



# Type D personality in obese patients, including selected aspects of body image

## Osobowość typu D u osób otyłych z uwzględnieniem wybranych aspektów obrazu ciała

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### Abstract

**Introduction and Objective.** Obesity is a disease that develops due to the occurrence or co-occurrence of various factors. So far, it has not been possible to link a selected personality type to obesity, but many of the traits observed in obese people are reflected in the type D personality. Understanding a patient's personality type or selected traits of this personality, allow improvement of the psychological functioning of the patient in the disease. This is particularly important in the case of chronic diseases, to which obesity belongs. The aim of the study was to determine the prevalence of type D personality among obese patients. There was also an attempt to assess the relationship between body perception and the occurrence of stress personality among obese people.

**Materials and method.** The study group consisted of 443 patients with BMI  $\geq 30$  kg/m<sup>2</sup>, hospitalized in selected hospital facilities in the Silesia Province in south-west Poland. The following research tools were used: the author's questionnaire, Type D Scale-14 (DS14), and the Body Image Questionnaire (KWCO-40).

**Results.** The prevalence of type D personality among obese patients was almost 40%. The actual prevalence of type D personality among obese patients was within 95% CI: (33.6% – 42.6%), while non-type D personality was within 95% CI: (28.3% – 37.1%), and intermediate personality within 95% CI: (24.8% – 33.3%). The most dissatisfaction with body image was found among respondents with type D personality, women, and those with Class III obesity.

**Conclusions.** Understanding and identifying the factors that influence the increasing problem of obesity is difficult, but based on the present study, the assumption is made that personality type may play a role in the development of this disorder.

### Key words

obesity, body image, BMI, distressed personality, type D personality, obese patients

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### Streszczenie

**Wprowadzenie i cel pracy.** Otyłość jest chorobą, która rozwija się wskutek występowania lub współwystępowania różnych czynników. Do tej pory nie udało się powiązać wybranego typu osobowości z otyłością, ale wiele cech obserwowanych u osób otyłych znajduje odzwierciedlenie w osobowości typu D. Znając typ osobowości pacjenta bądź wybrane cechy tej osobowości, można poprawić jego funkcjonowanie psychologiczne w chorobie, co ma szczególne znaczenie w przypadku chorób przewlekłych, do których należy otyłość. Głównym celem pracy było określenie częstości występowania osobowości typu D wśród pacjentów z otyłością. Podjęto również próbę oceny zależności między postrzeganiem ciała a występowaniem osobowości stresowej wśród osób otyłych.

**Materiał i metody.** Grupę badaną stanowiło 443 pacjentów z BMI  $\geq 30$ , hospitalizowanych w wybranych placówkach szpitalnych na terenie województwa śląskiego. Badanie polegało na wypełnieniu: autorskiej ankiety, Skali do Pomiaru Osobowości Typu D (DS14) oraz Kwestionariusza Wizerunku Ciała (KWCO-40).

**Wyniki.** Odsetek osób z osobowością typu D wśród badanych pacjentów otyłych wyniósł prawie 40%. Rzeczywista częstość występowania osobowości typu D wśród otyłych mieściła się w przedziale 95% PU: (33,6–42,6%), osobowości typu innego niż D w granicach 95% PU: (28,3–37,1%), a osobowości pośredniej w przedziale 95% PU: (24,8–33,3%). Częstość występowania poszczególnych typów osobowości u kobiet i mężczyzn nie różniła się istotnie ( $p = 0,9$ ). Największe niezadowolenie z wizerunku ciała stwierdzono wśród badanych o osobowości typu D, kobiet oraz osób z III klasą otyłości.

**Wnioski.** Zrozumienie i zidentyfikowanie czynników wpływających na rosnący problem otyłości nie jest łatwe, jednak na podstawie niniejszych badań przypuszcza się, że pewną rolę w rozwoju tego zaburzenia może odgrywać typ osobowości.

### Słowa kluczowe

otyłość, BMI, obraz ciała, osobowość typu D, osobowość stresowa, pacjenci otyli

## INTRODUCTION

Obesity, known as the epidemic of the 21st century, is not only a significant health problem but also an economic and social problem in both developed and developing countries. Since the 1970s, the prevalence of obesity has tripled worldwide [1]. The prevalence of obesity in Europe is projected to increase significantly by 2025: if current trends continue, the percentage of obese adults in most countries will be above 20%, and in some countries may exceed 40% (e.g. Croatia, Greece) [2]. In Poland, according to data for 2019 from Statistics Poland, 57% of Polish adults were characterized by above-normal body weight, compared to 53% in 2014 [3].

The etiology of obesity is composite. Interactions between various factors, including genetic, environmental, or psychological factors, among others, are crucial in the onset and development of this disease. The most common is simple obesity, the main cause of which is improper health behaviour. Two negative practices are most commonly prominent in obese individuals: eating overly large amounts of food with poor physical activity. Less common is secondary obesity, which is a consequence of taken medicines or genetic and/or neuroendocrine disorders [4]. Although excess caloric supply in the diet has a primary impact on adipose tissue, there is no evidence of a direct influence on the central nervous system (CNS) and the gut microbiome. Prolonged and often increased over time excess body fat leads to dysfunction in almost all organs. The chronic nature of obesity and its associated diseases is a very significant medical and economic burden on the health care system, and consequently, one of the most important recent public health problems [5, 6].

Human eating behaviour is regulated by centres located in the central nervous system, and influence appetite, feelings of hunger, and satiety. People consume food not only when they feel hungry, but also when they are sad, worried, or with a disturbed sense of safety. For this reason, psychological factors are increasingly cited among the main causes of overweight and obesity. These include disorders in the mechanism of self-control, low self-esteem, emotional disorders, and difficulties in coping with stress. Studies have confirmed that there is a link between psychological disorders and excessive body weight. Psychological disorders can be one of the causes of obesity, but can also develop or exacerbate its consequence [7, 8].

Researchers have attempted to attribute certain personality traits to obese people using a five-factor model of personality (FFM). It was shown that higher conscientiousness was related to reduced risk of obesity and less excess body weight gain in adulthood. Neuroticism appears to be associated with body weight in a curvilinear way – its greater severity is observed for excessively low and excessively high body mass index (BMI) values. The relationship between the other personality traits (agreeableness, openness to experience and extraversion) and obesity, on the other hand, is not obvious [9, 10]. However, several characteristic traits of obese people are reflected in the type D personality, the so-called distressed personality [7, 8].

