

Validation of ORTO-15 Questionnaire in the group of urban youth aged 15-21

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Summary

Aim. The aim of the study was the validation and adaptation of the ORTO-15 Questionnaire in the group of the Polish schoolgirls and schoolboys.

Method. The study included 399 participants (15-21 years old), all of them high school students in the city of Sosnowiec. The ORTO-15 is a tool created in Italy by L. M. Donini, comprising of 15 items describing intensification of orthorexia risk (population diagnosis). The validation procedure incorporated three basic methods to be applied in the reliability analysis – the comparison of double tests with the same method, the statistical properties analysis of test items as well as analysis of the relation of test items with the general test result. Moreover, the compliance of the ORTO-15 Questionnaire results with other questionnaire focused on eating habits (EAT-26) was studied.

Results. The reliability analysis of the ORTO-15 Questionnaire based on repeatability of the responses presents a very good (kappa: 0.81 – 1.00 for 5 items) and a good repeatability (kappa: 0.61 – 0.80 for 10 items). The reliability analysis based on the value of the Cronbach's α reached a satisfactory level (0.7 – 0.9). A full agreement of in the occurrence of orthorexia risk and the risk of eating disorders concerned 47.2% (Kappa = 0.04; 95% PU; 0.004 – 0.09) for the Ortho-40 and 88.2% (Kappa = 0.32; 95% CI: 0.17 – 0.47) for the Ortho-35.

Conclusions. The ORTO-15 questionnaire is a reliable tool to identify the risk of ON in population studies in the group of urban youth aged 15 – 21.

Key words: orthorexia, eating disorders, obsessive-compulsive disorders

Introduction

In the 21st century the subject of healthy eating habits has become extremely popular in the Western countries [1]. The media have been showing numerous news and popular science publications, as well as scientific ones [2-5] which present various – often contrary – information regarding proper and healthy eating habits [1]. The popular search engine google.com shows 227 000 000 results for the entry “healthy nutrition”, 164 000 000 results for “healthy food” or almost 38 000 000 for “anti-cancer diet” (as of 16th January 2013).

Paying attention to a healthy, well-balanced diet is certainly a desirable habit which has a positive effect on general health condition, however, extreme devotion to a particular dietary ideology may become harmful [1]. The term orthorexia nervosa (gr. ortho – right, correct; orexis – appetite, desire) was first used in 1997 by an American physician Steven Bratman, and is defined as a pathologic fixation connected with eating healthy and proper food [6]. Persons suffering from orthorexia avoid eating some types of food and/or particular manners of food-processing (e.g. cooking, frying, freezing, etc.), due to the belief that they are harmful to our health. They are obsessed with the quality and manner of food preparation, strictly follow the rules regarding the appearance and ingredients of meals, and each deviation from the diet evokes in them fear and a guilty conscience [6].

Orthorexia is not listed in the official classification of mental disorders (ICD-10, DSM-5). The problem is widely discussed in popular media, however, the professional literature presents little empirical data concerning its course, clinical picture and prevalence. The studies are mainly carried out in Europe, e.g. in Sweden [7], Austria [8], Hungary [9-11] and Italy [12-15], as well as in the European and Asian part of Turkey [16-19]. Comparatively little research has been done in the USA, where the idea originated [20- 23]. Despite an increasing interest in the phenomenon worldwide, there is no clear-cut definition and commonly accepted, unified diagnostic criteria. The relation between orthorexia and other nosologic items is also unclear [1].

Steven Bratman created the construct of orthorexia based on his own experience and the cases he had encountered during his professional career. In his book “Health Food Junkies” he described the symptoms, and later, on their basis, he created a list of ten questions to diagnose orthorexia [6]. The Orthorexia Self-Test developed by the author of the concept consists of 10 items to be addressed by a tested person on the basis of a dichotomous scale (Yes/No), and a person is believed to be orthorectic if he or she gives 4 “yes” answers [6]. Despite the fact that the Orthorexia Self-Test has not been submitted for validation procedure by the author, the professionals occasionally treat it as a diagnostic tool [7, 8].

