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Differential diagnosis of eating disorders with the use of classification trees (decision algorithm)

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Summary

Background: The aim of the study was to establish whether it is possible to make a correct diagnosis of various types of eating disorders on the basis of several variables.

Method: A group of 213 females, 20 to 26 years of age, took part in the study. 92 women (control group) and 121 women (research group). We used the Eating Disorder Inventory (EDI), the Socio-cultural Attitudes Towards Appearance Questionnaire-3 (SATAQ-3) and a questionnaire of behavior towards the body. A selection of dependent variable predictors of disorder was made and a classification tree was developed.

Results: People suffering from eating disorders differ from healthy individuals in the intensity of the variable "pattern for constructing emotional relationships on the basis of lack of trust and certainty in interpersonal relations". People suffering from various types of eating disorders differ – besides the BMI – on such psychological traits as fear of gaining weight and a restrictive strive to be slim, as well as dissatisfaction with the body. A differential diagnosis in line with a decision algorithm correctly identified healthy individuals in 100% of cases, bulimia in 78.72% of cases, binge eating disorder in 93.33% of cases, and anorexia in 86.36% of cases.

Conclusions: Psychological predictors of eating disorders may be arranged in the form of a classification tree. It is possible to make an accurate differential diagnosis of eating disorders on the basis of results of measurements of six variables.

eating disorders predictors, psychological variables, classification tree, differential diagnosis

INTRODUCTION

Differential diagnosis of eating disorders

Eating disorders (e.g. bulimia nervosa, anorexia nervosa or compulsive overeating/binge eating) are differentiated based on criteria laid out in the main disease classification systems: the International Statistical Classification of Diseases and Related Health Problems (ICD-10) in the European countries and the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) in the USA. Clinical practice suggests that the incidence of eating disorders is steadily on the rise. Both statistical and clinical practice reports (from physicians and psychologists) suggest that anorexia and bulimia nervosa are being considered "civilisation diseases" of the young generation, particularly of women and girls from Western Europe [1], including Poland [2-4].

The differentiation of criteria describing the so-called normal and psychopathological? traits behaviors in people suffering from anorexia, bu-

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limia or binge eating (one of the causes of obesity) is an important task for physicians, practicing psychologists and researchers. With the correct diagnosis, they may significantly aid the treatment process. Empirical characteristics and differentiation of diagnostic criteria (including the psycho-social criteria) in people suffering from anorexia, bulimia or compulsive overeating is an issue tackled in contemporary scientific research worldwide [5-13].

Medical (nosological) diagnosis does not fully define the psychological traits – crucial for a psychopathological analysis of eating disorders – which allow to precisely determine the criteria used in diagnosing various types of anorexia or bulimia nervosa. People may present with various psychological traits independent of the fact that they suffer from anorexia, bulimia or compulsive overeating. Such traits, combined with patient personality, may directly influence specific patterns of psychological functioning, adaptive defense mechanisms or stress coping strategies, as well as established patterns of social relationships.

The literature and empirical studies identify the following recurring dominant psychological traits in people with eating disorders: negative body image and dissatisfaction with the body, deficits in interoceptive awareness, excessive fear of gaining weight (often referred to as "fat phobia"), excessive perfectionism, impulsive eating, low self-assessment, distrust in establishing interpersonal relations, and fear of maturity [14]. These psychological variables on the one hand describe a certain dominant profile of psychological traits and attitudes in people suffering from eating disorders, and on the other hand may directly influence patient behavior in a given situation (e.g. of impulsive type – restrictive attitude towards the body, eating and physical activity). Thus, through endogenous (personality-based) stimulation to health-conscious/unhealthy reactions and attitude towards the body and nutrition, psychological (personality) variables may modify treatment efficiency and help establish the direction of psychological therapy, depending on the needs of the patient.

Among the most important theoretical concepts that formed the basis for theoretical assumptions of the current study model and selection of variables were contemporary cognitive concepts, namely the multifactor models of developing body dissatisfaction [15], and modern theories on socio-cultural influences on body attitudes [16-17], or the objectification theory [18].