Type D personalities consist of two relatively constant traits: negative affectivity (a propensity for experiencing negative emotions strongly) and social inhibition (a propensity to consciously refrain from expressing negative emotions and behaviours associated with them) [11, 12]. The specific way of feeling, thinking, and behaving observed in patients with type

D personality strongly affects the course of their treatment. They are more often noted for complications in the course of various diseases, which usually result from a worse mental state and non-compliance with medical recommendations. Patients with a distressed personality find it more difficult to control their illness and report more complaints about somatic problems [13].

The link between type D personality and certain diseases may be a consequence of impaired biological processes in the body, as a result of chronic psychological stress. It has been suggested that the trait system organization typical of type D personality first affects the neurohormonal system: the hypothalamic-pituitary-adrenal axis (HPA axis), the sympathetic-adrenal medullary axis (SAM axis), and the autonomic nervous system (ANS axis). This results in increased cortisol secretion (by the HPA axis) and increased synthesis of pro-inflammatory cytokines. Cortisol increases low-density lipoprotein (LDL) cholesterol levels, disrupts vascular endothelial function, increases blood pressure, and contributes to chronic low-grade inflammation (Fig. 1). Currently, it is believed that high levels of cortisol in people with type D personality may be a major cause of the high risk of cardiovascular disease, especially acute coronary heart disease, and may exacerbate neurodevelopmental processes and promote depressive mood disorders [14, 15, 16].

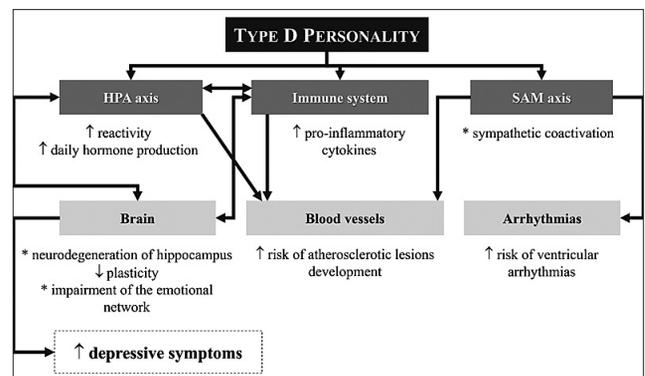


Figure 1. Pathophysiology of type D personality (based on: [16])

It seems that by understanding a patient's personality type or selected traits of this personality, it is possible to improve the patient's psychological functioning in the disease, which is particularly important in the case of chronic diseases to which obesity belongs. Therefore, the main purpose of this study was to determine the prevalence of type D personality among obese patients. Because certain personality traits can determine the perception of body image and thus the patient's attitude, an attempt was also made to evaluate the association of body perception and the occurrence of stress personality among obese patients.

## MATERIALS AND METHOD

**Study group.** Adults with a BMI  $\geq 30$  kg/m<sup>2</sup>, hospitalized in selected hospitals in the Silesian Province in south-west Poland, were qualified for the study. Consent was obtained from each hospital to perform the questionnaire study.

The study was carried out during the period from May 2017 – December 2018. The analysis included 443 properly completed questionnaires. The minimum size of the study group was set at

440 people, taking into account the average number of patients admitted to each hospital, and the undetermined prevalence of distressed personality among obese people in Poland.

The criteria for exclusion were the state of being unable to complete the questionnaires, including acute illness (e.g., fever, post-operative recovery) and symptoms indicating impaired cognitive functioning (autopsychic and allopsychic orientation disorders confirmed by screening).

Consent of the Bioethics Committee was not required due to the questionnaire nature of the research. In the light of the Polish Act of December 1996 on the professions of physician and dentist, the current study was not a medical experiment and therefore did not require evaluation (No.: KNW/0022/KB/106/18, dated 23/05/2018). All research standards were observed (including compliance with the Declaration of Helsinki). Patients participated in the study on a voluntary basis. The authors did not have access to medical documentation, including patient-identifiable data.

**Research tool.** Patients completed the author's questionnaire and standardized questionnaires Type D Scale-14 (DS14) and the Body Image Questionnaire (KWCO-40). The author's questionnaire included 15 questions, of which 7 were related to basic socio-demographic data (gender, age, place of residence, marriage status, education, work activity status), and 7 to obesity (weight, height, time struggling with the disease, comorbidities, medications taken, etc.). The author's survey included closed-ended type questions – 8 questions requiring users to select one of several proposed answers and 2 questions with a possible multiple choice. Only 4 questions were open-ended (age, height, weight and time of struggling with above-normal body weight).

The DS-14 scale [17, 18] was used to measure the type D personality. It contains 14 statements, of which 7 specify the tendency to experience negative emotions (Negative Affectivity; sentences with numbers 2, 4, 5, 7, 9, 12, 13), while the remaining 7 specify the tendency to social inhibition, i.e. to refrain from expressing negative emotions and their accompanying behaviours (social Inhibition; sentences with numbers 1, 3, 6, 8, 10, 11, 14). Each assertion was scored by the respondent using a 5-point Likert scale from 0 (false) – 4 (true); depending on the way in which the respondent can relate it to himself. A total of 0–28 points can be scored for each subscale. Interpretation of the results is as follows:

- type D personality à Social Inhibition and Negative Affectivity ≥10 points for each subscales;
- intermediate type of personality à Social Inhibition or Negative; affectivity ≥10 for one of the subscales;
- non-type D personality à Social Inhibition and Negative Affectivity <10 for each subscale.

The DS-14 scale is a good psychometric assessment tool with Cronbach's α=0.86 for the Negative Affectivity and 0.84 for the Social Inhibition [17, 18].

The Body Image Questionnaire (KWCO-40) by Głębocka [19] was used to examine the cognitive, emotional, and behavioural aspects of body image. It consists of 40 statements relating to 4 subscales:

- Cognition-Emotions (16 statements) – gives an answer about the respondent's opinion of his/her appearance in connection with the social environment and with the affective components, i.e. negative and positive feelings about the body, or feelings of guilt and anxiety.

