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## **The impact of interdisciplinary weight loss intervention on reduction in BMI and depression and anxiety levels [HADS] in patients with obesity. A study with repeated measurements design\*\***

### **Summary**

The article presents a study analyzing changes in body mass and depression and anxiety levels among the patients of the Obesity Clinic at the Municipal Hospital in Olsztyn. The aim of this study was to analyze long-term weight loss maintenance, and to evaluate depression and anxiety levels in people with obesity who participated in a weight loss treatment program in the Obesity Clinic in Olsztyn. Forty-five patients participated in a two-week weight loss program. During the treatment, the patients received support from a dietitian, a psychologist, a physician and a physiotherapist. The participants learned to consume regular meals five times a day (1200 kcal per day) to develop new eating habits, and they performed regular physical activity. During cognitive-behavioral therapy, the participants learned techniques that enabled them to reinforce new eating habits and adhere to a healthy diet. The patients were educated by all specialists during the two-week program in the obesity clinic. The study presents the results of the weight loss program in terms of body mass reduction and treatment of anxiety and depression which are often experienced by people with obesity who are unable to lose weight. The BMI and depression and anxiety levels were measured four times: before the weight loss program, at the end of the two-week program, as well as three and six months after the program. The results indicate that the program was effective in promoting sustainable weight loss.

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## Introduction

Obesity is a lifestyle disease which has escalated to the level of an epidemic in the 21st century. Depending on the severity of psychophysical complications, obesity may lead to psychophysical disability of both the individual and the society (Clark et al., 2023; Hannum et al., 2004).

Obesity is a complex disease. Body mass is determined by the interactions between genetic, familial, behavioral, cultural, and environmental factors (Dai, Alsallhe, Chalhaf, Riccò, Bragazzi, & Wu, 2020). Obviously, the primary factor responsible for patient weight control is inadequate diet and insufficient physical activity (Moschonis & Trakman, 2023). Psychological factors also exert a significant influence on weight gain and sustainable weight loss. Depression, anxiety disorders, and obesity are commonly co-occurring disorders. This may be determined by their common biological background (Bornstein, Schuppenies, Wong, & Licinio, 2006; Frank, Jokela, Batty, Lassale, Steptoe, & Kivimäki, 2022). Moreover, depression and obesity have been determined to potentially represent the same pathological process. Particularly atypical forms of depression are related to an increase in appetite, regulation of emotions by means of food, reduction of physical activity, and therefore an increase in body mass (Jokela & Laakasuo, 2023; Rosmond, 2004). Moreover, psychological consequences resulting from social stigmatisation of obesity cause the occurrence or intensification of pre-existing depression-anxiety problems (Obara-Gołębiowska, 2016; Puhl & Brownell, 2003). Results of long-term research also emphasise the strong mutual correlation between obesity and depression. It shows that depression increases the probability of the development of obesity (Silva, Coutinho, Ferriani, & Viana, 2020). An opposite dependency also exists, where being obese causes depression. Moreover, efficient reduction of body mass turns out to be a factor in decreasing the level of depression. Being depressive makes it difficult to change one's eating habits, and therefore – to lose excessive weight (Fulton, Décarie-Spain, Fioramonti, Guiard, & Nakajima, 2022; Oyekcin, Yildiz, Şahin, & Gür, 2011). In research by Svenningsson, Björkelund, Marklund and Gedda (2012), depression and anxiety disorders were diagnosed in 25% of obese patients.

Due to the multi-faceted etiology of obesity, various intervention techniques are recommended in weight loss programs. These techniques are implemented by a multidisciplinary team of specialists, including physicians, dieticians, physiotherapists, psychologists and, in some cases, surgeons (Kheniser, Saxon, &

