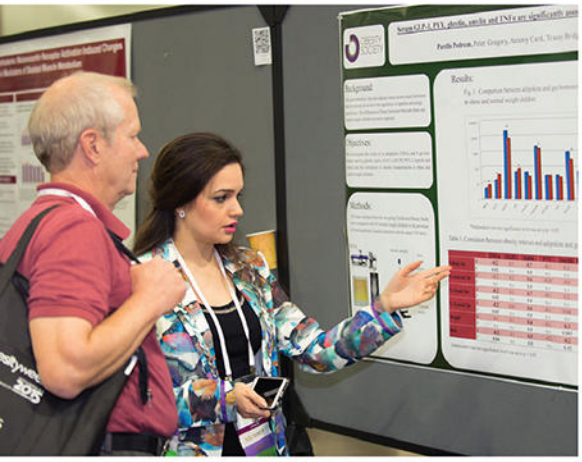

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Obesity

Effects of Self-Conditioning Techniques (Self-Hypnosis) in Promoting Weight Loss in Patients with Severe Obesity: A Randomized Controlled Trial

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Objective: The usefulness of the rapid-induction techniques of hypnosis as an adjunctive weight-loss treatment has not been defined. This randomized controlled trial evaluated whether self-conditioning techniques (self-hypnosis) added to lifestyle interventions contributed to weight loss (primary outcome), changes in metabolic and inflammatory variables, and quality of life (QoL) improvement (secondary outcomes) in severe obesity.

Methods: Individuals (with BMI = 35-50 kg/m^2) without organic or psychiatric comorbidity were randomly assigned to the intervention (n = 60) or control arm (n = 60). All received exercise and behavioral recommendations and individualized diets. The intervention consisted of three hypnosis sessions, during which self-hypnosis was taught to increase self-control before eating. Diet, exercise, satiety, QoL, anthropometric measurements, and blood variables were collected and measured at enrollment and at 1 year (trial end).

Results: A similar weight loss was observed in the intervention (–6.5 kg) and control (–5.6 kg) arms (β = –0.45; 95% CI: –3.78 to 2.88; P = 0.79). However, habitual hypnosis users lost more weight (–9.6 kg; β = –10.2; 95% CI: –14.2 to –6.18; $P < 0.001$) and greatly reduced their caloric intake (–682.5 kcal; β = –643.6; 95% CI: –1064.0 to –223.2; P = 0.005) in linear regression models. At trial end, the intervention arm showed lower C-reactive protein values (β = –2.55 mg/L; 95% CI: –3.80 to –1.31; $P < 0.001$), higher satiety score (β = 19.2; 95% CI: 7.71-30.6; P = 0.001), and better QoL (EuroQol health status) (β = 0.09; 95% CI: 0.02-0.16; P = 0.01).

Conclusions: Self-hypnosis was not associated with differences in weight change but was associated with improved satiety, QoL, and inflammation. Indeed, habitual hypnosis users showed a greater weight loss.

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Introduction

Because of the rising epidemic of obesity, little treatment success, and high rates of relapse, finding new approaches for its care has become increasingly important.

Some studies have evaluated the effectiveness of hypnosis as an adjunctive therapy for weight loss (1-3). Clinical hypnosis is a procedure in which changes in sensation, perception, thought, and behavior are suggested by a therapist; the hypnotic induction produces either "a distinct state of consciousness" or a normal state with heightened suggestibility according to the different theoretical conceptions of hypnosis (1,4).

Overall, hypnosis has been recognized as an effective tool for weight reduction, even if many methodological limitations of the published research (small cohorts, lack of long-term follow-up, variations in procedures, different response measurements) have been identified, making the evaluation of treatment efficacy difficult (5). Usually, traditional hypnotic techniques have been combined with social, cognitive, and behavioral psychological approaches. The hypnotic procedure has varied greatly among studies. The following methods have been used: a 9-week program, with the presentation of eating and dieting rules during the hypnotic sessions (6); the utilization of audiotapes after the hypnotic treatment with a therapist (7); the combination of hypnotic and behavioral therapy for 12 sessions over a

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period of 8.5 months (8); and a multifaceted program with suggestions for relaxation, self-control, and self-esteem, strengthening motivation toward change (9). Most of these treatments are long, demanding, and difficult to perform in clinical practice on a large number of patients. Moreover, during the hypnotic sessions, many researchers have given suggestions targeting aversion to specific high-calorie foods, persuading participants that overeating is a poison, or employing other techniques of aversion (10,11) rather than purposeful messages or pleasant suggestions for heightening the awareness of self-control and healthy functioning.

