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Personality traits of patients suffering from congenital heart defects
Cechy osobowości osób z wrodzonymi wadami serca

Praca doktorska

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1. Information note

This doctoral dissertation by Adrianna Skoczek, entitled *Personality traits of patients suffering from congenital heart defects*, is based on monothematic series of 3 first authorship original works, indexed in the PubMed database and other major scientific databases research, including those on the ISI Thomson Reuters list.

The total value of Impact Factor (IF) obtained with the publication of the papers is 2,046 according to the Thomson Reuters Journal Citation Reports and 110 points from Ministry of Science and Higher Education (according to the A list).

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2. *List of publications included in the doctoral dissertation*

1. **Skoczek A.,** Prochownik P., Gancarczyk U., Libiszewska N., Podolec P., Komar M.: *Personality traits of patients suffering from congenital heart defects*. Wiad Lek. 2019; 72 (11 cz 1): 2135-2144. DOI: 10.36740/WLek201911114; PMID: 31860861

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2. **Skoczek A.,** Prochownik P., Gancarczyk U., Libiszewska N., Podolec P., Podolec N., Komar M.: *Psychological correlates of patients' identity suffering from atrial septal defect (ASD) and patent foramen ovale (PFO).* J Thorac Dis. 2020 May; 12(5):1999-2018. DOI: 10.21037/jtd-20-220. PMID: 32642103

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3. **Skoczek A.,** Prochownik P., Podolec N., Gancarczyk U., Podolec P., Komar M.: *Personality traits of patients suffering from PFO and ASD and influence of COVID-19 pandemic time for patients suffering from congenital heart defects.*

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Publication in the international magazine *Wiadomości Lekarskie,* original paper.

Article indexed in: US National Library of Medicine National Institutes of Health – NCBI, Medline, PubMed, EBSCO, SCOPUS and Index Copernicus, (**MNiSW 20 pkt)** and Polska Bibliografia Lekarska.

In addition, the following article by second authorship was published in the series of publications, dealing with the very important issue of cardiological prevention. The article was prepared on the basis of parallel research.

3. Approval of the Bioethics Committee

The research project was approved by the Bioethics Committee of the Jagiellonian University No. 1072.6120.132.2017 of the September 28, 2017

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4. *Introduction and theoretical bases of the work*

Congenital heart defects are caused by abnormal development of the circulatory system in the foetal life or its inhibition, which may in turn be a consequence of the mother's bad habits during the pregnancy. Congenital heart defects depend on genetic factors, too [1].

Congenital heart defects

Congenital defects may cause too slow physical development of the child, while too rapid flow of blood through the lungs may cause frequent respiratory infections [1].

Patients with congenital heart disease usually do not report any symptoms or report only minor indisposition [2]. The characteristic symptoms of congenital heart defects are: exertional dyspnoea, cerebral circulation disorders, which may cause recurrent loss of consciousness [1].

Depending on the degree of cardiac dysfunction caused by congenital heart disease, patients may be at risk of: circulatory failure, endocarditis, arrhythmias, often leading to death. The treatment of heart defects is focused on surgical treatment. Congenital heart defects can be classified into non-leaky and leaky defects [1].

Over the years and uncontrolled heart defects may develop symptoms such as fatigue, dyspnoea, hepatomegaly, central cyanosis, and edema [2].

Patients may be qualified for percutaneous surgery to close the defect, while patients with a small leakage do not require any medical treatment [2].

Atrial septal defect ASD

Atrial septal defects can be divided into:

1. secondary opening, occurring in about 70% of patients with congenital heart disease - ASD II,
2. primary opening - partial loss of the atrio-ventricle septum, occurring in about 15% of patients with congenital heart defects - ASD I,
3. main vein, occurring in about 7% of patients with congenital heart defects - ASD sv,
4. coronary sinus, occurring in about 1% of patients with congenital heart defects - ASD cs [2].

ASD is one of the most common heart defects in adults, it is twice as common in women as in men, also in combination (about 30%) with trisomy 21 in the Down Syndrome [2].

Patent framen ovale PFO

Latin: *foramen ovale apertum*, English: patent foramen ovale PFO

PFO occurs in about 20% or even 30% of adults, most often it is diagnosed accidentally, during additional tests in patients at a young age after a stroke. PFO may lead to leakage from the right to the left atrium, possibly causing embolism, especially in the presence of an atrial septal aneurysm.

One of the visible symptoms of the obstruction of the orifice can be asymptomatic stroke at an early age [2].

A patent foramen ovale (PFO) is, in a way, a remnant of the so-called foramen ovale that connects the right and left atrium of the heart in foetal life. After the pressure changes in the atria after birth, the foramen ovale closes. This process may last up to one year of age. However, even in healthy people it is not completely closed [3]. The increasing pressure in the right atrium may be problematic, resulting in a change in the flow from left-right to right-left [4; 5]. Patent foramen ovale is not a heart defect and does not require special treatment [5]. PFO is associated with the risk of stroke [4]. It may result in a stroke, migraine headaches, and complications of decompression sickness in divers [5].

Psychocardiology

Nowadays heart diseases are one of the most serious epidemiological problems. Cardiovascular disease is one of the most common causes of death (about 400 people per 100,000 people). Most often, these are such diseases in which the participation of psychological factors has been detected [6].

Psychocardiology deals primarily with the course of treatment or rehabilitation of cardiological disorders, as well as the psychosocial factors themselves affecting the emergence of the above-mentioned disorders [7].

Psychological intervention in a cardiological patient is based on the patient's own work, which requires a lot of involvement in the process of change; conducted therapy by professionals, including interviews with the patient, regarding family structure, psychosocial factors [7].

It is necessary to remember how cardiological therapy of the patient affects his mental state. We can mention a number of psychopathological disorders, such as: disorders: consciousness, mood (manic, depressive), sleep, sometimes also psychotic [8].

Personality determinants in patients with congenital heart defects

In psychology, the concept of type A personality is known. type A behaviour pattern, considered to be one of the causes of cardiovascular disease. Type A behaviour is most common in people with coronary artery disease and may be the cause of a heart attack [6].

Of course, not only psychological factors have an impact on the development of health-related illnesses, but also the lifestyle is of great importance here [6].

The tasks that should be completed are primarily the health education of patients. Psychological help is needed not only because personality traits or other psychological factors are risk factors for cardiovascular disease, but also because the treatment and rehabilitation themselves are a source of stress [6].

However, the question arises: What personality traits are characteristic of adults suffering from a congenital heart defect? There are very few such studies. There are studies on the personality traits of children, adolescents suffering from congenital heart defects, but there is a lack of studies on the personality traits of adults and their impact on quality of life. There are known studies showing a lower level of extroversion (causing a worsening of emotional functioning) in people aged 15-20 years suffering from congenital heart defects, compared to healthy people. It was also shown that girls achieved high scores in conscientiousness, while boys achieved low scores in neuroticism; as well as the fact that unhealthy youth are less socially and emotionally adapted than healthy youth. It has also been shown that a higher level of extraversion is a good predictor of a higher level of quality of life, better emotional and social functioning. Similarly with the obtained low level of neuroticism or a higher level of conscientiousness. It was also shown that patients could not cope with stress. Most importantly, the above research helps in predicting the quality of life of patients in the future [9].

The influence of COVID-19 pandemic on patients of suffering from congenital heart defects

Each of the crises is associated with a negative impact on human mental health. Both patients who experienced various symptoms such as e.g. anxiety before the outbreak of the COVID-19 pandemic, and healthy people may deteriorate mental functioning [10].

The current pandemic situation directs people to reach for stimulants to reduce stress levels [10].

Research has been developed describing the level of extraversion associated with the current situation we are struggling with - COVID-19. People with a high level of extraversion were forced to increase social distance, which is very difficult for them. Higher conscientiousness results are associated with a lower tendency to violate recommendations [11].

Thus we still do not know how COVID -19 affects people with congenital heart defects, not only physically but also mentally.

It is therefore important to research the effects of SARS-CoV-2 on patients with congenital heart defects [12].

Recently, care for all patients, including cardiologic patients, has been significantly more difficult due to the coronavirus pandemic. Many patients with both ASD and PFO may feel disturbed by the lack of systematic contact with their attending physician, especially since the ailments caused by SARS-CoV-2 infection may resemble the already known cardiological ailments. The patient is not able to determine on his own what disease he can attribute to it, whether he has a heart defect or perhaps a coronavirus infection. COVID-19 is a disease caused by infection with the SARS-CoV-2 virus, involving the rapid spread of inflammatory processes in various organs. It attacks lungs as well as the cardiovascular system [13].

According to the aforementioned guidelines, patients requiring further diagnosis or invasive treatment were divided into groups defining the need for urgent or postponed medical procedures. For example, in patients with ASD or PFO, closure of the defect in the atrial septum, obstruction of the oval opening should be performed in the planned mode, i.e. it can be postponed for at least 3 months [13].

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6. Objective of the work

The aim: to identify specific personality traits of patients with congenital heart defects and to check their psychological functioning, and to identify the characteristic personality features of patients suffering from a specific heart defect (PFO - patent foramen ovale, ASD - atrial septal defect) by examining the level of anxiety as a state and as a trait, impulsivity, tendency to risk-taking, empathy, neuroticism, extraversion, psychoticism, and lying.

Thesis: Psychological traits of personality in patients with congenital heart defects.

Hypotheses:

1. Patients with congenital heart disease are characterized by high extraversion and low anxiety.
2. Patients with congenital heart disease are characterized by high empathy and low psychoticism.
3. Patients with congenital heart defects are characterized by low impulsivity and low tendency to risk taking.
4. Women with congenital heart disease are characterized by low psychoticism and high anxiety as a condition.
5. Men with congenital heart defects are characterized by high levels of neuroticism, high levels of lying and average level of empathy
6. Empathy is clearly the strongest characteristic of women with congenital heart disease;
7. A high level of psychoticism is characteristic of men suffering from a congenital heart disease;
8. Neuroticism is characteristic of women with congenital heart disease;
9. Extraversion is not a characteristic feature for men with congenital heart disease;
10. Lying is characteristic of women with congenital heart disease;

11. Impulsiveness is not a characteristic feature of women suffering from congenital heart disease;
12. Tendency to risk taking is characteristic of men with congenital heart disease;
13. Anxiety as a condition is characteristic of women suffering from a congenital heart disease;
14. Anxiety as a trait is not a characteristic trait for men with congenital heart disease;
15. Young people (<40 years old) suffering from congenital heart disease ASD are characterized by low levels of psychoticism, high anxiety as a condition and high empathy;
16. Elderly people (>40 years old) suffering from congenital heart disease ASD are characterized by high levels of impulsiveness and tendency to risk taking, as well as low levels of extraversion, and high levels of lies;
17. Young people (<40 years old) suffering from congenital heart disease PFO are characterized by low levels of anxiety as a trait, and high levels of empathy;
18. Older people (>40 years old) suffering from congenital heart disease PFO are characterized by high levels of neuroticism, low levels of lies, and low levels of impulsiveness;
19. Anxiety as a condition is a characteristic feature for people suffering from ASD heart disease— before surgery;
20. Anxiety as a trait is a characteristic trait for people suffering from PFO heart defect—after surgery.
21. Extraversion is characteristic of people suffering from congenital heart disease PFO.
22. Psychoticism is not characteristic of people with ASD congenital heart disease.
23. Neuroticism is clearly the strongest characteristic of people with congenital heart disease PFO.
24. Impulsiveness is characteristic of people with ASD congenital heart disease

25. Tendency to risk-taking is not characteristic of patients suffering from ASD congenital heart disease.
26. Empathy is characteristic of people with PFO congenital heart disease.
27. Anxiety as a condition is characteristic of people suffering from ASD.
28. Anxiety as a trait is characteristic of people suffering from PFO.

So far, this topic has not gained much popularity on interest. No studies of adults describing the personality traits of people suffering from congenital heart defects have been developed (PFO – patent foramen ovale and ASD – atrial septal defect). Therefore, work and research can be considered innovative.

7. Methodology of work

Description of the study

The examined group are patients with congenital heart defects, adult men, adult women, and the research area is John Paul II Hospital In Cracow, The Clinical Department of Cardiac and Vascular Diseases with the Intensive Cardiac Supervision Subdivision, Institute of Cardiology, Collegium Medicum of the Jagiellonian University in Cracow, John Paul II Hospital. The study involved 100 adults, undergoing surgery in John Paul II Hospital in Cracow in the field of heart defects such as ASD and PFO, in age groups 0-19 years, 20-34, 35-49, 50-64, 65-74, 75-89 and over 90 years, with the level of education: basic, vocational, secondary, incomplete higher, higher; inhabiting: village, city up to 40 thousand residents, a city with a population of 41-61 thousand, and a city with a population of 60 thousand; civil status: single, married, divorced, widow/widower, separated; occupation: students, unemployed persons, working persons, pensioners, retirees.

Inclusion criteria

Patients qualified for surgery, undergoing or after surgery, suffering from PFO and ASD, were qualified for the study. Patients were asked to complete a worksheet and all psychological methods. Both the survey and the questionnaire methods were anonymous.

The research was carried out personally by psychologist Adrianna Skoczek, MA. Psychometric analysis was performed through the quantitative and qualitative interpretation of psychological tests with statistical calculations using Statistica 12 and IBM SPSS Statistics version 25.

Research methods used

In this study, the following were used: record, tests and psychological questionnaires (EPQ-R (S) - Hans J. Eysenck and Sybil G. Eysenck; IVE - Hans J. Eysenck and Sybil G. Eystenck (2006); STAI CD Spielberger, RL Gorsuch, RE Lushene, original sheets were purchased from the Pracownia Testów Psychologicznych of the Polish Psychological Association in Warsaw.

The record used in the research project contained information on: the respondent's sex, age, education level, place of residence, marital status, and current employment status.

Psychological tests used in the research work

1. EPQ-R (S) Eysenck Personality Questionnaire-Revised Short Version by Hans J. Eysenck and Sybil G. Eystenck - consisting of 48 questions examining personality traits, such as: level of neuroticism, extraversion, psychoticism, lies; the method is characterized by good absolute stability, so it can be considered as a method of high reliability, as well as factor accuracy, there are also studies determining the significant correlations occurring between EPQ-R (S) and IVE and STAI. The method meets the conditions of psychometric goodness. The respondent's task is to answer 48 questions by answering Yes or No.
2. IVE Eysenck's Impulsivity Inventory by Hans J. Eysenck and Sybil G. Eystenck - 54 questions, examining: impulsivity, tendency to risk-taking, empathy; the method is characterized by good absolute stability, internal consistency, which can be considered as a method of high reliability, as well as factor accuracy, there are also studies that determine significant correlations between IVE and EPQ-R (S), and STAI. The method meets the conditions of psychometric goodness. The respondent's task is to answer 54 questions by answering Yes or No.
3. STAI the State-Trait Anxiety Inventory CD Spielberger, RL Gorsuch, RE Lushene - consisting of 40 questions (20 items on the X-1 and X-2 scales), measuring the level of anxiety as a state and as a feature; the method is characterized by high reliability and validity. The method meets the conditions of psychometric goodness. The respondent's task is to answer 54 questions by answering in X-1 definitely no, rather no, rather yes, definitely yes, and in X-2 almost never, sometimes, often, almost always.

8. Statistical methods

In the research, qualitative and quantitative features were assessed. The analysis of each of them has its specificity, consisting in the use of adequate statistical tools for comparisons. In order to characterize the structure of the studied variables, basic descriptive statistics were calculated in the form of measures of position and variability. The normality of the distributions of the analyzed variables was verified using the Shapiro-Wilk test. In order to establish the strength of the relationship between the variables, the vectors of Spearman's rank correlation coefficients were calculated. The U Mann-Whitney test non-parametric significance test and Kurskall-Wallis non-parametric analysis of variance and multiple comparison tests were also used. The structure index was calculated for the variables measured on the rank and nominal scales. A significance level of 0.05 was adopted for all analyzes. All analyzes were performed using the Statistica v.12 package.

In order to test the hypotheses put forward as part of the study, statistical analyzes were performed using the IBM SPSS Statistics version 25 package. Using it, the frequency analysis, the analysis of basic descriptive statistics together with the Kolmogorov-Smirnov distribution normality test, Pearson's r correlation analysis, analysis of variance in schemes were performed intra-group tests, U Mann-Whitney tests for independent samples and Student's t-tests for dependent and independent samples.

In order to test whether the assumption about the consistency of the distributions of the measured quantitative variables with the normal distribution has been met, the basic descriptive statistics were first analyzed together with the Kolmogorov-Smirnov test. The quantitative variables that were used to carry out the tests described later in this work were analyzed. In each case, the result of the test of the normality of the distribution turned out to be statistically significant.

9. Discussion and summary of the results

In the case of a smaller group of respondents (50 people, including 29 women, 21 men), the analysis of the test results allowed to state that the highest sten results in the EPQ-R (S) test occurred in neuroticism, extraversion and a lie. The highest results in the IVE test occurred in the case of empathy, while in the STAI test the highest results occurred for anxiety as a condition.

In the case of men, they obtained the highest sten scores in the EPQ-R (S) test on the lie scale. The highest results in the IVE test occurred in the case of empathy, while in the STAI test the highest results occurred for anxiety as a condition.

In the case of women, they obtained the highest results in the EPQ-R (S) test on the extraversion scale. The highest results in the IVE test occurred in the case of empathy, and in the case of the STAI test the highest results occurred for anxiety as a condition and as a trait:

1. Neuroticism is clearly the strongest characteristic of people with congenital heart disease.
2. Extraversion is characteristic of people suffering from a congenital heart disease.
3. Psychoticism is not characteristic of people with congenital heart disease.
4. Lying is characteristic of people with congenital heart disease.
5. Empathy is clearly the strongest characteristic of women and men with congenital heart disease.
6. Neuroticism is characteristic of women with congenital heart disease.
7. A high level of psychoticism is characteristic of men suffering from a congenital heart disease.
8. Extraversion is not a characteristic feature for men with congenital heart disease.
9. Lying is characteristic of women with congenital heart disease.
10. Impulsiveness is not a characteristic feature of women suffering from congenital heart disease.
11. Anxiety as a condition is characteristic of women suffering from a congenital heart disease.
12. Anxiety as a trait is not a characteristic feature of men with congenital heart disease.

The analysis gave rise to significant differences. In the analyzed group, extraversion for men was significantly higher than psychoticism and the results of lies were statistically significantly higher than psychoticism. There were no significant differences between

the values of items for women in the IVE test. Tendency to risk is characteristic for men with congenital heart disease. There were no significant differences between the values of items for men in the IVE test.

In men, no significant differences were found between the results of the variables anxiety as a condition and anxiety as a trait $p > 0.05$. Analysis of the results did not give grounds to conclude that gender significantly differentiates the results of the EPQ-R (S), IVE and STAI tests $p > 0.05$. There were no statistically significant correlations between age and the results of the analyzed tests $p > 0.05$. As the level of education increases, the level of anxiety as a feature decreases. Place of residence influenced the level of the variable lie. Analysis of the results did not give grounds to state that marital status significantly differentiates the results of the analyzed tests $p > 0.05$. The analysis of the results did not give rise to the conclusion that the work significantly differentiates the results of the analyzed tests $p > 0.05$.

In the case of a larger group (100 people, including 50 women, 50 men, including 70 people suffering from PFO and 30 with diagnosed ASD, the following results were obtained:

In the case of the examined women, statistically significant differences were found only between the level of psychoticism and all other analyzed variables. The results of extraversion, neuroticism and lies do not differ statistically from each other, and the level of declared empathy was statistically significantly higher than the levels of impulsiveness and tendency to risk-taking. The difference between impulsiveness and risk tendency to risk-taking turned out to be statistically significant, there were no significant statistical differences in the field of anxiety as a condition and trait.

For men, an insignificant difference was only observed between the level of neuroticism and the scale of lies; the difference between impulsiveness and tendency to risk-taking also turned out to be statistically significant, just as in the case of women no significant statistical differences were found in the field of anxiety as a condition and trait.

There was no statistically significant difference between the analyzed variables of anxiety as a trait and anxiety as a condition of persons before the surgery, of people suffering from ASD and after surgery in people suffering from PFO.

For people over 40 years of age suffering from ASD, an insignificant difference was only observed between the levels of extraversion and lies. The level of declared

empathy was statistically significantly higher than the levels of impulsiveness and tendency to risk-taking. The difference between impulsiveness and tendency to risk-taking turned out to be statistically insignificant. Based on the results, no statistically significant differences were found between the analyzed variables—anxiety as a trait and anxiety as a condition.

In the case of people suffering from the same condition below 40 years of age, a significant difference was observed only between levels of psychoticism and other variables, i.e., neuroticism, extraversion, and lies. The level of declared empathy was statistically significantly higher than the levels of impulsiveness and tendency to risk-taking. The difference between impulsiveness and tendency to risk-taking turned out to be statistically insignificant. Based on the results, no statistically significant differences were found between the analyzed variables—anxiety as a trait and anxiety as a condition.

For people suffering from PFO over 40, the level of lies turned out to be statistically significantly higher only than the level of psychoticism. The level of extraversion turned out to be statistically significantly higher only than the level of psychoticism. Other comparisons were not statistically significant. The level of declared empathy was statistically significantly higher than the levels of impulsiveness and tendency to risk-taking. The difference between impulsiveness and tendency to risk-taking turned out to be statistically insignificant. Based on the results, no statistically significant differences were found between the analyzed variables—anxiety as a trait and anxiety as a condition.