- Stereotypes (13 statements) – used to measure the association between the modern beauty canons and awareness of negative stereotypes of obese people.
- Behaviour (5 assertions) – measures the respondent's attitude toward weight control behaviours.
- Social Criticism (6 statements) – allows assessment of the level of the respondent's sense of acceptance of the environment.

Respondents rated each statement on a five-point scale, taking into account their own experiences and attitudes toward the behaviours or situations described in the statement from 1 (definitely not) – 5 (definitely yes). The sum of the scores obtained on each subscale was transformed into the values on the sten scale provided in Table 1. In each of the KWCO-40 subscales, a higher score indicated a higher level of dissatisfaction with the selected aspect of body image. The analyses conducted showed the KWCO-40 to be a reliable measurement method – the Cronbach's α for the entire questionnaire and the Cognition-Emotions subscale is 0.93, for the Stereotypes subscale 0.88, for the Behavior subscale 0.83, and the Social Criticism subscale 0.67 [19].

**Table 1.** Gender-standardized sten norms for Body Image Questionnaire [19]

Sten	Total scores for each subscale							
	Cognition-Emotions		Behaviour		Social Criticism		Stereotypes	
	F	M	K	M	K	M	K	M
1	≤19	≤11	≤6	≤3	≤3	≤4	≤29	≤28
2	20–26	12–16	7–8	4–6	4–5	5–6	30–33	29–32
3	27–33	17–22	9–10	7–8	6–7	7	34–37	33–36
4	34–40	23–28	11–12	9–10	8–10	8–9	38–42	37–39
5	41–47	29–34	13–14	11–12	11–12	10–11	43–46	40–43
6	48–54	35–40	15–16	13–14	13–14	12–13	47–50	44–47
7	55–61	41–46	17–18	15–16	15–16	14	51–54	48–50
8	62–68	47–52	19–20	17–18	17–18	15–16	55–58	51–54
9	69–75	53–58	21–22	19–21	19–20	17–18	59–62	55–58
10	76–80	59–80	23–25	22–25	21–30	19–30	63–65	59–65

F – female; M – male

**Statistical analysis.** SAS 9.2 (Institute INC., Cary, NC, USA) and Statistica 13.3 PL (StatSoft Kraków, Poland) were used for statistical analysis.

The study group was characterized by gender, personality type and obesity class in detail. The mean (X) with standard deviation (SD) or median (Me) with lower and upper quartile values (Q1-Q3) were used to present quantitative data. Qualitative data were presented as the number (n) with percentages (%). Normality of distributions was tested by using the Shapiro-Wilk test, based on histograms and curve parameters [20].

The χ<sup>2</sup> test and Kruskal-Wallis test with *post hoc* analysis were used to test the significance of the differences. Spearman's rank correlation was used to analyze the relationships between the study variables. W analizie związków między badanymi zmiennymi stosowano test korelacji nieparametrycznych Spearman'a. The impact of independent variables on the dependent variable was evaluated via logistic regression analysis, the results of which are presented as odds ratio values. A significance level of α = 0.05 was assumed.

## RESULTS

**Study group characteristics.** The study involved 443 patients: 265 women (59.8%) and 178 (40.2%) men. Their average age was  $49.6 \pm 17.5$  years, with women, on average, 2 years older than the men ( $50.3 \pm 15.9$  vs.  $48.4 \pm 15.4$ , respectively) ( $p^{\text{ch}^2}=0.2$ ) (Tab. 2). The mean height of participants was  $169.2 \pm 8.09$  cm ( $164.4 \pm 5.66$  cm for women vs.  $176.4 \pm 5.41$  cm for men). Body weight among the entire study group averaged  $111.89 \pm 17.99$  kg ( $106.54 \pm 15.90$  kg for women vs.  $119.85 \pm 18.03$  kg for men). The mean BMI had a value of  $39.00 \pm 5.25$  kg/m<sup>2</sup> – among women; BMI –  $39.3 \pm 5.12$  kg/m<sup>2</sup>, while in men it was slightly lower –  $38.48 \pm 5.41$  kg/m<sup>2</sup>.

**Type D personality among obese patients.** The frequency of type D, intermediate, and non-type D personality was assessed in the total group. The type D personality was the most common ( $n=169$ ; 38.2%), followed by the non-type D personality ( $n=145$ ; 32.7%), and the least common the intermediate personality ( $n=129$ ; 29.1%). Interval estimation

proved that the actual occurrence rate of distressed personality among the obese was within 95% CI: (33.6% – 42.6%), while the non-type D personality was within 95% CI: (28.3% – 37.1%), and the intermediate personality within 95% CI: (24.8%–33.3%). The frequency of each personality type in men and women did not differ significantly ( $p=0.9$ ).

Analyzing the type D personality by age ranges, it was observed that the prevalence of distressed personality in obese people increases with age. In the 31–40 age group, the frequency of type D personality was 17.2% ( $n=29$ ), followed by 18.3% ( $n=31$ ) in the 41–50 age group, 22.5% ( $n=38$ ) in the 51–60 age group, 16.6% ( $n=28$ ) in the 61–70 age group and 15.4% ( $n=26$ ) in the >70 age group. In contrast, in the group of obese people in the <30 age range, type D was present in 10% of the subjects ( $n=17$ ).

An analysis of the prevalence of each personality type was also performed, taking into account place of residence, marital status, education, status of work activities status, and self-assessment of financial situation. None of these factors had a significant effect on the differences in the frequency of type D (Tab. 3).

Respondents were asked about the length of time they had struggled with obesity and their attempts at weight reduction.