Recently, techniques with a rapid-induction phase have allowed the patient to go into hypnosis in a few minutes. Trained individuals can repeat the experience in complete autonomy (self-hypnosis), using a minimal amount of time during the day.

Overeating often involves loss of control and compulsive behaviors (12), and people frequently bring daily stress and worries to meals, thus eating in less conscious ways and consuming more calories than necessary.

We hypothesized that self-hypnosis could be applied before eating occasions or circumstances of irrational food need as an aid to increase awareness and self-control.

Therefore, our aims were to evaluate whether self-conditioning techniques (self-hypnosis) added to a traditional lifestyle approach (diet, exercise, and behavioral recommendations) in patients with severe obesity were effective in determining weight loss, changes in metabolic and inflammatory variables, and improvement in quality of life compared with the traditional lifestyle approach.

Methods

The methods of the present trial have been previously reported (13). The trial was conducted at the Unit of Clinical Nutrition of the Città della Salute e della Scienza Hospital in Turin, Italy. Participants were enrolled between January 2015 and June 2016.

Inclusion criteria were as follows: BMI 35 to 50 kg/m^2, aged 20 to 70 years, able to give written informed consent, and accepting hypnosis. The exclusion criteria were as follows: current or previous mental disorders diagnosed by an expert clinician and/or use of any psychotropic drug, insulin treatment, candidacy for bariatric surgery, current (or discontinued for <6 months) treatment with antiobesity drugs, and risk for heart failure, edema, or ascites (known heart diseases, chronic liver diseases, nephrotic syndrome, renal failure, untreated or uncompensated thyroid diseases). Before enrollment, in order to exclude clinically relevant psychiatric symptoms below diagnostic thresholds, patients completed the following questionnaires: the Hamilton Rating Scale for Depression (14), the Hamilton Anxiety Scale (15), and the Binge Eating Scale (16). Only individuals who satisfied all three scores (respectively, <8, <17, and <17) were considered for enrollment.

This prospective, randomized controlled, open-label, monocentric trial was registered at ClinicalTrials.gov (identifier NCT02978105).

Intervention

Eligible patients were randomized either to the experimental arm (self-conditioning techniques plus standard care) or the control arm (standard care, i.e., diet plus exercise plus behavioral recommendations) (Figure 1).

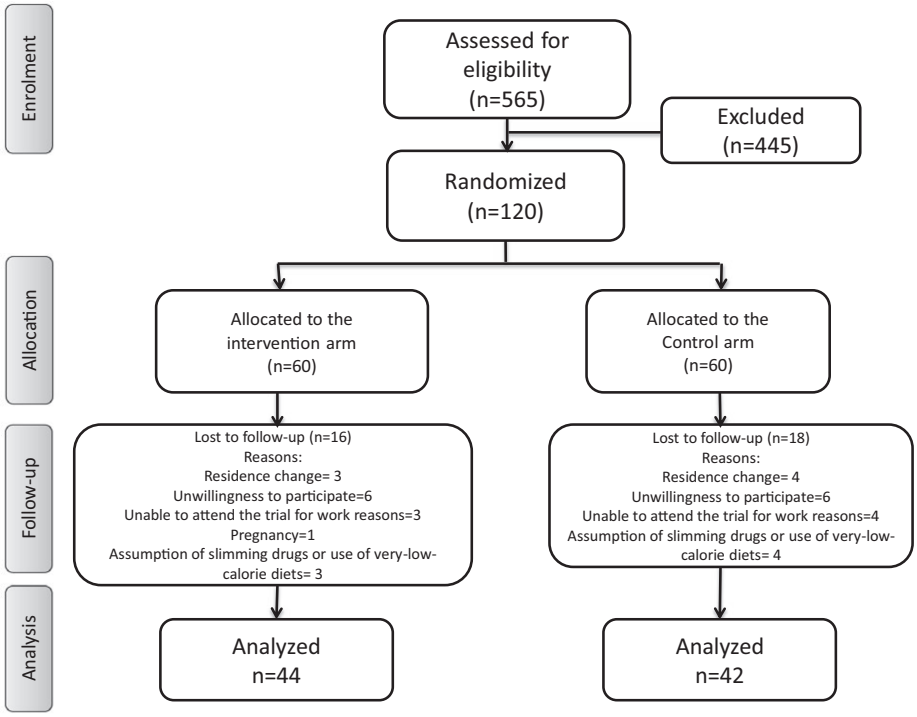

Figure 1 Flow of the study.