In people with PFO under 40, the level of extraversion turned out to be statistically significantly higher only than the level of psychoticism. In turn, the level of lies turned out to be statistically significantly higher only than the level of psychoticism. Considering the level of neuroticism, it also turned out to be statistically significantly higher only at the level of psychoticism. The level of declared empathy was statistically significantly higher than the levels of impulsiveness and tendency to risk-taking. The difference between impulsiveness and tendency to risk-taking turned out to be statistically insignificant. Based on the results, no statistically significant differences were found between the analyzed variables—anxiety as a trait and anxiety as a condition.

Among the respondents, the level of extraversion was statistically significantly higher than the level of all other variables. The level of lying was significantly different from the level of psychoticism, which in turn was statistically significantly lower than all other variables. The level of declared empathy was statistically significantly higher than the levels of impulsiveness and risk-aversion. In turn, the difference between impulsiveness and risk-aversion turned out to be statistically insignificant. Based on the results, no statistically significant difference was found between the analyzed variables - anxiety as a trait and anxiety as a state.

Based on the results, statistically significant differences in the levels of neuroticism, extraversion and lying were found. Women with congenital heart disease are significantly more neurotic and score significantly higher on the lie scale. Men, in turn, turn out to be more extroverted. Based on the results, statistically significant differences in the level of risk-aversion and empathy were found. Men are more likely to make risky decisions, while women are much more empathetic. Based on the results, statistically significant differences in the severity of anxiety, both as a state and a trait, were found between women and men. It is women who have a higher score on both analyzed scales.

In people suffering from ASD, the only insignificant difference in the analyzed case is that between levels of neuroticism and the scale of lying. The level of declared empathy was statistically significantly higher than the levels of impulsiveness and tendency to risk-taking. The difference between impulsiveness and tendency to risk-taking turned out to be statistically insignificant. Based on the results, no statistically significant difference was found between the analyzed variables - anxiety as a trait and anxiety as a condition.

In people suffering from PFO, a statistically significant difference was observed only between the level of psychoticism and other variables. The level of declared empathy was statistically significantly higher than the levels of impulsiveness and tendency to risk-taking. The difference between impulsiveness and tendency to risk-taking turned out to be statistically insignificant. Based on the results, a statistically significant difference was found between the analyzed variables - anxiety as a trait and anxiety as a condition.

10. List of the acronyms and abbreviations

Skrót	*Nazwa angielska*	*Nazwa polska*
PFO	patent foramen ovale	przetrwały otwór owalny
ASD	atrial septal defect	ubytek przegrody międzyprzedsionkowej
ASD I	atrial septal defect ostium primum	ubytek przegrody międzyprzedsionkowej typu pierwotnego
ASD II	atrial septal defect ostium secundum	ubytek przegrody międzyprzedsionkowej typu wtórnego
VSD	ventricular septal defect	zwężenie zastawki mitralnej
PDA	patent ductus arteriosus	przetrwały przewód tętniczy Botalla
AHA	American Heart Association	Amerykańskie Towarzystwo Kardiologiczne
ACC	American College of Cardiology	Amerykańskie Kolegium Kardiologii
ESC	European Society of Cardiology	Europejskie Towarzystwo Kardiologiczne
EPQ-R(S)	Eysenck Personality Questionnaire-Revised Short Version	Kwestionariusz Osobowości Eysencka w Wersji Skróconej
IVE	Eysenck's Impulsivity Inventory	Kwestionariusz Impulsywności Eysencka
STAI	the State-Trait Anxiety Inventory	Inwentarz Stanu i Cechy Lęku
COVID-19	coronavirus disease	choroba wywołana przez wirusa SARS-COV-2
SARS-COV-2	severe acute respiratory syndrome coronavirus 2	koronawirus ostrej niewydolności oddechowej 2
ACE 2	Angiotensin - converting enzyme 2	2 typ enzymu konwertującego angiotensynę
SCAI	Society of Cardiovascular Angiography and Intervention	Amerykańskie Towarzystwo Kardiologów Inwazyjnych
SCAI ELM	Society for Cardiovascular Angiography and Interventions Emerging Leader Mentorship	Program ELM prowadzony przez Amerykańskie Towarzystwo Kardiologów Inwazyjnych
STEMI	ST-segment elevation myocardial infarction	ostry zespół wieńcowy z uniesieniem odcinka ST
NSTEMI	non-ST-segment elevation myocardial inartction	ostry zespół wieńcowy bez uniesienia odcinka ST

11. Characteristics of the works included in the doctoral dissertation

Article No. 1

Skoczek A., Prochownik P., Gancarczyk U., Libiszewska N., Podolec P., Komar M.: *Personality traits of patients suffering from congenital heart defects*. Wiad Lek. 2019; 72 (11 cz 1): 2135-2144. DOI: 10.36740/WLek201911114; PMID: 31860861 Praca oryginalna

This article, which is an introduction to the doctoral dissertation, presents a description of the causes of congenital heart defects, attempts to diagnose them using medical devices, as well as the division of congenital heart defects in adults, including cyanotic and non-cyanotic.

The defects of PFO - patent foramen ovale and ASD - atrial septal defect are described in more detail, along with their causes, signs and symptoms, statistics of their occurrence and methods of their treatment. The next part describes the current state of psychocardiology and personality determinants in patients with congenital heart defects.

This article also presents the results of research carried out as part of a research project organized in John Paul II Hospital, The Clinical Department of Cardiac and Vascular Diseases with the Intensive Cardiac Surgeon Division Institute of Cardiology, Collegium Medicum of the Jagiellonian University in Cracow, with the participation of 50 patients with congenital heart defects undergoing surgery.

The authors presented the results and their statistical analyzes, which showed the specific personality traits of patients with congenital heart disease, as well as the current state of mental functioning of patients.

The results of the research can be used to better understand the patient, and also form the basis for the organization of comprehensive, interdisciplinary therapy of patients with congenital heart defects.

Article No. 2

Skoczek A., Prochownik P., Gancarczyk U., Libiszewska N., Podolec P., Podolec N., Komar M.: *Psychological correlates of patients' identity suffering from atrial septal defect (ASD) and patent foramen ovale (PFO).* J Thorac Dis. 2020 May; 12(5):1999-2018. DOI: 10.21037/jtd-20-220. PMID: 32642103 Praca oryginalna

The next article presents in detail PFO heart defects - patent foramen ovale and ASD - atrial septal defect, along with the causes and moments of their formation, as well as their health effects. The AHA / ACC, American Heart Association / American College of Cardiology, and European Society of Cardiology (ESC) guidelines for their treatment were also provided.

The results of a study carried out as part of a research project carried out as part of a research project organized in John Paul II Hospital, The Clinical Department of Cardiac and Vascular Diseases with the Intensive Cardiac Surgeon Division Institute of Cardiology, Collegium Medicum of the Jagiellonian University in Cracow, with the participation of 100 patients with congenital heart disease (70 patients with ASD and 30 with PFO).

The results of the study were divided into those for women, men, patients with ASD and before surgery, with PFO after surgery, and patients under and over 40 years of age.

The authors presented the results and their statistical analyzes, which showed the specific personality traits of patients with congenital heart disease in the above-mentioned groups.

Article No. 3

Skoczek A., Prochownik P., Podolec N., Gancarczyk U., Podolec P., Komar M.: *Personality traits of patients suffering from PFO and ASD and influence of COVID-19 pandemic time for patients suffering from congenital heart defects.*

Wiad Lek. 2020;73(9 p. II):1926-1933 DOI: 10.36740/WLek202009206 Praca oryginalna

This article describes in detail the process of formation, statistics of their occurrence and the effects on the patient's health of the formation of congenital heart defects such as PFO - patent formane ovale and ASD - atrial septal defect.

The results of the study conducted as part of the research project John Paul II Hospital, The Clinical Department of Cardiac and Vascular Diseases with the Intensive Cardiac Surgeon Division Institute of Cardiology, Collegium Medicum of the Jagiellonian University in Cracow, with the participation of 100 patients with congenital heart disease (70 patients with ASD and 30 with PFO).

Subsequently, an attempt was made to distinguish the characteristic personality traits among the group of all respondents, regardless of their heart defect, and then to divide them. The levels of neuroticism, extraversion, psychoticism, lying, impulsivity, tendency risk-taking, empathy, and anxiety as a state and anxiety as a trait were examined.

The influence of gender and heart defects on the personality traits of patients was also examined.

The impact of the COVID-19 pandemic on patients suffering from congenital heart defects has also been described.

12. Texts of the publications included in the doctoral dissertation

Article No. 1

1. **Skoczek A.,** Prochownik P., Gancarczyk U., Libiszewska N., Podolec P., Komar M.: *Personality traits of patients suffering from congenital heart defects*. Wiad Lek. 2019; 72 (11 cz 1): 2135-2144. DOI: 10.36740/WLek201911114; PMID: 31860861

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Article indexed in: US National Library of Medicine National Institutes of Health – NCBI, Medline, PubMed, EBSCO, SCOPUS and Index Copernicus, (**MNiSW 20 pkt)** and Polska Bibliografia Lekarska.

PRACE ORYGINALNE
ORIGINAL ARTICLES

PERSONALITY TRAITS OF PATIENTS SUFFERING FROM CONGENITAL HEART DEFECTS

DOI: 10.36740/WLek201911114

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ABSTRACT

Introduction: Personality traits of patients suffering from congenital heart defects

The work presents a research project carried out in John Paul II Hospital, The Clinical Department of Cardiac and Vascular Diseases with the Intensive Cardiac Surgeon Division Institute of Cardiology, Collegium Medicum of the Jagiellonian University in Cracow, with participation of patients with congenital heart defects.

We aimed to assess personality traits of clients suffering from congenital heart defects, in a group of women and men, younger, under 40 years old and older than 40 years old, with PFO and ASD before and after surgery.

The aim: identify specific personality traits of patients with congenital heart defects and to check the psychological functioning of patients by examining: the level of anxiety, impulsiveness, tendency to risk-taking, empathy, neuroticism, extraversion, psychoticism and lying.

Material and methods: We performed a psychological clinical assessment and conducted the psychological tests like EPQ-R(S) by Hans J. Eysenck and Sybil G. Eysenck, IVE by Hans J. Eysenck and Sybil G. Eystenck, STAI by C. D. Spielberger, R. L. Gorsuch, R. E. Lushene describing personality traits of patients.

Results: Patients (F=29, M=21), adult, with ASD and with PFO, with the level of education: basic, vocational, secondary, incomplete higher, higher; inhabiting: village, city up to 40 thousand residents, a city with a population of 41-61 thousand, and a city with a population of 60 thousand; civil status: single, married, divorced, widow/widower, separated; being: students, unemployed persons, working persons, pensioners, retirees.

Conclusions: The presented results and their statistical analyses showed specific personality traits of patients with congenital heart defects.

KEY WORDS: personality, personality traits, congenital heart defects, PFO, ASD, neuroticism, extraversion, psychoticism, lying, impulsiveness, tendency to risk-taking, empathy, anxiety as current state, anxiety as personality trait

Wiad Lek 2019, 72, 11 cz. I, 2135-2144

INTRODUCTION

Congenital heart defects are caused by abnormal development of the circulatory system in the fetal life or its inhibition, which may in turn be a consequence of the mother's bad habits during the pregnancy, primarily in the first trimester of pregnancy, such as: viral infections, drugs used; or depend on genetic factors. There are heart defects that do not cause any indisposition [1]. However, there are those that bring to the life of a sick person a number of ailments, which cause that the patient feels badly not only physically, but also mentally. The aim of the article is to identify specific personality traits of patients with congenital heart defects and to check their psychological functioning by examining: the level of anxiety, impulsivity, risk-taking, empathy, neuroticism, extraversion, psychoticism and lying.

The justification for the choice of this topic is the desire to become familiar with specific personality traits of patients with congenital heart defects, curiosity about how ill persons function and are psychologically adapted, the level of anxiety, impulsivity, risk propensity, empathy, neuroticism, extraversion, psychoticism and lies, examining effects on the occurrence of possible or already existing psychiatric disorders caused by the existence of a heart defect and an attempt to answer the question: *Do patients with congenital heart defects have specific personality traits?*

In the absence of available literature on the subject, the project can be considered pioneering.

CONGENITAL HEART DEFECTS

In order to recognize a heart defect, the physician first of all applies listening to the murmurs created above the heart with a characteristic location and type for a specific defect, as well as the analysis of changes in the image of the heart, electro and phonocardiological changes, or measurement of blood pressure. Example symptoms of congenital heart defects: tremor of a chest, the so-called cat's murmur, sometimes there is also a problem with too high blood pressure of the patient and others. Congenital defects may

cause too slow physical development of the child, while too rapid flow of blood through the lungs may cause frequent respiratory infections [1].

Characteristic symptoms of congenital heart defects are: effort dyspnoea, which may be accompanied by cough caused by stagnation in the lungs. There are also possible disorders of the cerebral circulation, which in turn may cause recurrent loss of consciousness or convulsions [1].

For diagnostics there are also used: one or two-dimensional echocardiography - to detect defects in the atrial septal or inter-ventricular septum; contrast echocardiography, which is particularly useful in the diagnosis of leaks [1].

Depending on the degree of cardiac dysfunction caused by congenital heart disease, ill persons may be at risk of: heart failure, endocarditis, cardiac arrhythmias, often fatal. Treatment of heart defects focuses on surgical treatment. Congenital malformations can be divided into defects without leakage and defects with leakage [1].

CONGENITAL HEART DEFECTS IN ADULTS

Congenital heart defects in adults are divided into:
1. Non-cyanotic heart disease with a leak at the level of:
a. the atria,
b. the ventricles,
c. the great arteries.
2. Cyanotic heart disease with a leak:
a. with reduced pulmonary flow,
b. Eisenmenger syndrome.
3. Valve defects:
a. atrio-ventricular valves,
b. valves of arterial trunks.
4. Others:
a. pathology of systemic veins,
b. lungs veins,
c. arterial trunks.

Birth defects that can be found in an adult: bicuspid aortic valve, aortic valve coarctation, valvular stenosis, atrial septal defect, patent ductus arteriosus, ventricular septal defect, Fallot tetralogy, Eisenmenger's syndrome, congenital corrected arterial trunks, left atrioventric valve regurgitation, Ebstein anomaly, Uhl's anomaly, subvalvular narrowing of the left ventricle outflow pathway, Valsava sinus aneurysm, coronary fistula, pulmonary arteriovenous fistula [3].

ATRIAL SEPTAL DEFECT ASD

Latin: defectus septi interatrialis, English: atrial septal defect – ASD

Atrial septal defects can be divided into:
a. secondary opening, occurring in about 70% of patients with congenital heart disease - ASD II,
b. primary opening - partial loss of the atrio-ventricle septum, occurring in about 15% of patients with congenital heart defects - ASD I,
c. main vein, occurring in about 7% of patients with congenital heart defects - ASD sv,
d. coronary sinus, occurring in about 1% of patients with congenital heart defects - ASD cs [3].

ASD is one of the most common heart defects in adults, it is twice as common in women as in men, also in combination (about 30%) with trisomy 21 in the Down Syndrome [3].

The leakage of oxygenated blood from the left to the right atrium is caused by the loss of the atrial septum [3].

SIGNS AND SYMPTOMS OF CONGENITAL HEART DEFECTS OF ADULTS

Patients with congenital heart disease usually do not report any complaints or report only minor discomforts. These defects are most often diagnosed at the moment of echocardiographic examination, less frequently by means of magnetic resonance or computed tomography. At the age of about 40, patients experience reduced physical capacity to cope with exercise, palpitations, atrial fibrillation. Over the years and uncontrollable heart defects, symptoms such as fatigue, dyspnoea, enlarged liver, central cyanosis, edema may appear [3].

Patients may be qualified for percutaneous surgical operation closing the defect, whereas patients with a small leak do not require any recommendations or special treatment. The latter can take advantage of all the charms of life, taking up activity in sport, pregnancy is also not contraindicated, the solution without the need of Cesarean cutting; on the other hand, pharmacologically treated persons may be exposed to danger while diving or being at high altitudes [3].

PATENT FORAMEN OVALE PFO

Latin: *foramen ovale apertum*, English: patent foramen ovale PFO

PFO occurs in about 20% or even 30% of adults, most often it is diagnosed accidentally, during additional tests in patients at a young age after a stroke. PFO may lead to leakage from the right to the left atrium, possibly causing embolism, especially in the presence of an atrial septal aneurysm.

One of the visible symptoms of the obstruction of the orifice can be asymptomatic stroke at an early age [3].

VENTRICULAR SEPTAL DEFECT

Latin: *defectus septi interventricularis*, English: ventricular septal defect VSD

Diagnosed in about 10% of patients with congenital heart defects, consisting of leakage of blood oxygenated from the left to the right ventricle, and sometimes to the right atrium. Uncontrolled can lead to heart failure [3].

PATENT DUCTUS ARTERIOSUS PDA

Latin: *ductus arteriosus persistens*, English: patent ductus arteriosus - PDA

Congenital heart defect, associated with complications arising during the rubella, from which a pregnant woman

suffered - I trimester of pregnancy, consisting of the connection of the left pulmonary artery with the aorta. Characteristic symptoms are: leakage, exercise dyspnoea, palpitations [3].

TETRALOGY OF FALLOT

Latin: *tetralogia Falloti*, English: tetralogy of Fallot

The most common cyanosis defect after the patient reaches the first year of life. Patients complain about symptoms such as in the case of previous heart defects as well as chest pains. Characteristic symptoms may also be: rod-shaped squares, pronounced nails [3].

EISENMENGER SYNDROME

Latin: *syndroma Eisenmengeri*, English: Eisenmenger syndrome

If untreated, it can lead to pulmonary arterial hypertension. It exists as a complication of diagnosed congenital malformations, most of them being leaky. Patients report a feeling of lack of air, sometimes also fainting, unconsciousness [3].

RIGHT VENTRICULAR OUTFLOW TRACT OBSTRUCTION

It involves the development of changes in the pulmonary valve [3].

LEFT VENTRICULAR OUTFLOW TRACT OBSTRUCTION

This is the most common defect in approximately 2% of adults with congenital heart disease and this is the so-called bilipler valve, occurring about 4 times more often in men [3].

AORTIC COARTATION

Latin: coarctatio aortae; stenosis isthmi aortae, English: aortic coartation

This disadvantage is primarily the narrowing of the aorta. 2-5 times more often in men compared to women, often combined with Turner syndrome. Hypertension, as well as headaches, are characteristic for this defect [3].

The congenital heart defects highlighted above are only some of the existing ones.

HEART DEFECTS WITHOUT LEAKAGE

The following are briefly discussed heart defects without leakage, such as: stenosis of the main aorta, congenital pulmonary stenosis, dextrocardia and Ebstein syndrome [1].
Narrowing of the main artery
Congenital narrowing of the pulmonary artery
Dextrocardia
Ebstein syndrome

HEART DEFECTS WITH LEAK

This section will discuss heart defects with leakage such as: ventricular septal defect, atrial septal defect, persistent arterial duct Botalla [1]

Ventricular septal defect - Defectus septi ventriculorum, consists in the flow of blood from the left to the right ventricle, which may cause its growth, as well as increased blood flow through the small circulation. A characteristic symptom is the appearance of a loud systolic murmur. To diagnose this disadvantage, one can use a radiological examination that can determine the widening of the pulmonary artery trunk as well as an electrocardiographic examination indicating the total or partial block of the right bundle of the His bundle [1].

Atrial septal defect - Defectus septi atriorum - ASD, consisting of a complete absence of atrial septum - with a very severe heart defect or partial omission of the oval hole valve [1].

PSYCHOLOGY IN CARDIOLOGY - PSYCHOCARDIOLOGY

Cardiology has its achievements in the work of psychologists. Already in 1961 a psychological studio was established thanks to Zdzisław Askanas, who was tasked with a holistic approach to the treatment and rehabilitation of patients with ischemic heart disease. Currently, heart disease is one of the most serious epidemiological problems. Cardiovascular disease is one of the most common causes of death (about 400 people per 100,000 people). Most often, these are such diseases in which the participation of psychological factors has been detected [4].

Psychocardiology deals primarily with the course of treatment or rehabilitation of cardiological disorders, as well as the psychosocial factors themselves affecting the emergence of the above-mentioned disorders. It also focuses primarily on improving the patient's quality of life. Psychocardiology has developed over the years. W. Harvey already pointed out in his works how much influence emotions have in the emergence of cardiological problems. One by one W. Osler described factors such as time pressure, today you could say workaholism; that may affect coronary vascular changes to a greater extent than lack of moderation in food and drink [5].

Cardiology has its achievements in the work of psychologists. It should be mentioned that Poland was one of the first countries to focus on psychological problems of patients suffering from cardiovascular diseases [5].

Already in 1961, on the initiative of Professor Askanas, the first psychological laboratory was established in the department of cardiology, whose task was a holistic approach to the treatment and rehabilitation of patients with coronary heart disease [6, 7].

Thanks to Professor Zdzisław Askanas /1910-1974/, a Polish doctor, cardiologist, academic teacher at the Medical Faculty of the Medical University of Warsaw, the creator and the first Head of the First Chair and Clinic of Cardiology at the Medical University of Warsaw, in

1962 the founder of the Central Cardiovascular Disease Clinic, and in 1965 the founder of the Institute of Cardiology in Warsaw introduced many innovative methods in cardiology. Professor Askanas was a teacher of many outstanding Polish cardiologists. He also created the Warsaw Academic School of Cardiology, in which his students were concentrated [6, 7].