Classification trees

Analysis with the use of classification trees is one of the basic data-mining techniques used in many scientific disciplines such as medicine (diagnostics), computer sciences (data structures), botany (classification) and psychology (decision theory) [19-20]. Classification trees owe their popularity to their simplicity, reliability, possibility of data exploration, and wide interpretation of results, presented in a graphic, simple to interpret format [21]. Classification trees allow us to determine the class of quality-dependent variable to which a specific case belongs. By measuring one or more predictors, they describe the dependence between independent variables and the dependent variable. Classification trees simplify the complex relations that occur between variables, as well as providing their detailed description, enabling a selection of significant variables as well as predicting future relations between individual variables on the basis of data [22]. A classification tree enables a formulation of a set of diagnostics guidelines/prompts (a decision algorithm) which can be expressed in several logical conditions of the "if – then" type. At the same time, to start with no assumptions are made as to the nature of the relation between predictors and the dependent variable, whether it is linear or modeled by a specific binding function, or even whether it is a monotonic dependence. Classification trees are thus perfectly suitable for analyzing connections between variables, as the *a priori* awareness is insignificant and there are no theories or models which explain which variables are interrelated and in what way. In this type of analysis the classification tree method enables to identify relations between several variables undetectable by other analytic techniques [23].

The construction of a classification tree begins with selection of variables that make up the best predictors of the dependent variable. Then, using the Classification and Regression Trees (CRT) tool, available in the Data Mining mod-

ule [24], predictors can be arranged hierarchically is such a way that, starting with the best predictors at split nodes, the critical ranges of independent variables are determined. Split nodes describe the degree of severity/intensification of dependent variables assumed for the purpose of the analysis, gradually dividing the analyzed group into two categories. At end nodes two sets of cases are obtained, separated by a reference to the dependent variable, uniform with regard to the intensification of assumed traits (e.g. a group of people with eating disorders and a control group) [25].

METHOD

Aims

The study had three aims. First, to determine the psychological predictors of eating disorders, that is select the variables and tools which allow to differentiate groups of patients suffering from anorexia, bulimia or compulsive overeating, as well as those without eating disorders. Another aim was to establish the quality differences between specific groups (healthy individuals, people suffering from bulimia, anorexia and binge eating disorder). The third aim of the study was to establish whether it is possible to correctly diagnose eating disorders with the use of classification trees. The aims may be presented in the form of the following research questions:

1. Is a correct diagnosis of eating disorders based on the measurement of several psychological variables possible?
2. Which psychological variables are the best predictors of eating disorders?
3. What are the psychological differences between people without eating disorders and people suffering from anorexia, bulimia and compulsive overeating?
4. What is the level of diagnostic accuracy when classification trees are used to diagnose eating disorders?

Study materials

The study was conducted from 2007 to 2014 on a population of 120 females with eating disorders (control group is 120 women (research group) and 120 healthy women (control group) of identical age range as the clinical group. The study also served as source material for conducting an additional empirical analysis presented in this paper looking at the use of decision algorithms in differential diagnosis: the psycho-social variables identified within the clinical group, as well as between the clinical group and controls (the norm versus eating pathologies).

The main research questionnaires used were:

1. Eating Disorder Inventory (EDI), Polish version: measurement of body dissatisfaction[1,2]. Cronbach's alpha was high and satisfactory in all subscales of the Polish version (ranging from 0.60 to 0.92).
2. The Sociocultural Attitudes Towards Appearance Scale – 3 (SATAQ-3) questionnaire, Polish version adapted for the study. The Polish version was used for pilot studies. Sampling compatibility (KMO) was measured at 0.983. The results of Bartlett's sphericity test allowed to reject the hypothesis concerning the identity matrix ($\chi^2 = 3046.280$; d.f. = 276; $p < 0{,}001$). Factor analysis was performed for verification and calculation of statistical ratios for all items in the questionnaire, and the factors identified were subjected to Varimax rotation with Kaiser normalization. On the basis of exploratory factor analysis, three factors were determined, which jointly explain some 70% of total variance of data collected: factor I – "Search for information concerning body image" (8 items), factor II – "Pressure of socio-cultural norms" (7 items), and factor III – "Internalization of socio-cultural norms" (9 items). The selected factors, labeled as subscales, showed high level of reliability indicators, as Cronbach's alpha exceeded 0.92.
3. The Body-Directed Behavior Questionnaire (pol. Kwestionariusz Zachowań wobec Ciała – KZWC) – a 32-item questionnaire developed by the authors for measuring one of the dependent variables – restrictive and compensatory behavior towards the body. The indicator of sampling adequacy and Bartlett's sphericity test to KZWC was at KMO = 0.771. Bartlett's sphericity test al-