**Table 2.** Characteristics of the study group by gender

	Total n; % 443; 100%	Gender		Chi <sup>2</sup>
		Female n; % 265; 59.8%	Male n; % 178; 40.2%	
<b>Age (years)</b>				
≤30	54; 12.2%	31; 11.7%	23; 13.0%	Ch <sup>2</sup> =2.038 df=5 p=0.8
31–40	88; 20.0%	52; 19.6%	36; 20.2%	
41–50	95; 21.5%	53; 20.0%	42; 23.6%	
51–60	93; 21.0%	58; 21.9%	35; 19.7%	
61–70	62; 14.0%	37; 14.0%	25; 14.0%	
>70	51; 11.5%	34; 12.8%	17; 9.5%	
<b>Place of residence</b>				
Village	62; 14.0%	39; 14.7%	23; 12.9%	Ch <sup>2</sup> =2.709 df=4 p=0.6
Town with population <50.000	22; 5.0%	13; 4.9%	9; 5.0%	
City with population 50.000–100.000	37; 8.3%	20; 7.5%	17; 9.5%	
City with population 10.000–250.000	223; 50.3%	128; 48.3%	95; 53.4%	
City with population >250.000	99; 22.4%	65; 24.5%	34; 19.1%	
<b>Marital status</b>				
Married	224; 50.6%	137; 51.7%	87; 48.9%	Ch <sup>2</sup> =5.758 df=5 p=0.3*
Divorced	78; 17.7%	43; 16.2%	35; 19.7%	
Widowed	36; 8.1%	23; 8.7%	13; 7.3%	
Single	77; 17.4%	41; 15.5%	36; 20.2%	
Separated	2; 0.4%	2; 0.7%	0	
Concubinate	26; 5.8%	19; 7.2%	7; 3.9%	
<b>Educational level</b>				
Primary	11; 2.5%	5; 1.9%	6; 3.4%	Ch <sup>2</sup> =1.001 df=3 p=0.8
Professional	54; 12.2%	33; 12.5%	21; 11.8%	
Secondary	199; 44.9%	120; 45.3%	79; 44.4%	
Higher	179; 40.4%	107; 40.4%	72; 40.5%	
<b>Occupational activity</b>				
Unemployed	34; 7.7%	22; 8.3%	12; 6.7%	Ch <sup>2</sup> =11.003 df=4 p=0.02
Employed	258; 58.2%	146; 55.1%	112; 62.9%	
Pensioner	107; 24.2%	64; 24.2%	43; 24.2%	
Student	11; 2.4%	5; 45.5%	6; 3.4%	
Other	33; 7.5%	28; 10.6%	5; 2.8%	
<b>Financial situation</b>				
Very bad	2; 0.4%	3; 0.7%	0	Ch <sup>2</sup> =1.931 df=4 p=0.7*
Bad	18; 4.1%	11; 4.2%	7; 3.9%	
Satisfactory	296; 66.8%	173; 65.3%	123; 69.1%	
Good	102; 23.0%	63; 23.8%	39; 21.9%	
Very good	25; 5.6%	16; 6.0%	9; 5.0%	

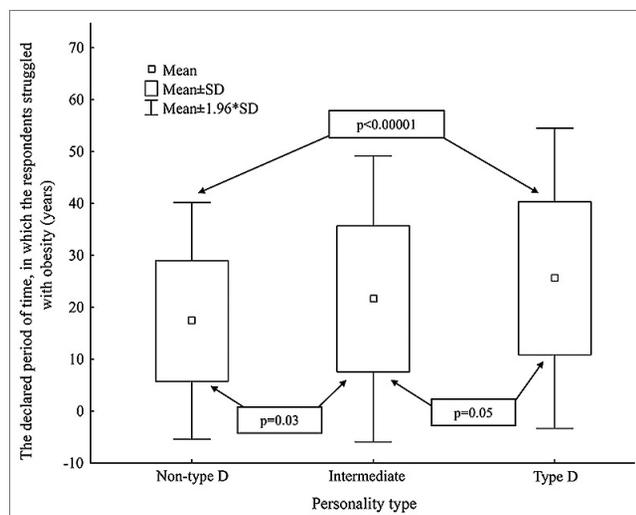
\* analysis did not include the value of 0

**Table 3.** Prevalence of analyzed personality types in the study group

	Personality type		Chi <sup>2</sup>
	Non-type D n; % 274; 61.8%	Type D n; % 169; 38.2%	
<b>Age (years)</b>			
≤30	37; 13.5%	17; 10.0%	Ch <sup>2</sup> =8.390 df=5 p=0.1
31–40	59; 21.5%	29; 17.2%	
41–50	64; 23.4%	31; 18.3%	
51–60	55; 20.1%	38; 22.5%	
61–70	34; 12.4%	28; 16.6%	
>70	25; 9.1%	26; 15.4%	
<b>Place of residence</b>			
Village	40; 14.6%	22; 13.0%	Ch <sup>2</sup> =4.594 df=4 p=0.3
City, with populations <50.000	10; 3.6%	12; 7.1%	
City, with populations 50.000–100.000	21; 7.7%	16; 9.5%	
City, with populations 10.000–250.000	136; 49.6%	87; 51.5%	
City, with populations >250.000	64; 24.5%	32; 18.9%	
<b>Marital status</b>			
Married	128; 46.7%	96; 56.8%	Ch <sup>2</sup> =5.685 df=5 p=0.3*
Divorced	53; 19.3%	25; 14.8%	
Widowed	23; 8.4%	13; 7.7%	
Single	52; 19.0%	25; 14.8%	
Separated	2; 0.7%	0	
Concubinate	16; 5.9%	10; 5.9%	
<b>Educational level</b>			
Primary education	4; 1.5%	7; 4.2%	Ch <sup>2</sup> =3.625 df=3 p=0.3
Professional education	33; 12.0%	21; 12.4%	
Secondary education	128; 46.7%	71; 42.0%	
Higher education	109; 39.8%	70; 41.4%	
<b>Occupational activity</b>			
Unemployed	9; 6.2%	15; 8.9%	Ch <sup>2</sup> =3.625 df=3 p=0.3
Employed	93; 64.1%	86; 50.9%	
Pensioner	24; 16.6%	53; 31.4%	
Student	4; 2.8%	5; 2.9%	
Other	15; 10.3%	10; 5.9%	
<b>Financial situation</b>			
Very bad	1; 0.7%	1; 0.6%	0.3*
Bad	7; 4.8%	10; 5.9%	
Satisfactory	94; 64.8%	114; 67.5%	
Good	34; 23.5%	36; 21.3%	
Very good	9; 6.2%	8; 4.7%	

\* analysis did not include the value of 0

The average period of struggle with obesity among the respondents was  $21.7 \pm 13.9$  years, while the median was 20 years with a quartile range of 20. In women, the period was  $21.6 \pm 14.5$  and in men  $21.9 \pm 13.2$  years ( $p=0.4$ ). The study group proved to be heterogeneous in terms of years of struggle with obesity among different personality types. Study participants who represented the group with a non-type D personality struggled with obesity for  $17.3 \pm 11.6$  years, those with intermediate type for  $21.6 \pm 14.05$ , and those with a type D for  $25.6 \pm 14.7$  years (Fig. 2).