The first empirical attempt to develop criteria for orthorexia diagnosis and the diagnostic tool was made by the team of Lorenzo Maria Donini from the Sapienza

University in Rome [12, 13]. In order to unify the criteria, they proposed to base a diagnosis on the ascertainment of the obsessive-compulsive personality traits, the presence of exaggerated concern with healthy eating, a constant and non-temporary nature of the disorder, as well as the demonstration that behaviours connected with eating have negative effect on individual's life quality. On the basis of the developed assumptions for the diagnostic criteria, the team created a tool to assess orthorexia symptoms occurrence which takes into account the issues which Steven Bratman had previously proposed. The ORTO-15 Questionnaire is a tool consisting of 15 items describing intensification of the orthorectic behaviour and referring to cognitive and emotional aspects connected with eating as well as the clinical orthorexia symptoms (assumed diagnostic criteria). A tested individual addresses particular items of the test on the basis of a Likert scale (always, Often, Sometimes, Never). The higher the result obtained in the test, the closer to normal are the behaviours connected with healthy eating habits of the tested individual [13].

The study was conducted in the Nutritional Science Institute of the Sapienza University in Rome in the group of 404 subjects (236 females and 168 males) with different age and education. The study excluded individuals under 16 due to their insufficient influence on eating choices. The study used the "health fanatic" eating habits questionnaire developed for the purposes of this study as well as a fragment of the MMPI questionnaire regarding the obsessive-compulsive disorders. Bratman's assumptions concerning the presence of eating and obsessive-compulsive disorders in orthorexia provided a basis for including in the group of orthorexia risk (high result in the questionnaire regarding healthy eating and high result in the MMPI test). On the basis of the obtained result the studied persons were divided into four groups; the orthorexia risk group consisted of individuals who obtained high results in the healthy eating and MMPI questionnaires. Study results showed that orthorexia prevalence is 6.9%, it is more common among men and there are no statistically significant differences in age range, BMI, marital status, profession, and number of children [12]. Next, in order to assess the reliability of the tool for population, diagnosis of orthorexia ORTO-15 created by the team was distributed among 121 persons with diverse demographic data and then compared with the results obtained in the first study [13].

The validation of the ORTO-15 questionnaire consisted in the assessment of the diagnostic value of the test – the calculation of sensitivity, specificity and the predictive value of the test (positive and negative). The analysis of variance showed statistically significant differences between the result of ORTO-15 in particular groups ($F = 11.9$, $p = 0.000$). Individuals in the orthorexia risk group obtained significantly lower results in the ORTO-15 test than in other groups (39.3 ± 4 vs. 42.3 ± 4 ; $t = 5.9$, $p = 0.000$). The study analysed three values of the cut-off point (< 35 , < 40 , < 45). The ORTO-15 test obtained satisfactory statistical values only for the cut-off point of 40 points (sensitivity = 100%, specificity = 73.6%, the positive predictive value = 17.6%, the negative predictive value = 100%) [13]. In subsequent study carried out in Italy with the ORTO-15 test it was suggested to lower the cut-off point due to an excessive number of diagnoses [14, 15]. In the study of Ramacciotti et al. [14], in the group of 177 individuals with various demographic data the prevalence of orthorexia was as

much as 57.6% with the cut-off point of < 40 and 11.9% for the cut-off point of < 35. In the study of Segura-Garcia et al. [15] carried out in the group of 577 sportspeople aged 16-45 (388 males, 189 females) the prevalence of orthorexia symptoms was 28% for females and 30% for males. However, it is worth mentioning that prevalence of eating disorders (EAT-26) as well as the obsessive-compulsive disorders (YBC-EDS) was much higher than in the control group [15].

The ORTO-15 questionnaire originally was developed in the Italian language and it underwent validation procedure in Italy [13], Turkey [17], Brazil [24] and the USA [25]. Also, the German [26] and Hungarian [9, 10] language versions are used in the studies, although they have not yet been validated. The ORTO-15 test is the most frequently used tool to carry out population diagnosis of orthorexia [16, 18, 19]

The epidemiology of orthorexia in Poland remains unknown and there is no established tool that could be used to assess its prevalence. The aim of the study discussed in this paper was the development and adaptation to the Polish conditions of the ORTO-15 questionnaire – a diagnostic tool for orthorexia symptoms. This is the first scientific attempt to adapt a diagnostic tool for orthorexia prevalence to the Polish conditions. The validation of the Polish version of the questionnaire will not only allow the determination of the orthorexia epidemiology in Poland – which could mark the beginning of its preventive treatment – but could also act as a reference point for all subsequent studies of orthorexia. The validation of the ORTO-15 questionnaire to the Polish conditions is a part of the larger project entitled “Orthorexia prevalence and conditioning among urban youth aged 15-19”.