lowed for a rejection of the hypothesis concerning the identity matrix (χ^2 = 2894.531; d.f. = 465; p < 0,001). This justifies performing a factor analysis using the main axes method with Varimax rotation and Kaiser normalization. Thus, four factors were distinguished (named for the content they represented): factor I – diet scale (12 items), factor II – physical exercise scale (9 items), factor III – scale of restrictive application of diets (7 items), and factor IV – compensatory behaviors scale (4 items). A 32-item questionnaire, KZWC, was established. Significant values for specific indicators of the "diets" sub-scale – restrictive application of diets applied, restrictive physical activity, as well as compensatory (bulimic) behaviors – were between 0.582 (three indicators of diet variable, restricting food (intake) control and two for restricting physical activity) and 0.974. Most factor values exceeded 0.700. Thus, reliability of internal consistency was sufficient for investigations with the KZWC questionnaire. Table 1 presents basic data concerning operationalization of study variables and measurement methods.

Table 1. Operationalization of study variables and measurement methods for 120 women with eating disorders (research group) and 120 women without eating disorders (controls)

Variables	Measuring method	Empirical definition of the variable*
1.Body mass index (BMI)	Diagnostic sheet – data from clinical history	The value obtained by dividing body mass (in kg) by the square of the body height (in meters). BMI <16.0 – severe underweight; 16.0–16.99 emaciation; 17.0–18.49 underweight; 18.5–24.99 normal/healthy weight; 25–29.9 overweight
Psychological factors – Eating Disorder Inventory (EDI) scales, Polish version		
2. Dissatisfaction with the body	"dissatisfaction with the body"	High level (not required to stay healthy) of intensified dissatisfaction with whole body image or with various parts of the body.
3. Deficits in interoceptive awareness	"interoceptive awareness"	High level of difficulty with recognizing emotional states and reacting to them, as well as to stimuli and sensations received from the body.
4. Tendency to bulimic thinking and impulsive attitude towards food	"bulimia"	Substantially intensified obsessive (bulimic) thoughts concerning food, overeating, and provoking compensatory reactions concerning the body.
5. Perfectionism	"perfectionism"	Highly intensified inclinations to meet the expectations of the social environment and/ or the highest standards attainable to satisfy personal ambitions.
6. Self-esteem – feeling incompetent and inefficient	"inefficiency"	Self-assessment of feeling of no value (negative assessment of one's own competencies and skills).
7. A pattern of building emotional relationships on the basis of an attitude of distrust and uncertainty of interpersonal relations	"distrust in interpersonal relations"	High level of uncertainty and distrust in relations with people (intensification of difficulties in bonding with people).
8. Fear of gaining weight and restricting striving to be slim	"striving to be slim"	Intense fear of gaining weight and getting fat (and in connection with that – development of an intense desire to get ever slimmer).

9. Fear of maturity	"fear of maturity"	Severe fear of maturity (an adult longing for maternal care experienced in childhood and the feeling of safety of that time).
Socio-cultural attitudes towards the body and physical appearance – SATAQ-3		
10. Internalization of socio-cultural norms	"internalization"	High level of comparison and assimilation of attractiveness standards, ideal body image – set and promoted by contemporary culture, represented by mass media (e.g. television, radio, press).
11. Pressure of socio-cultural norms	"Pressure of socio-cultural norms"	High level of pressure felt when confronted with messages transmitted by the media (TV, radio, magazines and periodicals, adverts, etc.), which promote standards concerning physical appearance, and behavior exerted towards the body.
12. Searching for information concerning body image and looks	"Searching for information concerning body image"	Highly frequent reaching for various information pertaining to socio-cultural standards of body image and physical appearance, promoted in mass media.
Restrictive and compensatory behavior towards the body – The Body-Directed Behavior Questionnaire (KZWC)		
13. Application of diets	"Diets"	Very frequent dieting.
14. Restrictive application of diets	"Restrictive application of diets"	High level of intensified restrictive control of type and amounts of food consumed on everyday basis.
15. Restrictive physical activity	"Restrictive physical activity"	High frequency of various physical activities (sport) in order to reduce body weight and change body image, which is considered unacceptable.
16. Compensatory (bulimic) behavior	"Compensatory (bulimic) behavior"	High frequency of using – without indication – provoked vomiting, laxatives, diuretics and diet supplements: most frequently for the purpose of reducing body weight, emptying the stomach of the food consumed.