All participants received the recommendation of performing at least 20 min/d of brisk walking, according to the Borg scale criteria (17), and a diet by a trained registered dietitian with similar nutrient compositions (energy ~1,500 ± 100 kcal/d 15%-20% proteins [70 ± 5 g], 55%-60% carbohydrates [180 ± 10 g], and 25%-30% lipids [55 ± 5 g]) but containing different foods, varying according to personal eating habits, tastes and preferences, cultural traditions, and work-life habits. Verbal and written behavioral recommendations were given to all patients, i.e., recommendations about exercise inclusion in daily activities and simple tips to favor diet adherence (e.g., do not buy foods on an empty stomach, do not do anything else when eating).

The participants were followed up every 3 months (at 3, 6, 9, and 12 months after enrollment) by a dietitian and a medical doctor, during which a physical assessment, the recording of adverse events or effects, and a check for compliance with the protocol were performed. During visit intervals (at 1.5, 4.5, and 10.5 months after enrollment), participants were called by phone and asked about adverse events and compliance with the intervention.

Subjects who withdrew from the study before 12 months for any reason, or those who took slimming products or drugs or employed techniques to lose weight other than those recommended (e.g., very low-calorie diets, highly unbalanced diets) during the trial, were considered dropouts.

Self-hypnosis

The experimental group received three individual hypnosis sessions performed by trained personnel (two nurses, one medical doctor). To minimize the potential lack of fidelity, the health care providers were assigned to the sessions by a scheduled rotation among sessions to ensure a balanced intervention. Rapid-induction techniques were used, and the patient went into a hypnotic condition in a few minutes (18).

Timing of the hypnosis sessions was 2 weeks, 6 weeks, and 15 weeks after randomization (13). The first session of the hypnotic procedure (lasting about 30 minutes) was briefly introduced, and information about medical hypnosis and its potential application as an amplification of personal resources to manage self-control was given. During this phase, the degree of susceptibility to hypnosis was evaluated by the Spiegel eye-roll test (19). Thereafter, the rapid hypnotic induction was determined through a technique of attention focusing (fixating on a point or focusing attention on a part of one's body) and ratification of what was happening. The hypnotic procedure has already been described (13).

During the anchor phase, the subject received a self-conditioning symbolic signal (i.e., joining the thumb with the index or making a fist with the thumb folded inside the hand) by which he/she could rapidly enter into a hypnotic condition in complete autonomy (self-hypnosis) many times during the day. The anchor stage was then checked, and if necessary, the procedure was repeated a second and/or third time by changing suggestions and/or the symbolic anchor signal. Finally, instructions were given about self-hypnosis use before each meal or food-compulsion occasion for about 3 minutes (10 seconds to enter, 2 minutes of "safe-place" thinking with muscle relaxation and mental well-being, and 30 seconds to exit).

In the subsequent two sessions ("reinforcements sessions") lasting 20 to 30 minutes, participants reported difficulties and problems with, barriers to, and benefits of self-hypnosis. The skill of entering into hypnosis was checked again, and suggestions for overcoming the encountered barriers and problems were given (13).

The hypnotic sessions had a common core, but the manner of hypnosis induction was individualized based on the participants' characteristics.

Quality control

The participants' acquired skills were checked each session by the hypnotists with the evaluation of typical muscle changes (muscle inertia, levitation, catalepsy), characteristic physical appearance (variation of facial expression, movements of eyelids or eyeballs, swallowing, changes in respiratory rate, vasodilation), and alteration of consciousness (partial detachment from reality, time warp, realistic images, and conceived situations). The hypnotic condition achieved was considered satisfactory if all the above reported conditions were present at the same time.

In the case of low hypnotizability, the participant was still encouraged to apply the procedure before each meal and food-compulsion attack.

Outcomes

The primary outcome was between-arm weight change at 12 months after randomization.

Secondary outcomes were between-arm changes in waist circumference, arterial blood pressure, metabolic and inflammatory variables, satiety, well-being, and eating and exercise patterns.

Randomization

The list of randomization, stratified by age (50; >50 years), gender, and BMI (40; >40), was generated by a variable-length block procedure that was masked to researchers. The randomization procedure was centrally run through an online procedure (available at https://www.epiclin.it). A unique code was assigned to each participant.