Kashyap, 2021; Tur, Alòs, Iglesias, Luque, Colom, Escudero, & Burguera, 2011). Evidence-based weight loss methods effectively contribute to the treatment of obesity and co-morbid conditions. Cognitive-behavioral therapy (CBT) is one of such methods (Dalle Grave, Soave, Ruocco, Dametti, & Calugi, 2020; Gade, Hjelmesæth, Rosenvinge, & Friborg, 2014; Spoer & Fullilove, 2015). Obesity treatment involves lifestyle changes, consumption of regular meals, calorie reduction and exercise (Castelnuovo, Pietrabissa, Manzoni, Cattivelli, Rossi, Novelli, & Molinari, 2017; Comşa, David, & David, 2020). Cognitive-behavioral therapy is often incorporated into weight loss treatments to reinforce new eating habits (Moraes et al., 2020). It enables patients with obesity to change negative self-perceptions as well as attitudes towards the world and people who prevent them from making healthier life choices. The participants are taught practical skills for changing unhealthy habits and achieving healthy weight. This is a very important consideration when obesity results from unsustainable behavioral patterns and low levels of physical exertion (Wadden & Foster, 2000). Cognitive-behavioral therapy is also effective in the treatment of depression and anxiety which can directly influence weight loss and long-term weight loss maintenance (Castelnuovo et al., 2017). Depression and anxiety contribute to overeating, and they must be addressed during therapy. According to research, psychological factors are crucial for implementing effective lifestyle changes and achieving weight loss goals (Jackson, Steptoe, Beeken, Kivimaki, & Wardle, 2014). The key strategies in CBT include stimulus control, problem solving training, motivational interviews, cognitive restructuring, behavioral changes and self-monitoring, goal formulation and analysis of weight loss obstacles. Ash and colleagues (2006) demonstrated that a short-term weight loss program involving CBT delivered positive outcomes immediately after the treatment and at nine-month follow-up. Also the review of the studies about the effectiveness of CBT in implementing lifestyle changes proven the efficacy of CBT interventions in implementing lifestyle changes, especially for weight loss and weight maintenance (Kurnik Mesarič et al., 2023). According to research, both individual and group therapy are effective in obesity management (Comşa et al., 2020; Dalle Grave et al., 2020; Kheniser, Saxon, & Kashyap, 2021).

As is widely known, obesity is a factor leading to numerous psychophysical complications in the general population (Dai et al., 2020). For this reason, it is very important to conduct research focused on finding effective ways to fight obesity. Therefore, the aim of this study was to analyze long-term weight loss maintenance, and to evaluate depression and anxiety levels in people with obesity who participated in a two-week weight loss treatment program in the Obesity Clinic in Olsztyn.

## Materials and methods

The study involved 45 women with obesity aged 26 to 66 years ( $M = 51.7$ ;  $SD = 12.2$ ), with a BMI higher than 30 ( $M = 35.57$ ;  $SD = 2.36$ ). Sample selection was performed in accordance with the so-called inclusion criteria. These included: female sex, age over 18, and body mass suggesting obesity. The criteria excluding from the research include failure to meet the basic criteria of inclusion in the research, pregnancy, lactation, legal restrictions, lack of consent for participation in the examination, and absence of sanity due to a mental disorder, serious mental disorders, or addiction.

Table 1. Sociodemographic characteristics of the study group

|                                |    |
|--------------------------------|----|
| <b>Education (N)</b>           |    |
| Occupational                   | 4  |
| Secondary                      | 16 |
| Higher                         | 25 |
| <b>Marital status (N)</b>      |    |
| Married                        | 26 |
| Divorced                       | 8  |
| Widow                          | 6  |
| Single                         | 5  |
| <b>Place of residence (N)</b>  |    |
| Village                        | 5  |
| City under 100,000 inhabitants | 16 |
| City over 100,000 inhabitants  | 24 |

All participants gave verbal consent to participate and the study was approved by the University of Warmia and Mazury Ethics Committee for Scientific Research, Olsztyn, Poland. All subjects participated in a two-week weight loss program in the Obesity Clinic of the Municipal Hospital in Olsztyn. During the program, the patients were placed on a 1200 calorie diet composed of five daily meals. The number of calories and the diet received by the patients was determined by the dietician working on the ward. The focus of the program is on the consumption of regular meals to promote healthy eating habits. The participants were regularly monitored by a diabetologist and an endocrinologist and received round-the-clock nursing care. All patients attended individual and group therapy sessions. During therapy, the patients learned cognitive-behavioral strategies which were helpful during weight loss. The acquired techniques promoted self-control, stimulus control, slow eating, and behavioral reinforcement. The patients were educated about healthy nutrition and the role of social support during weight loss. Other therapeu-

tic techniques were also deployed during individual sessions, including cognitive restructuring, problem solving skills and constructive strategies for coping with stress, depression and negative emotions. The program also included group and individual meetings with a dietician. The patients attended daily physiotherapy sessions, including hydro massage and dry massage. The program involved daily exercise routines, including group training and individual training, to improve the participants' physical fitness levels. The patients also attended dance classes taught by a professional instructor. The participants had free access to the sauna, gym, and exercise beds. During all the above activities, the patients received health education and advice from a physician, a dietician, a psychologist, and a physiotherapist.