EDI, Eating Disorder Inventory.

* The indicators of psychological and socio-cultural variables provided in the table were assessed on the basis of numerical values obtained via measurement methods ascribed to those variables. Average intensity and median values were assessed. Low and elevated values (1st and 2nd quartile) – no intensification of variable and no harmful influence of the variable on health. High and very high values (3rd and 4th quartile) – intensified variable, harmful influence on health.

Study group

A total of 213 women aged 20–26 years were included in the study: 92 of them were controls (women without eating disorders), and 121 were a clinical group (women with eating disorders: anorexia nervosa, bulimia nervosa or binge eating disorder). Both groups were similar regarding socio-demographic and socio-cultural factors (age, marital status, education, place of residence). Subjects were selected intentionally, with the basic selection criteria being the presence (clinical group) or absence (controls) of a specific type of eating disorder based on a medical diagnosis of anorexia nervosa or bulimia nervosa (according to ICD-10, generally in the F50 category). The clinical group consisted of 30 women with the diagnosis of bulimia nervosa (ICD-10 F50.2), 60 women with the diagnosis of anorexia nervosa (ICD-10 F50.0), including 30

women with bulimia-type anorexia (restricting-purging) and 30 women with restricting type anorexia, and 30 women diagnosed with binge eating disorder (ICD-10 F50.4).

Course of the study

The study was conducted in two stages. Stage one was conducted in the years 2007–2009. The study then comprised 92 women, aged 20-26 years – humanities and medicine students. They became the control group. In the second stage, spanning the years 2009–2012, we examined 121 women with medically documented diagnosis of anorexia, bulimia nervosa, or binge eating disorder (research group). The clinical group was examined in Polish centers for the treatment of eating disorders, which comprise a day-care unit for the treatment of neurotic disorders and eating disorders, a mental health outpatient clinic, and an outpatient clinic for neurotic disorders. The study was performed observing the principles of ethics and in complete anonymity. Consent had been obtained from the Ethics Committee of the Faculty of Pedagogics and Psychology of the University of Silesia in Katowice, Poland.

RESULTS

Psychological predictors of eating disorders

A preliminary selection of dependent variables (predictors) was carried out in order to proceed smoothly and efficiently with the classification tree construction stage and to perform an initial exploration of data. When selecting the variables, a subset of predictors was chosen, assuming that relations between predictors and dependent variables (responses) are linear or monotonic. The data mining space exploration of variables was carried out with the Statistica software, available in the Data Mining module as the tool called "Selection and Elimination of Variables", and as a result six predictors of dependent variables have been selected (norm/standard vs type of eating disorders): (1) pressure of socio-cultural norms ($\chi^2 = 209.35$; $p<0.001$); (2) fear of gaining weight and restrictive striving for slimness ($\chi^2 = 170.33$; $p<0.001$); (3) pattern for building emotional relationships on the basis of a distrustful attitude and uncertainty ($\chi^2 = 255.96$; $p<0.001$); (4) body weight ($\chi^2 = 112.22$; $p<0001$); (5) body mass index (BMI) ($\chi^2 = 34.79$; $p<0.001$); and (6) dissatisfaction with the body ($\chi^2 = 52.86$; $p<0.001$). An exploratory analysis of data was supplemented with a cross-case analysis by means of one-way analysis of variance for cross-case groups (ANOVA, F-test). We aimed to establish which selected predictors are significantly different regarding the value of dependent variable (norm vs type of eating disorder). Descriptive statistics and the results of analysis are presented in Table 2.

Table 2. Ranking of psychological predictors of eating disorders ($p<0.001$ for all indications).

