Do psychological factors help to reduce body mass in obesity or is it *vice versa*? Selected psychological aspects and effectiveness of the weight-loss program in the obese patients

Monika Bąk-Sosnowska,[1] Adam Pawlak,[2] Violetta Skrzypulec-Plinta[3]

[1]Department of Psychology, School of Health Care, Medical University of Silesia, Katowice; [2]Department of Psychology, Katowice School of Economics, Katowice; [3]Department of Women's Disease Control and Prevention, School of Health Care, Medical University of Silesia, Katowice, Poland

Abstract

The aim of this study was to assess the strength and direction of the correlation between cognitive appraisal, emotional state, social functioning and the effectiveness of a weight-loss program undertaken by obese subjects. The out-patient weight-loss program encompassed 150 obese women. Assessments were carried out at four time points: at the start of the weight-loss program and then after a 5%, 10% and a 15% reduction of the initial body mass. The research tools used were: a survey, the Situation Appraisal Questionnaire (SAQ), the Emotional State Questionnaire (ESQ), and the Q-Sort Social Functioning Questionnaire. The cognitive appraisal, emotional state and social functioning of the study group changed significantly (P<0.001). Significantly more individuals with a 15% body mass reduction, as compared with individuals with no body mass reduction, had an early obesity onset, *i.e.* at the age of <10 years old (P<0.001). Significantly more individuals with no body mass reduction, compared with individuals with a 15% reduction, had a later obesity onset, *i.e.* between the ages of 20 and 30 (P<0.001) and between 50 and 60 (P<0.001). Significantly more individuals with a 15% body mass reduction, compared with individuals with no mass reduction, had previously experienced the jojo effect (P<0.001) and had successfully lost weight (P<0.001). Significantly more individuals with no body mass reduction, compared with individuals with a15% reduction, had a history of unsuccessful attempts at reducing body mass (P<0.001). We conclude that the attitude of obese patients towards a weight-loss program is not a deciding factor for its effectiveness. As body mass reduces, the attitude improves.

Introduction

Excessive body mass triggers a number of negative somatic, psychological and social consequences. It leads to physical overload and a lower fitness level, thereby contributing to the development of ailments and diseases.[1] Self-esteem and the general quality of life become lower, the image of one's own body becomes negative, and psychopathological symptoms, such as anxiety and depression may develop.[2-4] Furthermore, excessive body mass may cause social and professional discrimination, interfere with interpersonal contacts and hinder the finding of a life partner.[4,5] For a number of reasons, obesity may be considered a source of psychological stress.

The current psychological conception of stress emphasizes the relational theory, first formulated by R.S. Lazarus,[6] whereby stress is not located within individuals or their environment but is seen as a type of relationship (interaction, transaction) between the two. According to R.S. Lazarus and S. Folkman,[7] psychological stress is *a particular relationship between a person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her wellbeing*.

Based on a cognitive appraisal, a situation may be classified into one of three categories: harm/loss (when an injury or damage has already taken place), threat (when harm or loss are expected but have not yet taken place, or challenge (when an event is seen as motivating for action that could bring benefit). The assessment of an event as a threat or a challenge (primary appraisal) is followed by a secondary appraisal, during which the individual evaluates their physical, psychological and social resources for coping with a given situation.[8] Cognitive appraisal arouses the emotions of threat, harm/loss, challenge or benefit. The manifestations and escalation of these emotions depend directly on the interpretation of the situation and a person's coping possibilities.

According to L. Martin,[9] mood is a source of information. A positive attitude towards a task releases positive emotions, which in turn facilitate taking action and persevering until the set objective has been reached. D.C. McClelland showed that motivation to achieve is a tendency to surpass standards of excellence,[10] and is connected with experiencing positive emotions in task situations perceived as a challenge. Most motivational techniques (visualization, affirmation), also applicable to excessive weight reduction, focus on creating the sense of challenge or on determining the real benefits that can be drawn from taking the challenge. Still, clinical practice shows that many individuals have problems with arousing, and especially with maintaining, motivation to lose weight when the effects prove lesser or slower than expected. At the same time, successful body mass reduction causes improved psychological wellbeing and self-satisfaction which, paradoxically, often leads to overeating and body mass regain.