Material

ORTHO-15 Questionnaire

The ORTO-15 Questionnaire is a tool consisting of 15 items describing the intensification of the orthorectic behaviour. Particular question sets study attitudes against choosing, buying, preparing and eating food thought to be healthy. Each item is assessed by a studied person with the use of the Likert type scale – always, often, sometimes, never. The closer a studied person’s attitude to a proper eating pattern is, the higher the point value of the response to the test (1, 2, 3, 4 points, respectively). Test items refer to the cognitive and emotional aspects connected with eating and the orthorexia symptoms (6 items) taken from the orthorexia symptoms list of Steven Bratman (some verbal aspects have been changed, though). The author of the test suggested the cut-off point to be at the level of 40 points [13]. The Questionnaire items and the score are presented in Table 1.

Table 1. ORTO-15 Questionnaire

		Always	Often	Sometimes	Never
1	When eating, do you pay attention to the calories of the food?				
2	When you go in a food shop do you feel confused?				

table continued on the next page

3	In the last 3 months, did the thought of food worry you?				
4	Are your eating choices conditioned by your worry about your health status?				
5	Is taste of food more important than the quality when you evaluate food?				
6	Are you willing to spend more money to have healthier food?				
7	Does the thought about food worry you for more than three hours a day?				
8	Do you allow yourself any eating transgressions?				
9	Do you think your mood affects your eating behaviour?				
10	Do you think that the conviction to eat only healthy food increases self-esteem?				
11	Do you think that eating healthy food changes your life-style (frequency of eating out, friends...)?				
12	Do you think that consuming healthy food may improve your appearance?				
13	Do you feel guilty when transgressing?				
14	Do you think that on the market there is also unhealthy food?				
15	At present, are you alone when having meals?				
SCORING GRID FOR ORTO-15 QUESTIONNAIRE RESPONSES					
ITEMS		RESPONSES			
		Always	Often	Sometimes	Never
2, 5, 8, 9		4	3	2	1
3, 4, 6, 7, 10, 11, 12, 14, 15		1	2	3	4
1, 13		2	4	3	1

Eating Attitude Test, EAT-26

EAT-26 is a scale developed in 1982 by D. Garner and P. Garfinkel [27], consisting of 26 items devoted to assess attitudes and eating behaviours in three areas of symptoms connected with eating disorders, included in sub-scales: losing weight, bulimia and excessive concentration on eating, control. The test is applied as a screening tool to detect symptoms of eating disorders in general population, yet it is not used for diagnostic purposes. The author of the polish standardisation of the tool is K. Włodarczyk-Bisaga [28, 29]. The maximum number of points for each item is 3, the higher the score in the general result, the higher the intensification of eating disorders symptoms. A criterion for acceptance in the eating disorders group is obtaining 20 points or more. Reliability of Cronbach's α for the whole scale is 0.84 [28, 29].

Subjects of the study

The study included 399 students of high schools in Sosnowiec, with 253 girls (63.4%) and 146 boys (36.6%) aged 15–21 (the mean age was 16.9 ± 1.0 year). The BMI index of the studied individuals ranged between 12.3–37.6 for boys (the mean value = 20.9 ± 3) and 15.2–37.6 for girls (the mean value = 21.1 ± 1).

Method

Two grammar schools and two technical colleges were selected from all the schools in Sosnowiec. In each school, two classes of the same year were selected for the study. The majority of the studied pupils, 283 respondents (70.9%) were the grammar school students, and the remaining part consisted of the technical college students (116 people, 29.1%). Only those who expressed their consent in writing took part in the study. In the case of the under-aged students, the parent/counsellor consent was also required.

The project received a positive opinion of the Bioethical Committee of the Medical University of Silesia in Katowice, Poland: Resolution No. KNW/0022/KB1/39/I/11, financed by the Nutricia Foundation scientific grant in 2011–2012.

Validation procedure of the ORTHO-15 Questionnaire.