Predictor	χ^2
Perfectionism	178.42
Pressure of socio-cultural norms	209.35
Search for information concerning body image	233.29
Pattern of building emotional relations on the basis of distrust and uncertainty	254.66
Fear of gaining weight and restrictive striving for slimness	170.33
Internalization of socio-cultural norms	209.91
Restricting physical activity	245.72
Interoceptive awareness	106.87
Body weight	112.22
Fears associated with reaching maturity	56.80
Dissatisfaction with the body	52.86
BMI	34.79

BMI, body mass index.

The data collected in Table 2 indicate that the six predictors of the dependent variable differentiate, with statistical significance, between a group of healthy women and women suffering from one of the three types of eating disorders. By referring to body weight ($F = 29.92$, $p<0.001$), BMI ($F = 24.41$, $p<0.001$), and the four psychological variables: dissatisfaction with the body ($F = 10.86$, $p<0.001$), pressure of socio-cultural norms ($F = 168.07$, $p<0.001$), patterns for building emotional relations ($F = 233.87$, $p<0.001$), and fear of gaining weight ($F = 58.98$,

p<0.001) it is possible to differentiate between healthy individuals and individuals experiencing various types of eating disorders, as well as to form a correct differential diagnosis. It is worth noting that in the group of healthy women, the least intensity variable was found to be the pattern for building emotional relationships on the basis of a distrustful attitude and uncertainty, and they had the lowest intensity fear of gaining weight and restricting strive for slimness. Bulimia stands out due to the highest levels of all four psychological variables. Women with compulsive overeating/binge eating disorder (BED) had the highest average weight (BMI), whereas women suffering from anorexia demonstrate the lowest body weight and BMI, but the highest pressure of socio-cultural norms.

Table 3. Descriptive statistics of psychological predictors of eating disorders

	Body weight		Body mass index (BMI)		Dissatisfaction with the body		Pressure of socio-cultural norms		Pattern for building emotional relations		Fear of gaining weight and restrictive striving to being slim	
	x	σ_x	x	σ_x	x	σ_x	x	σ_x	x	σ_x	x	σ_x
Healthy	59.24	7.78	21.2	3.31	12.6	9.34	13.43	2.57	3.75	5.45	8.74	7.44
Bulimia	57.81	11.68	20.63	4.51	21.77	9.9	23.28	2.17	17.77	1.78	18.51	1.19
Binge eating disorder (BED)	69.27	9.81	24.6	3.46	13.73	6.26	22.7	2.87	16.87	1.19	15.43	1.38
Anorexia	49.6	6.54	17.69	2.39	16.57	9.87	23.5	4.92	17.48	0.88	18.45	1,26

Table 4. Classification tree predictions and observables

Observed	Predicted by the decision algorithm								Observables' ∑	
	Norm		Bulimia		BED		Anorexia			
	n	%	n	%	n	%	n	%	n	%
Norm	89	96.74	1	1.09	2	2.17	0	0	92	100
Bulimia	0	0	37	78.72	0	0	10	21.28	47	100
BED	0	0	2	6.67	28	93.33	0	0.00	30	100
Anorexia	0	0	4	9.09	2	4.55	38	86.36	44	100

BED, binge eating disorder.

Differential diagnosis of eating disorders with the application of classification trees

The six selected predictors of the dependent variable have been arranged into a classification tree, presented in Figure 1.

Optimal classification of eating disorders, in accordance with the decision algorithm presented in Figure 1, has been established on the basis of v-fold cross-validation. It has been found that a classification tree achieves a correct identification of healthy individuals in 100% of cases, correct diagnosis of bulimia in 78.72% of cases, correct diagnosis of BED in 93.33% of cases, and anorexia nervosa in 86.36% of cases. The application of a decision algorithm may lead to incorrect diagnosis of anorexia nervosa in persons suffering from bulimia nervosa in 21.28% cases, of individuals with bulimia suffering from BED in 6.67% of cases; 9.09% of persons suffering from anorexia nervosa may be incorrectly diagnosed as bulimic, and 4.55% as suffering from BED.