The aim of the study was to determine the strength and direction of the correlation between cognitive appraisal, emotional state, social functioning and the effectiveness of a weight-loss program in the obese.

Correspondence: Monika Bak-Sosnowska, Department of Psychology, Medical University of Silesia, Medyków Street 12, 40-752 Katowice, Poland. Tel. +48.322088645.
E-mail: b_monique@poczta.onet.pl

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Materials and Methods

Design

The prospective correlational study of a sample of adult obese women was conducted over a period of 15 months, between 2009 and 2011, in the *Waga* Out-patient Clinic for Metabolic Diseases in Katowice. The study

protocol was approved by the Bioethics Committee of Medical University of Silesia and all subjects gave their informed written consent for participation in the study.

Participants

The study encompassed 150 women with excessive body mass who volunteered to participate in an out-patient weight-loss program. The inclusion criteria for the study were: age of majority, female gender (approx. 90% of patients reporting to the out-patient clinic were women), BMI >25 (overweight or obesity), and declared motivation for active body mass reduction.

Descriptive statistics were used to characterize the study group. The mean age of the study subjects was 42.97±13.55 years old, and the mean body mass was 97.93±16.47 kg, with a mean BMI of 37.17±6.42 kg/m^2. Most respondents had secondary or tertiary education (70.7%), were professionally active (60.7%), were in a relationship (60.7%), and had at least one child (78%).

Most respondents declared adult-onset obesity, *i.e.* at the age of >20 years old (62%), at least one previous attempt at reducing body mass (95.3%), but mostly unsuccessful (71.3%). The majority of study participants took an independent decision to participate in the weight-loss program (71.3%) and expected a body mass reduction of >5 kg (99.3%). As the most important benefits of the weight-loss program, the study participants listed (more than one answer was possible): improved social functioning (84%), improved health (74.7%), improved psychological wellbeing (61.3%), increased physical attractiveness (59.3%), and increased physical fitness (46%).

Procedure

The weight-loss program was started by groups of several patients at a time. The patients were weighed and measured, participated in a lecture concerning the causes and consequences of obesity, received general recommendations regarding their diet, physical exercise and modification of habits. Next, each patient had an individual consultation with a physician, during which the patient's general health and weight background were evaluated. The patients received detailed therapeutic recommendations and thereafter reported for consultation with the physician and the dietician approx. once a month. There was no fixed endpoint of the weight-loss program. The patients treated at the clinic were asked to follow 1200 kcal diet, with 5 meals a day and to exercise at least 1 hour a day.

Participation in the study was voluntary and conditional upon fulfillment of the inclusion criteria. The first measurement of the analyzed variables was made at the start of the program. In order to qualify for the subsequent stages of the study, the patients had to achieve a 5%, 10% and a 15% reduction of the initial body mass respectively. Study exclusion criteria were: body mass reduction <1 kg over a period of two consecutive calendar months, resignation from the program, a 15% reduction of the initial body mass. Exclusion from the study had no impact on the possibility to continue the weight-loss program.

Throughout the program, the participants remained in telephone contact with the researchers, informing them about the achieved body mass reduction. The participants were subsequently invited to a meeting with a view to confirm objectively their body mass reduction and to fill out psychological tests. In cases where study participants failed to contact the researchers, it was the researchers who sought to contact the participants so as to discuss the results of their weight-loss program. If no such results were reported, or the participant resigned from participation in the weight-loss program, they were informed about exclusion from the study, with a possibility to continue treatment in the out-patient clinic.

Instruments

Four research tools were used: a survey, the Situation Appraisal Questionnaire (SAQ), the Emotional State Questionnaire (ESQ), and the Q-Sort Social Functioning Questionnaire.