The development of the Polish version of the ORTHO-15 Questionnaire commenced with two independent forward translations prepared by the Italian translators from the original Italian version of the scale. The original version of ORTHO-15 Questionnaire was obtained from the author of this test together with his consent to its validation and application in the study. A comparison of the two versions was conducted, and on the basis of these translations a new, improved in terms of the language and style version in the Polish language was created. The approved final version was back-translated into Italian by a person who had not been engaged in the translation process up to that moment and later it was compared with the original version by a sworn translator of the Italian language. No significant discrepancies were found between the original and the Polish translation. The questionnaire was approved for further studies.

Next step consisted in carrying out the study on a group of pupils from the upper secondary schools in Sosnowiec. It took place in the classrooms during form periods; the subject of the study were instructed on how to complete the test by a member of the scientific team who remained in the classroom till the end of the test. In the course of completing the test the subjects could address questions to the person conducting the study. Apart from completing two questionnaires (ORTHO-15, EAT-26), the studied persons were asked to provide the following information: date of birth, male/female, and the type of school (grammar school or technical college). Once the questionnaire part of the test was completed, each subject of the study was individually measured and weighted. The subjects were informed about the second part of the test after two weeks, however, they did not receive the information that it is necessary to complete one of the questionnaires for the second time.

To assess the reliability of the ORTO-15 test standard recommendations were applied [30, 31]. The validation procedure incorporated three basic methods to be applied in the reliability analysis – the comparison of double tests with the same method (the estimation of the internal stability of the test), the analysis of statistical properties of test items (the assessment of internal consistency of the test) as well as analysis of the relation of test items with the general test result. Due to the lack of the so-called “gold standard” for orthorexia, it was impossible to refer the obtained results of the questionnaire to an external reference value. To assess the criterion validity, the ORTO-15 results were also compared with the results of the EAT-25 questionnaire (eating disorders symptoms) and the BMI (Body Mass Index).

The results obtained in the ORTO-15 Questionnaire were interpreted with the reference recommendations of its authors, by calculating the total score value ascribed to particular responses (see Table 1.). The sum of the scores obtained by a respondent (theoretical range: 15-60) constituted the so-called orthorexia risk factor (ORF). According to the literature, orthorexia is diagnosed when the factor value does not exceed 40 points (the reference definition). Additionally, an internal definition was used – the one suggested by the nature of distribution of the orthorexia risk factor in the studied population (the cut-off point = 35) and referring to the percentile method (the value suggesting orthorexia was assumed to be a value corresponding to the fifth percentile of the orthorexia risk factor distribution, the cut-off point = 33). The results obtained in EAT-26 test were interpreted in accordance with its authors’ recommendations – the scale for each item was 0–3, obtaining at least 20 points suggested that the subject of the test was loaded with the risk of eating disorders.

Statistical analysis

Data analysis was carried out with the procedures accessible in the R Foundation for Statistical Computing; Version 2.15.0. The level of statistical significance was determined at $p < 0.05$.

Estimation of the repeatability degree of the particular responses was done with the Cohen’s kappa statistical test. The Cohen’s kappa significance test is used to verify the hypothesis on the agreement between the results of two measurements of a trait and is based on the Cohen’s kappa coefficient calculated for a given sample. This coefficient determines the degree of compliance of two measurements of the same variable in different conditions. It is calculated for dependent categorical variables, and its value falls in the range of -1 to 1, where 1 equals a complete agreement and 0 equals a random agreement. In the study, the statistical agreement was determined with the conventional scale where the kappa values have the following meaning: 0.81–1.00 almost perfect agreement, 0.61–0.80 substantial agreement, 0.41–0.60 moderate agreement, 0.20–0.40 fair agreement, < 0.21 slight agreement [30].

In order to assess the repeatability of results in the case of the quantitative variable measurement (in this case the total ORF), the Bland-Altman procedure was applied. The Bland-Altman descriptive procedure presents a degree of agreement between two different assays or indexes. One of the main applications of the Bland-Altman plot is

to compare two measurements assays, where each of them is burdened with a certain measurement error [32].