After leaving the hospital, each patient received individual guidance from a dietician on diet and the appropriate number of calories. For 3 months after the end of the stay, all patients benefited from the obligatory psychological consultations held twice a month. Meetings were held at the patient's place of residence, via the Internet or by phone. At the meetings, patients received support and psychological help depending on their individual situation and needs. While providing psychological help, cognitive-behavioral strategies were used, consistent with the previous two-week intervention. For the next three months, the patients managed to maintain the introduced changes on their own.

### Conducted measurements

The following parameters were measured four times: body mass, body height, and depression and anxiety levels. The first measurement was performed on the first day of the weight loss program. The second measurement was conducted upon the completion of the two-week treatment. The third and fourth measurements were performed three and six months after the weight loss program, respectively. Patients were instructed how to measure their own body weight. They were asked to weigh themselves in the morning on an empty stomach. The results of the third and fourth measurements were collected by post or e-mail.

Changes in body mass were determined by calculating the body mass index based on the following formula:  $BMI = \text{body mass} / (\text{body height})^2$ . The BMI does not measure body fat percentage, but it is a reliable indicator of obesity, overweight and underweight. The commonly accepted BMI ranges are underweight –  $BMI < 18.5$ , normal weight –  $BMI = 18.5 - 24.99$ , overweight –  $BMI = 25 - 29.9$ , class I obesity –  $BMI = 30 - 34.9$ , class II obesity –  $BMI = 35 - 39.9$ , class III obesity –  $BMI > 40$ .

The applied research tool was Hospital Anxiety and Depression Scale HADS (Zigmond & Snaith, 1983). The questionnaire is applied to analysing the level of

anxiety and depression in hospitalised patients and outpatients. This research employed the HADS scale in the Polish adaptation by de Walden-Gałuszko and Majkowicz (2000). The questionnaire is used to measure anxiety and depression levels in inpatients and outpatients. It consists of 14 questions, including 7 items examining anxiety and 7 items relating to depressive symptoms. The sensitivity of the depression subscale is 90.0%, and the specificity is 92.2%. Sensitivity of the anxiety subscale is 86.5%, specificity – 94.9%, Cronbach's alpha coefficient for the depression subscale is 0.9, for the anxiety subscale – 0.8. Responses are assessed according to a 4-point Likert scale (0–3). In both subscales, scores are summed. Scores of 0 to 7 indicate a level of anxiety and/or depression within the normal range, 8 to 10 – a borderline score, while a score of 11 points and above indicates a pathological level of the measured variables.

During the fourth measurement, the patients were asked the following question: “In your opinion, which factors were most helpful and which were most detrimental to maintaining weight loss and the lifestyle changes introduced during the program?”.

### Statistical method

Calculations were performed using the Statistica 12 package. The normality of data distribution was evaluated with the Shapiro-Wilk W test. The Friedman test for one-way ANOVA by ranks was used for variables that were not normally distributed or when the assumption of homogeneity of variance was not met during the comparison of the measured parameters and questionnaire results over time (measurements 1 vs. 2 vs. 3 vs. 4). Significant differences were analyzed with the Conover-Inman post-hoc test.

### Results

Presented below are the results relating to changes in BMI levels and depression and anxiety in patients participating in a two-week weight loss program in the Obesity Clinic of the Municipal Hospital in Olsztyn and at 3 and 6 months after leaving the hospital.

The calculated values of BMI were normally distributed at every point in time, and the assumption of homogeneity of variance was met ( $p=0.287$ ), which suggests that repeated measures ANOVA should be used. However, the assumption of sphericity ( $p=0.000$  in Mauchly's sphericity test) was not met. Therefore, the significance of differences was verified with the use of multivariate tests for repeated measurements.