Characteristics of the study group

Patient details were obtained from a survey designed specifically for the purposes of the study. The survey was composed of 17 multichotomous questions concerning: sociodemographic data, the history and treatment of obesity, and the expectations connected with the current weight-loss program. For 16 questions, only one answer was possible, whilst for the question concerning the expected benefits from the weight-loss program, more than one answer was possible. The exact instruction was: *please answer the following questions by filling in the dotted spaces or circling the correct answer*.

Assessment of cognitive situation

The assessment of cognitive situation was carried out using the Situation Appraisal Questionnaire (SAQ) by Wrze niewski, Jakubowska-Winiecka and Włodarczyk. The questionnaire was designed on the basis of Lazarus's relational theory of stress and was first used to evaluate the cognitive situation among cardiac patients. Based on the questionnaire, a factor analysis was performed to assess the perception of a stress situation in four categories: threat (threat of losing valued resources), loss/harm (loss of valued resources), active challenge (necessity of motivation, personal engagement, fight), passive challenge (a chance that does not require or does not depend on personal involvement). The reliability of the questionnaire measured with Cronbach's α coefficient is 0.84. The questionnaire consists of 35 statements referring to the current problematic situation. Each statement is accompanied by a Likert-type scale. The exact instruction was: *please circle the number that best describes your present assessment of your situation connected with excessive body mass and dieting. Please respond to all statements*.

Assessment of emotional state

The emotional state of the study participants was assessed with the Emotional State Questionnaire (ESQ) designed under the supervision of Prof. Heszen-Niejodek on the basis of Lazarus's relational theory of stress. The questionnaire was first used to measure examination stress. The questionnaire facilitates the assessment of emotional state in four categories: threat (fear of injury or damage), harm/loss (the feeling of damage), challenge(hope for profits), benefit (the feeling of profit). The reliability of the questionnaire measured with Cronbach's α coefficient is 0.55. The questionnaire consists of a list of 15 emotions. For each emotion, there is a seven-point scale describing its intensity. The exact instruction was: *for each emotion, please circle the number that best describes its intensity in connection with excessive body mass and dieting. Please respond to all points*.

Assessment of social functioning

The social functioning of the study participants was assessed with the Q-Sort Social Functioning Questionnaire designed by Wojciszke and Pienkowski. Its original version consists of 60 self-descriptive statements referring to social functioning. For the purposes of the study, two statements concerning physical appearance and physical attractiveness were added: *men do not find me attractive* and *I feel good in my body*. Each statement is accompanied by a Likert-type scale. Self-assessment is achieved by means of quantitative results for positive and negative evaluation. The exact instruction was: *for each statement, please circle the number that best describes your self-perception in relation to excessive body mass and dieting. Please respond to all statements*.

At all time-points, the study participants' body mass and height were measured using the same RADWAG electronic scales, and the BMI was calculated.

Statistical analysis

The obtained data was analyzed with the SPSS statistical package, using: descriptive statistics, the two percentages test, Kolmogorov-Smirnov test, Student's t-test, analysis of variance (ANOVA), Tukey's test, Pearson's correlation, chi^2 test, and the contingency coefficient.

Results

Out of a total of 150 patients who commenced the weight-loss program, 71 (47.33%) withdrew, thereby resigning from participation in the study. The reasons given were: lack of satisfactory effects of the program (77.46%), additional family responsibilities (9.86%), taking up a (new) job (8.46%), and pregnancy (4.22%). Out of the remaining group of patients, 30 were excluded from the study due to body mass reduction <1 kg over two consecutive calendar months. Finally, 49 patients who obtained a 15% body mass reduction qualified for the last stage of the study. Table 1 shows the study group size and their BMI at each stage of the study.

The normality of distribution of the analyzed variables: cognitive appraisal, emotional state and social functioning, was confirmed using the Kolmogorov-Smirnov test.

The distribution was normal, so an univariate analysis of variance (ANOVA) was used to test whether the mean values of the above variables were changing during the process of weight reduction.