Level of internal consistency of the test was assessed by analysing the correlation of answers to questions with a total score of the questionnaire on the basis of Cronbach's statistics. The raw and standardised Cronbach's α coefficients were calculated (value scaling of variables – answers to questions with the assumption that the standard deviation equals 1). Cronbach's formulas applied to calculate reliability coefficient of attitudes scales and personality questionnaires whose items require choosing one of a few possible answers categories (e.g. Likert scale) [30]. The satisfactory level of consistency was accepted to be defined by the standardised value of α statistics within the range 0.70–0.90. Apart from calculating general α statistics, the impact of separate questions on the consistency level of the questionnaire was defined by analysing a potential improvement of α value after a possible removal of subsequent questions from the questionnaire.

In order to assess the external accuracy of the tool, a method of determination of common variance between the compliance in orthorexia risk diagnosis ORTO-15 and diagnosis of eating disorders risk on the basis of EAT-26 test (the so-called diagnostic accuracy). Diagnostic compliance was analysed in two scenarios (Orto-40 and Orto-35) on the basis of proportion of diagnoses co-occurrence and the value of Kappa statistics with a 95% confidence interval. The analysis also covered the relation between score values of the ORTO-15 and EAT-26 tests by calculating the Spearman's rank correlation coefficient and statistical significance of the obtained result. The chi-square test was used to assess the statistical significance for relationships between qualitative data.

Results

Reliability assessment of the ORTO-15 Questionnaire on the basis of a twofold study – estimation of test absolute stability

The analysis of repeatability of answers to questions from ORTO-15 Questionnaire includes 15 questions. Each question was answered by a participant on the basis of a four-point scale: 1, 2, 3, 4 points. Table 2 shows mean score values of the responses obtained in the first and the second study and the values of Cohen's kappa statistic expressing a statistical level of responses to particular questions.

Table 2. Mean score values of the responses obtained in the first and the second study and statistical dimension of repeatability of responses to the ORTO-15 questions

Question	Measurement 1	Measurement 2	Kappa statistic	95%CI
When eating, do you pay attention to the calories of the food?	3.03 ± 0.87	2.99 ± 0.89	0.89	0.85–0.92
When you go in a food shop do you feel confused?	3.40 ± 0.80	3.39 ± 0.80	0.81	0.76–0.86
In the last 3 months, did the thought of food worry you?	3.09 ± 0.97	3.09 ± 0.96	0.82	0.77–0.86
Are your eating choices conditioned by your worry about your health status?	2.82 ± 0.81	2.84 ± 0.81	0.77	0.71–0.82

table continued on the next page

Is taste of food more important than the quality when you evaluate food?	1.94 ± 0.76	1.99 ± 0.79	0.75	0.69–0.80
Are you willing to spend more money to have healthier food?	2.75 ± 0.84	2.73 ± 0.81	0.80	0.75–0.84
Does the thought about food worry you for more than three hours a day?	3.66 ± 0.72	3.64 ± 0.74	0.77	0.70–0.84
Do you allow yourself any eating transgressions?	2.73 ± 0.82	2.77 ± 0.82	0.72	0.67–0.78
Do you think your mood affects your eating behaviour?	2.56 ± 0.93	2.62 ± 0.95	0.73	0.67–0.78
Do you think that the conviction to eat only healthy food increases self-esteem?	3.05 ± 0.96	3.03 ± 0.96	0.80	0.75–0.84
Do you think that eating healthy food changes your life-style (frequency of eating out, friends...)?	3.11 ± 0.98	3.06 ± 0.93	0.74	0.69–0.79
12. Do you think that consuming healthy food may improve your appearance?	2.05 ± 0.96	2.13 ± 0.98	0.76	0.71–0.81
13. Do you feel guilty when transgressing ?	2.97 ± 1.02	2.98 ± 1.03	0.77	0.73–0.82
14. Do you think that on the market there is also unhealthy food?	1.46 ± 0.71	1.55 ± 0.77	0.66	0.59–0.73
15. At present, are you alone when having meals?	2.71 ± 0.80	2.72 ± 0.81	0.77	0.72–0.83

On the basis of the obtained results it can be assumed that five questions (1, 2, 3, 6, 10) were characterized by a very good repeatability ($\kappa = 0.81\text{--}1.00$) and the remaining ten questions (4, 5, 7, 8, 9, 11, 12, 13, 14, 15) by good repeatability ($\kappa = 0.61\text{--}0.80$).