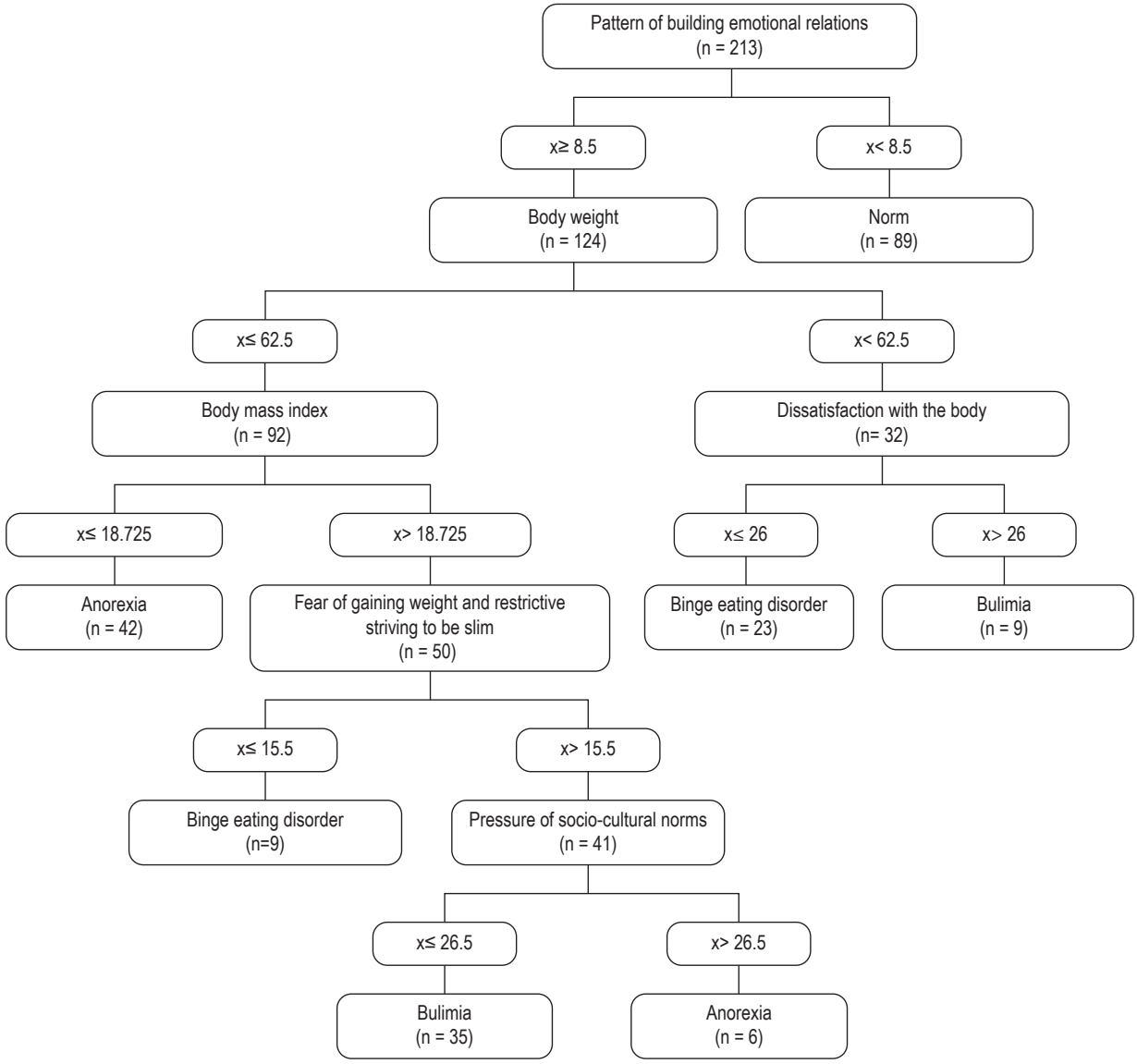

Fig. 1. Classification tree for eating disorders.

DISCUSSION

The analysis of study results indicates that among the psychological variables which make up the decision algorithm for differentiating various types of eating disorders (from the perspective of psychological diagnosis), a notable variable is the pattern for building emotional relations on the basis of distrust and uncertainty. The study indicates that the difficulties individuals face in building emotional bonds with others, in case of all types of eating disorders studied, turned out to be an important psychological variable, which differentiated healthy women from those suffering from eating disorders. Problems in interpersonal relations and distrustful attitude in relations constitute a psychological variable which – in numerous studies conducted on clinical groups of adults and minors with anorexia and bulimia – was not directly listed as a risk factor in the development of eating disorders, yet it was indicated as an important variable in the description of psychological characteristics of persons with eating disorders [26].