Throughout his life he was characterized by great enthusiasm for his actions, dedication to work and consistency. Professor Askanas›s desperation resulted in very effective teaching, many thematically diverse scientific works, and above all extremely caring, patient-oriented care, development of very specialized care for initially internist patients, which has been focused on cardiological patients over the years [6, 7].

It was on the initiative of professor Asnanas in the Cardiology Clinic in Warsaw that a multidisciplinary team was created, dealing with all cardiological patients, consisting of doctors, nurses, diagnostics, epidemiologists, rehabilitators and psychologists [6, 7].

The use of psychological methods in cardiology and their gradual implementation were dealt with by: doc. Stanisław Siek), Henryka Ostrowska, Jan Tylka, Barbara Dębska, Józef Latoch and Marek Mordyński [6, 7].

The efforts of the team of prof. Askanas aimed at early rehabilitation of cardiac patients and quickly restoring their full fitness [6, 7].

The scientist's achievements have been noticed not only in Poland but also abroad, and are still used in modern cardiology [6, 7].

Psychological intervention in a cardiological patient is based on the patient's own work, which requires a lot of involvement in the process of change; conducted therapy by professionals, including interviews with the patient, regarding family structure, psychosocial factors [5].

The development of ischemic heart disease, as a model cardiological disease, is associated with deepening depression as well as stress, low level of support or low socioeconomic status [5].

It is necessary to remember how cardiological therapy of the patient affects his mental state. We can mention a number of psychopathological disorders, such as: disorders: consciousness, mood (manic, depressive), sleep, sometimes also psychotic - e.g. after using cardiological drugs [8].

PERSONALITY DETERMINANTS OCCURRING IN PATIENTS WITH CONGENITAL HEART DEFECTS

In psychology, the concept of type A personality is known. type A behaviour pattern, considered to be one of the causes of cardiovascular disease. This is one of the psychological risk factors of the above-mentioned group of somatic diseases. The creators of the theory are Friedman and Rosenman. Patients with this type of behaviour are ambitious, focused on success, achieving everything that is possible in the shortest possible time, often hostile, with excessive reactivity, they are often hostile to other people regardless of the situation, as one of temperamental traits, expressiveness. Type A behaviour is most common in people with coronary artery disease and may be the cause of a heart attack [4].

However, the question is what personality traits are characterized by adults suffering from congenital heart disease? There are very few such studies.

Of course, not only psychological factors have an impact on the development of health-related illnesses, but also the lifestyle is of great importance here. These include: cigarette smoking, a rich diet, raising cholesterol levels, stress and inability to deal with it, lack of support from loved ones and the environment in which patients live and work [4].

The tasks that should be completed are primarily the health education of patients. Psychological help is needed not only because personality traits or other psychological factors are risk factors for cardiovascular disease, but also because the treatment and rehabilitation themselves are a source of stress [4].

There are known studies on the rehabilitation of patients after myocardial infarction. It is important to remember that the rehabilitation of a cardiac patient involves work in an interdisciplinary team: cardiologists, psychologists, and physiotherapists. It should also be remembered how important psychological assistance is to the patient before starting treatment, during hospital treatment, but also after leaving hospital. Psychological therapy is carried out in this case in order to minimize the negative effects of the disease, establish an attitude towards illness and health, solve family problems or professional problems [4].

However, the question arises: What personality traits are characteristic of adults suffering from a congenital heart defect? There are very few such studies. There are studies on the personality traits of children, adolescents suffering from congenital heart defects, but there is a lack of studies on the personality traits of adults and their impact on quality of life. There are known studies showing a lower level of extroversion (causing a worsening of emotional functioning) in people aged 15-20 years suffering from congenital heart defects, compared to healthy people. Patients were examined to determine the level of extraversion, diligence, agreeableness, openness and neuroticism. It was also shown that girls achieved high scores in conscientiousness, while boys achieved low scores in neuroticism; as well as the fact that sick youth are less socially and emotionally adapted than healthy youth. It has also been shown that a higher level of extraversion is a good predictor of a higher level of quality of life, better emotional and social functioning. Similarly with the obtained low level of neuroticism or a higher level of conscientiousness. It was also shown that patients could not cope with stress. Most importantly, the above research helps in predicting the quality of life of patients in the future [9].

Personality traits such as optimism or conscientiousness, openness to experience are "cardioprotective" to a large extent prevent the development of cardiovascular

diseases. Optimism is one of the positive personality traits, understood as a tendency to anticipate good experiences in the future, protecting against coronary heart disease, especially in the elderly. These patients also reported less pain after surgery. Conscientiousness is a predictor of longevity in healthy people. The same applies to openness to experience [10].

Due to the fact that the work is pioneering, research hypotheses have been adopted on the basis of the correlation between the occurrence of cardiovascular diseases and personality type A.

THE AIM

Objective: To show personality traits typical of patients with congenital heart defects.

The aim of the work is to resolve the issue of personality specifics, and thus the different characteristics of people who suffer from congenital heart defects. Therefore, the following questions should be answered: Is there a relationship between personality traits and the occurrence of a congenital heart defect? What personality traits are characteristic for patients with congenital heart defects?

Adopted hypotheses:

Personality traits in psychological terms of patients with congenital heart defects.

Patients with congenital heart disease are characterized by high extraversion and low anxiety.

Patients with congenital heart disease are characterized by high empathy and low psychoticism.

Patients with congenital heart defects are characterized by low impulsivity and low risk propensity.

Women with congenital heart disease are characterized by low psychoticism and high anxiety as a condition.

Men with congenital heart defects are characterized by high levels of neuroticism, high levels of lying and average level of empathy.

MATERIALS AND METHODS

The examined group are patients with congenital heart defects, adult men, adult women, and the research area is John Paul II Hospital In Cracow, The Clinical Department of Cardiac and Vascular Diseases with the Intensive Cardiac Supervision Subdivision, Institute of Cardiology, Collegium Medicum of the Jagiellonian University in Cracow, John Paul II Hospital. The study involved 50 adults, including 29 women and 21 men, undergoing surgery In John Paul II Hospital In Cracow in the field of heart defects such as ASD and PFO, in age groups 0-19 years, 20-34, 35-49, 50-64, 65-74, 75-89 and over 90 years, with the level of education: basic, vocational, secondary, incomplete higher, higher; inhabiting: village, city up to 40 thousand residents, a city with a population of 41-61 thousand, and a city with a population of 60 thousand; civil status: single, married, divorced, widow/widower, separated; being: students, unemployed persons, working persons, pensioners, retirees.

The research was carried out personally by psychologist Adrianna Skoczek. Psychometric analysis was performed by quantitative and qualitative interpretation of psychological tests along with statistical calculation using the Statistica 12 program.

USED METHODS

Psychological tests:

EPQ-R (S) - Hans J. Eysenck and Sybil G. Eysenck [2]; consisting of 48 questions, examines the level of neuroticism, extraversion, psychoticism, lies

IVE - Hans J. Eysenck and Sybil G. Eystenck [11] consists of 54 questions, examines impulsiveness, risk-taking, empathy

STAI C. D. Spielberger, R. L. Gorsuch, R. E. Lushene [12] - consisting of 40 questions, examines the level of anxiety as a state and as a trait

STATISTICAL ANALYSIS TOOLS

In the studies, qualitative and quantitative traits were assessed. The analysis of each of them has its own specificity, which consists in applying adequate statistical tools to comparisons. In order to characterize the structure of the variables studied, basic descriptive statistics were calculated in the form of position and variability measures. The verification of the normality of distributions of the analysed variables was carried out using the Shapiro-Wilk test. In order to determine the strength of the link between the variables, the vectors of the Spearman's rank correlation coefficients were calculated. Non-parametric Significance Test of Mann-Whitney U Differences was used as well as nonparametric analysis of Kurskall-Wallis variance and multiple comparison tests. The structure index was calculated for variables measured in rank and nominal scales. A significance level of 0.05 was assumed for all analyses. All analyses were performed using the Statistica v.12 package.

RESULTS

The analysis of the test results was started from the short characterization of the analysed sample due to the qualitative variables for which the structure indices were calculated.

42% of men and 58% of women participated in the study (Fig.1).

40% of respondents declared their secondary education, 26% vocational, 22% higher, and 6% basic and incomplete higher (Fig. 2).

50% of respondents declared a village as a residence, 24% a city over 61 thousand residents and 14% city to 41 thousand residents and 12% city from 41-61 thousand residents (Fig. 3).

46% of the female respondents were married, 30% of male respondents were married, 10% were in bachelor and 8% were maids, 4% were divorced and 2% were widows (Fig.4).

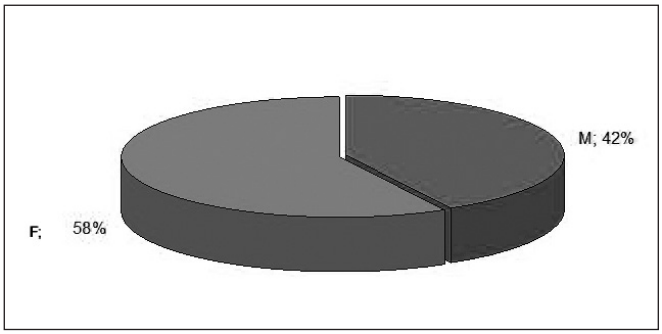

Fig. 1. Sex

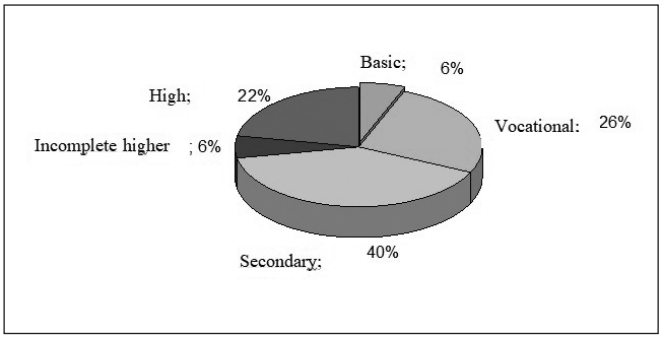

Fig. 2. Level of education

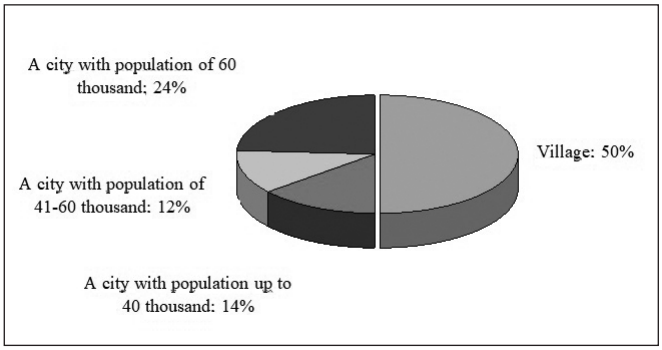

Fig. 3. Place of residence

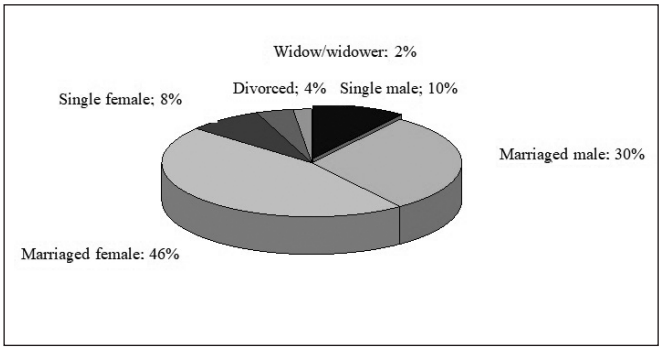

Fig. 4. Marital status

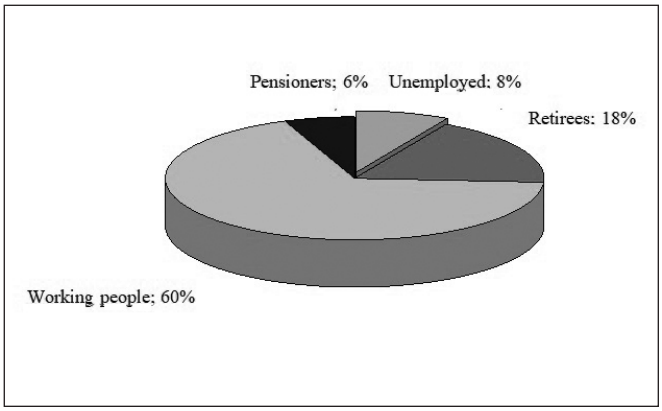

Fig. 5. Work

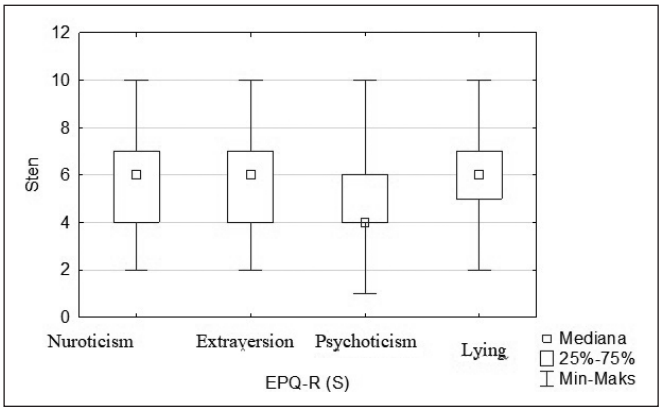

Fig. 6. Categorized box chart of EPQ-R(S) results obtained in the whole group.

68% of respondents were working people, 18% were pensioners and 8% were unemployed and 6% were retired (Fig. 5).

DESCRIPTIVE STATISTICS

The median age in the analyzed group is 47 years, the minimum age is 22 years and the maximum age is 68 years.

TEST RESULTS FOR THE ENTIRE SAMPLE

The analysis of the results allowed to state that the highest sten scores in the EPQ-R (S) test occurred in the neurotics median = 6, the extraversion median = 6 and the median lie = 6 (mean results). The highest results in the IVE test occurred in the case of empirical median = 6.5 (high score) and in the STAI test the highest score occurred for anxiety as sten 5 (average score).

TEST RESULTS FOR MEN

The analysis of the results allowed to state that the highest sten scores in the EPQ-R (S) test occurred in the median = 6 (median results). The highest results in the IVE test occurred in the case of empirical median = 6 (average score) and in the STAI test the highest score occurred for anxiety as sten 6 (average score).

Table 1. Value p for multiple (double-sided) comparisons; Sten (Sheet6) Independent variable (grouping): EPQ-R (S)

Variable	Average	Median	Minimum	Maximum	Standard deviation	Coefficient of variation
age	46.28	47.00	22.00	68.00	12.48	26.96

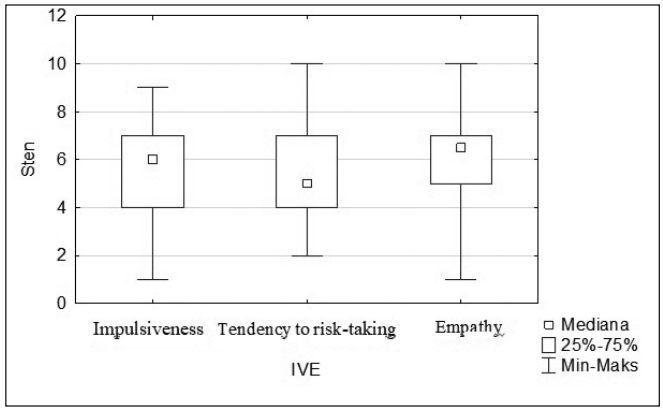

Fig. 7. Categorized box chart of IVE results obtained in the whole group.

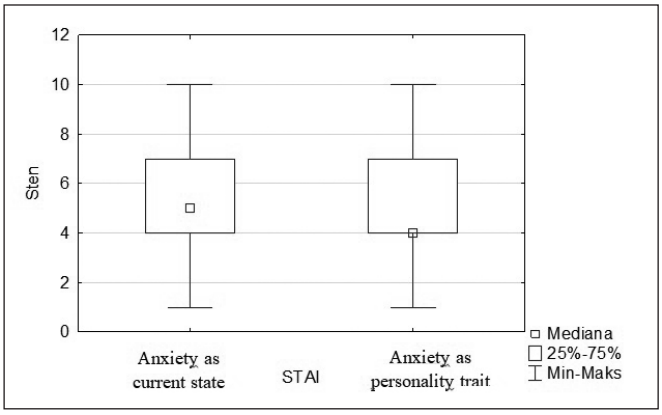

Fig. 8. Categorized box chart of STAI results obtained in the whole group.

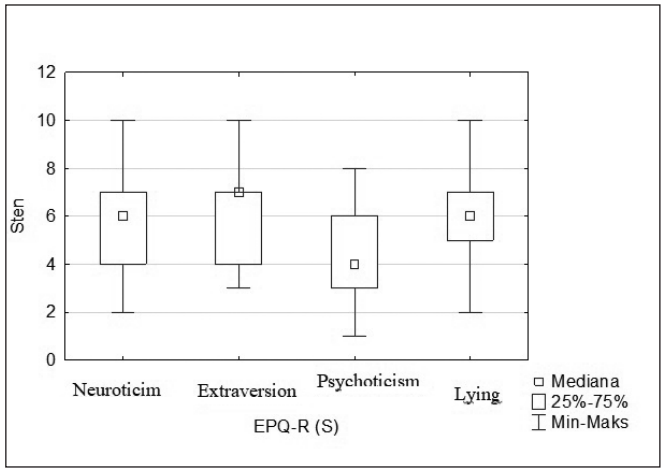

Fig. 9. Categorized box chart of EPQ-R(S) results obtained in the group of man.

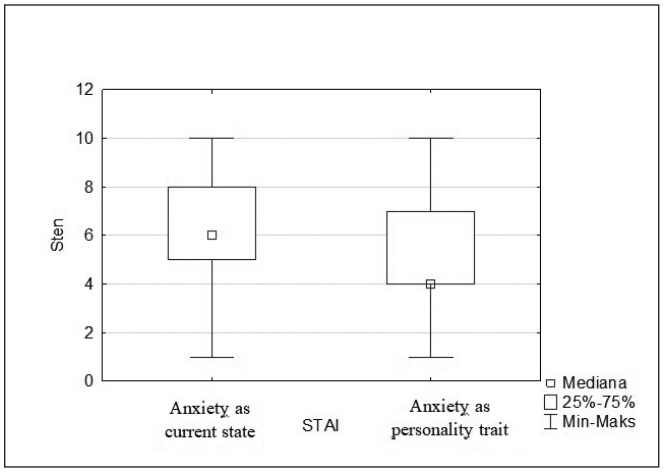

Fig. 10. Categorized box chart of EPQ-R(S) results obtained in the group of woman.

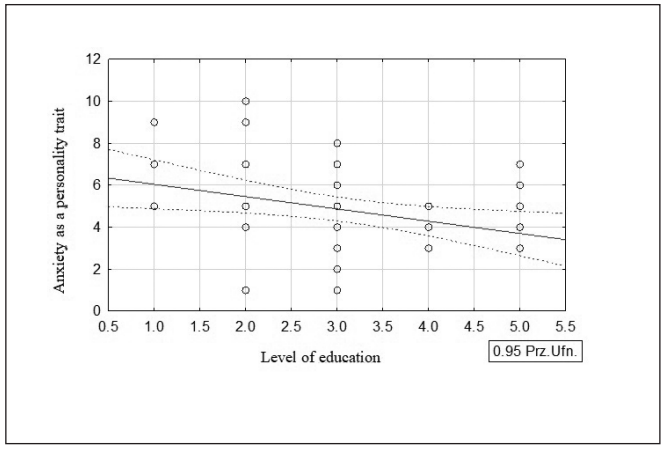

Fig. 11. Correlation of Spearman's rank order (level of education and ankiety as a trait). The correlation coefficients determined are significant with p <.05000.

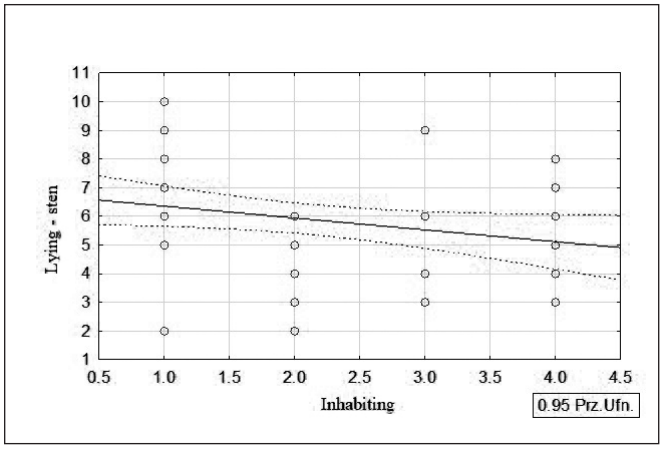

Fig. 12. Correlation of Spearman's rank order (inhabiting and lying trait). The correlation coefficients determined are significant with p <.05000.

TEST RESULTS FOR WOMEN

The analysis of the results allowed to state that the highest sten scores in the EPQ-R (S) test occurred in the extraversion median = 7 (high result). The highest results in the IVE test occurred in the case of empathy median = 7 (high result) and in the STAI test the highest score occurred for anxiety as a state and as a trait 6 (average score):

1. Neuroticism is clearly the strongest characteristic of people with congenital heart defects.
2. Extraversion is characteristic of people suffering from congenital heart disease.
3. Psychotism is not characteristic of people with congenital heart defects.
4. The lie is characteristic of people with congenital heart defects.