Blinding

Blinding participants and health professionals was not possible because of the nature of the intervention. However, the personnel who performed the laboratory analyses and anthropometric measurements and collected questionnaire data were blinded to the arm assignment.

Safety

Adverse events and compliance with the study protocol were monitored both during each visit and between the visits (by phone calls). Participants were instructed to inform the researchers if adverse effects occurred.

Ethics

The study protocol received ethical approval from the local ethics committee. All the procedures were conducted according to the Helsinki Declaration. All patients provided written informed consent to participate.

Measurements

At enrollment and at 12 months (trial end), all the participants were submitted to the following: 3-day food record; the Minnesota-Leisure-Time-Physical-Activity questionnaire (20); the Satiety Labeled Intensity Magnitude scale (21); the satisfaction and well-being EuroQol-5D questionnaire (Index and Visual Analog Scale) (22); anthropometric and arterial blood pressure measurements; and blood sample collections after an overnight fast to measure glucose, insulin, glycated hemoglobin, total and high-density lipoprotein cholesterol, triglycerides, and high-sensitivity C-reactive protein (CRP).

Body weight and waist circumference were also measured at 3, 6, and 9 months from randomization.

Participants from the intervention arm were asked about the frequency of self-hypnosis use; they were divided into individuals with low (0-1), medium (2-3), or high hypnotizability (4) according to the score obtained by the Spiegel eye-roll test.

The physical activity level was calculated as the product of the duration and frequency of each activity (hours/week), weighted by an estimate of the metabolic equivalent of the activity and summed for the activities performed (20).

Anthropometric and blood pressure measurements and laboratory methods have been previously published (13). Homeostasis model assessment-insulin resistance was calculated according to the published algorithm (23).

Statistical analyses

The sample size was calculated in relation to the primary outcome, i.e., the between-arm weight change at 12 months after randomization. Available data on patients with clinical characteristics similar to those enrolled were used. With an effect size of 0.67 and a two-tailed α error of 0.05, 48 patients per arm were needed to obtain 90% power. This number was increased to 60 because of the possibility of dropouts.

Endpoint analyses were based on the between-arms comparisons of the changes from baseline to 12 months after randomization (deltas). Linear regression models were used to compare deltas of the analyzed endpoints between arms, adjusting for the baseline measurement and the randomization stratification variables (gender, age [50; >50 years], and BMI [40; >40]).

An intention-to-treat analysis including all the randomized patients was performed by using two approaches to deal with dropouts. First, we performed multiple imputation of missing 12-month variables using the method of chained equations, a technique operating under the assumption that missing data are "missing at random" (24). Combined estimates were obtained from 50 imputed data sets. In the second approach, we imputed missing variables under the scenario that dropouts would have worsened their outcomes. Therefore, the average observed worsening was assigned to dropouts.

For each randomization arm, mean changes from baseline for weight, BMI, and waist circumference were estimated at 3, 6, 9, and 12 months using linear regression models for repeated measures. Interaction terms between arms and the time point variables were included to estimate the specific mean change from baseline for each arm at fixed times. To account for the repeated measures on the same subject, mean changes from baseline were estimated controlling the standard errors with the Huber-White Sandwich Estimator (25).

The associations between hypnosis-use frequencies (coded as dummy variables), as well as anthropometric or laboratory variables, and questionnaire scores were evaluated by linear regression models, adjusted for the randomization stratification variables.

Results

The clinical and laboratory characteristics at enrollment were very similar between the two randomization arms (Table 1).

At 12 months, there were 16/60 (26.7%) individuals lost at follow-up from the intervention arm and 18/60 (30.0%) from the control arm. The main reasons for dropout are reported in Figure 1. No significant difference was evident between individuals who completed the trial and those who were lost, even if the latter tended to be younger and more frequently male (Supporting Information Table S1).

During the trial, no death or hospitalization occurred. Other adverse events (i.e., infections, trauma, acute inflammatory conditions) occurred to a similar extent in both trial arms.

Hypnosis did not cause any adverse effects in the intervention group.

Changes in anthropometric and laboratory variables

Changes in anthropometric and laboratory variables are reported in Table 2.

Deltas (i.e., between-arm differences in trial-end values minus baseline values) of weight were −6.5 kg and −5.6 kg in the intervention and control arms, respectively, without a significant between-arm difference. Other deltas did not differ between arms, with the exception of delta CRP values, which significantly decreased in the intervention arm.

In both arms, individuals significantly reduced their weight, BMI, and waist circumference values from baseline to trial end (Supporting Information Table S2). Within-group variations were significantly different as early as 3 months after randomization.