Table 2. Results for BMI – Descriptive statistics

| Descriptive statistics | <i>N</i> important | Average | Median | Minimum | Maximum | <i>SD</i> |
|------------------------|--------------------|---------|--------|---------|---------|-----------|
| BMI I                  | 45                 | 34.6    | 34.3   | 30.2    | 48.1    | 6.0       |
| BMI II                 | 45                 | 32.6    | 33.0   | 28.9    | 45.2    | 5.9       |
| BM III                 | 45                 | 30.4    | 30.1   | 27.5    | 42.0    | 5.2       |
| BMI IV                 | 45                 | 29.6    | 30.0   | 2.1     | 39.2    | 4.6       |

Table 3. Results for BMI – Homogeneity tests for variance

| Homogeneity tests for variance | Hartley      | Cochrane | Bartlett   | <i>a</i>  | <i>p</i> |
|--------------------------------|--------------|----------|------------|-----------|----------|
|                                | <i>F</i> max | C        | Chi-square | <i>df</i> |          |
| BMI                            | 1.7          | 0.3      | 3.8        | 3         | 0.287    |

Table 4. Results for BMI – Mauchley sphericity test

| Mauchley sphericity test | <i>W</i> | Chi-square. | <i>df</i> | <i>p</i> |
|--------------------------|----------|-------------|-----------|----------|
| TIME                     | 0.2      | 73.3        | 5         | 0.000    |

Table 5. Results for BMI – Multivariate tests for repeated measurement

| Multivariate tests for repeated measurement | Test     | Value | <i>F</i> | Effect    | Error     | <i>p</i> |
|---------------------------------------------|----------|-------|----------|-----------|-----------|----------|
|                                             |          |       |          | <i>df</i> | <i>df</i> |          |
| TIME                                        | Wilks    | 0.1   | 128.7    | 3         | 42        | 0.000    |
|                                             | Pillai   | 0.9   | 128.7    | 3         | 42        | 0.000    |
|                                             | Hotelln. | 9.2   | 128.7    | 3         | 42        | 0.000    |
|                                             | Roy      | 9.2   | 128.7    | 3         | 42        | 0.000    |

BMI values differed significantly ( $p=0.000$ ) in measurements 1–4. The average BMI was determined at 34.6 ( $SD\pm 6.0$ ) in measurement 1, 32.6 ( $SD\pm 5.9$ ) in measurement 2, 30.4 ( $SD\pm 5.2$ ) in measurement 3, and 29.6 ( $SD\pm 4.6$ ) in measurement 4.

Table 6. Results for BMI – Test post-hoc NIR

| Test post-hoc NIR | BMI I | BMI II | BM III | BMI IV |
|-------------------|-------|--------|--------|--------|
| BMI I             |       | 0.000  | 0.000  | 0.000  |
| BMI II            | 0.000 |        | 0.000  | 0.000  |
| BM III            | 0.000 | 0.000  |        | 0.005  |
| BMI IV            | 0.000 | 0.000  | 0.005  |        |

Significant differences ( $p < 0.05$ ) were noted in each compared pair of variables, and the least significant difference ( $p = 0.005$ ) was observed between measurements 3 and 4.

Table 7. Results for HADS – Descriptive statistics

| Descriptive Statistics | <i>N</i><br>important | Average | Median | Minimum | Maximum | <i>SD</i> |
|------------------------|-----------------------|---------|--------|---------|---------|-----------|
| HADS Depression I      | 45                    | 16.4    | 17.0   | 4.0     | 25.0    | 4.3       |
| HADS Depression II     | 45                    | 15.3    | 15.0   | 7.0     | 23.0    | 3.1       |
| HADS Depression III    | 45                    | 14.6    | 14.0   | 7.0     | 21.0    | 2.9       |
| HADS Depression IV     | 45                    | 14.5    | 14.0   | 7.0     | 21.0    | 2.8       |
| HADS Anxiety I         | 45                    | 16.5    | 18.0   | 8.0     | 23.0    | 4.3       |
| HADS Anxiety II        | 45                    | 15.8    | 16.0   | 5.0     | 23.0    | 4.0       |
| HADS Anxiety III       | 45                    | 14.8    | 15.0   | 5.0     | 21.0    | 3.9       |
| HADS Anxiety IV        | 45                    | 14.7    | 15.0   | 5.0     | 21.0    | 3.9       |

Table 8. Results for HADS (Anxiety) – ANOVA Friedman

| ANOVA Friedman                                                | Average | Sum   | Average | <i>SD</i> |
|---------------------------------------------------------------|---------|-------|---------|-----------|
| Chi square ANOVA ( $N = 45$ , $df\ 3$ ) = 25,7<br>$p\ .00001$ | Range   | Range |         |           |
| HADS Anxiety I                                                | 3.0     | 136.0 | 16.5    | 4.3       |
| HADS Anxiety II                                               | 2.5     | 112.5 | 15.8    | 4.0       |
| HADS Anxiety III                                              | 2.0     | 88.5  | 14.8    | 3.9       |
| HADS Anxiety IV                                               | 2.0     | 88.6  | 14.7    | 3.9       |
| Value $p$ – post-hoc                                          | I       | II    | III     | IV        |

| ANOVA Friedman   | Average | Sum   | Average | SD    |
|------------------|---------|-------|---------|-------|
| HADS Anxiety I   |         | 0.007 | 0.000   | 0.008 |
| HADS Anxiety II  | 0.007   |       | 0.006   | 0.006 |
| HADS Anxiety III | 0.000   | 0.006 |         | 0.005 |
| HADS Anxiety IV  | 0.000   | 0.006 | 0.953   |       |