Subsequent analyses were aimed at verifying whether there are significant differences between the results converted into stents for individual EPQ-R (S), IVE and STAI tests. For this, Anova Kruskala-Wallis and the Mann-Whitney U test for the STAI test were used (Tab. 1).

Kruskal-Wallis test: H (3, N = 200) = 11.63656 p = 0.0087 (Fig. 6).

The analysis provided the basis for finding significant differences H (3, N = 200) = 11.63 p = 0.0087. In the analyzed group extraversion was significantly higher than psychotism p = 0.046 and the results of the lie were statistically significantly higher than psychoticism.

There were no significant differences between item values in the IVE test: H (2, N = 150) = 4.28; p = 0.12 (Fig.7).

There were no significant differences between item values in the STAI test: p = 0.09 (Fig. 8-9).

The same analyses were carried out by women and men:

1. Empathy is clearly the strongest characteristic of women with congenital heart defects.
2. Neuroticism is characteristic of women with congenital heart defects.

There were no significant differences in the case of women between items in the EPQ-R (S) test. Kruskal-Wallis test: H (3, N = 116) = 5.52 p = 0.14 (Fig. 10):

1. A high level of psychoticism is characteristic of men suffering from congenital heart disease.
2. Extraversion is not a characteristic feature for men with congenital heart defects.

The analysis provided the basis for finding significant differences H (3, N = 84) = 8.80; p = 0.032. In the analyzed group extraversion for men was significantly higher than psychotism p = 0.027 and the results of the lie were statistically significantly higher than psychoticism:

1. A lie is characteristic of women with congenital heart defects.
2. Impulsivity is not a characteristic feature of women suffering from congenital heart disease.

There were no significant differences between the items' values for women in the IVE test: H (2, N = 87) = 2.31 p = 0.31.

Inclination to risk is characteristic for men with congenital heart disease.

There were no significant differences between the items' values for men in the IVE test: H (2, N = 63) = 1.85 p = 0.40

Anxiety as a condition is characteristic of women suffering from congenital heart disease.

In the case of women, the results of the variable anxiety as a state were statistically significantly higher than the results of anxiety as a trait p = 0.032.

1. Anxiety as a trait is not a characteristic feature for men with congenital heart defects.

In men, there were no significant differences between the results of anxiety variables as a state and anxiety as a trait of> 0.05.

Subsequent analyzes were aimed at verifying whether gender significantly differentiates the results of EPQ-R (S), IVE and STAI.

The analysis of the results did not give grounds for stating that the sex significantly differentiates the results of EPQ-R (S), IVE and STAI tests p> 0.05.

Another analysis aimed at verifying whether the age is significantly statistically related to the results of tests carried out for this purpose, the Spearman rank correlation coefficient was applied.

There were no statistically significant associations between age and results of the analyzed tests p> 0.05.

Another analysis aimed at verifying whether education is significantly statistically related to the results of tests carried out for this purpose, the Spearman's rank correlation coefficient was applied.

Correlation of Spearman's rank order. The correlation coefficients determined are significant with p <.05000

The analysis allowed to find a statistically significant negative average correlation between the variables Education & Anxiety as a trait - sten R = -0.39; p = 0.005. Along with the increase in the level of education, the level of anxiety as a trait decreases (Fig. 11).

Another analysis aimed at verifying whether education is significantly statistically related to the results of tests carried out for this purpose, the Spearman's rank correlation coefficient was applied.

Correlation of Spearman's rank order. The correlation coefficients determined are significant with p <.05000

The analysis made it possible to find a statistically significant negative average correlation between the variables Place of location & Lie - sten R = -0.33; p = 0.02. With the increase in the place of residence, the level of the variable lie decreased (Fig. 12).

Another analysis aimed to verify whether marital status significantly differentiates the analyzed results of EPQ-R (S), IVE and STAI tests

Analysis of the results did not give grounds for stating that marital status significantly differentiates the results of the analyzed tests by p> 0.05.

The next analysis was to verify whether the work significantly differentiates the analyzed results of EPQ-R (S), IVE and STAI tests

The analysis of the results did not give grounds for stating that the work significantly differentiates the results of the analyzed tests by p> 0.05.

DISCUSSION

The analysis of the research results allowed to state that the highest sten results in the EPQ-R (S) test occurred in neu-

roticism, extraversion and a lie. The highest results in the IVE test occurred in the case of empathy, while in the STAI test the highest results occurred for anxiety as a condition.

In the case of men, they obtained the highest sten scores in the EPQ-R (S) test on the lie scale. The highest results in the IVE test occurred in the case of empathy, while in the STAI test the highest results occurred for anxiety as a condition.

In the case of women, they obtained the highest results in the EPQ-R (S) test on the extraversion scale. The highest results in the IVE test occurred in the case of empathy, and in the case of the STAI test the highest results occurred for anxiety as a condition and as a trait:

1. Neuroticism is clearly the strongest characteristic of people with congenital heart disease.
2. Extraversion is characteristic of people suffering from a congenital heart disease.
3. Psychoticism is not characteristic of people with congenital heart disease.
4. Lying is characteristic of people with congenital heart disease.
5. Empathy is clearly the strongest characteristic of women and men with congenital heart disease.
6. Neuroticism is characteristic of women with congenital heart disease.
7. A high level of psychoticism is characteristic of men suffering from a congenital heart disease.
8. Extraversion is not a characteristic feature for men with congenital heart disease.
9. Lying is characteristic of women with congenital heart disease.
10. Impulsiveness is not a characteristic feature of women suffering from congenital heart disease.
11. Anxiety as a condition is characteristic of women suffering from a congenital heart disease.
12. Anxiety as a trait is not a characteristic feature of men with congenital heart disease.

The analysis gave rise to significant differences. In the analyzed group, extraversion for men was significantly higher than psychoticism and the results of lies were statistically significantly higher than psychoticism. There were no significant differences between the values of items for women in the IVE test. Tendency to risk is characteristic for men with congenital heart disease. There were no significant differences between the values of items for men in the IVE test.

In men, no significant differences were found between the results of the variables anxiety as a condition and anxiety as a trait $p > 0.05$. Analysis of the results did not give grounds to conclude that gender significantly differentiates the results of the EPQ-R (S), IVE and STAI tests $p > 0.05$. There were no statistically significant correlations between age and the results of the analyzed tests $p > 0.05$. As the level of education increases, the level of anxiety as a feature decreases. Place of residence influenced the level of the variable lie. Analysis of the results did not give grounds to state that marital status significantly differentiates the results of the analyzed tests $p > 0.05$. The analysis of the results did not give rise to the conclusion that the work significantly differentiates the results of the analyzed tests $p > 0.05$.

CONCLUSIONS

Research on the relationship between congenital heart defects and personality traits of people suffering from congenital heart defects are very important in the everyday practice of every doctor. The well-being of a patient with a congenital heart disease requires interdisciplinary care consisting of specialists from various fields, such as doctors, nurses, midwives, physical therapists, psychologists, and nutritionists [5].

Due to scarce scientific data on this issue, and mainly concerning ischemic myocardial disease, as a model unit in cardiology, activities that could lead to the establishment of the aforementioned relationship should be intensified. This subject is dealt with in psychocardiology focused on: health promotion, psychoprophylaxis, facilitating the prevention, early detection and treatment of cardiological diseases, alleviating the consequences of diagnosis, therapy of cardiological diseases. The activities of psychocardiologists are also directed at the education of members of a multidisciplinary, cooperating therapeutic team; conducting scientific research in the field of psychology, sociology and medicine, because the results of the above-mentioned individual studies can contribute to the emergence of effective methods in the fight against cardiovascular diseases [5].

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Conflict of interest
Authors declare no conflict of interest

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Original Article

Psychological correlates of patients' identity suffering from atrial septal defect (ASD) and patent foramen ovale (PFO)

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Contributions: (I) Conception and design: A Skoczek, M Komar; (II) Administrative support: All authors; (III) Provision of study materials or patients: A Skoczek, P Podolec, M Komar; (IV) Collection and assembly of data: A Skoczek, P Prochownik, P Podolec, M Komar; (V) Data analysis and interpretation: A Skoczek, P Podolec, M Komar; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

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Background: The work presents a research project carried out in hospital with participation of 100 (50 female, 50 male) patients with congenital heart defects [atrial septal defect (ASD) and patent foramen ovale (PFO)]. The aim of the study was to identify specific personality traits of patients with congenital heart defects and to check the psychological functioning of patients by examining: the level of anxiety, impulsiveness, tendency to risk-taking, empathy, neuroticism, extraversion, psychoticism and lying. The presented results and their statistical analyses showed specific personality traits of patients with congenital heart defects.

Methods: The research was conducted by psychologist Adrianna Skoczek. We performed a psychological clinical assessment and conducted the psychological tests like Eysenck Personality Questionnaire-Revised Short Version [EPQ-R(S)] and Eysenck's Impulsivity Inventory (IVE) by Hans J. Eysenck and Sybil G. Eystenck, the State-Trait Anxiety Inventory (STAI) by C. D. Spielberger, R. L. Gorsuch, R. E. Lushene describing personality traits of patients.

Results: The level of extraversion was statistically significantly higher than the level of all other variables. The level of lies was significantly different from the level of psychoticism, which in turn was statistically significantly lower than all other. In the case of the examined women, statistically significant differences were found only between the level of psychoticism and all other analyzed variables.

Conclusions: The conducted research shows that patients suffering from ASD or PFO have specific personality traits what allow to better understanding of suffering patients.

Keywords: Atrial septal defect (ASD); patent foramen ovale (PFO); personality, personality traits, congenital heart defects

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Introduction

Atrial septal defect (ASD) is the most common acyanotic heart defect. ASD occurs in 30–40% in general population of all adult patients, while persistent oval hole (PFO) in 20–25% of adult patients. Correctly constructed atrial septum consists of a primary, secondary septum, atrioventricular septum (1).

PFO

PFO is a remnant of the so-called oval opening connecting

the right and left atria of the heart in utero. After changing the pressure in the atria after birth, the oval opening closes. This process may last until the first year of life. However even in healthy people, it is not completely closed (2). Increasing pressure in the right atrium resulting in a change in flow from left-right to right-left (1,3) may be problematic. A PFO is not a heart defect, it does not require special treatment (3). PFO is associated with the risk of stroke (1) and may result in stroke, migraine headaches, and complications of decompression sickness in divers (3).

Secondary ASD

ASD, the so-called secondary ASD. A small defect of the secondary hole type can grow in the first decade of life, those measuring over 20 mm are considered large (1). In this heart defect, the main problem is the lack of continuity of the septum tissue that causes direct blood flow between the left and right atria. We distinguish secondary ASDII defects, first ASDI defects and coronary sinus defects (3).

Treatment

In the event of re-embolism into the central nervous system, the patient is directed to percutaneous closure of PFO, but first of all, if there is an atrial septal aneurysm, the next stage is antiplatelet therapy (4).

In the case of low leakage and normal pulmonary pressure, the patient does not require any medical activities or recommendations; whereas in the case of left-right leakage, invasive treatment should be performed, the decision of which is made individually depending on additional adverse circumstances; in case of tricuspid regurgitation, surgery is required (5).

According to American Heart Association/American College of Cardiology (AHA/ACC) and European Society of Cardiology (ESC), one of the most commonly used treatment methods are surgical treatment and percutaneous interventions. This applies to ASD and PFO.

The mortality associated with surgical treatment is below 1% in persons without additional disease burden. The prognosis is worse in elderly patients, especially those with additional morbidity (6,7).

The method of choice in the ASD treatment is percutaneous closure of the defect. The required condition is a maximum diameter of the defect below 38 mm and a width of the edge 5 mm along the entire circumference except for the parts at the aorta (6,7).

Such treatment is possible in approximately 80% of patients. There have been no deaths in several recent studies. About 1% of patients, however, suffered serious complications. Some patients experience transient atrial tachyarrhythmias in the peri-operative period. Atrial or aortic wall damage and thromboembolic events are very rare. It is recommended that all patients undergoing percutaneous closure of ASD have antiplatelet therapy of 100 mg or more of acetylsalicylic acid per 24 hours (6,7).

The following hypotheses were adopted:

(I) Empathy is clearly the strongest characteristic of women with congenital heart disease;
(II) A high level of psychoticism is characteristic of men suffering from a congenital heart disease;
(III) Neuroticism is characteristic of women with congenital heart disease;
(IV) Extraversion is not a characteristic feature for men with congenital heart disease;
(V) Lying is characteristic of women with congenital heart disease;
(VI) Impulsiveness is not a characteristic feature of women suffering from congenital heart disease;
(VII) Tendency to risk is characteristic of men with congenital heart disease;
(VIII) Anxiety as a condition is characteristic of women suffering from a congenital heart disease;
(IX) Anxiety as a trait is not a characteristic trait for men with congenital heart disease;
(X) Young people (<40 years old) suffering from congenital heart disease ASD are characterized by low levels of psychoticism, high anxiety as a condition and high empathy;
(XI) Elderly people (>40 years old) suffering from congenital heart disease ASD are characterized by high levels of impulsiveness and risk appetite, as well as low levels of extraversion, and high levels of lies;
(XII) Young people (<40 years old) suffering from congenital heart disease PFO are characterized by low levels of anxiety as a trait, and high levels of empathy;
(XIII) Older people (>40 years old) suffering from congenital heart disease PFO are characterized by high levels of neuroticism, low levels of lies, and low levels of impulsiveness;
(XIV) Anxiety as a condition is a characteristic feature for people suffering from ASD heart disease—before surgery;

(XV) Anxiety as a trait is a characteristic trait for people suffering from PFO heart defect—after surgery.

Objectives

We aimed to assess personality traits of clients suffer PFO and ASD in group of the woman and the man, in age ranges 0–19, 20–34, 35–49, 50–64, 65–74, 75–89 and above 90 years old; with the level of education: basic, secondary, vocational, incomplete higher, higher,; inhabiting: in the countryside, in a city up to 41,000 inhabitants, in a city of 41,000–61,000 inhabitants, a city of over 61,000 inhabitants; including marital status: marriage, divorces, widowers/widows; on employment: unemployed, employed, pensioners; before and after the procedure.

Methods

We performed a psychological clinical assessment and conducted the psychological tests like Eysenck Personality Questionnaire-Revised Short Version [EPQ-R(S)] by Hans J. Eysenck and Sybil G. Eysenck, the Eysenck's Impulsivity Inventory (IVE) by Hans J. Eysenck and Sybil G. Eystenck, the State-Trait Anxiety Inventory (STAI) by C. D. Spielberger, R. L. Gorsuch, R. E. Lushene describing personality traits of patients.

Statistical development of research results

Statistical tests were performed using IBM SPSS Statistics version 25 to test the hypotheses set out in the study.

With its help, frequency analysis, analysis of basic descriptive statistics together with the Kolmogorov-Smirnov distribution normality test, Pearson r correlation analysis, variance analysis in intra-group schemas, Mann-Whitney U tests for independent samples and Student's *t*-tests for dependent and independent samples were performed.

Results

Patients (female =50, male =50), with ASD (n=70) and with PFO (n=30); before surgery n=79, after surgery n=21; with the level of education: basic (n=5), secondary n=41, vocational n=23, incomplete higher n=4, higher n=27; residents: in the countryside n=43, in the city up to 41,000 inhabitants n=15, in the city 41,000–61,000 inhabitants n=12, a city with over 61,000 inhabitants n=30; including marital status n=20, married n=73, divorcees n=5, widower/widow n=2; on employment: the unemployed n=9, employed n=71, pensioners n=15, pensioners n=5.

The results of the EPQ-R(S) test turned out to be statistically significant, for $P<0.001$; The level of extraversion was statistically significantly higher than the level of all other variables. The level of lies was significantly different from the level of psychoticism, which in turn was statistically significantly lower than all other variables. Similarly, in the case of the IVE test, the result turned out to be statistically significant, also for $P<0.001$. In the case of the examined women, statistically significant differences were found only between the level of psychoticism and all other analyzed variables. The results of extraversion, neuroticism and lies do not differ statistically from each other, and the level of declared empathy was statistically significantly higher than the levels of impulsiveness and tendency to risk-taking. The difference between impulsiveness and risk tendency to risk-taking turned out to be statistically significant, there were no significant statistical differences in the field of anxiety as a condition and trait. For men, an insignificant difference was only observed between the level of neuroticism and the scale of lies; the difference between impulsiveness and tendency to risk-taking also turned out to be statistically significant, just as in the case of women no significant statistical differences were found in the field of anxiety as a condition and trait. There was no statistically significant difference between the analyzed variables of anxiety as a trait and anxiety as a condition of persons before the surgery of people suffering from ASD and after surgery in people suffering from PFO. For people over 40 years of age suffering from ASD, an insignificant difference was only observed between the levels of extraversion and lies.

The level of declared empathy was statistically significantly higher than the levels of impulsiveness and tendency to risk-taking. The difference between impulsiveness and tendency to risk-taking turned out to be statistically insignificant. Based on the results, no statistically significant differences were found between the analyzed variables—anxiety as a trait and anxiety as a condition. In the case of people suffering from the same condition below 40 years of age, a significant difference was observed only between levels of psychoticism and other variables, i.e., neuroticism, extraversion, and lies. The level of declared empathy was statistically significantly higher than the levels of impulsiveness and tendency to risk-taking. The difference between impulsiveness and tendency to risk-taking turned

Table 1 Basic descriptive statistics together with the distribution normality test

Psychological method	M	Mdn	SD	Sk.	Kurt.	Min	Max	K-S	P
EPQ-R(S)									
Neuroticism	5.86	6.00	3.58	0.11	–1.13	0.00	12.00	0.12	0.002
Extraversion	8.39	9.00	2.52	–0.46	–0.68	2.00	12.00	0.17	<0.001
Psychoticism	2.54	2.00	1.67	1.24	3.32	0.00	10.00	0.19	<0.001
Lies	7.21	7.00	2.77	–0.31	–0.33	0.00	12.00	0.10	0.014
IVE									
Impulsiveness	6.53	6.00	3.98	0.37	–0.74	0.00	15.00	0.13	<0.001
Tendency to risk-taking	5.86	4.00	4.01	0.69	–0.66	0.00	15.00	0.19	<0.001
Empathy	13.60	14.00	3.26	–0.94	1.37	1.00	19.00	0.13	<0.001
STAI									
Anxiety as a condition	40.46	39.00	11.09	0.31	–0.29	20.00	74.00	0.08	0.091
Anxiety as a trait	41.49	40.00	8.90	0.53	0.18	24.00	69.00	0.10	0.012

STAI, the State-Trait Anxiety Inventory; M, average; Mdn, median; SD, standard deviation; Sk., skewness; Kurt., kurtosis; Min, the lowest value; Max, highest value; K-S, Kolmogorov-Smirnov test result; EPQ-R(S), Eysenck Personality Questionnaire-Revised Short Version; IVE, Eysenck's Impulsivity Inventory.

out to be statistically insignificant. Based on the results, no statistically significant differences were found between the analyzed variables—anxiety as a trait and anxiety as a condition. For people suffering from PFO over 40, the level of lies turned out to be statistically significantly higher only than the level of psychoticism. The level of extraversion turned out to be statistically significantly higher only than the level of psychoticism. Other comparisons were not statistically significant. The level of declared empathy was statistically significantly higher than the levels of impulsiveness and tendency to risk-taking. The difference between impulsiveness and tendency to risk-taking turned out to be statistically insignificant. Based on the results, no statistically significant differences were found between the analyzed variables—anxiety as a trait and anxiety as a condition. In people with PFO under 40, the level of extraversion turned out to be statistically significantly higher only than the level of psychoticism. In turn, the level of lies turned out to be statistically significantly higher only than the level of psychoticism. Considering the level of neuroticism, it also turned out to be statistically significantly higher only at the level of psychoticism. The level of declared empathy was statistically significantly higher than the levels of impulsiveness and tendency to risk-taking. The difference between impulsiveness and tendency to risk-taking turned out to be statistically insignificant. Based on the results, no statistically significant differences were found between the analyzed variables—anxiety as a trait and anxiety as a condition.

Basic descriptive statistics of measured quantitative variables

In order to check whether the assumption about the compliance of the distribution of measured quantitative variables with the normal distribution was met, the first analysis of basic descriptive statistics together with the Kolmogorov-Smirnov test was performed. The quantitative variables that were used to carry out the tests described later in the work were analyzed. In each case, the result of the distribution normality test turned out to be statistically significant. This means that the distributions of the analyzed variables are not normal. Nevertheless, under no circumstances does the skewness value exceed the contractual absolute value of 2 (8). The results of all calculated statistics together with the distribution normality test are presented in *Table 1*. The level of significance was assumed to be $P<0.05$.

Table 2 The severity of personality traits measured by the EPQ-R(S) tool among the women surveyed

Traits	M	SD	F	P
Neuroticism	0.57	0.29	34.96	<0.001
Extraversion	0.65	0.23		
Psychoticism	0.22	0.15		
Lies	0.65	0.23		

EPQ-R(S), Eysenck Personality Questionnaire-Revised Short Version; M, average; SD, standard deviation.