Intention-to-treat analyses confirmed the significant reduction in CRP values in the intervention arm (Supporting Information Tables S3 and S4).

Changes in lifestyle habits and drug use

Mean energy intake significantly decreased in both groups at follow-up (1,470.6 ± 281.1 kcal and 1,496.9 ± 311.9 kcal in the intervention and control arms, respectively; $P < 0.001$ for within-group difference in both groups). Mean differences were −423.8 and −379.0 kcal, respectively, in the intervention and control arms ($P = 0.84$). The composition in macronutrients did not significantly change from baseline to trial end in both arms (data not shown).

TABLE 1 Baseline characteristics of the patients

	Intervention arm	Control arm	Total
Number	60	60	120
Age (y)	49.0 ± 12.7	49.0 ± 13.0	49.0 ± 12.8
Males (%)	33.3	30.0	31.7
Actual smokers (%)	20.0	21.7	20.8
MET (h/wk)	24.5 (28.1)	28.3 (38.0)	25.6 (32.6)
Height (m)	1.64 ± 10.2	1.63 ± 9.6	1.63 ± 9.9
Weight (kg)	110.7 ± 17.1	108.6 ± 16.7	109.6 ± 16.9
BMI (kg/m^2)	41.2 ± 4.7	41.0 ± 3.8	41.1 ± 4.3
Waist circumference (cm)	122.0 ± 12.5	121.0 ± 11.5	121.5 ± 12.0
Percent body fat	45.3 ± 4.6	45.0 ± 6.1	45.1 ± 5.4
Systolic blood pressure (mmHg)	130.2 ± 16.1	130.8 ± 13.6	130.5 ± 14.8
Diastolic blood pressure (mmHg)	81.5 ± 10.6	81.5 ± 8.3	81.5 ± 9.5
Dietary intakes			
Energy (kcal)	1,872.6 ± 589.2	1,875.1 ± 466.7	1,873.8 ± 529.2
Carbohydrates (% total kcal)	48.8 ± 7.0	47.7 ± 8.1	48.3 ± 7.5
Sugars (% total kcal)	12.1 ± 3.9	11.3 ± 5.1	11.7 ± 4.5
Proteins (% total kcal)	16.6 ± 2.7	16.5 ± 3.0	16.5 ± 2.9
Total fats (% total kcal)	33.5 ± 5.4	34.7 ± 7.0	34.1 ± 6.3
Saturated fatty acids (% total kcal)	9.6 ± 2.6	9.7 ± 2.8	9.6 ± 2.7
Polyunsaturated fats (% total kcal)	7.5 ± 1.8	7.8 ± 2.1	7.6 ± 1.9
Fiber (g/d)	17.1 ± 5.2	17.3 ± 5.3	17.2 ± 5.2
Laboratory variables			
Fasting glucose (mg/dL)	94.1 ± 20.2	91.3 ± 17.9	92.7 ± 19.0
Glycated hemoglobin (mmol/mol)	41.4 ± 8.9	40.2 ± 6.8	40.8 ± 7.9
Fasting insulin (μU/mL)	14.0 (6.7)	13.8 (11.4)	14.0 (8.5)
HOMA-IR (mmol/L × μU/mL)	3.1 (2.0)	3.4 (2.8)	3.2 (2.4)
CRP (mg/L)	5.3 (5.4)	5.4 (7.1)	5.3 (6.4)
Total cholesterol (mg/dL)	185.8 ± 41.0	186.4 ± 24.7	186.1 ± 33.7
HDL cholesterol (mg/dL)	49.8 ± 13.4	47.1 ± 12.2	48.4 ± 12.8
Triglycerides (mg/dL)	105.5 (55.0)	111.5 (56.0)	96.5 (49.0)
Drugs			
Antihypertensive (%)	46.7	43.3	45.0
Hypoglycemic agents (%)	6.7	5.0	5.8
Lipid-lowering (%)	13.3	11.7	12.5
Questionnaires			
Satiety score	50 (50)	50 (40)	50 (60)
EuroQol VAS	61.8 ± 16.3	64.2 ± 17.3	63.0 ± 16.8
EuroQol health status	0.67 ± 0.21	0.72 ± 0.14	0.70 ± 0.18

Data given as mean ± SD, or median (interquartile range).
HDL, high-density lipoprotein; HOMA-IR, homeostasis model assessment-insulin resistance; MET, metabolic equivalent; VAS, visual analog scale; CRP, C-reactive protein.