Repeatability of the ORTO-15 Questionnaire result in the point scale.

Total ORF was calculated for data representing the first and the second measurement (test-retest). Mean difference between the 1st and 2nd orthorexia risk factor was 1.15, with a standard deviation 1.53 and the range from 0 to 10. Table 3 presents the frequency of differences among particular classes, where 0 = complete agreement (no difference).

Table 3. Frequency of difference in agreement of the ORTO-15 questionnaire between the first and the second test (test-retest) on a point scale.

Difference in agreement (points)	Studied Participants (% of total)
0	167 (45.1%)
1	95 (25.6%)
2	51 (13.7%)
3	29 (7.8%)

table continued on the next page

4	11 (2.9%)
5	8 (2.1%)
6	5 (1.3%)
7	3 (0.8%)
8	0
9	0
10	1 (0.2%)

In order to assess the repeatability of results in the case of the quantitative variable measurement (in this case the total orthorexia risk factor), the Bland-Altman procedure was applied. The analysis of the chart (Figure 1.), as well as the fact that within “ $\bar{x} \pm 1.96 SD$ ” (here: $1.15 \pm 1.96 \times 1.53$) there were 95.4% of the differences implying a good repeatability of the total orthorexia risk factor [see: 32].

Repeatability of orthorexia nervosa diagnosis

Orthorexia nervosa was diagnosed when the total ORF did not exceed the threshold score of 40 (Ortho-40), which happened in 209 subjects (53.7%) in the first study and in 199 subjects (52.6%) in the second study. Full agreement was in 88.1% of the subjects, and the statistical dimension of repeatability was expressed by the kappa statistics = 0.76 (95% CI: 0.69–0.82). When the arbitrary cut-off level of 35 (Orto-35) was applied for the orthorexia diagnostic purpose, the full agreement of the diagnosis understood in such a way referred to 94.2% of the subjects. Kappa statistics value was in this case 0.78 (95% CI: 0.69–0.87).

Assessment of reliability of ORTO-15 Questionnaire on the basis of the analysis of statistical properties of test items and the relation of the test items with a general test result.

Reliability analysis of the questionnaire on the basis of the analysis of statistical properties of test items and the relation of the test items with a general test result

showed that the Cronbach’s α raw coefficient was 0.78, and the standardized coefficient was 0.77. Table 4 presents the impact of particular questions on the general level of consistency of the test defined by the values of alpha coefficients within the range of 0.70–0.90. Moreover, the results of partial correlations analysis showed that none of the correlations exceeded the value of 0.6. The Table 4 presents the correlation coefficients of responses to particular questions with a general result of the test and the values of the Cronbach’s α raw and standardised coefficients after a possible removal of a given question from the questionnaire.

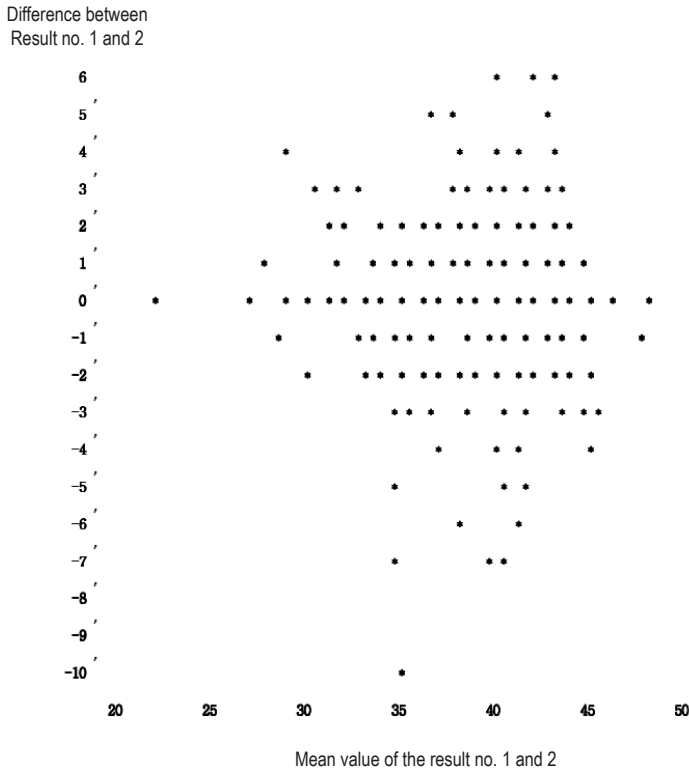


Figure 1. Repeatability of the measurement of the total ORF – the result of the Bland-Altman procedure