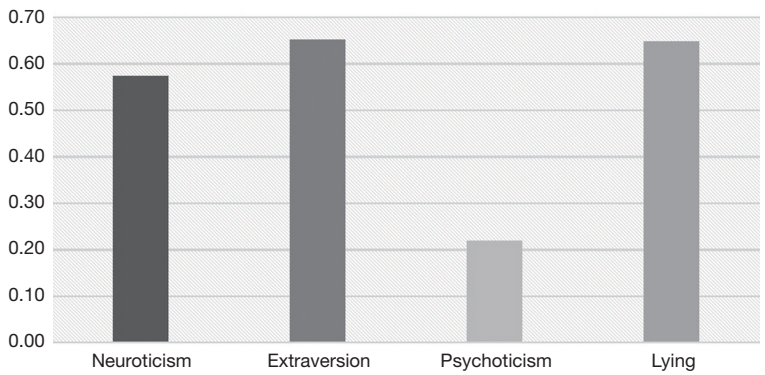

Figure 1 The average of the analyzed dimensions of the EPQ-R(S) tool Hans J. Eysenck and Sybil G. Eysenck for the examined women. EPQ-R(S), Eysenck Personality Questionnaire-Revised Short Version.

Congenital heart disease and personality traits among women

Analyzes were carried out among a group of women. First, an analysis of the variance of results obtained by the examined women on the scales of the tool EPQ-R(S) (9) was performed. Due to violation of the assumption about the sphericity of variables, the Greenhouse-Geisser correction was applied in reporting the result of the analysis. The test result proved to be statistically significant [F (2.40; 117.40) =34.96; P<0.001; η2 =0.42]. The eta value of the square indicates that the observed effect is strong. In order to check the essence of this effect, a *post hoc* analysis (with Bonferroni correction) was carried out. Statistically significant differences were found only between the level of psychoticism and all other analyzed variables. The results of extraversion, neuroticism and lies do not differ statistically significantly. The discussed average values are presented in *Table 2* and *Figure 1*.

Then, an analogous analysis of the variance of results obtained was carried out on the scales of the IVE tool (10). The test result proved to be statistically significant [F (2, 98) =95.71; P<0.001; η2 =0.66]. The eta value of the square indicates that the observed effect is very strong. In order to check the essence of this effect, a *post hoc* analysis (with Bonferroni correction) was carried out. The level of declared empathy was statistically significantly higher than the levels of impulsiveness and tendency to risk-taking. The difference between impulsiveness and tendency to risk-taking also turned out to be statistically significant. The values of the discussed means and the result of the analysis of variance are presented in *Table 3* and *Figure 2*.

Then the Student's *t*-test analysis for repeated measurements was performed. The results obtained by the examined women on the scales of the STAI tool (11) were compared with each other.

Based on the results presented in *Table 4*, no statistically significant difference was found between the analyzed variables. The compared means are illustrated in *Figure 3*.

Congenital heart disease and personality traits among men

Then, similar analyzes were carried out among the studied men. First, the analysis of variance results obtained on the tool scales EPQ-R(S) (9). Due to violation of the assumption

Table 3 The severity of personality traits measured by the IVE tool Hans J. Eysenck and Sybil G. Eysenck among the women surveyed

Traits	M	SD	F	P
Impulsiveness	0.35	0.21	95.71	<0.001
Tendency to risk-taking	0.26	0.21		
Empathy	0.75	0.17		

IVE, Eysenck's Impulsivity Inventory; M, average; SD, standard deviation.

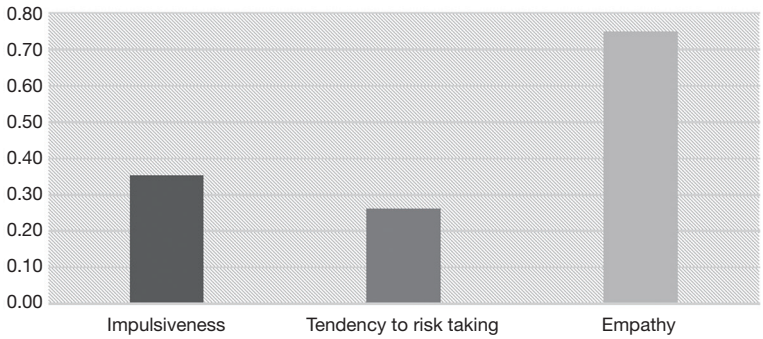

Figure 2 Average of analyzed dimensions of the IVE tool Hans J. Eysenck and Sybil G. Eysenck for the examined women. IVE, Eysenck's Impulsivity Inventory.

Table 4 The severity of traits measured with the STAI tool C. D. Spielberger, R. L. Gorsuch, R. E. Lushene among the examined women

Features	M	SD	*t*	P	95% CI		d Cohena
					LL	UL	
Anxiety as a trait	2.22	0.46	0.05	0.961	–0.16	0.17	0.00
Anxiety as a condition	2.22	0.56					

STAI, the State-Trait Anxiety Inventory; M, average; SD, standard deviation; CI, confidence interval for the difference between means; LL and UL, lower and upper limits of the confidence interval.

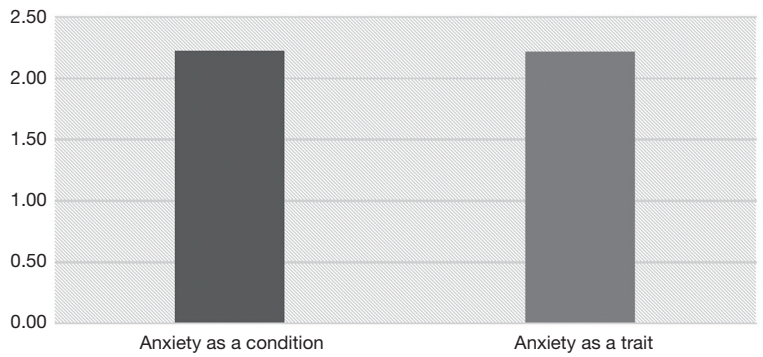

Figure 3 The average of the analyzed dimensions of the STAI tool C. D. Spielberger, R. L. Gorsuch, R. E. Lushene for the examined women. STAI, the State-Trait Anxiety Inventory.

Table 5 The severity of personality traits measured by the EPQ-R(S) tool Hans J. Eysenck and Sybil G. Eysenck among the surveyed men

Traits	M	SD	F	P
Neuroticism	0.40	0.28	53.41	<0.001
Extraversion	0.75	0.18		
Psychoticism	0.21	0.13		
Lies	0.55	0.22		

EPQ-R(S), Eysenck Personality Questionnaire-Revised Short Version; M, average; SD, standard deviation.

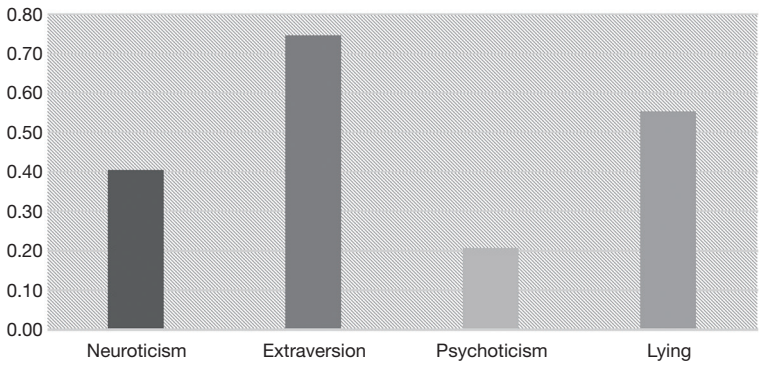

Figure 4 The average of the analyzed dimensions of the EPQ-R(S) tool Hans J. Eysenck and Sybil G. Eysenck for the examined men. EPQ-R(S), Eysenck Personality Questionnaire-Revised Short Version.

Table 6 The intensification of personality traits measured by the IVE tool Hans J. Eysenck and Sybil G. Eysenck among the surveyed men

Traits	M	SD	F	P
Impulsiveness	0.34	0.21	36.63	<0.001
Tendency to risk-taking	0.47	0.25		
Empathy	0.68	0.17		

IVE, Eysenck's Impulsivity Inventory; M, average; SD, standard deviation.

about the sphericity of variables, the Greenhouse-Geisser correction was applied in reporting the result of the analysis. The test result turned out to be statistically significant [F (2.35; 115.35) =53.41; P<0.001; η2 =0.52]. The eta value of the square indicates that the observed effect is very strong. In order to check the essence of this effect, a *post hoc* analysis (with Bonferroni correction) was carried out. An insignificant difference was only observed between the level of neuroticism and the scale of lies. The discussed average is presented in *Table 5* and *Figure 4*.

Then, an analogous analysis of the variance of results obtained on the IVE scales was carried out by (10). Due to violation of the assumption about the sphericity of variables, the Greenhouse-Geisser correction was applied in reporting the result of the analysis. The test result proved to be statistically significant [F (1.78; 87.31) =36.63; P<0.001; η2 =0.43]. The eta value of the square indicates that the observed effect is very strong. In order to check the essence of this effect, a *post hoc* analysis (with Bonferroni correction) was carried out. The level of declared empathy was statistically significantly higher than the levels of impulsiveness and tendency to risk-taking. The difference between impulsiveness and tendency to risk-taking also turned out to be statistically significant. The values of the discussed means and the result of the analysis of variance are presented in *Table 6* and *Figure 5*.

Then the Student's *t*-test analysis for repeated measurements was performed. The results obtained by the

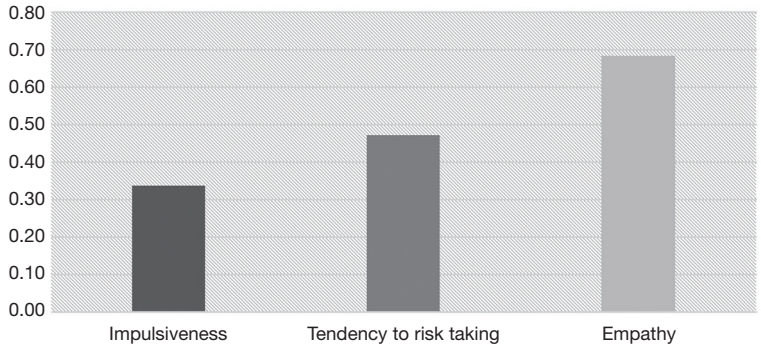

Figure 5 Average of analyzed dimensions of IVE tool Hans J. Eysenck and Sybil G. Eysenck for the examined men. IVE, Eysenck's Impulsivity Inventory.

Table 7 The severity of traits measured by the STAI tool C. D. Spielberger, R. L. Gorsuch, R. E. Lushene among the examined men

Features	M	SD	*t*	P	95% CI		d Cohena
					LL	UL	
Anxiety as a trait	1.83	0.47	–2.17	0.035	–0.21	–0.01	0.25
Anxiety as a condition	1.93	0.38					

STAI, the State-Trait Anxiety Inventory; M, average; SD, standard deviation; CI, confidence interval for the difference between means; LL and UL, lower and upper limits of the confidence interval.

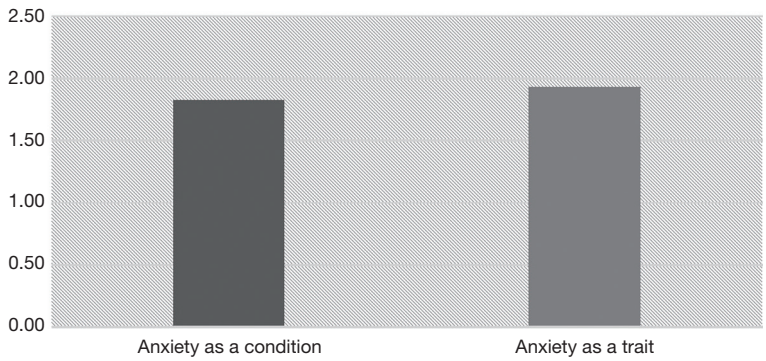

Figure 6 Average of the analyzed dimensions of the STAI tool for the examined men. STAI, the State-Trait Anxiety Inventory.

examined men on the scales of the STAI tool (11) were compared with each other.

Based on the results presented in *Table 7*, a statistically significant difference was found between the analyzed variables. The compared means are illustrated in *Figure 6*.

Personality traits among patients with ASD before the surgery

To verify the next hypothesis, a Student's *t*-test was carried out for dependent samples. The results obtained on the scales of the STAI tool (11) were compared by the respondents with ASD defect before surgery. Based on the results presented in *Table 8*, no statistically significant difference was found between the analyzed variables. The compared means are illustrated in *Figure 7*.

Personality traits among patients with PFO defect after surgery

To verify the next hypothesis, a Student's *t*-test was carried

Table 8 Strength of features measured with the STAI tool C. D. Spielberger, R. L. Gorsuch, R. E. Lushene among subjects with ASD defect prior to surgery

Features	M	SD	*t*	P	95% CI		d Cohena
					LL	UL	
Anxiety as a trait	2.01	0.40	0.28	0.781	–0.10	0.13	0.04
Anxiety as a condition	2.03	0.52					

STAI, the State-Trait Anxiety Inventory; ASD, atrial septal defect; N, number of observations; M, average; SD, standard deviation; CI, confidence interval for the difference between means; LL and UL, lower and upper limits of the confidence interval.

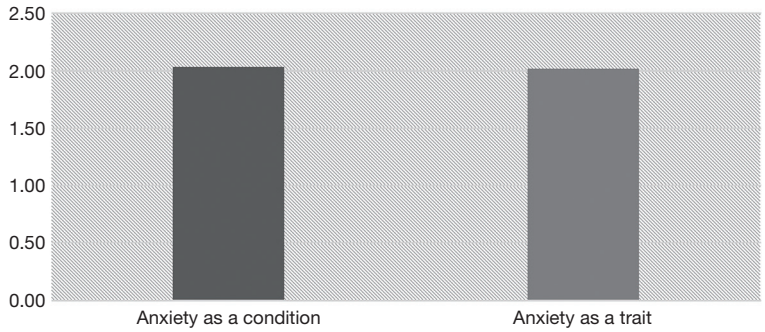

Figure 7 Mean of the analyzed dimensions of the STAI tool C. D. Spielberger, R. L. Gorsuch, R. E. Lushene for subjects with ASD defect before surgery. STAI, the State-Trait Anxiety Inventory; ASD, atrial septal defect.

out for dependent samples. The results obtained on the scales of the STAI tool (11) were compared by subjects with a PFO defect after surgery. Based on the results presented in *Table 9*, no statistically significant difference was found between the analyzed variables. The compared means are illustrated in *Figure 8*.

Congenital heart disease ASD and personality traits in the group over 40 years of age

In order to verify the next hypothesis, analogous analyzes were carried out, but among those with ASD over 40. First, an analysis of the variance of results obtained by this group of subjects on the scales of the EPQ-R(S) (9) tool was performed. Due to violation of the assumption about the sphericity of variables, the Greenhouse-Geisser correction was applied in reporting the result of the analysis. The test result turned out to be statistically significant [F (2.34; 103.10) =37.52; P<0.001; η2 =0.46]. The eta value of the square indicates that the observed effect is strong. In order to check the essence of this effect, a *post hoc* analysis (with Bonferroni correction) was carried out. An insignificant difference was only observed between the levels of extraversion and lies. The discussed average is presented in *Table 10* and *Figure 9*.

Then, an analogous analysis of the variance of results obtained on the IVE scales was carried out (10). Due to violation of the assumption about the sphericity of variables, the Greenhouse-Geisser correction was applied in reporting the result of the analysis. The test result turned out to be statistically significant [F (1.54; 67.91) =46.61; P<0.001; η2 =0.51]. The eta value of the square indicates that the observed effect is strong. In order to check the essence of this effect, a *post hoc* analysis (with Bonferroni correction) was carried out. The level of declared empathy was statistically significantly higher than the levels of impulsiveness and tendency to risk-taking. The difference between impulsiveness and tendency to risk-taking turned out to be statistically insignificant. The values of the discussed means and the result of the analysis of variance are presented in *Table 11* and *Figure 10*.

Then the Student's *t*-test analysis for repeated measurements was performed. The results obtained by subjects over 40 years old with ASD defect were compared with each other on the scales of the STAI tool (11). Based on the results presented in *Table 12*, no statistically significant differences were found between the analyzed variables. The compared means are illustrated in *Figure 11*.

Table 9 Intensification of features measured with the STAI tool C. D. Spielberger, R. L. Gorsuch, R. E. Lushene among patients with PFO defect after surgery

Features	M	SD	*t*	P	95% CI		d Cohena
					LL	UL	
Anxiety as a trait	1.73	0.25	1.53	0.267	–0.30	0.64	0.90
Anxiety as a condition	1.90	0.09					

STAI, the State-Trait Anxiety Inventory; PFO, patent foramen ovale; M, average; SD, standard deviation; CI, confidence interval for the difference between means; LL and UL, lower and upper limits of the confidence interval.

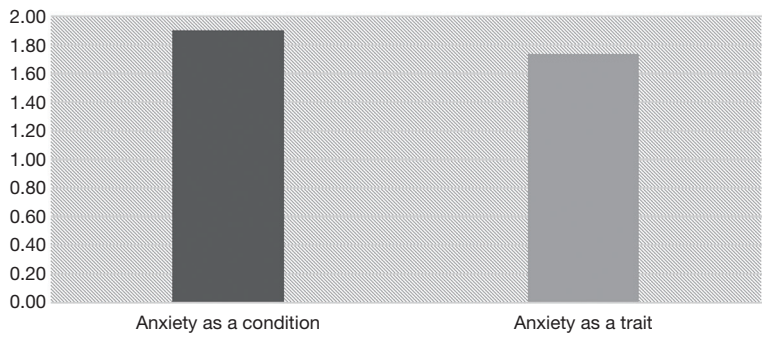

Figure 8 The average of the analyzed dimensions of the STAI tool C. D. Spielberger, R. L. Gorsuch, R. E. Lushene for subjects with PFO defect after surgery. STAI, the State-Trait Anxiety Inventory; PFO, patent foramen ovale.

Table 10 Intensification of personality traits measured with the EPQ-R(S) tool Hans J. Eysenck and Sybil G. Eysenck among those over 40 years old with ASD

Traits	M	SD	F	P
Neuroticism	0.43	0.29	37.52	<0.001
Extraversion	0.71	0.19		
Psychoticism	0.24	0.14		
Lies	0.61	0.23		

EPQ-R(S), Eysenck Personality Questionnaire-Revised Short Version; ASD, atrial septal defect; M, average; SD, standard deviation.

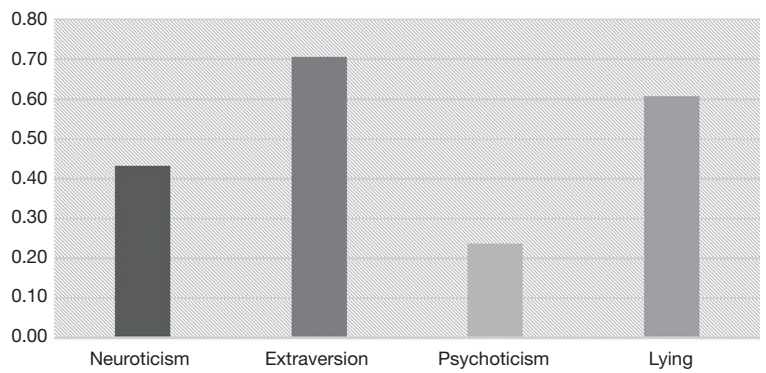

Figure 9 Average of the dimensions of the EPQ-R(S) tool Hans J. Eysenck and Sybil G. Eysenck for subjects over 40 years old with ASD. EPQ-R(S), Eysenck Personality Questionnaire-Revised Short Version; ASD, atrial septal defect.

Table 11 The severity of personality traits measured with the IVE tool Hans J. Eysenck and Sybil G. Eysenck among those over 40 years old with ASD

Traits	M	SD	F	P
Impulsiveness	0.33	0.19	46.61	<0.001
Tendency to risk-taking	0.39	0.28		
Empathy	0.72	0.15		

IVE, Eysenck's Impulsivity Inventory; ASD, atrial septal defect; M, average; SD, standard deviation.

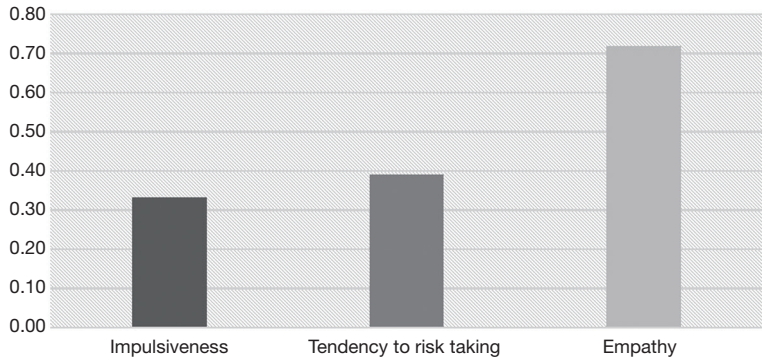

Figure 10 Average of analyzed dimensions of IVE tool Hans J. Eysenck and Sybil G. Eysenck for subjects over 40 years old with ASD. IVE, Eysenck's Impulsivity Inventory; ASD, atrial septal defect.

Table 12 The severity of personality traits measured with the STAI tool C. D. Spielberger, R. L. Gorsuch, R. E. Lushene among those over 40 years old with ASD

Features	M	SD	*t*	P	95% CI		d Cohena
					LL	UL	
Anxiety as a trait	2.01	0.41	−0.55	0.589	−0.20	0.11	0.11
Anxiety as a condition	1.96	0.50					

STAI, the State-Trait Anxiety Inventory; ASD, atrial septal defect; M, average; SD, standard deviation; CI, confidence interval for the difference between means; LL and UL, lower and upper limits of the confidence interval.