**Figure 2.** The declared period of time, in which the respondents struggled with obesity, by personality type

The majority of the study participants, 67.2% ( $n=298$ ), declared that they were currently in the process of attempting weight reduction and this was the second attempt, while 20.5% ( $n=91$ ) stated that they were not currently in the process of weight reduction, but had made such attempts in the past. Only about 7% ( $n=31$ ) of all participants said that they had never attempted weight loss, and about 5% of the respondents were in the process of their first attempt at weight loss. Women were significantly more likely than men to attempt to lose excessive weight. In the analysis of personality type and weight reduction attempts, there were no statistically significant differences. Each personality type was characterized by a similar frequency of weight reduction attempts. Undertaking subsequent attempts at weight reduction was declared by 63.5% ( $n=92$ ) of those with a non-type D personality, 70.5% ( $n=91$ ) with intermediate type, and 68.0% ( $n=115$ ) with type D.

Respondents were also asked whether obesity had previously occurred in their family. The overwhelming number of participants, 80% ( $n=356$ ), confirmed that obesity had already occurred in the family. In both the men and women, obesity in the family was confirmed in about 80% of cases ( $p=0.4$ ). Patients who were characterized by type D were significantly more likely ( $p=0.01$ ) than those with other personality types to declare the presence of obesity among family members – 87% ( $n=147$ ) for type D, 78.3% ( $n=101$ ) for intermediate, and 74.5% ( $n=108$ ) for non-type D personality.

An important aspect was the presence of comorbidities associated with obesity in the subjects, among whom almost all respondents – 88% ( $n=390$ ), declared that they had any comorbidity? (Did or did not have a comorbidity?)

Approximately 54% ( $n=238$ ) stated metabolic problems, 45% ( $n=199$ ) indicated cardiovascular problems, while another 22.5% ( $n=100$ ) stated that they had digestive tract problems, 20.3% ( $n=90$ ) nervous system problems, 19.2% ( $n=85$ ) with the liver, 17.6% ( $n=78$ ) with the osteoarticular system, 16% ( $n=71$ ) with the thyroid, 15.6% ( $n=69$ ) with the kidneys, 14.9% ( $n=66$ ) with the respiratory system, 6% ( $n=27$ ) with the pancreas and 2.5% ( $n=11$ ) with connective tissue.

Furthermore, 13.7% ( $n=61$ ) of the respondents indicated the presence of health problems other than those listed. In the overall study group, about 13% ( $n=57$ ) of patients marked only 1 comorbidity, 25.3% ( $n=112$ ) declared 2 comorbidities, while 3 or more comorbidities were prevalent in almost 50% of respondents ( $n=221$ ). The occurrence of comorbidities was also analyzed from the perspective of personality type. Patients with distressed personality were the most likely to report comorbidities (93%;  $n=158$ ) and differed significantly from other personality types in this regard. It was also shown that metabolic, cardiovascular, respiratory, renal, gastrointestinal, liver, and pancreatic diseases were significantly more frequently associated with type D than non-type D and intermediate personality (Tab. 4).

**Table 4.** Prevalence of diseases by personality type

	Personality type			Chi <sup>2</sup>
	Non-type D	Inter-mediate	Type D	
Comorbidities Yes, n (%)	112; 77%	120; 93%	158; 93%	Chi <sup>2</sup> =23.863 df=2; p<0.0001
Cardiovascular diseases Yes, n (%)	51; 35%	56; 43%	92; 54%	Chi <sup>2</sup> =11.870 df=2; p=0.003
Respiratory diseases Yes, n (%)	15; 10%	20; 15,5%	31; 18%	Chi <sup>2</sup> =3.990 df=2; p=0.14
Kidney diseases Yes, n (%)	10; 7%	22; 17%	37; 22%	Chi <sup>2</sup> =13.651 df=2; p=0.001
Gastrointestinal diseases Yes, n (%)	19; 13%	27; 21%	54; 32%	Chi <sup>2</sup> =16.146 df=2; p<0.001
Liver diseases Yes, n (%)	16; 11%	25; 19%	44; 26%	Chi <sup>2</sup> =11.330 df=2; p=0.003
Pancreatic diseases Yes, n (%)	3; 2%	8; 6%	16; 9%	Chi <sup>2</sup> =7.467 df=2; p=0.02
Metabolic disorders Yes, n (%)	61; 42%	72; 56%	105; 62%	Chi <sup>2</sup> =12.953 df=2; p=0.002
Thyroid diseases Yes, n (%)	14; 10%	26; 20%	31; 18%	Chi <sup>2</sup> =6.681 df=2; p=0.03
Osteoarticular diseases Yes, n (%)	20; 14%	22; 17%	36; 21%	Chi <sup>2</sup> =3.071 df=2; p=0.2
Nervous system diseases Yes, n (%)	25; 17%	24; 19%	41; 24%	Chi <sup>2</sup> =2.704 df=2; p=0.3
Connective tissue diseases Yes, n (%)	2; 1%	1; 1%	8; 5%	Chi <sup>2</sup> =5.819 df=2; p=0.06
Other diseases Yes, n (%)	10; 7%	21; 16%	30; 18%	Chi <sup>2</sup> =8.710 df=2; p=0.01

About 70% ( $n=313$ ) of respondents claimed to use pharmacotherapy. The highest number, 52.3% ( $n=232$ ), used drugs other than those listed in the questionnaire, and up to 29.1% ( $n=129$ ) – anti-diabetic drugs. The patients additionally declared taking allergy medications (12.1%;  $n=54$ ), anti-depressants (9.2%;  $n=41$ ), glucocorticosteroids (7.6%;  $n=34$ ) and anti-epileptic drugs (3.3%;  $n=15$ ). Women were relatively

commonly declared using gynecological drugs (18.1%; n=48 women). In conclusion, 32.5% (n=144) reported the use of 1 drug, 2 pharmaceuticals by 25% (n=111), and more than 2 by 13.3% (n=59). The odds of taking more drugs are about 40% lower for those with type D personality, compared to non-type D personality (OR D x non-D= 0.610; 95% CI 0.429–0.867).

**Evaluation of body image in the group of people with obesity.** For body image assessment, study participants completed the body image questionnaire (KWCO-40). The results obtained by the respondents in each subscale of the KWCO-40 were compared with normative values and classified as: low, medium, and high. Due to the different norms for men and women, the analyses were performed by gender (Tab. 5).