Significant differences ( $p=0.000$ ) were observed between HADS-M scores for anxiety in measurements 1–4. Significant differences in HADS-M scores for anxiety were noted in each compared pair of measurements, excluding the differences between measurements 3 and 4 ( $p=0.953$ ) which were not statistically significant ( $p>0.05$ ).

Table 9. Results for HADS (Depression) – ANOVA Friedman

| ANOVA Friedman                                              | Average | Sum   | Average | SD    |
|-------------------------------------------------------------|---------|-------|---------|-------|
| Chi square ANOVA ( $N=45$ , $df\ 3$ ) = 19,0<br>$p\ .00028$ | Range   | Range |         |       |
| HADS Depression I                                           | 3.0     | 134.5 | 16.4    | 4.3   |
| HADS Depression II                                          | 2,5     | 112.0 | 15.3    | 3.1   |
| HADS Depression III                                         | 2,0     | 91.5  | 14.6    | 2.9   |
| HADS Depression IV                                          | 2.0     | 91.6  | 14.5    | 2.8   |
| Value $p$ – post-hoc                                        | I       | II    | III     | IV    |
| HADS Depression I                                           |         | 0.017 | 0.000   | 0.017 |
| HADS Depression II                                          | 0.017   |       | 0,029   | 0.029 |
| HADS Depression III                                         | 0.000   | 0.029 |         | 1.000 |
| HADS Depression IV                                          | 0.017   | 0.029 | 1.000   |       |

Significant differences ( $p=0.000$ ) were observed between HADS-M scores for depression in measurements 1–4, excluding the differences between measurements 3 and 4 ( $p=1.000$ ), which were not statistically significant ( $p>0.05$ ).

The most frequent responses are presented in the table below.

Table 10. The participants' responses regarding factors which were most helpful and most detrimental to weight loss during the program and weight loss maintenance after the program – measurement 4

|                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Factors that were most helpful in adopting healthy eating habits and performing physical activity        | <ul style="list-style-type: none"> <li>• Knowledge disseminated by the physiotherapist, dietician, psychologist and physician during group sessions;</li> <li>• Lifestyle changes and physical activity during the program;</li> <li>• Individual sessions with a dietician concerning healthy eating habits – the acquired knowledge was introduced to daily practice after the program;</li> <li>• Individual sessions with a physiotherapist concerning the safest and most effective types of exercise – the acquired knowledge was introduced to daily practice after the program;</li> <li>• Individual sessions with a physician concerning health and treatment options – the acquired knowledge was introduced to daily practice after the program;</li> <li>• Behavioral techniques and strategies that were learned during the program and introduced to daily practice after the treatment. Individual sessions with a therapist during which the participants learned about cognitive strategies for changing unhealthy habits;</li> <li>• Support from other participants after the end of the program (communication by telephone and email).</li> </ul> |
| Factors that were most detrimental to maintaining healthy eating habits and exercising after the program | <ul style="list-style-type: none"> <li>• Work-related stress;</li> <li>• Tight work schedule makes eating regular meals impossible;</li> <li>• Other household members do not approve of the changes in the patient's diet;</li> <li>• Friends and family members do not approve the patient's abstinence from certain foods during social events;</li> <li>• Travel;</li> <li>• Lack of professional support after the program.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

## Discussion

This study evaluated the long-term effectiveness of a two-week interdisciplinary weight loss program for patients with obesity with BMI>30. The aim of the study was to analyze the influence of lifestyle changes and coping strategies on the patients' BMI and depression and anxiety levels. The results were used to address the research problem. The investigated parameters were measured in 45 participants on four dates. The first measurement was performed on the first day of the two-week weight loss program, and the second measurement was conducted directly after the end of the program. The results indicate that the program contributed to a significant improvement in the evaluated parameters. A significant reduction in BMI and levels of depression and anxiety was observed during the

second measurement. Previous study demonstrated that patients with obesity participating in two-week weight loss programs were able to improve their quality of life in the physical, psychological, social and environmental dimension when they received multidisciplinary assistance from trained specialists (Obara-Gołębiowska & Salwach-Kuberska, 2017). Similar results were reported by other researchers who observed that interdisciplinary weight loss programs promoting healthy lifestyle changes brought positive outcomes in objective and subjective perceptions of the patients' physical and psychological well-being (Comşa et al., 2020; Pratt, Lazorick, Lamson, Ivanescu, & Collier, 2013; Stubbs, Hillier, Pallister, Avery, McConnon, & Lavin, 2015).