We should take into account the fact that people with eating disorders referred to in this paper are characterized by differentiated dysfunctions in personality structure. In such disorders, the difficulties in building emotional bonds often constitute a versatile and universal pattern of emotional reaction of distrust in situations in which social contacts are established. The ap-

plies also to people suffering from anorexia nervosa or bulimia nervosa. The scope of exposing the pattern of distrust and difficulties in building emotional relations with others, as well as expressing personal thoughts and feelings in the presence of third parties (with increasing social alienation) may depend on the level of personality structure disorders in an individual with anorexia nervosa, bulimia nervosa or binge eating disorder. Many psychological theories confirm the importance of disturbances of bonding in the development of psychosomatic disturbances in the psychopathology of anorexia or bulimia [24,26-27].

As concerns other psychological variables, isolated in this study and describing the characteristics of individuals suffering from anorexia or bulimia and juxtaposed with those of healthy individuals, they appear in many contemporary studies, for instance in the long-term and large-population studies by Garner et al. [8]). Garner noted so-called psychological risk factors for the development of eating disorders risk factors, such as: dissatisfaction with the body, striving for slimness and the influence of pressure of socio-cultural norms concerning the body image. The tendency to "strive to be slim" or "fear of gaining weight" has been described as one of the main features related to the origin and maintenance of eating disorder symptoms [1,8,23]. In a study conducted on Polish women, we also observed – in the differential diagnosis of patients with anorexia, bulimia or binge eating disorder – a specific structure of the physical self, dominated by high level of dissatisfaction with the body, fear of gaining weight and striving for slimness, as well as an emaciated body shape [2,3,28]. In our studies of Polish women with bulimia and anorexia, we have noted a highly intensified pattern of distrust and uncertainty in creating emotional bonds and building relationships with other people, as well as the importance of internalization of the influence of socio-cultural norms of the body image [3,4].

To sum up, it is worth pointing out to the limitations of the studies presented in this paper. They result from many factors, among others from the difficulties of conducting clinical studies and limited access to a clinical group of patients. There is also the need to retain a level skepticism regarding the empirical data obtained due to the relatively low number of subjects in the clinical group, and the fact that samples comprised only women (men were excluded from the study due to their small number in treatment groups). Owing to these limitations, it would be difficult to make arbitrary conclusions about the differentiation power of psychologically verified variables in anorexia or bulimia. Nevertheless, the application of a decision algorithm may be an interesting method of differentiating psychological traits in people with eating disorders, useful in clinical diagnosis and treatment.

The studies clearly indicate that classification trees enable the development of a decision algorithm and a differential diagnosis of eating disorders. Conducting a cross-match test allows to establish the level of model fit to the sample and the level of diagnostic accuracy. In the present studies the analysis concerned the psychological characteristics of just 213 women. Due to a small sample size for the use of the Data Mining tool, one should approach the differential diagnosis made solely on the basis of the model presented in Figure 1 with caution. Moreover, the classification tree describes relations between only six psychological and sociological variables, selected in compliance with the results of statistical analyses. It is possible that a classification tree and decision algorithm concerning other variables or a greater number of variables would allow for a greater diagnostic accuracy. The diagnostic model presented in this paper should be verified using another independent sample, including a different age group, a group of males or a mixed group.

CONCLUSIONS

The results indicate that healthy individuals and subjects experiencing one of the three types of eating disorders may be correctly differentiated on the basis of measuring the following six variables: body weight, BMI, and psychological variables: dissatisfaction with the body, pressure of socio-cultural norms, pattern for building emotional relationships on the basis of an attitude of distrust and uncertainty of interpersonal relations in subjects, fear of gaining weight, and striving towards slimness.

Predictors of eating disorders may be arranged in a decision algorithm, which allows not only to make a correct differential diagnosis, but also to perform exploration and analysis of relations between psychosocial variables which describe groups exposed to various types of eating disorders. The differential diagnosis presented in this paper, with the proposed decision algorithm applied, is based on selected variables and may constitute a proposal for a clinical diagnosis of the psychological traits studied. Following the algorithm, we may also attempt to forecast the probability that the psychological traits will occur in persons who suffer from anorexia, bulimia or binge eating disorder.

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