The subscale Cognition-Emotions significantly showed the lowest scores for those with non-D personalities, and the highest scores for D-type personalities ( $X = 47.0 \pm 9.8$  vs.  $X = 55.8 \pm 9.5$ , respectively;  $p < 0.0001$ ) (Fig. 3a).

Analysis of the Behaviour subscale, with a categorization into different personality types, showed the same association, i.e. statistically significant differences between the mean values obtained by those with D and non-type D personality, and non-type D and intermediate personality (Fig. 3b).

However, analysis of the Social Criticism subscale showed that each of the personalities studied differed significantly from each other concerning the scores obtained on this subscale of the KWCO-40 questionnaire (Fig. 3c).

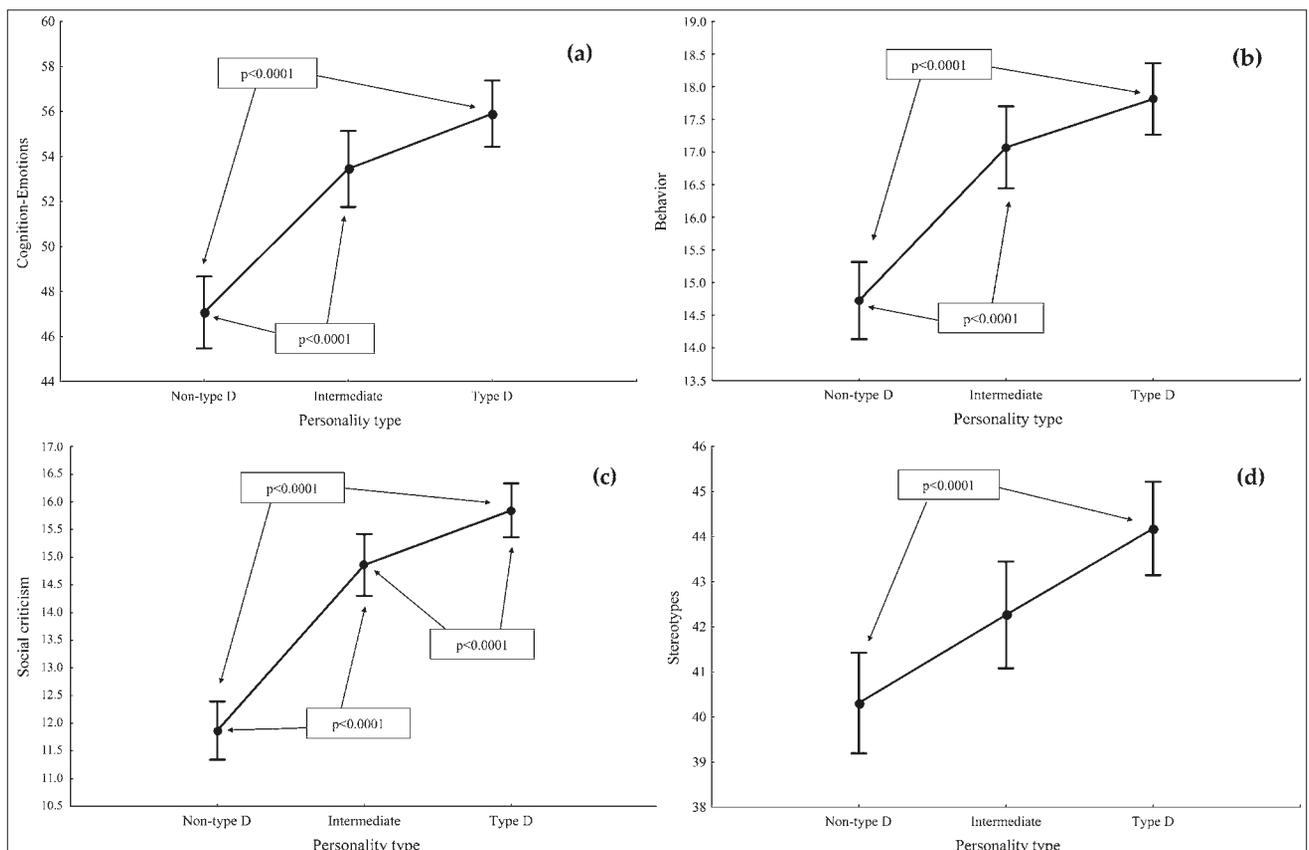
Analysis of the Stereotypes subscale showed significant differences in scores between non-D and D-type personalities (Fig. 3d).

**Table 5.** Scores obtained for each subscale of KWCO-40, in relation to normative values, by gender

Scores obtained for each subscale of KWCO-40, in relation to normative values	Total n; %	Gender		Chi <sup>2</sup>
		Female n; %	Male n; %	
		265; 59.8%	178; 40.2%	
<b>Cognition-Emotions</b>				
Low	23; 5.1%	17; 6.4%	6; 3.4%	Ch <sup>2</sup> =7.54 df=2; p=0.02
Medium	124; 28.0%	84; 31.7%	40; 22.4%	
High	296; 66.8%	164; 61.9%	132; 74.2%	
<b>Behaviour</b>				
Low	47; 10.6%	21; 7.9%	26; 14.6%	Ch <sup>2</sup> =8.46 df=2; p=0.01
Medium	124; 28.0%	68; 25.7%	56; 31.5%	
High	272; 61.4%	176; 66.4%	96; 53.9%	
<b>Social Criticism</b>				
Low	46; 10.4%	33; 12.4%	13; 7.3%	Ch <sup>2</sup> =3.17 df=2; p=0.2
Medium	193; 43.6%	111; 41.9%	82; 46.1%	
High	204; 46.0%	121; 45.7%	83; 46.6%	
<b>Stereotypem</b>				
Low	201; 45.4%	98; 37.0%	103; 57.9%	Ch <sup>2</sup> =27.83 df=2; p<0.0001
Medium	173; 39.1%	109; 41.1%	64; 35.9%	
High	69; 15.5%	58; 21.9%	11; 6.2%	

A correlation analysis between BMI and the scores obtained in each subscale was also performed. The Cognition-Emotions subscale was most strongly correlated with obesity  $R=0.57$  ( $p < 0.0001$ ), followed by the Stereotypes subscale  $R=0.51$  ( $p < 0.0001$ ), the Behaviour subscale  $R=0.48$  ( $p < 0.0001$ ) and the Social Criticism subscale  $R=0.40$  ( $p < 0.0001$ ).

