, UE – uncontrolled eating, EE – emotional eating, CR – cognitive restriction, DAS-D – depression, DAS-A – anxiety, DAS-S – stress, LSE – low self-esteem.

Table IV
Intervention group.

Dependent variable	T test T1-T2 (n=50)	P value	F test (n=27)	P value	Post-hoc					
					T1-T2		T1-T3		T2-T3	
					Mean difference	P value	Mean difference	P value	Mean difference	P value
BMI	4.41	.00	8.98	.00	1.01	.00	1.69	.00	.66	.10
UE	3.83	.00	5.50	.00	2.74	.02	3.51	.00	.81	.47
EE	1.50	.13	1.13	.26	-	-	-	-	-	-
CR	1.07	.29	.64	.52	-	-	-	-	-	-
DAS-D	2.34	.02	2.16	.12	-	-	-	-	-	-
DAS-A	.78	.43	2.69	.07	-	-	-	-	-	-
DAS-S	1.96	.055	3.56	.03	2.18	.01	1.55	.06	-.63	.47
LSE	4.67	.00	12.86	.00	2.11	.00	3.66	.00	1.55	.06

To test for differences between t1, t2 and follow-up (t3) we used two statistical tests. First, we used paired samples t-tests to test the differences between t1 and t2 for the 50 person group. There were significant differences in BMI, uncontrolled eating, depression and low self-esteem (Table IV Intervention group). Also, the t-test for the difference in stress is close to the threshold of statistical significance (p=0.055). For all the variables mentioned there was a decrease in the mean value, which supports our hypotheses regarding BMI, uncontrolled eating, depression and low self-esteem. Regarding the other variables investigated, decreases were also observed, but they were not statistically significant (see table IV Intervention group).

Next, we used the F-test (repeated measures Anova) to test for differences between t1, t2 and t3, only for the 27 participants who completed the questionnaires and at follow-up. This analysis is necessary to investigate whether the effects were also maintained at follow-up and to see whether the results are different if we only consider the 27 participants. Where the F-test had a statistically significant value, we also performed a post hoc analysis to locate these statistically significant differences using Fisher's LSD test.

Thus, we obtained a statistically significant value for BMI. The post hoc tests show us that there are statistically significant differences between t1 and t2 (p=.00) and t1 and t3 (p=.00) and no differences between t2 and t3 (p=0.1). Thus, the BMI levels were significantly reduced from t1 to t2. A decrease in BMI can also be observed from t2 to t3, but this is not statistically significant.

Regarding uncontrolled eating we can see that the F-test is statistically significant (p=.00), and post hoc tests show that there are significant differences between t1 and t2 (p=.02), and between t1 and t3 (p=.00). We also obtained a significant F for stress (p=.03). Post hoc tests show that the difference between t1 and t2 is statistically significant (p=.01), and the difference between t1 and t3 is close to being statistically significant (p=.06).

We also obtained a statistically significant F-value for low self-esteem (p=.00). The post hoc tests show us that the difference between t1 and t2 is statistically significant (p=.00) and the difference between t1 and t3 is statistically significant (p=.00), and the difference between t2 and t3 is close to being statistically significant (p=0.06).

Thus, we can conclude that the 27 participants who

took part in all 3 measurements experienced significant decreases as a result of the intervention in BMI, uncontrolled eating, stress and low self-esteem. These decreases were maintained at t3 or even emphasized in some cases (BMI and low self-esteem).

Given the fact that the control group is a non-equivalent group, and there are differences in BMI between the two groups at the start of the intervention, we wanted to investigate the possibility that the decreases were not due to the intervention, but to the fact that the participants in the intervention group had regressed towards the mean due to higher t1 scores. To test this possibility, we divided the intervention group into two subgroups (BMI less than 30 and BMI greater than 30). Thus, there are 16 people with a BMI less than 30 and 34 people with a BMI greater than 30. Table V shows the mean scores for the two groups for all variables investigated.

Table V
Means and standard deviations for BMI<30 and BMI>30.

Indicator	BMI <30	BMI >30
BMI	28.4 (0.99)	36.22 (5.27)
UE	22.7 (5.33)	23.41 (4.92)
EE	16.37 (5.67)	16.11 (4.31)
CR	16.18 (2.99)	16.02 (2.54)
DAS-D	5.37 (4.42)	5.14 (3.03)
DAS-A	4.37 (3.91)	3.79 (3.31)
DAS-S	7.00 (4.93)	6.79 (4.29)
LSE	16.37 (6.55)	18.14 (6.63)

To test whether the decrease in the variables investigated was different for the two categories, we performed mixed Anova tests (where the time variable has two conditions, t1 and t2, and the category variable BMI also has two modalities, BMI<30 and BMI>30). Thus, we analyzed the interaction effects between the two variables. The interaction in this case shows us whether the reduction in BMI (and the other investigated variables) is different for the 2 groups.

The interaction between the two variables is not statistically significant ($p=.95$). The reduction in BMI is practically the same for both groups.

We also performed mixed Anova analyses for the other variables and examined the interaction between the time and the BMI category variables. None of these interactions are statistically significant, demonstrating that decreases in uncontrolled eating, stress, and low self-esteem do not differ according to the BMI category.

The hypotheses advanced regarding differences between t1 and t2 ($n=50$) are supported by results for BMI, uncontrolled eating, low self-esteem and depression. For the stress variable, the difference between t1 and t2 is close to the statistical significance threshold.