Median (interquartile range) metabolic equivalent values at follow-up were 24.8 (27.2) and 30.5 (41.7) h/wk in the intervention and control arms, respectively, without a significant difference in within- and between-group analyses.

During follow-up, there were small variations in the therapy of the patients: hypoglycemic drugs were added to two subjects from the intervention arm and one subject from the control arm; lipid-lowering agents were added to one subject from each arm; and antihypertensive drugs were suspended from one subject from the intervention arm and added to one subject from the control arm.

Changes in satiety and health status

Participants from the intervention arm showed increased satiety and quality of life scores at trial end (Table 2), with within-group significant differences ($P = 0.001$, $P < 0.001$, and $P = 0.002$ for satiety, EuroQol Visual Analog Scale, and EuroQol health status, respectively). In the

TABLE 2 Trial-end values of variables and comparisons between arms by a linear regression model

	Intervention arm		Control arm				
	Trial-end value	Mean delta	Trial-end value	Mean delta	Adjusted mean difference on delta (β)[1]	95% CI	*P*
Weight (kg)	102.9 ± 16.3	−6.5	100.8 ± 18.6	−5.6	−0.45	−3.78 to 2.88	0.79
BMI (kg/m^2)	38.7 ± 5.0	−2.4	38.8 ± 5.5	−2.1	−0.24	−1.49 to 1.01	0.70
Waist circumference (cm)	115.2 ± 14.7	−6.3	115.8 ± 14.7	−4.9	−1.34	−5.06 to 2.37	0.47
Percent body fat	42.5 ± 5.5	−3.1	43.5 ± 6.3	−1.5	−1.38	−2.91 to 0.15	0.08
Systolic blood pressure (mmHg)	125.4 ± 15.1	−4.0	129.6 ± 17.5	−2.6	−3.11	−9.28 to 3.07	0.32
Diastolic blood pressure (mmHg)	79.9 ± 13.2	−2.3	80.7 ± 8.2	−1.1	−1.03	−5.59 to 3.53	0.65
Fasting glucose (mg/dL)	92.0 ± 19.4	−2.3	91.5 ± 18.3	+0.3	−1.17	−8.18 to 5.84	0.74
Glycated hemoglobin (mmol/mol)	39.0 ± 6.7	−2.7	38.4 ± 6.7	−1.8	−0.33	−2.3 to 1.64	0.74
Fasting insulin (μU/mL)	14.0 (10.2)	−3.7	15.3 (12.8)	−1.5	−1.50	−4.44 to 1.43	0.31
HOMA-IR (mmol/L × μU/mL)	3.3 (2.2)	−1.1	3.5 (2.6)	−0.4	−0.44	−1.26 to 0.39	0.30
CRP (mg/L)	2.2 (3.0)	−3.5	3.7 (6.0)	−0.7	−2.55	−3.80 to −1.31	<0.001
Total cholesterol (mg/dL)	180.9 ± 31.3	−5.3	182.7 ± 33.5	−2.8	−2.07	−14.0 to 9.81	0.73
HDL cholesterol (mg/dL)	53.3 ± 13.3	+4.0	50.9 ± 15.6	+4.9	−0.48	−4.05 to 3.09	0.79
Triglycerides (mg/dL)	94.5 (41.5)	−10.0	91.5 (32.0)	−21.6	9.14	−3.61 to 21.9	0.16
Satiety score	80 (30)	+19.3	50 (60)	−1.4	19.2	7.71 to 30.6	0.001
EuroQol VAS	73.4 ± 13.7	11.9	66.9 ± 18.2	3.7	6.90	0.63 to 13.2	0.03
EuroQol health status	0.77 ± 0.13	0.11	0.69 ± 0.21	−0.02	0.09	0.02 to 0.16	0.01

Data given as mean ± SD, or median (interquartile range).
Delta = trial-end value minus baseline value.
[a]Adjusted for stratification variables (age, gender, BMI) and the baseline value of the variable.
HDL, high-density lipoprotein; HOMA-IR, homeostasis model assessment-insulin resistance; VAS, visual analog scale ; CRP, C-reactive protein.

controls, these scores did not change significantly. The associations between being in the intervention arm and the scores were confirmed by linear regression (Table 2) and by the intention-to-treat analyses (Supporting Information Tables S3 and S4).