Congenital heart disease ASD and personality traits in the group under 40 years of age

In order to verify the next hypothesis, analogous analyzes were carried out, but among those with ASD under the age of 40. First, an analysis of the variance of results obtained by this group of subjects on the scales of the tool EPQ-R(S) (9) was performed. Due to violation of the assumption about the sphericity of variables, the Greenhouse-Geisser correction was applied in reporting the result of the analysis. The test result turned out to be statistically significant [F (1.94; 40.68) =23.99; P<0.001; η2 =0.53]. The eta value of the square indicates that the observed effect is strong. In order to check the essence of this effect, a *post hoc* analysis (with Bonferroni correction) was carried out. A significant difference was observed only between levels of psychoticism and other variables. The discussed averages are presented in *Table 13* and *Figure 12*.

Then, an analogous analysis of the variance of results obtained on the IVE scales was carried out (10). The test result turned out to be statistically significant [F (2, 42) =10.89; P<0.001; η2 =0.34]. The eta value of the square indicates that the observed effect is strong. In order to check the essence of this effect, a *post hoc* analysis (with Bonferroni correction) was carried out. The level of declared empathy was statistically significantly higher than

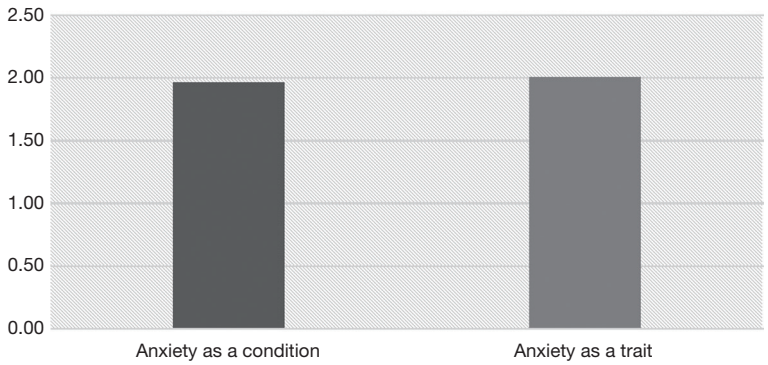

Figure 11 The average of the analyzed dimensions of the STAI tool C. D. Spielberger, R. L. Gorsuch, R. E. Lushene for subjects over 40 years old with ASD defect. STAI, the State-Trait Anxiety Inventory; ASD, atrial septal defect.

Table 13 The severity of personality traits measured with the EPQ-R(S) tool Hans J. Eysenck and Sybil G. Eysenck among those under 40 with ASD

Traits	M	SD	F	P
Neuroticism	0.57	0.30	23.99	<0.001
Extraversion	0.73	0.19		
Psychoticism	0.16	0.10		
Lies	0.56	0.23		

EPQ-R(S), Eysenck Personality Questionnaire-Revised Short Version; ASD, atrial septal defect; M, average; SD, standard deviation.

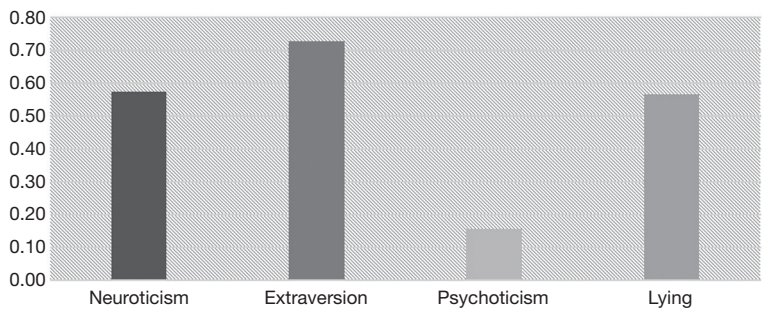

Figure 12 Average of the dimensions of the EPQ-R(S) tool Hans J. Eysenck and Sybil G. Eysenck for subjects under 40 years old with ASD. EPQ-R(S), Eysenck Personality Questionnaire-Revised Short Version; ASD, atrial septal defect.

the levels of impulsiveness and tendency to risk-taking. The difference between impulsiveness and tendency to risk-taking turned out to be statistically insignificant. The values of the discussed means and the result of the analysis of variance are presented in *Table 14* and *Figure 13*.

Then the Student's *t*-test analysis for repeated measurements was performed. The results obtained by subjects under 40 with ASD defect were compared with each other on the scales of the STAI tool (11). Based on the results presented in *Table 15*, no statistically significant differences were found between the analyzed variables. The compared means are illustrated in *Figure 14*.

PFO congenital heart disease and personality traits in the group over 40 years old

In order to verify the next hypothesis, analogous analyzes were carried out, but among those over 40 years old with

Table 14 The severity of personality traits measured with the IVE tool Hans J. Eysenck and Sybil G. Eysenck among those under 40 with ASD

Traits	M	SD	F	P
Impulsiveness	0.41	0.23	10.89	<0.001
Tendency to risk-taking	0.41	0.22		
Empathy	0.68	0.23		

IVE, Eysenck's Impulsivity Inventory; ASD, atrial septal defect; M, average; SD, standard deviation.

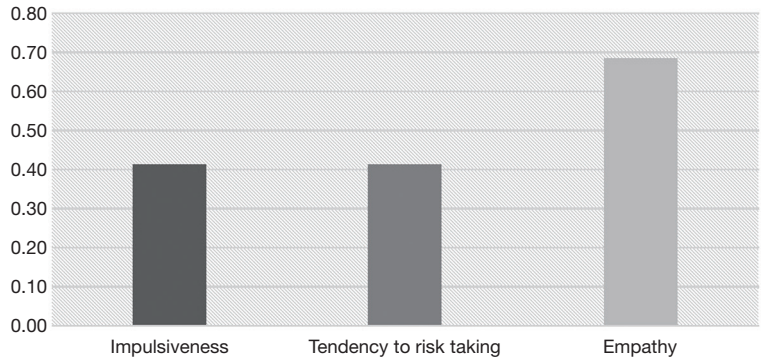

Figure 13 Average of analyzed dimensions of IVE tool Hans J. Eysenck and Sybil G. Eysenck for subjects under 40 years of age with ASD. IVE, Eysenck's Impulsivity Inventory; ASD, atrial septal defect.

Table 15 The severity of personality traits measured by the STAI tool C. D. Spielberger, R. L. Gorsuch, R. E. Lushene among those under 40 with ASD

Features	M	SD	*t*	P	95% CI		d Cohena
					LL	UL	
Anxiety as a trait	2.09	0.47	0.62	0.54	−0.14	0.26	0.11
Anxiety as a condition	2.15	0.62					

STAI, the State-Trait Anxiety Inventory; ASD, atrial septal defect; M, average; SD, standard deviation; CI, confidence interval for the difference between means; LL and UL, lower and upper limits of the confidence interval.

PFO defect. First, an analysis of the variance of results obtained by this group of subjects on the scales of the tool EPQ-R(S) (9) was performed. The test result proved to be statistically significant [F (3, 42) =7.79; P<0.001; η2 =0.36]. The eta value of the square indicates that the observed effect is strong. In order to check the essence of this effect, a *post hoc* analysis (with Bonferroni correction) was carried out. The level of lies turned out to be statistically significantly higher only than the level of psychoticism. The level of extraversion turned out to be statistically significantly higher only than the level of psychoticism. Other comparisons were not statistically significant. The discussed average is presented in *Table 16* and *Figure 15*.

Then, an analogous analysis of the variance of results obtained on the IVE scales was carried out (11). The test result turned out to be statistically significant [F (2, 28) =29.63; P<0.001; η2 =0.68]. The eta value of the square indicates that the observed effect is strong. In order to check the essence of this effect, a *post hoc* analysis (with Bonferroni correction) was carried out. The level of declared empathy was statistically significantly higher than the levels of impulsiveness and tendency to risk-taking. The difference between impulsiveness and risk tendency to risk-taking turned out to be statistically insignificant. The values of the discussed averages and the result of the analysis of variance are presented in *Table 17* and *Figure 16*.

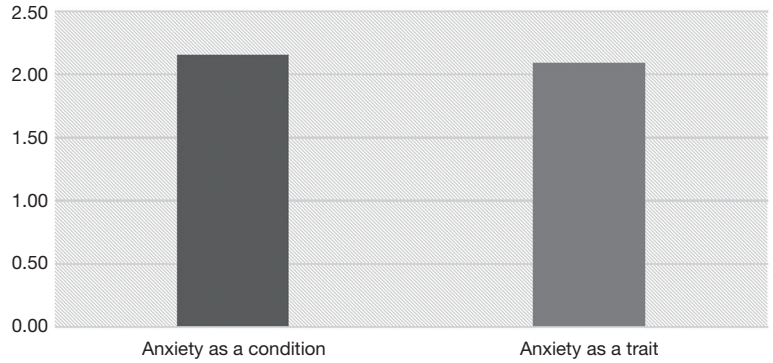

Figure 14 The average of the analyzed dimensions of the STAI tool C. D. Spielberger, R. L. Gorsuch, R. E. Lushene for subjects under 40 with ASD. STAI, the State-Trait Anxiety Inventory; ASD, atrial septal defect.

Table 16 The severity of personality traits measured by the EPQ-R(S) tool Hans J. Eysenck and Sybil G. Eysenck among those over 40 years old with a PFO defect

Traits	M	SD	F	P
Neuroticism	0.45	0.31	7.79	<0.001
Extraversion	0.64	0.25		
Psychoticism	0.28	0.18		
Lies	0.67	0.19		

EPQ-R(S), Eysenck Personality Questionnaire-Revised Short Version; PFO, patent foramen ovale; M, average; SD, standard deviation.

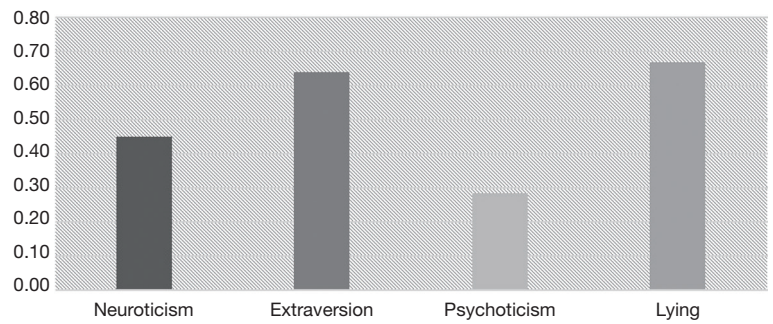

Figure 15 The average of the dimensions of the analyzed tool EPQ-R(S) Hans J. Eysenck and Sybil G. Eysenck for subjects over 40 years old with a PFO defect. EPQ-R(S), Eysenck Personality Questionnaire-Revised Short Version; PFO, patent foramen ovale.

Then the Student's *t*-test analysis for repeated measurements was performed. The results obtained by subjects under 40 with ASD defect were compared with each other on the scales of the STAI tool (11). Based on the results presented in *Table 18*, no statistically significant differences were found between the analyzed variables. The compared means are illustrated in *Figure 17*.

PFO congenital heart disease and personality traits in the group under 40 years of age

In order to verify the next hypothesis, analogous analyzes were carried out, but among those under the age of 40 with PFO defect. First, an analysis of the variance of results obtained by this group of subjects on the scales of

Table 17 The severity of personality traits measured with the IVE tool Hans J. Eysenck and Sybil G. Eysenck among those over 40 years old with PFO defect

Traits	M	SD	F	P
Impulsiveness	0.30	0.20	29.63	<0.001
Tendency to risk-taking	0.27	0.22		
Empathy	0.74	0.19		

IVE, Eysenck's Impulsivity Inventory; PFO, patent foramen ovale; M, average; SD, standard deviation.

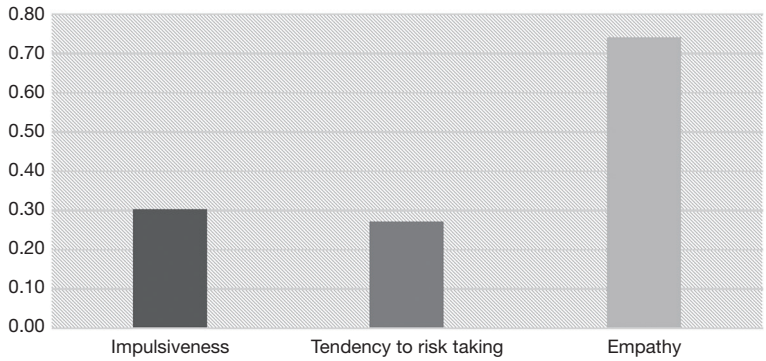

Figure 16 Average of the analyzed dimensions of the IVE tool Hans J. Eysenck and Sybil G. Eysenck for subjects over 40 years old with PFO defect. IVE, Eysenck's Impulsivity Inventory; PFO, patent foramen ovale.

Table 18 The severity of personality traits measured by the STAI tool C. D. Spielberger, R. L. Gorsuch, R. E. Lushene among those over 40 years old with PFO defect

Features	M	SD	*t*	P	95% CI		d Cohena
					LL	UL	
Anxiety as a trait	2.22	0.52	−1.48	0.161	−0.45	0.08	0.36
Anxiety as a condition	2.04	0.49					

STAI, the State-Trait Anxiety Inventory; PFO, patent foramen ovale; M, average; SD, standard deviation; CI, confidence interval for the difference between means; LL and UL, lower and upper limits of the confidence interval.

the tool EPQ-R(S) (9) was performed. Due to violation of the assumption about the sphericity of variables, the Greenhouse-Geisser correction was applied in reporting the result of the analysis. The test result turned out to be statistically significant [F (2.03; 24.35) =13.54; P<0.001; η2 =0.53]. The eta value of the square indicates that the observed effect is strong. In order to check the essence of this effect, a *post hoc* analysis (with Bonferroni correction) was carried out. The level of extraversion turned out to be statistically significantly higher only than the level of psychoticism. In turn the level of lies turned out to be statistically significantly higher only than the level of psychoticism. Considering the level of neuroticism, it also turned out to be statistically significantly higher only at the level of psychoticism. The discussed average is presented in *Table 19* and *Figure 18*.

Then, an analogous analysis of the variance of results obtained on the IVE (10) tool scales was performed. The test result turned out to be statistically significant [F (2, 24) =14.03; P<0.001; η2 =0.54]. The eta value of the square indicates that the observed effect is strong. In order to check the essence of this effect, a *post hoc* analysis (with Bonferroni correction) was carried out. The level of declared empathy was statistically significantly higher than the levels of impulsiveness and risk propensity. The difference between impulsiveness and risk appetite turned out to be statistically

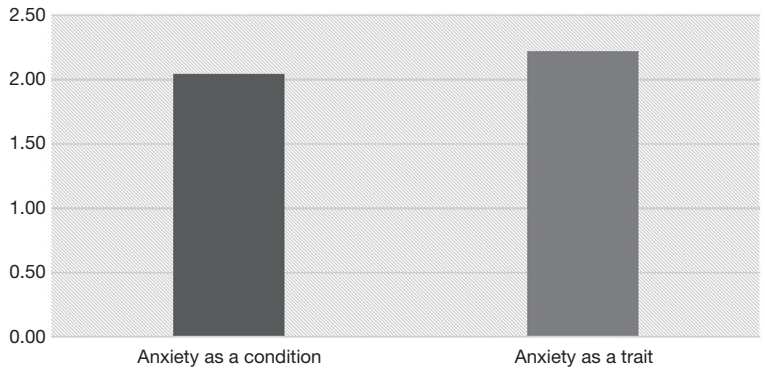

Figure 17 Average of the dimensions of the STAI tool C. D. Spielberger, R. L. Gorsuch, R. E. Lushene for subjects over 40 years old with PFO defect. PFO, patent foramen ovale.

Table 19 The severity of personality traits measured with the EPQ-R(S) tool Hans J. Eysenck and Sybil G. Eysenck among those under 40 years of age with a PFO defect

Traits	M	SD	F	P
Neuroticism	0.45	0.25	13.54	<0.001
Extraversion	0.73	0.23		
Psychoticism	0.13	0.10		
Lies	0.60	0.30		

EPQ-R(S), Eysenck Personality Questionnaire-Revised Short Version; PFO, patent foramen ovale; M, average; SD, standard deviation.

insignificant. The values of the discussed means and the result of the analysis of variance are presented in *Table 20* and *Figure 19*.

Then the Student's *t*-test analysis for repeated measurements was performed. The results obtained by respondents under 40 with a PFO defect were compared with each other on the scales of the STAI tool (11). Based on the results presented in *Table 21*, no statistically significant differences were found between the analyzed variables. The compared means are illustrated in *Figure 20*.

Discussion

In the case of women statistically significant differences were found between the level of psychoticism and all other analyzed variables. The results of extraversion, neuroticism and lies do not differ statistically from each other, and the level of declared empathy is statistically significantly higher than the levels of impulsiveness and tendency to risk-taking. On the other hand, the difference between impulsiveness and tendency to risk-taking turned out to be also statistically significant, no significant statistical differences were found in the scope of anxiety as a condition and feature.

For men, an insignificant difference was only observed between the level of neuroticism and the scale of lies; the difference between impulsiveness and risk appetite also turned out to be statistically significant, just as in the case of women no significant statistical differences were found in the field of anxiety as a condition and trait.

There was no statistically significant difference between the analyzed variables of anxiety as a trait and anxiety as a condition in people before the surgery of people suffering from ASD and after surgery in people suffering from PFO.

For people over 40 years of age suffering from ASD, an insignificant difference was only observed between the levels of extraversion and lies. The level of declared empathy was statistically significantly higher than the levels of impulsiveness and risk propensity. The difference between impulsiveness and risk appetite turned out to be statistically insignificant. Based on the results, no statistically significant differences were found between the analyzed variables—anxiety as a trait and anxiety as a condition.

In the case of people suffering from the same condition below 40 years of age, a significant difference was observed

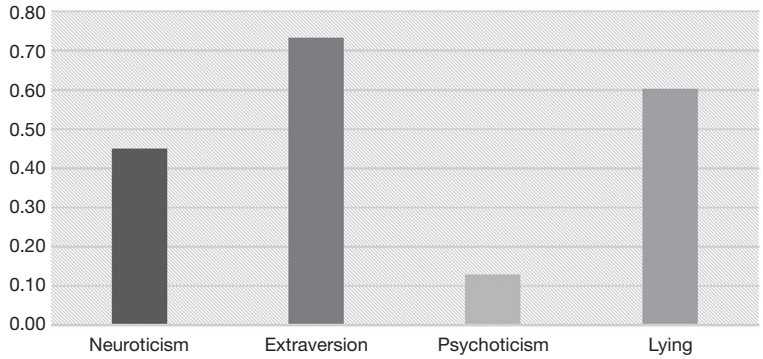

Figure 18 The mean of the analyzed dimensions of the EPQ-R(S) tool Hans J. Eysenck and Sybil G. Eysenck for subjects under 40 years of age with a PFO defect. EPQ-R(S), Eysenck Personality Questionnaire-Revised Short Version; PFO, patent foramen ovale.

Table 20 The severity of personality traits measured with the IVE tool by Hans J. Eysenck and Sybil G. Eysenck among those under 40 years of age with PFO defect

Traits	M	SD	F	P
Impulsiveness	0.28	0.24	14.03	<0.001
Tendency to risk-taking	0.35	0.21		
Empathy	0.71	0.16		

IVE, Eysenck's Impulsivity Inventory; PFO, patent foramen ovale; M, average; SD, standard deviation.

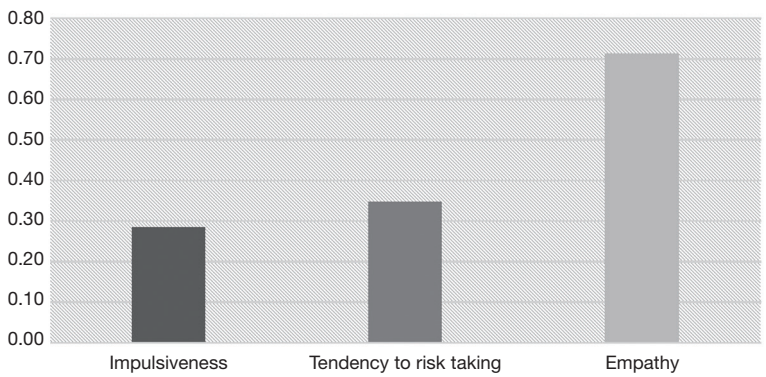

Figure 19 Average of analyzed dimensions of IVE tool Hans J. Eysenck and Sybil G. Eysenck for subjects under 40 years of age with PFO defect. IVE, Eysenck's Impulsivity Inventory; PFO, patent foramen ovale.

only between levels of psychoticism and other variables, i.e., neuroticism, extraversion, and lies. The level of declared empathy was statistically significantly higher than the levels of impulsiveness and risk propensity. The difference between impulsiveness and risk appetite turned out to be statistically insignificant. Based on the results, no statistically significant differences were found between the analyzed variables—anxiety as a trait and anxiety as a condition.