The hypotheses advanced regarding the differences between t1 and t3 ($n=27$) are supported by results on BMI, uncontrolled eating and low self-esteem. It should be noted that the stress variable is also close to the statistical significance threshold. At the same time, at the level of the variables anxiety and depression, the F-test was close to the threshold of statistical significance.

Discussion

The main objective of the present study was to evaluate the effects of an intervention based on a combination of CBT and hypnosis techniques. The results of the study show that the intervention was effective in reducing BMI. Within the intervention group there was a statistically significant difference between the pre-intervention and the post-intervention measurements. Moreover, this effect was for visible in both overweight (BMI between 26-30) and obese individuals (with a BMI higher than 30), demonstrating that participants benefited from the intervention, regardless of the BMI level. For the control group, there was no significant change in BMI. Taken together, these results support the effectiveness of the intervention in reducing BMI.

Related to the three dimensions of the eating behavior, uncontrolled eating, emotional eating and cognitive restraint, there were interesting and partly surprising changes. Thus, as expected, uncontrolled eating was significantly reduced, but emotional eating, while showing significant decreases, did not reach the statistical significance threshold, whereas cognitive restriction did not change to a relevant extent.

It should be noted that the applied intervention targeted all three dimensions of the eating behavior. Previous studies in the field show that among the three dimensions, emotional eating has the strongest association with BMI and shows the largest changes following psychological interventions for weight management (Dakanalis et al., 2023; van Strien et al., 2016)

A possible explanation for the fact that in the present study uncontrolled eating was reduced more than the other dimensions could be attributed to the techniques used in the applied intervention. Among other things, the intervention focused on analyzing the impulses to eat in order to identify their underlying causes. Thus, participants were taught to differentiate between real hunger and impulses to eat triggered by factors such as the presence of tempting food, social circumstances and unhealthy eating habits, and to eat only when feeling real hunger. An alternative explanation could be that it is more difficult to manage eating urges triggered by intense negative emotions (which is measured by the emotional eating dimension in the TFEQ) than it is to manage uncontrolled eating urges triggered by internal and external factors that do not carry such an intense emotional load (the factors measured by the uncontrolled eating dimension in the TFEQ).

As the above discussion shows, overweight and obesity often occur against the background of the relationship between eating behaviors and a negative emotional background. For this reason, we also investigated negative emotions, depression, anxiety and stress and the changes obtained in relation to them following the intervention. Thus, in the intervention group setting there was a significant decrease in depression, while for stress, although there were significant reductions, the statistical significance threshold was not reached. In relation to the anxiety dimension, surprisingly, here the smallest changes were observed following the intervention. We thought it would be interesting to investigate what the trends were

for the three dimensions and separately for the group of participants from whom we collected data and at the t3 follow-up time (n=27). Although the number of people who participated in the t3 measurements decreased, these measurements (6 months after the end of the intervention) also allowed us to analyze the dynamics over time of these dimensions. First of all, it should be noted that when we analyze only the “follow-up” group (n=27), the changes in stress and anxiety are emphasized (in the sense of decreasing), and for depression, the differences are similar to those of the whole intervention group. One possible explanation for these interesting results could be related to the higher levels of motivation and adherence to the programme, but we do not have explicit measures for these. Encouragingly, we remark that even after the 6-month interval (follow-up measurement) these differences tend to be maintained.

Taken as a whole, we can see that all three dimensions have changed, with a downward trend in both depression on one hand, and stress and anxiety on the other. These results, together with the decreases in eating behaviors (uncontrolled and emotional eating) may explain the decrease in BMI following the intervention. As previous studies show (van Strien 2018, Dakanalis et al., 2023) emotional and uncontrolled eating may be mediators between negative emotional states (such as depression) and BMI. Thus, our results are consistent with this explanation and with the way the intervention design was conceived, which was designed to produce changes in the psychological factors that are notorious among the causes of obesity.

We can assume that the techniques used in the intervention, which aimed to reduce uncontrolled and emotional eating as well as depression, stress and anxiety, had an effect on reducing BMI.

A limitation of the present study is that, for practical reasons, the people in the two groups (intervention and control) were not randomly selected, and there is a possibility that the changes in the intervention group were due to the high scores of the participants at the beginning of the intervention (Regression toward mean). However, we have addressed this limitation through the detailed analyses performed, showing that all participants benefited from the intervention, regardless of the BMI level (<30 and >30).

The present study, through its results, paves the way towards a new level of exploration of the links between a person’s thoughts, emotions and behaviors on the one hand and their body weight on the other. The findings of the study, which largely confirm the data in the literature, lead to the need for further research, especially by practitioners, by selecting and adjusting techniques according to the trends illustrated in the present study. At the same time, however, there is also a need to re-examine the issues raised in this study in research of the most rigorous possible design and, depending on the resources that can be allocated, as broad as possible in terms of the number of participants, the time periods involved (minimum 6 months for the intervention itself) or the measurements made.

Conclusions

1. The present study shows that the proposed intervention, based on a combination of CBT and hypnosis techniques is effective in reducing BMI.
2. The present study shows that the proposed intervention, based on a combination of CBT techniques and hypnosis is effective in reducing uncontrolled eating, depression and low self-esteem.
3. The intervention confirms the maintenance of the positive results obtained over a follow-up period of 6 months.
4. The results of the study show that there are complex relationships between the psycho-emotional aspects and body weight.
5. We consider that the results obtained in the present study are quite promising and thus support the idea of the effectiveness of the combination of CBT techniques and hypnosis.

Conflict of interests

The authors declare no conflicts of interests.

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