Frequency of self-hypnosis use

At trial end, 16/44 (36.3%) claimed to practice self-hypnosis regularly once per day, 7/44 (15.9%) more frequently than once per day, 9/44 (20.5%) less frequently than once per day (i.e., with a weekly frequency), and 12/44 (27.3%) claimed to practice it rarely or never. The corresponding values of delta weight were −9.6 kg (≥once per day), −7.5 kg (<once per day), and +0.2 (rarely or none).

The frequency of hypnosis use was significantly associated with changes in weight, BMI, waist circumference, and energy intake after adjusting for age, gender, and BMI (Supporting Information Table S5). No significant association was evident with the other anthropometric and laboratory variables or with questionnaire scores.

The frequency of self-hypnosis declined with time. The prevalence of individuals practicing the procedure ≥once per day, <once per day, and rarely or none was 77.8%, 15.6%, and 6.7%, respectively, at 6 months and 72.7%, 15.9%, and 11.4%, respectively, at 9 months.

Hypnotizability

Participants in the intervention arm were divided according to the Spiegel eye-roll test into individuals with low (43.2%), medium (52.3%), or high hypnotizability (4.5%) (19).

No difference in the hypnotizability scores was evident between individuals who completed the follow-up and those who did not (Supporting Information Table S1). The susceptibility to hypnosis did not correlate with any outcome, either the anthropometric and laboratory variables or the scores of the analyzed questionnaires.

Discussion

The use of self-hypnosis was not associated with between-group changes in weight or other anthropometric variables. A significant improvement in quality of life, satiety score, and CRP values was found in the intervention arm. Furthermore, habitual self-hypnosis users showed greater weight loss and reduced energy intakes.

Changes in anthropometric variables

The literature has reported that hypnosis leads to variable weight loss at 6 months, with a difference ranging from 4 to 8 kg between the groups with and without hypnosis (2,6,7). Hypnosis has been reported to be successful, not by itself as a treatment for obesity but as a facilitator of a specific lifestyle intervention by increasing patient involvement in the therapeutic process (6). Therefore, hypnosis has usually been combined with behavioral approaches, and most of these treatments are long-lasting, complex, challenging, and, therefore, difficult to perform routinely (6–9).

Our hypnotic approach had the advantage of being rapid, and our intervention was less demanding and easier to implement in clinical practice. However, we did not find any significant differences between arms

in the change of anthropometric variables. Accordingly, less intensive hypnosis programs like ours have led to a lower difference in weight loss between groups, i.e., a < 1-kg difference (26). Nevertheless, our participants from the intervention arm who used self-hypnosis more frequently (≥ once per day) showed a much greater weight loss (with an adjusted mean difference of ~10 kg) and reduction in energy intake compared with those practicing rarely or not at all.

We should take into consideration the fact that, after 12 months, only 52% of the participants practiced self-hypnosis ≥ once per day, with a trend toward a progressive reduction of use with time. Indeed, the reported average use of hypnosis programs in the medium term (>6 months) has been similar to ours (6).

The impact of hypnosis has been reported to increase over time, being more effective in the long term because it allows the establishment of a reinforcement in healthy behaviors that continues beyond the training period (1,6,27). Weight maintenance requires continued motivation and engagement; the use of a reinforcement incentive tool, such as self-hypnosis, might be a successful motivational strategy in promoting the maintenance of weight change. Accordingly, a significant weight loss at 18 months compared with baseline (27) or a weight loss of 10 kg at 2 years (6) has been reported by the few studies evaluating the long-term effects of hypnosis.

Changes in quality of life and satiety score

Both quality of life and satiety increased in our intervention arm. These changes were not associated with the frequency of self-hypnosis use.

Accordingly, satisfaction was reported to be greater in the hypnosis arms of the trials (6), and only the hypnotherapy aimed at reducing stress, but not the one that induced a negative attitude toward food, was effective in determining a significant weight loss with respect to baseline (26). Unlike other studies that have employed techniques inducing fear or hate toward eating and showing some foods as a body poison (10,11,27), we referred to methods of "ego strengthening" and esteem-enhancement suggestions, with the objective to reduce stress and possibly emotional eating by increasing self-control and conscious eating. Our results suggest that the improvement in patients' belief in their capacity to control events might have adjunctive benefits. Furthermore, typical hypnotic inductions closely resemble conventional relaxation training (1). Therefore, the finding of a better quality of life in those who have been subjected to hypnosis is not unexpected. Furthermore, our approach might have strengthened individual self-efficacy, the increase of which correlates with weight loss and favorably modulates eating behavior and food compulsivity (28).