The analysis showed that the cognitive assessment changed significantly in patients who completed the program. The perception of the situation as threatening [F(3.144)=37.10; P<0.001] and harmful [F(3.144)=31.19; P<0.001] became less intense, whilst the perception of the situation as a challenge - both active [F(3.144)=10.29; P<0.001] and passive [F(3.144)=29.18; P<0.001] increased. The post - hoc HSD Tukey's test showed the differences in the analyzed variables between the consecutive stages of the study. Only significant difference took place after obtaining a 5% body mass loss (P<0.01).

The emotional state of the study participants changed significantly. The sense of threat [F(3.144)=44.40; P<0.001] and harm/loss decreased [F(3.144)=31.832; P<0.001], whilst the sense of benefit [F(3.144)=33.16; P<0.001] and challenge [F(3.144)=12.49; P<0.001] increased.

Furthermore, the social functioning of the study group participants changed significantly. The number of positive self-evaluation statements increased [F(3.144)=19.73; P<0.001], whilst negative self-evaluation statements decreased [F(3.144)=23.67; P<0.001].

The obtained results confirm that body mass reduction in the obese improves their psychosocial functioning. However, using Pearson's r correlation coefficient, no connection was found between the extent of body mass reduction and the initial values of the examined variables: cognitive situation assessment, emotional state and social functioning. Data analysis with Student's t-test for independent samples showed no differences in the initial values of these variables between individuals with no body mass reduction and individuals with a 15% body mass reduction. Detailed analyses did not confirm any differences in this regard between individuals with no body mass reduction and individuals with a 5% or 10% body mass reduction.

After confirming the normality of distribution of BMI and age, the initial values were compared between the no reduction group and the 15% body mass reduction group. Student's t-test showed no differences between the subgroups. The nonparametric chi^2 test was used to compare the subgroups with regard to the initial values of the variables: education, professional activity, marital status, number of children, the number of previous attempts to reduce body mass, type of present motivation towards body mass reduction. There were no differences between the subgroups in this regard. Using the contingency coefficient, the absence of correlations between the initial values of these variables and the extent of body mass reduction was confirmed.

However, it was observed that the no body mass reduction group differed from the 15% body mass reduction group with regard to age at obesity onset (chi^2=13.49; P<0.05) and past effects of weight loss attempts (chi^2=12.15; P<0.01). Because the chi^2 test was statistically significant, the contingency coefficient was used to determine the strength of correlation between variables.

It was confirmed the correlation between age at obesity onset and the extent of body mass reduction (C=0.37; P<0.05) as well as the correlation between previous attempts to reduce body mass and the effects of the present weight-loss program (C=0.35; P<0.01).

The two percentages test was used to check whether in both groups is the same percentage of people who represent the analyzed variable. It was showed that: significantly more individuals with a 15% initial body mass reduction had obesity onset before the age of 10 [u=5.32; P<0.001].

Significantly more individuals with no body mass reduction had obesity onset between the ages of 20 and 30 (u=5.32; P<0.001) and between 50 and 60 (u=4.77; P<0.001) as compared with individuals with a 15% initial body mass reduction. The details are presented in Figure 1.

Furthermore, the two percentages test showed that: significantly more individuals with a 15% initial body mass reduction had previously experienced the jojo effect (u=4.37; P<0.001) and had successfully lost weight (u=2.28; P<0.001), as compared with individuals with no body mass reduction. Significantly more individuals with no body mass reduction, as compared with individuals with a 15% initial body mass reduction, had previously failed to reduce body mass (u=7.02; P<0.001). The details are presented in Figure 2.