On the Cognition-Emotions subscale, high scores predominated among the extremely obese (BMI >40 kg/



**Figure 3.** Scores obtained for individual KWCO-40 subscales, by personality type: (a) Cognition-emotions subscale; (b) Behavior subscale; (c) Social Criticism subscale; (d) Stereotypes subscale

m<sup>2</sup>) and those with class II obesity (BMI 35–40 kg/m<sup>2</sup>), while their percentage was significantly lower among those with class I obesity (BMI 30–35 kg/m<sup>2</sup>); respectively, n=180; 88% vs. n=75; 65% and n=67; 54% (p<0.0001). The following subscales obtained similar results: Behaviour n=169; 83% (obese class III) vs. n=66; 57% (obese class II) vs. n=54; 44% (obese class I) (p<0.0001); Social Criticism n=127; 62% (obese class III) vs. n=71; 58% (obese class II) vs. n=40; 47% (obese class I) (p<0.0001). In the Stereotypes subscale, low scores were most often recorded in obese class I – 76% (n=93), while their percentage was much lower in subsequent obese classes – for class II obesity at 42% (n=49), and class III obesity at 49% (n=99).

## DISCUSSION

The specific nature of distressed personality, associated with a stronger experience of negative emotions and a tendency to over-control the expression of their feelings, causes patients with this personality type to cope worse while experiencing illness [21].

In the present study, type D personality was the most common – it was found in 38.2% of patients (n=169). This indicates a relatively high percentage of people with distressed personality among the obese, in comparison with the average prevalence of distressed personality in the general population, which is around 26% [22]. However, the frequency of type D is very variable. In research among general population in Australia, type D was recorded in 39.7% of respondents, while in analyses for the British and Irish populations, 38.5% of participants were classified as type D [23, 24]. In Germany, in a study conducted in 2010 among the general population, there was a lower prevalence of distressed personality – 31%, in Israel in 2011–24.1% (adult volunteers), and in Taiwan in 2013 (general population) – 16% [25–27]. Studies conducted in Poland, mainly in selected professional groups, have shown that type D personality characterized 27.8% – 45.6% of healthcare workers, 30.1% of secondary school teachers, and 43% of students who specialize in dietetics [28–31]. The frequency of type D in the general population in Poland has been estimated at 9.3% and 34.8%, depending on the study [18, 32].

The relatively high prevalence of Type D personality found in the current study may have to do with the nature of the study group, which included only obese individuals. There are not many studies evaluating the prevalence of distressed personality among obese or overweight individuals, but the few available do indicate a higher percentage of type D in overweight respondents. Among overweight and obese Korean middle-aged women, type D personality was observed in 32.4% of the participants. The authors of the study indicate that this value substantially exceeds the prevalence of type D among hypertensive patients (24.7%) and patients with coronary artery disease (26.1%) in the Korean population [33]. The findings of this study are particularly important since currently patients with cardiovascular disease are considered the group with the highest prevalence of distressed personality, ranging from 26–53% [34].

The prevalence of distressed personality in people with different BMI values was also part of a study conducted among Taiwanese respondents with type 2 diabetes. Based on the results, 38.8% of obese participants were found to

have a type D personality, while non-type D (together intermediate and non-type D personality) was reported in 61.2% of the patients. Moreover, the prevalence of distressed personality was highest in the obese group (46.3%), compared to overweight (24.4%) and normal-weight (29.3%) individuals [35]. A study of patients without cardiovascular disease found no difference between type D and non-type D in obesity prevalence, but distressed personality was associated with increased BMI [36]. A similar correlation was shown in a study of the general population in Iceland – distressed personality was associated with larger waist circumference and higher BMI values [37].

Obesity is often associated with many of comorbidities, which can be both a cause and a consequence of excessive body weight. This is reflected in the findings of the current study which indicate that 88% of the participants suffered from at least one concomitant disease, with the most common being metabolic problems (54%). Moreover, a statistically significant finding was observed between poorer health and stress personality, with the highest percentage of comorbidities reported among respondents with type D personality (93%). The most frequently reported were metabolic disorders (62%) and cardiovascular problems (54%). An inappropriate response to stress, associated with type D personality, is considered to determine homeostatic dysfunction and susceptibility to psychosomatic diseases [38]. This is mainly due to the interactions that occur between psychological factors, immune processes, and neuroendocrine mechanisms. Chronic stress strongly affects the HPA axis, leading to increased cortisol secretion and an increased inflammatory response, manifested by increased levels of natural killer cells (NK) and cytokines, including interleukin-1 $\beta$  (IL-1 $\beta$ ) and plasma interleukin-6 (IL-6). Chronic activation of the immune system can manifest as depressed mood and even depression, which is an independent risk factor for the development of coronary heart disease, osteoporosis, and some studies indicate an association between depression and hypertension, peptic ulcers, and diabetes. A factor mediating these interactions, increased cortisol levels inhibit growth hormone and the hypothalamus-pituitary-gonadal axis (HPG axis), exacerbating visceral fat accumulation. Hypercortisolism and excess visceral fat lead to dyslipidaemia, insulin resistance, and hyperinsulinism [39].

However, interesting results were also obtained concerning the frequency of type D in particular age ranges – type D was most prevalent among older people, especially in the 51–60 age range (22.5%), and least prevalent among respondents under the age of 30 (10%). Convergent findings appear in Korean studies in which the prevalence of type D personality in the general population (mean age = 43.3 $\pm$ 12.8 years) was 27.8%, while among adolescents (junior high school students – mean age = 12.90 $\pm$ 0.331 years and high school students – mean age = 15.66 $\pm$ 0.6 years) it was only 18.2% [40]. A study conducted in France showed a different link – type D personality was less often characterized by adults (mean age = 53.19 $\pm$ 8.35 years) – 22.2%, than students (mean age = 24.26 $\pm$ 8.52 years) – 32.5% [41].