Finally, even if individuals from both arms similarly reduced their energy intakes, satiety was significantly increased only in the intervention arm. This is in line with the known modulation of appetite- and satiation-associated peptides and hormone levels through psycho-neuro-immuno and psycho-neuro-endocrine mechanisms, even in the absence of substantial weight loss (5,26).

Change in CRP values

Participants from our intervention arm showed a significant reduction in CRP values, the most commonly used acute-phase reactant marker of inflammation. This finding is intriguing and suggests a complicated relationship between the mind and the body. It is well known that distress and quality of life are associated with inflammation and immunologic measures, and chronic, systemic inflammation has been proposed as one mechanism underlying psychologic and physical health problems (29–32). Higher levels of psychological distress have been associated with increased circulating CRP values and other inflammatory variables through pathways including the sympathetic nervous system and the hypothalamic-pituitary-adrenal axis (32–34); furthermore, the associations between psychological distress and chronic age-related diseases and mortality might be modulated, at least in part, by inflammation as well as other conditions, such as immunological factors or dysregulated hormonal responses (35). Our results could have clinical implications, owing to the chronic subclinical inflammatory state of the individuals with obesity and the predictive role of chronic inflammation for cardiovascular diseases, frailty, disability, and mortality (36,37).

Hypnotic susceptibility

Hypnotizability was not a significant predictor of weight loss or other outcomes in our patients, which is in line with some studies and a recent meta-analysis (7,38,39) but unlike others showing a significant relationship between hypnotic susceptibility and weight-loss outcomes (10,40,41).

Indeed, methods of evaluating the degree of susceptibility to hypnosis varied greatly, and its assessment has been criticized because correlations between hypnotizability and treatment outcome might be indicators of expectancy effects rather than effects of some special hypnotic process (1,5). Furthermore, other studies have aimed at inducing deeper changes at the cognitive-behavioral level, with numerous long-lasting hypnosis sessions requiring a high capacity for trance; therefore, hypnotic abilities can assume greater importance (10,40). Contrariwise, our short-term sessions of self-hypnosis were aimed at obtaining a brief moment of relaxation, during which each participant could evoke the suggestion that he/she would be able to control the amount of food subsequently eaten. Therefore, it is reasonable to think that the frequency of use of self-hypnosis was more important than the degree of susceptibility in our patients.

Finally, we have chosen a very simple measure for pretesting for hypnotizability; other complex and time-requiring tests have been considered even counterproductive because such methods could take more time than the therapy, creating concern or irritation in the patient (39).

Limitations

The main limitation of this trial was the higher-than-expected percentage of dropouts (28%). Other hypnosis studies have reported even higher dropout rates (6,27,42), and >50% of patients with obesity, above all the youngest, discontinued treatment in clinical practice (43). Furthermore, we took care to perform an accurate intention-to-treat analysis with imputation of missing values, and the results did not change meaningfully.

The number of patients who completed the intervention was smaller than that originally defined as an adequate sample size; however, the reduction of statistical power with the actual number of analyzed patients was negligible (from 90% to 86%).

We used a very simple approach with three sessions of about 30 minutes each, the last of which was at 15 weeks after randomization. Therefore, the participants remained approximately 8 months without receiving any reinforcement session. Accordingly, we observed a decline in the use of self-hypnosis with time. We cannot exclude that a more intensive intervention could have resulted in a greater between-arm difference in the outcomes. However, our goal was to test a simple method, easily applicable to the largest possible number of individuals in clinical practice.

Assessments of quality of life and satiety were highly subjective, and the knowledge of the study arm might have influenced the participants' responses. However, there was biological plausibility in the associations found. Furthermore, CRP, a variable associated with overall distress and blindly measured, was found to be significantly associated with the intervention arm. The presence of participants with low hypnotizability could have influenced the results; this, however, guaranteed greater generalizability of our data. Furthermore, hypnosis susceptibility did not correlate with any of the measured outcomes. Finally, we failed to assess other aspects, such as attitude toward hypnosis and sleep quality, which could represent potential confounding factors.

Conclusion

Self-hypnosis is a noninvasive intervention, free of side effects, that was not associated with greater weight loss when added to lifestyle recommendations but did improve satiety, quality of life, and CRP values after 12 months. Indeed, habitual users of self-hypnosis lost more weight and greatly reduced their energy intakes.

Both the cost–benefit balance of this procedure and further trials in larger samples should be performed before final conclusions about its benefits can be drawn. **O**

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