Table 4. Impact of responses to particular questions of the ORTO-15 Questionnaire on questionnaire’s reliability

Question	Correlation Coefficient	Cronbach's α coefficient	
		Raw	Standardized
When eating, do you pay attention to the calories of the food?	0.57	0.75	0.74
When you go in a food shop do you feel confused?	0.29	0.77	0.76
In the last 3 months, did the thought of food worry you?	0.53	0.75	0.74
Are your eating choices conditioned by your worry about your health status?	0.43	0.76	0.75
Is taste of food more important than the quality when you evaluate food?	0.20	0.81	0.80

table continued on the next page

Are you willing to spend more money to have healthier food?	0.37	0.77	0.76
Does the thought about food worry you for more than three hours a day?	0.51	0.76	0.74
Do you allow yourself any eating transgressions?	0.15	0.78	0.77
Do you think your mood affects your eating behaviour?	0.40	0.77	0.75
Do you think that the conviction to eat only healthy food increases self-esteem?	0.54	0.75	0.74
Do you think that eating healthy food changes your life-style (frequency of eating out, friends...)?	0.45	0.76	0.75
12. Do you think that consuming healthy food may improve your appearance?	0.54	0.75	0.74
13. Do you feel guilty when transgressing ?	0.59	0.75	0.74
14. Do you think that on the market there is also unhealthy food?	0.23	0.78	0.77
15. At present, are you alone when having meals?	0.29	0.77	0.76

Analysis of compliance of orthorexia risk (ORTO-15) and eating disorders risk (EAT-26).

The analysis of orthorexia risk presence and eating disorders risk was carried out in parallel in two scenarios – Table 5 presents the compliance of diagnoses for Orto-40, Table 6 presents analogous results for Orto-35.

Table 5. Compatibility of orthorexia risk presence and eating disorders risk for Orto-40 criterion

Orthorexia risk	Eating disorders risk	
	Yes	No
Yes	21 (5.6%)	191 (50.9%)
No	7 (1.8%)	156 (41.6%)

Table 6. Compatibility of orthorexia risk presence and eating disorders risk for Orto-35 criterion

Orthorexia risk	Eating disorders risk	
	Yes	No
Yes	14 (3.7%)	30 (8.0%)
No	14 (3.7%)	317 (84.5%)

The perfect agreement of the orthorexia risk presence (Orto-40) and the eating disorder risk applied to 47.2% with kappa = 0.04 (95% CI: 0.004–0.09), $\chi^2 = 4.19$; $p = 0.04$. In the case of Orto-35, the perfect agreement for the diagnosis of these disorders applied to 88.2% with kappa = 0.32 (95% CI: 0.17–0.47), $\chi^2 = 42.7$; $p < 0.001$.

The results did not find the correlation between BMI and the ORTO-15 result to be statistically significant (for Orto-40 $r = -0.04$; $p = 0.03$; for Orto-35 $r = -0.01$; $p = 0.7$; Spearman's correlation).

The correlation between the results of the ORTO-15 and the EAT-26 questionnaires was also assessed. The results of the correlation analysis of these questionnaires find the point results for the orthorexia risk to be correlated to a statistically significant extent to the point result for the eating disorders risk ($r = -0.12$; $p = 0.01$).

Discussion

On the basis of the obtained results it may be assumed that the ORTO-15 Questionnaire is a reliable tool to identify orthorexia in the youth population study. The responses to particular questions are characterized by a very good or good repeatability. Orthorexia diagnosis, based on the referential criterion suggested by the author of the test [8] as well as on our own criterion (the cut-off point at the level of 35 points) is characterized by good repeatability. The obtained value of Cronbach's α statistics is satisfactory and lies within commonly accepted range of 0.7–0.9 [33]. It is of a special significance for the carried-out analysis because the questionnaire did not include many questions. A small number of questions, even with a good compatibility of the questionnaire, is accompanied with lower values of Cronbach's α statistics [34]. Individual values, both of raw and standardised Cronbach's α coefficients do not suggest the necessity of removing any of the questions – responses to these questions are correlated in a satisfactory degree with a general result of the test. Moreover, a statistical argument substituting the purposefulness of retaining all the questions is the fact that the alpha statistics did not exceed the value of 0.9. An additional significant argument for the reliability of the tested tool is the fact that the raw and standardised values of Cronbach's α coefficients are very similar.