Discussion

The results of this study confirmed that, together with the reduction of body mass, also the appraisal of the situation, emotional state and social functioning of the study participants changed. The positive impact of a successful weight-loss program on the psychological functioning of the obese was reported by other authors: the achievement of even a small body weight loss, results in an improved quality of life in the aspect of psychological health and social functioning,[11-13] increased sensation of self-efficacy and satisfaction with one's body,[14] and improved psychological wellbeing.[15]

However, in our study, we observed that the perception of one's own situation as threatening or harmful became weaker as early as after the first 5% body mass reduction, and thereafter was seen more as a challenge. The changes in this regard did not reach statistical significance at any subsequent stage of the study. This mechanism may be explained with Lazarus's relational theory of stress, according to which it is not the objective situation but its subjective interpretation that affects the emo-

Table 1. Stages of the study and the respective body mass index of study participants.

Stage	N.	Mass (kg/m^2)	Standard deviation (kg/m^2)	Body mass index (%)
1	150	37.18	6.43	0
2	113	35.51	6.25	5
3	80	34.03	5.97	10
4	49	32.44	5.79	15

tional reaction and the coping strategies.[6] This observation is crucial for the understanding of the nature of the psychological process of weight losing, as it suggests that the positive psychological consequences connected with body mass reduction are the result of the sheer fact of having lowered the initial body mass, and they do not increase proportionally to further body mass reduction. This may be of vital importance for sustaining motivation towards continuing the weight-loss program, as one of the key aspects for sustained action is providing positive reinforcement, *e.g.* in the form of a reward. The results obtained from this study cannot easily be confronted with the results of other authors, as data on the process of change of mood or cognition throughout a weight-loss program is scarce. Instead, the differences in this regard are typically analyzed after achieving a predefined body mass reduction.[11-15]

Regardless of the dynamics of the process, the achievement of a target weight reduction improves the wellbeing and functioning of the obese. It is therefore essential to increase the chances of success of such individuals undertaking a weight-loss program. Adequate motivation is generally recognized as conducive to goal realization. Positive attitude, expressed as positive beliefs and emotions towards a goal, increases the chances for its achievement.[10] For the obese population, this means that a positive attitude towards a weight-loss program increases their chances for body mass reduction and for maintaining the achieved effect for a longer time. This is confirmed by the research of Desouz,[16] Palmeira and Rieger,[17,18] who showed that the treatment of obesity-related apathy resulted in better effects of the weight-loss program, whilst a more positive perception of one's own body and improved emotional state were conducive to maintaining the obtained results. The study by Stotland of approx. 6000 individuals aiming to reduce excessive body mass under the supervision of the family doctor, showed that with the passage of treatment time, positive motivation (benefit-oriented thinking) was equally strong and stable, whilst negative motivation (cost-oriented thinking) became weaker.[19]

Our study did not confirm that the initial motivation of obese individuals, estimated on the basis of cognitive situation appraisal and emotional state, has an impact on the effects of the weight-loss program. No differences in body mass reduction were observed between the studied individuals depending on their perception of obesity as a threat, harm or challenge. There was no significant impact of body mass-related emotions on the results achieved. Similarly, they type of the expected benefits in connection with the planned body mass reduction (*e.g.* improved health, improved physical condition, increased physical attractiveness, improved interpersonal relations) had no significant impact. The results of our study seem to suggest a different from the commonly accepted direction of the correlation between the analyzed variables. Namely, it is not the attitude that influences the extent of body mass reduction during a weight-loss program. On the contrary, it is the body mass reduction that triggers changes in the attitude of the dieting individual towards their weight-loss program.

This explanation suggests that factors other than attitude play a deciding role in the effectiveness of a weight-loss program. Researchers implicate the initial body mass,[20] emotional state,[16] social support,[21] self-body image and the level of aspirations.[22,23] Our study reveals the importance of two factors: the age of obesity onset and past attempts to reduce body mass. The younger the age at onset, especially before the age of 10, the greater was the body mass reduction during the analyzed weight-loss program. Furthermore, positive past experiences in body mass reduction were conducive to greater body mass reduction throughout the analyzed weight-loss program.