For people suffering from PFO over 40, the level of lies turned out to be statistically significantly higher only than the level of psychoticism. The level of extraversion turned out to be statistically significantly higher than the level of psychoticism. Other comparisons were not statistically significant. The level of declared empathy was statistically significantly higher than the levels of impulsiveness and risk

Table 21 The severity of personality traits measured with the STAI tool C. D. Spielberger, R. L. Gorsuch, R. E. Lushene among those under 40 years of age with PFO defect

Features	M	SD	*t*	P	95% CI		d Cohena
					LL	UL	
Anxiety as a trait	2.09	0.39	−1.81	0.095	−0.45	0.04	0.35
Anxiety as a condition	1.89	0.70					

STAI, the State-Trait Anxiety Inventory; M, average; SD, standard deviation; CI, confidence interval for the difference between means; LL and UL, lower and upper limits of the confidence interval; PFO, patent foramen ovale.

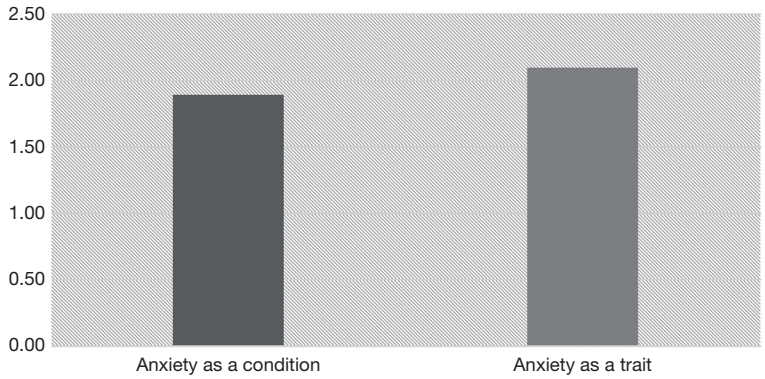

Figure 20 Average of the analyzed dimensions of the STAI tool C. D. Spielberger, R. L. Gorsuch, R. E. Lushene for subjects under 40 years of age life with a disadvantage of PFO. IVE, Eysenck's Impulsivity Inventory; PFO, patent foramen ovale.

propensity. The difference between impulsiveness and risk appetite turned out to be statistically insignificant. Based on the results, no statistically significant differences were found between the analyzed variables—anxiety as a trait and anxiety as a condition.

In people with PFO under 40, the level of extraversion turned out to be statistically significantly higher than the level of psychoticism. However, the level of lies turned out to be only higher than the level of psychoticism. Considering the level of neuroticism, it also turned out to be statistically significantly higher in terms of psychoticism. The level of declared empathy was statistically significantly higher than the levels of impulsiveness and risk propensity. The difference between impulsiveness and risk appetite turned out to be statistically insignificant. Based on the results, no statistically significant differences were found between the analyzed variables—anxiety as a trait and anxiety as a condition.

In the case of women the level of declared empathy is statistically significantly higher than the levels of impulsiveness and tendency to risk-taking. On the other hand, the difference between impulsiveness and tendency to risk-taking turned out to be also statistically significant. For men, an insignificant difference was only observed between the level of neuroticism and the scale of lies; the difference between impulsiveness and risk appetite also turned out to be statistically significant, just as in the case of women no significant statistical differences were found in the field of anxiety as a condition and trait. For people over 40 years of age suffering from ASD, an insignificant difference was only observed between the levels of extraversion and lies. The level of declared empathy was statistically significantly higher than the levels of impulsiveness and risk propensity. In the case of people suffering from the same condition below 40 years of age, a significant difference was observed only between levels of psychoticism and other variables, i.e., neuroticism, extraversion, and lies. The level of declared empathy was statistically significantly higher than the levels of impulsiveness and risk propensity. For people suffering from PFO over 40, the level of lies turned out to be statistically significantly higher only than the level of psychoticism. The level of extraversion turned out to be statistically significantly higher than the level of psychoticism. The level of declared empathy was statistically

significantly higher than the levels of impulsiveness and risk propensity. In people with PFO under 40, the level of extraversion turned out to be statistically significantly higher than the level of psychoticism. However, the level of lies turned out to be only higher than the level of psychoticism. Considering the level of neuroticism, it also turned out to be statistically significantly higher in terms of psychoticism. The level of declared empathy was statistically significantly higher than the levels of impulsiveness and risk propensity.

Conclusions

The conducted research shows that patients suffering from ASD or PFO have specific personality traits what allow to better understanding of suffering patients.

Acknowledgments

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Footnote

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at http://dx.doi.org/10.21037/jtd-20-220). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was approved by Bioethics Commission of Jagiellonian University in Cracow (No. 1072.6120.132.2017 from 28th September 2017) and informed consent was taken from all the patients. All patients agreed to the examination (part of the studies completed before the surgery, some after the surgery). Patients expressed willingness to participate in the operation, and the study submitted reported and approved by the bioethics committee. The study involved completing three psychological tests (EPQ-R, IVE, STAI) examining the personality structure and level of anxiety. This article does not contain any studies with human participants performed by any of the authors. This article does not contain any studies with animals performed by any of the authors. This article does not contain any studies with human participants or animals performed by any of the authors.

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Article No. 3

3. **Skoczek A.,** Prochownik P., Podolec N., Gancarczyk U., Podolec P., Komar M.: *Personality traits of patients suffering from PFO and ASD and influence of COVID-19 pandemic time for patients suffering from congenital heart defects.*

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ORIGINAL ARTICLE

PERSONALITY TRAITS OF PATIENTS SUFFERING FROM PFO AND ASD AND INFLUENCE OF COVID-19 PANDEMIC TIME FOR PATIENTS SUFFERING FROM CONGENITAL HEART DEFECTS

DOI: 10.36740/WLek202009206

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CLINICAL DEPARTMENT OF CARDIAC AND VASCULAR DISEASES WITH THE INTENSIVE CARDIAC SUPERVISION SUBDIVISION, INSTITUTE OF CARDIOLOGY, COLLEGIUM MEDICUM OF THE JAGIELLONIAN UNIVERSITY IN CRACOW, JOHN PAUL II HOSPITAL, CRACOW, POLAND

ABSTRACT

Introduction: The work presents a research project carried out in John Paul II Hospital in Cracow in Clinical Department of Cardiac and Vascular Diseases with the Intensive Cardiac Supervision Subdivision, with participation of 100 (50 F, 50 M) patients with congenital heart defects. The purpose of the work is to resolve the issue of personality specifics, and thus the different characteristics of people who suffer from congenital heart defects. Therefore, the following questions should be answered: Is there a relationship between personality traits and the occurrence of a congenital heart defect? What personality traits are characteristic for patients with congenital heart defects?

The aim: We aimed to assess personality traits of clients suffering from PFO and ASD. The article also talks about how coronavirus pandemic affects patients with congenital heart disease

Materials and methods: The research was conducted by psychologist Adrianna Skoczek. We performed a psychological clinical assessment and conducted the psychological tests like Eysenck Personality Questionnaire-Revised Short Version [EPQ-R(S)] and Eysenck's Impulsivity Inventory [IVE] by Hans J. Eysenck and Sybil G. Eysenck, the State-Trait Anxiety Inventory [STAI] by C. D. Spielberger, R. L. Gorsuch, R. E. Lushene describing personality traits of patients. Patients (F=50, M=50), with ASD (n=70) and with PFO (n=30).

Results: In people suffering from ASD, the level of declared empathy was statistically significantly higher than the levels of impulsiveness and tendency to risk-taking. In people suffering from PFO, a statistically significant difference was observed only between the level of psychoticism and other variables. The level of declared empathy was statistically significantly higher than the levels of impulsiveness and tendency to risk-taking, a statistically significant difference was found between the analyzed variables - anxiety as a trait and anxiety as a condition.

Conclusions: The results of the study allowed us to isolate the specific personality traits of patients suffering from congenital heart defects.

KEY WORDS: atrial septal defect; patent foramen ovale; personality traits; congenital heart defects, COVID-19

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INTRODUCTION

PFO - patent foramen ovale - a persistent oval hole is a remnant of an oval hole located in the atrial septum. Blood circulation in utero takes place through: the umbilical vein, the venous line to the inferior vena cava, then the blood is led to the right atrium where, joining the blood from the superior vena cava, through the oval opening it leads to the left atrium of the fetus [1].

After delivery, due to the increase in pressure in the left atrium, the primary septum adheres to the secondary septum, which leads to narrowing of the oval opening channel, and then in most cases to close the opening. In about 25% of cases, the primary and secondary septa do not completely merge, which leads to the formation of a permanent oval hole [1].

ASD - atrial septal defect - a defect in the atrial septum causes blood leakage between the atria. ASD losses are divided into: ASDII - secondary hole type - occurs by approx. 80% of subjects - incorrectly developed secondary septum, ASDI - primary hole type - occurs in approx. 15% of subjects - pathological development and connection of endocardial cushions, svSD - main vein type - occurs in approx. 5% of patients - complete or partial septal defect is found between the main vein and right pulmonary veins, csASD - coronary sinus type - occurs in approx. 1% of patients - complete or partial hypoplasia of the coronary sinus wall adjacent to the left atrium [1].

THE AIM

To show personality traits typical of patients with congenital heart defects.

The following research hypotheses were adopted:

1. Extraversion is characteristic of people suffering from congenital heart disease PFO.
2. Psychoticism is not characteristic of people with ASD congenital heart disease.
3. Neuroticism is clearly the strongest characteristic of people with congenital heart disease PFO.
4. Impulsiveness is characteristic of people with ASD congenital heart disease.

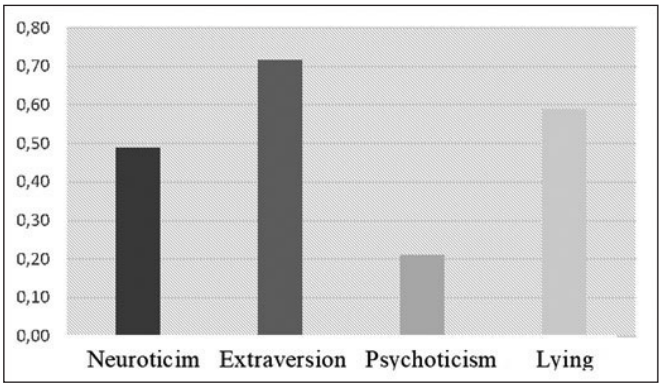

Fig. 1. The mean of the analyzed dimensions of the EPQ-R (S) tool Hans J. Eysenck and Sybil G. Eysenck for subjects with ASD defect
EPQ-R(S), Eysenck Personality Questionnaire-Revised Short Version, ASD, atrial septal defect

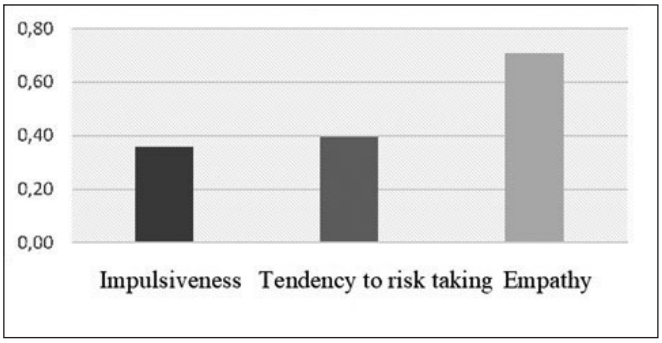

Fig. 2. Average of analyzed dimensions of IVE tool Hans J. Eysenck and Sybil G. Eysenck for subjects with ASD defect
IVE, Eysenck's Impulsivity Inventory, ASD, atrial septal defect

5. Tendency to risk-taking is not characteristic of patients suffering from ASD congenital heart disease.
6. Empathy is characteristic of people with PFO congenital heart disease.
7. Anxiety as a condition is characteristic of people suffering from ASD.
8. Anxiety as a trait is characteristic of people suffering from PFO.

MATERIAL AND METHODS

INFLUENCE OF COVID-19 PANDEMIC TIME FOR PATIENTS SUFFERING FROM CONGENITAL HEART DEFECTS

Each of the crises is associated with a negative impact on human mental health. Both patients who experienced various symptoms such as e.g. anxiety before the outbreak of the COVID-19 pandemic, and healthy people may deteriorate mental functioning [2].

The most important factors that affect the deterioration of a person's mental state during a pandemic are: isolation, lack of contact with loved ones, increasing domestic violence as well as a constant feeling of uncertainty about the future. In most countries, there are signs of depression as well as anxiety in

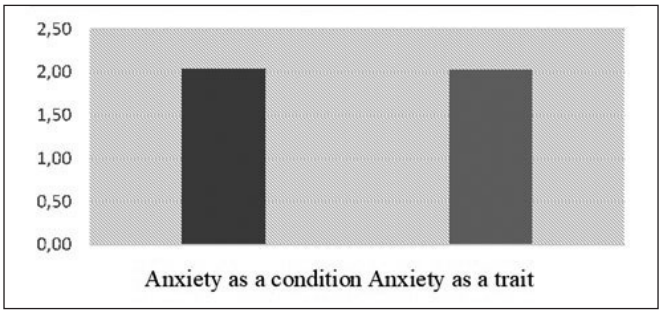

Fig. 3. Average of the analyzed dimensions of the STAI tool C. D. Spielberger, R. L. Gorsuch, R. E. Lushene for subjects with ASD defect
STAI, the State-Trait Anxiety Inventory, ASD, atrial septal defect

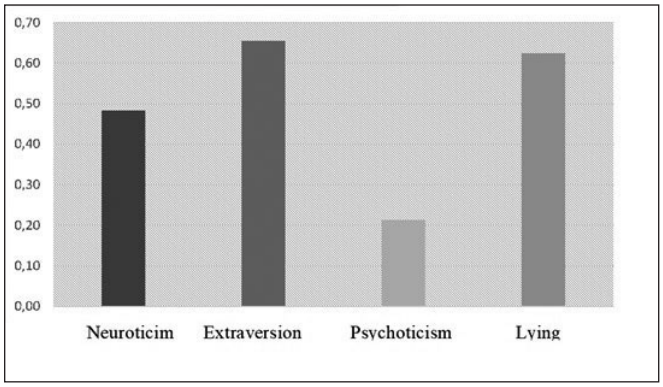

Fig. 4. Average of the dimensions of the EPQ-R (S) tool Hans J. Eysenck and Sybil G. Eysenck for subjects with a PFO defect.
EPQ-R(S), Eysenck Personality Questionnaire-Revised Short Version, PFO, patent foramen ovale

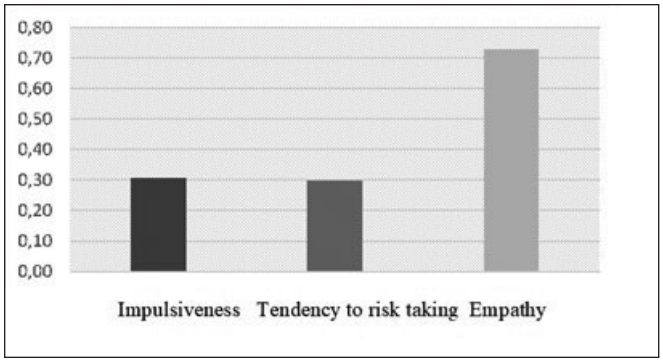

Fig. 5. Average of analyzed dimensions of IVE tool Hans J. Eysenck and Sybil G. Eysenck for subjects with PFO defect.
IVE, Eysenck's Impulsivity Inventory, PFO, patent foramen ovale

people healthy so far. The current pandemic situation directs people to reach for stimulants to reduce stress levels [2].

Research has been developed describing the level of extraversion associated with the current situation we are struggling with - COVID-19. People with a high level of extraversion were forced to increase social distance, which is very difficult for them. Higher conscientiousness results are associated with a lower tendency to violate recommendations [3].

People with cardiovascular disease (in particular, hypertension and coronary artery disease) have been shown to be at greater risk of COVID-19 infection. This

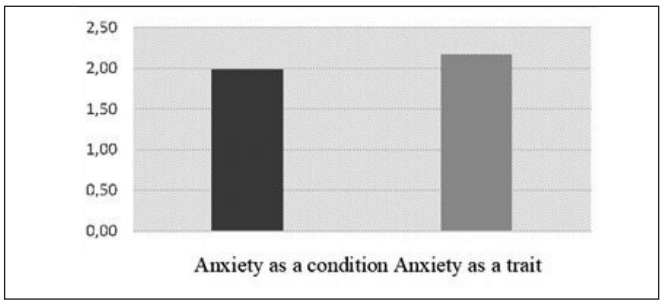

Fig. 6. The average of the analyzed dimensions of the STAI tool C. D. Spielberger, R. L. Gorsuch, R. E. Lushene for subjects with a PFO defect.
STAI, the State-Trait Anxiety Inventory; PFO, patent foramen ovale

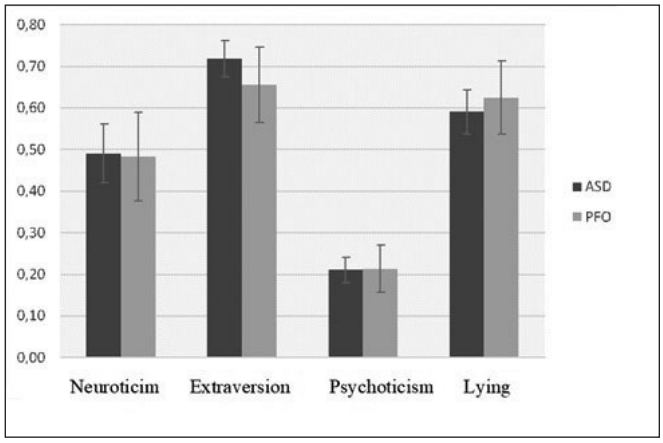

Fig. 7. Average levels of personality traits measured with the EPQ-R (S) tool Hans J. Eysenck and Sybil G. Eysenck, broken down by patients with ASD and PFO defects.
EPQ-R(S), Eysenck Personality Questionnaire-Revised Short Version, ASD, atrial septal defect; PFO, patent foramen ovale

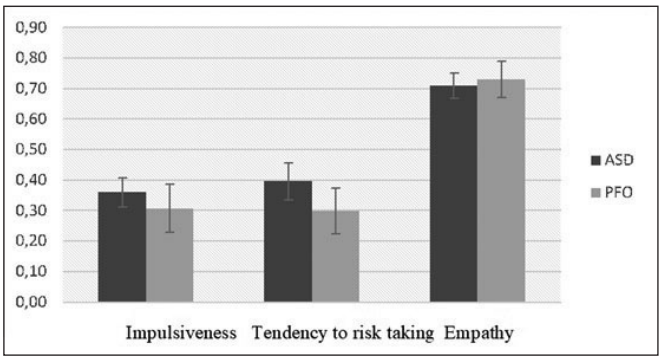

Fig. 8. Average levels of personality traits measured with the IVE tool Hans J. Eysenck and Sybil G. Eysenck, broken down by patients with ASD and PFO defects.
IVE, Eysenck's Impulsivity Inventory, ASD, atrial septal defect; PFO, patent foramen ovale

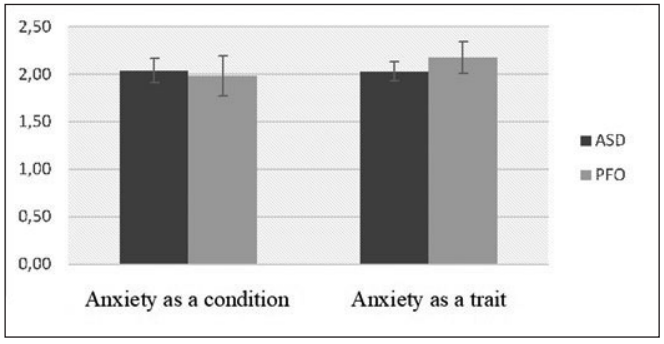

Fig. 9. Average levels of personality traits measured with the STAI tool C. D. Spielberger, R. L. Gorsuch, R. E. Lushene, broken down by patients with ASD and PFO defects.
STAI, the State-Trait Anxiety Inventory, ASD, atrial septal defect; PFO, patent foramen ovale

has often been associated with accelerated patient death. Unfortunately, to date, no studies have been developed regarding the exposure of people suffering from congenital heart defects [4].

Thus we still do not know how COVID -19 affects people with congenital heart defects, not only physically but also mentally. It is therefore important to research the effects of SARS-CoV-2 on patients with congenital heart defects. Other studies, in turn, showed that during a pandemic people show a lot of psychological conflicts between the desire to adhere to some rules in order to live in safety and the desire to maintain normality [5].

Recently, care for all patients, including cardiologic patients, has been significantly more difficult due to the coronavirus pandemic. Many patients with both ASD and PFO may feel disturbed by the lack of systematic contact with their attending physician, especially since the ailments caused by SARS-CoV-2 infection may resemble the already known cardiological ailments. The patient is not able to determine on his own what disease he can attribute to it, whether he has a heart defect or perhaps a coronavirus infection. COVID-19 is a disease caused by infection with the SARS-CoV-2 virus, involving the rapid spread of inflammatory processes in various organs. It attacks lungs as well as the cardiovascular system. It may have a different course in different patients. Approximately 20% of patients may have a severe course and these patients require hospitalization, intensive care and mechanical ventilation. About 1/5 -1/3 of hospital-treated patients have their cardiovascular system damaged, and about 40% of them die [6].

The site of entry of the SARS-CoV-2 virus is ACE 2 receptors that are found in the lungs, heart and kidneys. This virus then enters the endothelial cells, leading to their destruction. Damaged cells in the cardiovascular system initially cause microcirculation disorders, leading to vasoconstriction, which results in ischemia of many organs, intensification of inflammatory processes and hypercoagulability [6].