Making direct comparisons between the results obtained in different studies on Type D personality is very difficult, since the prevalence of distressed personality may depend on many factors, including cultural differences, size of the study population, varying conditions and lifestyles, gender

or age, among others [22]. Furthermore, personality, specially selected personality traits, are not stable. On the one hand, type D personality and each of its components individually are heritable (the level of heritability for negative emotionality is 49%, for social inhibition – 50%, for both combined – 49%) [42].

In contrast, research in the past decade suggests the role of environmental factors in the development and formation of personality. For example, most people have been shown to experience an increase in levels of conscientiousness and emotional stability between adolescence and early adulthood. Some researchers believe that the changes in personality that occur during life are stochastic, while others argue that strong personal experiences or other environmental factors can affect a complete change in personality [43].

In an obese person, a negative self-image of the body can have a significant impact on daily functioning, and therefore on functioning in the disease. Body image consists of several elements, including perception, cognition, affect, and behaviour, but is additionally shaped by several of socio-cultural factors. The current promoted standards of attractiveness, combined with dissatisfaction with appearance and criticism from the social environment, contribute to unfavourable changes in body image. The influence of socio-cultural factors is particularly evident in obese people – up to 96% of obese girls are stigmatized [19]. In addition, it was found that for children, an abnormal BMI was associated with lower self-esteem in all aspects analyzed, including poorer body image, eating disorders, and even poorer academic performance [44]. It has also been noted that children with obesity are characterized by being more dissatisfied with their appearance, more susceptible to attention from the community, and less well-liked than peers with a normal BMI [45]. Obesity in childhood has a very negative impact on their later functioning – individuals who have had a problem with excessive body weight from an early age have been observed to be characterized by more dissatisfaction with their appearance in the future, even when they lose excessive pounds [46]. Negative body perception contributes to low self-esteem and feelings of loneliness, leading to impaired mental health, including depression, which further exacerbates the negative image [19]. How important the role of body image is in forming our health is also indicated by studies focusing on positive body image, which, although not the usual opposite of dissatisfaction with one's appearance, can help in understanding the relationships that take place. People with high levels of positive body image are less likely to report symptoms of depression, have higher self-esteem, and represent less unhealthy eating behaviours. It has also been noted that a positive body image can promote self-consciousness and, consequently, increased sensitivity to one's personal needs [47].

The current study indicates a dominant negative body image among obese patients. More than 45% of the respondents scored considered high on 3 of the 4 subscales – the exception was the subscale: Stereotypes. Men and women differed in body image, as reflected in the individual subscales. Women, more often than men, represented high levels of weight-control behaviours (subscales: Behaviour) and were more aware of negative stereotypes of the obese (subscales: Stereotypes). Men were more likely to have poorer opinions of their appearance (subscales: Cognition-Emotions), while both genders experienced criticism from

their social surroundings to a comparable, but rather high intensity. The class of obesity was also a factor influencing the severity of negative body image – a higher body weight of respondents positively correlated with a worse opinion of their appearance, lower acceptance of their surroundings, and more frequent initiation of weight control behaviours.

For the majority, the conclusions from self-study correspond to the observations of the author of the questionnaire, indicating a negative perception of body image in people with obesity, but the level of the negative image was significantly different. In all KWCO-40 subscales, self-reported respondents from the present study scored significantly higher, compared to those with abnormal body weight surveyed by Głębocka [19]. The observed differences may be related to type D personality which affected almost 40% of the participants in the present study. A detailed analysis showed that body image perception in all subscales was significantly most negative in obese people with distressed personality. Previous studies confirm the above observations – people with type D, especially those with high levels of negative emotionality, are more dissatisfied with their appearance [48]. Similar correlations were also found for selected personality traits that are closely related to distressed personality, neuroticism, and extraversion. High levels of neuroticism predict dissatisfaction with appearance for both men and women [49]. Individuals characterized by high neuroticism, attach more importance to how they look and are more likely to compare themselves to others; at the same time, they are more rejection-sensitive, which may exacerbate their striving for an ideal appearance.

Concerning extraversion, it has been noted that its low intensity increases the likelihood of a more negative body image. Those with low levels of extraversion are characterized by greater shyness and less focus on interpersonal relationships, and therefore may be more susceptible to the influence of socio-cultural factors contributing to negative body image [50]. Psychological stress is believed to be a key factor in the links between the above-normal body weight and body image. Studies with adolescents have confirmed a significant relationship between interpersonal stress and negative body image, regardless of gender. The stressful background of negative body image is an additional factor that links it to the type D personality [51].

Similarly to the current study, foreign scientific reports indicate that individual attitudes toward body image are linked to gender. In general, girls and women, compared to the male gender, are less satisfied with their appearance and perceive their bodies as fatter than they actually are [52]. This is mainly because that the importance of physical appearance is far more emphasized for women, especially in economically developed countries, making women more focused on their appearance than men [49]. The insights into the impact of BMI on body image also correspond to observations in the current study – the greater the above-normal body weight, the worse the perception of one's appearance. However, it is worth noting that these associations show some gender variation, which is also due to patterns operating in society. For women, for whom the ideal is a slim appearance, the correlation is linear – dissatisfaction with body image increases as weight increases. In contrast, for men who prefer a muscular appearance, the relationship is curvilinear – too low and too high BMIs are most often associated with poorer body image, while medium BMI values correlate with lower

levels of appearance dissatisfaction [49, 52]. Considering the impact of self-perception on health and well-being, it is believed that it should be included in intervention programmes undertaken by medical personnel [47].

## CONCLUSIONS

Understanding and identifying factors that influence the growing problem of obesity is not easy, but based on the present study, it is speculated that personality type, or at least selected personality traits, may play a role in the development of this disease. The percentage of people with type D personality, which was observed among obese patients, was almost 40% (38.2%), indicating a fairly high prevalence of this type of personality, compared to the average prevalence rate in the general population (about 26%). Previous studies have indicated an association of Type D personality with some disease entities, mainly due to its stressful nature, but similar analyses concerning obesity are lacking.

Perhaps this study will contribute to the start of more research into the possibility of considering stress personality as an independent risk factor for the development of obesity. It would be reasonable to adapt treatment methods to the patient's personality, which would greatly improve his/her functioning in the disease, as well as increase the chance of later recovery. The current predominant attitude toward obese people as lazy and having unhealthy eating habits should evolve towards better psychological support, as well as attempts to understand the reasons behind improper health behaviours. Without a comprehensive approach, modifications to health attitudes by themselves may fail.

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