The results of the third and fourth measurements were used to assess long-term outcomes three and six months after the program. The third measurement was conducted three months after the weight loss program. According to the elicited information, none of the participants gave up healthy eating habits or exercise. The acquired knowledge and coping strategies contributed to sustained weight loss and healthy lifestyle changes. Further weight reduction and lower levels of depression and anxiety were observed in the studied group of patients. An improvement in the psychological well-being of patients who lost weight was also reported by Stapleton et al. (2013). The fourth and last measurement was performed six months after the weight loss program. All the surveyed patients adhered to healthy eating habits and continued to exercise six months after the program. The last measurement also revealed a significant decrease in body mass and BMI. However, six months after the program, the severity of depression and anxiety was not changed in comparison to the level noted during the third measurement. Clinical experience shows that the feelings of satisfaction, enthusiasm, regained control, and motivation are somewhat diminished several months after the weight loss program. The lifestyle changes that must be introduced for sustained weight loss pose a considerable challenge and require significant involvement, perseverance and self-control that can be compromised under exposure to physical, psychological, and social stressors (Tsigos et al., 2009). According to the surveyed subjects, the absence of professional support after the program detracted from their motivation to maintain healthy lifestyle changes in the face of a crisis. The patients believed that regular support would improve their well-being, increase satisfaction, and minimize fluctuations in their motivation for change. Work- and family-related problems were also regarded as significant obstacles to sustained weight loss. Most patients agreed that the knowledge disseminated by dietitians and physiotherapists and the cognitive-behavioral techniques learned during the program were very helpful in maintaining healthy eating habits. The practiced weight loss strategies enabled the participants to introduce positive changes in their daily lives.

However, there are some limitations to the present study that should inform future work. The major limitation of the present study is small research group – 45 and lack of male respondents. Future research covering larger research groups with male respondents would be an interesting follow-up of the present study.

## Conclusions

The evaluated interdisciplinary weight loss intervention was an effective method of obesity treatment. In subjects with obesity with BMI > 30, weight loss was accompanied by a reduction in depression and anxiety levels. According to research, an improvement in the patients' well-being is a motivational factor that contributes to the maintenance of positive lifestyle changes and minimizes the risk of undesirable behaviors (Burke, Ewing, Ye, Styn, Zheng, Music, & Sereika, 2015; Kheniser et al., 2021; Łuszczzyńska, 2007; Ogińska-Bulik, 2007). Effective weight loss also helps ease depression (Gautam, Tripathi, Deshmukh, & Gaur, 2020; Oyekcin et al., 2011). In the present study, depression and anxiety levels decreased in the first three months after the weight-loss program. Six months after the program were comparable to the results noted during the third measurement. It should be noted, however, that the main aim of the program was to assist the participants in reducing their body mass, and this goal was fully met. The effectiveness of interdisciplinary weight loss programs in the treatment of obesity was also confirmed by other researchers. For instance, according to Powell et al. (2007), physicians, dieticians, psychotherapists, and physiotherapists should work together during weight loss interventions to develop detailed lifestyle change plans for sustained weight loss. Effective interventions in weight loss programs should rely on the knowledge and experience of professionals who resort only to evidence-based therapeutic techniques. The cited authors also recognized the effectiveness of cognitive-behavioral techniques in instilling self-control and eradicating unhealthy habits in patients with obesity. Other studies also demonstrated that weight loss interventions combining a low-calorie diet with physical activity and cognitive-behavioral therapy are highly effective in the long-term (Fabricatore et al., 2007; Kurnik Mesarič et al., 2023; Obara-Gołębiowska, 2017). Conclusions and practical implications resulting from the conducted research may contribute to scientific disciplines such as rehabilitation psychology and special pedagogy in connection with therapy and rehabilitation of patients.

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### Conflicts of Interest:

There is no conflict of interests.

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