In order to assess the external accuracy of the test, the comparison of ORTO-15 questionnaire results was carried out with the tool of the accepted accuracy which checks the risk of eating disorders – EAT-26 [29] (diagnostic accuracy) and then their common variance was determined. A full compliance of diagnoses of orthorexia and eating disorders risks referred to 47.2% for the threshold value for ORTO-15 at 40 points, and 88.2% for the threshold value at 35 points. The choice of the questionnaire for eating disorders was made due to the lack of accepted tools for orthorexia risk. Moreover, orthorexia does not constitute a unit of the official classifications (ICD-10, DSM-5), which made it impossible to show correlations between the result of the questionnaire and a clinical diagnosis. It should also be pointed out that there are limitations connected with determination of questionnaire accuracy on the basis of comparisons with other testing tool [30].

Study results suggest that the criterion for orthorexia diagnosis to be found in literature (Orto-40) generates too many diagnoses (53.7% in the first study, 52.6% in the second study) in the urban youth population. Similar observations were made for the Italian population [14, 15]. Therefore, it seems to be more appropriate to use a criterion referring to the decisional level, equalling 35 points. The choice of a non-

referential cut-off point for the interpretation of the ORTO-15 Questionnaire results was arbitrary. The decision was made mostly on the basis of the analysis of results distribution, accepting the borderline 5% of results (the “fifth percentile”) as significant, as in the statistical practice of defining a predictive value by means of the value distribution analysis in a population. A compatibility of diagnosis of orthorexia risk and eating disorders risk is better when orthorexia is defined at 35 points. Application of this criterion also suggests a significantly lower level of prevalence of orthorexia risk in the urban youth population (13.7%).

The study was conducted for a particular age group (15 to 21), which restricts the possibility of extending the results to apply to the entire population. According to ORTO-15 Questionnaire author’s recommendations, pupils under the age of 15 were excluded from the study, due to their insufficient influence on the choice of their food [13]. It should be stressed, however, that adolescence is a period of intensive changes taking place in the biological, psychological and social areas. A changing body makes adolescents concentrate on their organisms and how they function, including nutrition. The maturation process is accompanied by the development of autonomy and independence, and the need of making one’s own choices in terms of ideologies to believe in [35]. Finally, adolescence is a period when prevalence of eating disorders is the highest as compared to the whole life, and it concerns also the sub-clinical forms [36]. Applying a restrictive and selective diet may lead to malnutrition and social life disturbances [6]. Therefore, it is a priority to assess the scale of this phenomenon in this particular group and to undertake preventive measures.

Another limitation for applying the ORTO-15 Questionnaire is the lack of results for the clinical group diagnosed as suffering from orthorexia. Despite single-existing descriptions of orthorexia [6, 37], there is a lack of diagnostic criteria on the basis of which it would be possible to create a clinical group. It is difficult to define unequivocally whether a person with a high score in the questionnaire represents only a specific life-style characterising in a healthy eating habits or, whether this person has a medical problem resulting from pathological eating patterns. It should be remembered, however, that not in all the cases of the attempts to introduce healthy eating habits and the behaviours connected with this attempt reach a pathological level.

Conclusions

On the basis of the obtained results the ORTO-15 Questionnaire may be accepted as a reliable tool to identify the risk of orthorexia in population studies in the group of Polish youth, however, it is not free of limitations. It should be stressed that at present there is no other tool in Poland which would allow to identify the presence of orthorexia risk. Development of a tool to single out persons threatened with a pathology from a population constitutes only an introduction to further studies of orthorexia. For a better understanding of this phenomenon, the presence of orthorexia symptoms in a clinical population of individuals with classified disorders, such as eating disorders, obsessive-compulsive disorders or behavioural addictions should first be estimated.

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