The correlation between age at obesity onset, psychosocial functioning and effective coping is inconclusive. On the one hand, a longer exposure to obesity-related physical and psychosocial consequences triggers psychological defense and adaptation mechanisms, which lower the level of discomfort. On the other hand, however, early disease onset correlates with intensification of psychopathological symptoms, as confirmed for example by Guerdjikova,[24] who showed that individuals who have been obese since childhood, suffer from more eating disorders, mainly bulimia, than individuals who gained weight only in adulthood. Also another researches proved obesity duration to correlate negatively with one's respect for one's own body.[25] Moreover, early obesity onset and unsuccessful past attempts at reducing body mass, may lead to the learned helplessness syndrome, which consists in reinforcing beliefs as to the absence of causality between one's actions and their consequences.[26] Referring the results of our study to the data present in the literature, it would seem that there are a number of interconnected factors, such as the number and the quality of past experiences connected with reducing weight, that influence the correlation between age at obesity onset and the effectiveness of its treatment. Other authors emphasize the importance of weight cycling throughout life and the presence of associated diseases,[27] as well as the importance of setting a

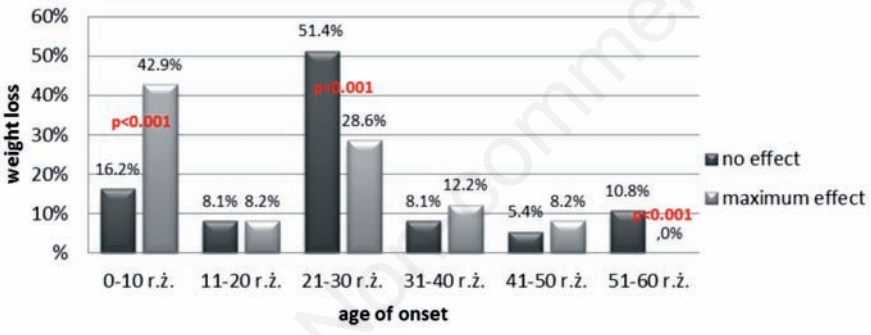

Figure 1. Age at obesity onset and the effectiveness of the weight-loss program.

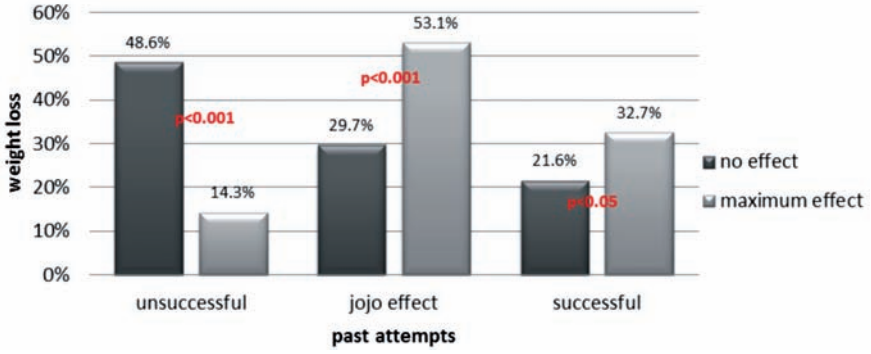

Figure 2. Past attempts at reducing body mass and the effectiveness of the weight-loss program.

positive example by individuals who have succeeded in reducing excessive body mass.[28]

The results obtained in our study show that age, initial BMI, demographic factors and the attitude towards the weight loss didn't have a significant impact on the weight loss effectiveness. However, the initial weight and the previous experiences of the weight loss reduction were important. This may suggest that not the present mental or physical condition, but the mental image of the person (especially body image), plays a key role in effective body mass reduction. The mental image may include not only the shape and size of the body or emotional relationship with it, but also the self-efficacy that influencing functioning of the body. Comparison of the effectiveness of weight loss treatment between persons who differ substantially in mental body image perception, could be continued in further research.

Conclusions

The conducted study showed, that the attitude of an obese person to a weight-loss program is not a deciding factor for its effectiveness, although it improves with body mass reduction. It was also observed, that age at obesity onset and the effectiveness of past attempts at reducing body mass have a significant impact on the effectiveness of a weight-loss program.

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