Common complications of SARS-CoV-2 infection are thrombophlebitis, acute coronary syndromes, myocarditis, acute heart failure as well as arrhythmias. Both arrhythmias and shortness of breath, chest pain, weakness, intolerance to physical exertion and swelling of the lower extremities can occur in PFO and ASD, as well as affect patients with these congenital heart defects and additionally infected with coronavirus. It should also be noted that drugs used to treat COVID-19 and complications such as antiviral drugs, chloroquine, hydroxychloroquine, azithromycin, antiarrhythmic and anticoagulant drugs also have proarrhythmic effects. In a study conducted in Wuhan, arrhythmias were seen in approximately 17% of

Table 1. The severity of personality traits measured with the EPQ-R (S) tool Hans J. Eysenck and Sybil G. Eysenck among those with ASD

Neuroticism		Extraversion		Psychoticism		Lying		F	p
M	SD	M	SD	M	SD	M	SD		
0,49	0,30	0,72	0,19	0,21	0,13	0,59	0,22	61,28	<0,001

M -mediana; SD - standard deviation; F - result of variance analysis; p - statistical significance
EPQ-R(S), Eysenck Personality Questionnaire-Revised Short Version, ASD, atrial septal defect

Table 2. The severity of personality traits measured by the IVE tool among subjects with ASD defect

Impulsiveness		Tendency to risk-taking		Empathy		F	p
M	SD	M	SD	M	SD		
0,36	0,20	0,40	0,26	0,71	0,17	58,97	<0,001

M -mediana; SD - standard deviation; F - result of variance analysis; p - statistical significance
IVE - Eysenck's Impulsivity Inventory, ASD - atrial septal defect

Table 3. Intensification of features measured with the STAI tool C. D. Spielberger, R. L. Gorsuch, R. E. Lushene among subjects with ASD defect

Anxiety as a condition		Anxiety as a trait				95% CI		
M	SD	M	SD	t	p	LL	UL	d Cohena
2,03	0,43	2,04	0,54	0,12	0,904	-0,11	0,13	0,02

M - mediana; SD - standard deviation; t - Student's t test result; p - significance; 95% CI - confidence interval for the difference between means; LL and UL - lower and upper limits of the confidence interval
STAI - the State-Trait Anxiety Inventory; ASD - atrial septal defect

Table 4. The severity of personality traits measured with the EPQ-R (S) tool Hans J. Eysenck and Sybil G. Eysenck among the subjects with PFO defect

Neuroticism		Extraversion		Psychoticism		Lying		F	p
M	SD	M	SD	M	SD	M	SD		
0,48	0,30	0,66	0,25	0,21	0,16	0,63	0,25	17,47	<0,001

M - mediana; SD - standard deviation; F - result of variance analysis; p - statistical significance
EPQ-R(S), Eysenck Personality Questionnaire-Revised Short Version, PFO, patent foramen ovale

Table 5. The severity of personality traits measured with the IVE tool Hans J. Eysenck and Sybil G. Eysenck among the subjects with PFO defect

Impulsiveness		Tendency to risk-taking		Empathy		F	p
M	SD	M	SD	M	SD		
0,31	0,22	0,30	0,21	0,73	0,17	44,41	<0,001

M -mediana; SD - standard deviation; F - result of variance analysis; p - statistical significance
IVE, Eysenck's Impulsivity Inventory; PFO, patent foramen ovale

Table 6. The severity of features measured with the STAI tool among those with a PFO defect

Anxiety as a condition		Anxiety as a trait				95% CI		
M	SD	M	SD	t	p	LL	UL	d Cohena
2,17	0,47	1,99	0,59	-2,44	0,021	-0,35	-0,03	0,34

N - number of observations; M - mediana; SD - standard deviation; t - Student's t test result; p - significance;
95% CI - confidence interval for the difference between means; LL and UL - lower and upper limits of the confidence interval
STAI - the State-Trait Anxiety Inventory, PFO - patent foramen ovale

patients in intensive care. This study did not analyze the type of arrhythmias. It should be noted that the factors predisposing to a more severe course of COVID-19 are male sex, advanced age, hypertension, diabetes, obesity, and cardiovascular diseases. Knowledge about the mechanisms causing a worse course COVID-19 in patients with cardiovascular disease is under investigation. Nevertheless, these patients require special care due to the limited access to healthcare services and medical procedures. The patients themselves also often seek help too late because of the pre-infection medicine. In studies conducted in Hong Kong during the SARS-2 epidemic, it was noted that from the time of onset of angina pain to the initiation of invasive treatment - primary percutaneous coronary angioplasty, PCI was about 3.5 times longer than the corresponding period of the previous year [6].

Table 7. The relationship between anxiety and personality traits measured with the STAI tool by C. D. Spielberger, R. L. Gorsuch, R. E. Lushene and IVE tool Hans J. Eysenck and Sybil G. Eysenck

		Anxiety as a condition	Anxiety as a trait
Impulsiveness	Pearson r	0,21	0,36
	Revelance	0,040	<0,001
Tendency of risk taking	Pearson r	-0,38	-0,30
	Revelance	<0,001	0,003
Empathy	Pearson r	0,22	0,27
	Revelance	0,031	0,007

STAI - the State-Trait Anxiety Inventory;
IVE - Eysenck's Impulsivity Inventory;

Table 8. The relationship between anxiety and personality traits measured with the STAI tool by C. D. Spielberger, R. L. Gorsuch, R. E. Lushene and EPQ-R (S) Hans J. Eysenck and Sybil G. Eysenck

		Anxiety as a condition	Anxiety as a trait
Neuroticism	Pearson r	0,40	0,51
	Revelance	<0,001	<0,001
Extraversion	Pearson r	-0,15	-0,22
	Revelance	0,151	0,027
Psychoticism	Pearson r	0,11	0,16
	Revelance	0,275	0,115
Lying	Pearson r	-0,08	-0,16
	Revelance	0,461	0,123

EPQ-R(S) - Eysenck Personality Questionnaire-Revised Short Version
STAI - the State-Trait Anxiety Inventory;

Table 9. Relationship of personality traits measured with IVE tools Hans J. Eysenck and Sybil G. Eysenck and EPQ-R (S) Hans J. Eysenck and Sybil G. Eysenck

		Impulsiveness	Tendency to risk-taking	Empathy
Neuroticim	Pearson r	0,53	-0,23	0,39
	Revelance	<0,001	0,019	<0,001
Extraversion	Pearson r	0,09	0,19	0,06
	Revelance	0,362	0,056	0,547
Psychoticism	Pearson r	0,27	0,06	-0,16
	Revelance	0,006	0,526	0,121
Lying	Pearson r	-0,36	-0,37	0,00
	Revelance	<0,001	<0,001	0,968

EPQ-R(S) - Eysenck Personality Questionnaire-Revised Short Version
IVE - Eysenck's Impulsivity Inventory;

Therefore, on April 21, 2020, European Society of Cardiology (ESC Guidance for the Diagnosis and Management of CV Disease during the COVID-19 Pandemic) guidelines have been published which aim to provide appropriate care to this group of patients. Also other societies around the world such as the Canadian Association of Interventional Cardiology, American College of Cardiology's (ACC), Interventional Council and Society of Cardiovascular Angiography and Intervention (SCAI), Society for Cardiovascular Angiography and Interventions Emerging Leader Mentorship (SCAI ELM) Members and Graduates, Peking Union Medical College Hospital have developed guidelines for the management of patients with STEMI and NSTEMI myocardial infarction depending on the coexistence of COVID-19 [6].

According to the aforementioned guidelines, patients requiring further diagnosis or invasive treatment were divided into groups defining the need for urgent or postponed medical procedures. For example, in patients with ASD or PFO, closure of the defect in the atrial septum, obstruction of the oval opening should be performed in the planned mode, i.e. it can be postponed for at least 3 months [6].

STATISTICAL DEVELOPMENT OF RESEARCH RESULTS

Statistical tests were performed using IBM SPSS Statistics version 25 to test the hypotheses set out in the study. With its help, frequency analysis, analysis of basic descriptive statistics together with the Kolmogorov-Smirnov distribution normality test, Pearson r correlation analysis, variance analysis in intra-group schemas, Mann-Whitney U tests for independent samples and Student's t tests for dependent and independent samples were performed.

CONGENITAL HEART DISEASE ASD AND PERSONALITY TRAITS OF PEOPLE SUFFERING FROM IT

In order to verify the next hypothesis, analogous analyzes of personality traits were carried out among subjects with ASD congenital heart disease. First, an analysis of the variance of results obtained by this group of subjects on the scales of the EPQ-R (S) tool [7]. Due to violation of the assumption about the sphericity of variables, the Greenhouse-Geisser correction was applied in reporting the result of the analysis. The test result turned out to be statistically significant - $F(2.20; 151.53) = 61.28$; $p < 0.001$; $\eta 2 = 0.47$. The eta value of the square indicates that the observed effect is strong. In order to check the essence of this effect, a post hoc analysis (with Bonferroni correction) was carried out. The only insignificant difference in the analyzed case is that between levels of neuroticism and the scale of lying. The averages described are presented in Table 1 and Figure 1.

Then, an analogous analysis of the variance of results obtained on the IVE scales was carried out [8]. Due to violation of the assumption about the sphericity of variables, the Greenhouse-Geisser correction was applied in reporting the result of the analysis. The test result turned out to be statistically significant - $F(1.68; 115.68) = 58.97$; $p < 0.001$; $\eta 2 = 0.46$. The eta value of the square indicates that the observed effect is very strong. In order to check the essence of this effect, a post hoc analysis (with Bonferroni correction) was carried out. The level of declared empathy was statistically significantly higher than the levels of impulsiveness and tendency to risk-taking. The difference between impulsiveness and tendency to risk-taking turned out to be statistically insignificant. The values of the discussed averages and the result of the analysis of variance are presented in Table 2 and Figure 2.

Then the Student's t-test analysis for repeated measurements was performed. The results obtained by the subjects with ASD defect were compared on the scales of the STAI tool [9].

Based on the results presented in Table 3, no statistically significant differences were found between the analyzed variables. The compared means are illustrated in Figure 3.

CONGENITAL HEART DISEASE PFO AND PERSONALITY TRAITS OF PEOPLE SUFFERING FROM IT

In order to verify the next hypothesis, analogous analyzes were carried out, but among those with a PFO defect. First, an analysis of the variance of results obtained by this group of subjects on the scales of the EPQ-R (S) tool was carried out [7]. The test result proved to be statistically significant - $F(3; 87) = 17.47$; $p < 0.001$; $\eta 2 = 0.38$. The eta value of the square indicates that the observed effect is strong. In order to check the essence of this effect, a post hoc analysis (with Bonferroni correction) was carried out. A statistically significant difference was observed only between the level of psychoticism and other variables. The discussed averages are presented in Table 4 and Figure 4.

Then, an analogous analysis of the variance of results obtained on the IVE scales was carried out [8]. The test result turned out to be statistically significant - $F(2, 58) = 44.41$; $p < 0.001$; $\eta 2 = 0.61$. The eta value of the square indicates that the effect observed is very strong. In order to check the essence of this effect, a post hoc analysis (with Bonferroni correction) was carried out. The level of declared empathy was statistically significantly higher than the levels of impulsiveness and tendency to risk-taking. The difference between impulsiveness and tendency to risk-taking turned out to be statistically insignificant. The values of the discussed means and the result of the analysis of variance are presented in Table 5 and Figure 5.

Then the Student's t-test analysis for repeated measurements was performed. The results obtained by the subjects with PFO defect were compared on the scales of the STAI tool [9].

Based on the results presented in Table 6, a statistically significant difference was found between the analyzed variables. The compared means are illustrated in Figure 6.

INFLUENCE OF THE TYPE OF HEART DEFECT ON PERSONALITY TRAITS

To verify the next hypothesis, a series of Mann-Whitney U tests were conducted. A nonparametric test was used due to a clear violation of the assumption about the equivalence of the compared groups. First, the influence of the type of heart defect on personality traits measured with the tool EPQ-R (S) [7]. The test result turned out to be statistically insignificant in the case of neuroticism ($p = 0.940$), extraversion ($p = 0.349$), psychoticism ($p = 0.917$) and the scale of lying ($p = 0.348$). The compared means are illustrated in Figure 7.

Then Mann-Whitney U tests were carried out for independent samples comparing the levels of severity of traits measured with the STAI tool [9] in the group with ASD and PFO defects. The test result was insignificant in the case of differences in the levels of impulsiveness ($p = 0.190$), tendency to risk-taking ($p = 0.104$) and empathy ($p = 0.639$). The compared means are illustrated in Figure 8.

Then Mann-Whitney U tests were carried out for independent samples comparing the levels of severity of traits measured with the STAI tool [4] in the group with ASD and PFO defects. The test result was insignificant in the case of the difference in levels of anxiety as both a condition ($p = 0.399$) as well as as traits ($p = 0.194$). The compared means are illustrated in Figure 9.

In addition, a series of Pearson r correlations were made between the scales used in the study of tools. First, the

results on the IVE scales were compared with [8] and STAI tool [9]. Based on the results presented in Table 1-6, statistically significant correlations were found between all variables. The results on the anxiety scale as a state correlate positively, weakly with the results on the impulsiveness and empathy scales. This means that as the results on the anxiety scale as a state increase, the results on the impulsiveness and empathy scales increase. A statistically significant, moderate but negative correlation with results on the tendency to risk-taking scale was found in the relationship between anxiety as a condition and tendency to risk-taking. This means that as results on the anxiety scale increase as a result, the results on the tendency to risk-taking scale decrease. In the case of results on the anxiety scale as a feature, statistically significant correlations were found with the results on all scales of the IVE tool [8]. In the case of the relationship with impulsiveness, it is positive and moderate, and empathy is positive, but weak. In the case of the relationship between the results on the anxiety scale as a feature and the results on the tendency to risk-taking scale, a statistically significant, moderate, but negative relationship was also observed (Table 7-9).

ETHICAL STATEMENT

The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was approved by Bioethics Commission of Jagiellonian University in Cracow (No. 1072.6120.132.2017 from 28th September 2017) and informed consent was taken from all the patients. All patients agreed to the examination (part of the studies completed before the surgery, some after the surgery). Patients expressed willingness to participate in the operation, and the study submitted reported and approved by the bioethics committee. The study involved completing three psychological tests (EPQ-R(S), IVE, STAI) examining the personality structure and level of anxiety. This article does not contain any studies with human participants performed by any of the authors. This article does not contain any studies with animals performed by any of the authors. This article does not contain any studies with human participants or animals performed by any of the authors.

DISCUSSION

In people suffering from ASD, the only insignificant difference in the analyzed case is that between levels of neuroticism and the scale of lying. The level of declared empathy was statistically significantly higher than the levels of impulsiveness and tendency to risk-taking. The difference between impulsiveness and tendency to risk-taking turned out to be statistically insignificant. Based on the results, no statistically significant difference was found between the analyzed variables - anxiety as a trait and anxiety as a condition.

In people suffering from PFO, a statistically significant difference was observed only between the level of psychoticism and other variables. The level of declared empathy was statistically significantly higher than the levels of impulsiveness and tendency to risk-taking. The difference between impulsiveness and tendency to risk-taking turned out to be statistically insignificant. Based on the results, a statistically significant difference was found between the analyzed variables - anxiety as a trait and anxiety as a condition.

CONCLUSIONS

The results of the study allowed us to isolate the specific personality traits of patients suffering from congenital heart defects.

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Conflict of interest
Authors declare no conflict of interest.

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Jednocześnie wyrażam zgodę na przedłożenie w/w pracy przez mgr Adriannę Skoczek jako część rozprawy doktorskiej w formie spójnego tematycznie zbioru artykułów opublikowanych w czasopismach naukowych.

Oświadczam, iż samodzielna i możliwa do wyodrębnienia część ww. pracy wykazuje indywidualny wkład mgr Adrianny Skoczek wynoszący 75% i polegający na:

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-gromadzeniu i analizie danych
-odpowiedzialności za analizę statystyczną
-napisanie artykułu
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-ostateczną akceptację artykułu

Paweł Prochownik
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(podpis współautora)

Kraków, 30.10.2020r.

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OŚWIADCZENIE

Jako współautor prac:.

1. **Skoczek A.,** Prochownik P., Podolec N., Gancarczyk U., Podolec P., Komar M.: *Personality traits of patients suffering from PFO and ASD and influence of COVID-19 pandemic time for patients suffering from congenital heart defects.* Wiad Lek. 2020;73(9 p. II):1926-1933 DOI: 10.36740/WLek202009206

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Natalia Podolec - Szczepara
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-ostateczną akceptację artykułu

Urszula Gancarczyk
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(podpis współautora)

Kraków, 30.10.2020r.

Prof. dr hab. n. med. Piotr Podolec
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-ostateczną akceptację artykułu

Monika Komar
.....

(podpis współautora)

14. Streszczenie

Cechy osobowości osób z wrodzonymi wadami serca to temat, który cieszy się niezbyt dużym zainteresowań wśród badaczy na całym świecie. Stąd praca ta może zostać uznana za innowacyjną. Brak opracowań na ten temat skłonił autorkę do przeprowadzenia badań w tym kierunku.

Praca przedstawia projekt badawczy zrealizowany w Krakowskim Szpitalu Specjalistycznym im. Jana Pawła II w Krakowie w Oddziale Klinicznym Chorób Serca i Naczyń z Pododdziałem Intensywnego Nadzoru Kardiologicznego Krakowskiego Szpitala Specjalistycznego im. Jana Pawła II, Instytutu Kardiologii Collegium Medicum Uniwersytetu Jagiellońskiego w Krakowie, z udziałem 100 pacjentów z wrodzonymi wadami serca (ASD – atrial septal defect i PFO – patent foramen ovale). Badania przeprowadzono za pomocą testów psychologicznych: EPQ-R(S) – Hans J. Eysenck i Sybil G. Eysenck; IVE – Hans J. Eysenck i Sybil G. Eysenck; STAI C. D. Spielberger, R. L. Gorsuch, R. E. Lushene.

Prezentowane wyniki i ich statystyczne analizy ukazały specyficzne cechy osobowości chorych z wrodzonymi wadami serca.

Celem badań było wyodrębnienie specyficznych cech osobowości chorych z wrodzonymi wadami serca oraz sprawdzenie funkcjonowania psychologicznego pacjentów poprzez zbadanie: poziomu lęku, jako stan i lęku jako cecha, impulsywności, skłonności do ryzyka, empatii, neurotyzmu, ekstrawersji, psychotyzmu i kłamstwa.

Analiza dała podstawy do stwierdzenia istotnych różnic. W analizowanej grupie ekstrawersja dla mężczyzn była istotnie wyższa niż psychotyzm oraz wyniki kłamstwa były istotnie statystycznie wyższe niż psychotyzm. Nie stwierdzono istotnych różnic pomiędzy wartościami itemów dla kobiet w teście IVE. Skłonność do ryzyka jest charakterystyczna dla mężczyzn z wrodzonymi wadami serca. Nie stwierdzono istotnych różnic pomiędzy wartościami itemów dla mężczyzn w teście IVE.

W mężczyzn nie stwierdzono istotnych różnic pomiędzy wynikami zmiennych lęk jako stan i lęk jako cecha $p>0,05$. Analiza wyników nie dała podstaw do stwierdzenia, że płeć istotnie różnicuje wyniki testów EPQ-R (S), IVE i STAI $p>0,05$. Nie stwierdzono istotnych statystycznie powiązań pomiędzy wiekiem, a wynikami analizowanych testów $p>0,05$. Wraz ze wzrostem poziomu wykształcenia maleje poziom lęku jako cechy. Miejsce zamieszkania miało wpływ na poziom zmiennej kłamstwo. Analiza wyników nie dała podstaw do stwierdzenia, że stan cywilny istotnie różnicuje wyniki

analizowanych testów p>0,05. Analiza wyników nie dała podstaw do stwierdzenia, że praca istotnie różnicuje wyniki analizowanych testów p>0,05.

W przypadku większej liczebności grupy (100 osób, w tym 50 kobiet, 50 mężczyzn, w tym 70 osób cierpiących na PFO i 30 ze zdiagnozowanym ASD) uzyskano wyniki badań:

W przypadku kobiet istotne statystycznie różnice stwierdzono pomiędzy poziomem psychotyczności, a wszystkimi pozostałymi analizowanymi zmiennymi. Wyniki ekstrawersji, neurotyczności oraz kłamstwa nie różnią się od siebie istotnie statystycznie, jak również poziom deklarowanej empatii jest istotnie statystycznie wyższy niż poziomy impulsywności oraz skłonności do ryzyka. Natomiast różnica pomiędzy impulsywnością a skłonnością do ryzyka okazała się również istotna statystycznie, nie stwierdzono istotnych różnic statystycznych w zakresie lęku jako stan i cecha.

W przypadku mężczyzn nieistotną różnicę zaobserwowano jedynie pomiędzy poziomem neurotyczności a skalą kłamstwa; różnica pomiędzy impulsywnością a skłonnością do ryzyka okazała się również istotna statystycznie, tak samo jak w przypadku kobiet nie stwierdzono istotnych różnic statystycznych w zakresie lęku jako stan i cecha.

Nie stwierdzono istotnej statystycznie różnicy pomiędzy analizowanymi zmiennymi lękiem jako cecha i lękiem jako stan u osób przed zabiegiem osób cierpiących na ASD i po zabiegu u osób cierpiących na PFO.

W przypadku osób pow. 40 roku życia cierpiących na ASD nieistotną różnicę zaobserwowano jedynie pomiędzy poziomami ekstrawersji i kłamstwa. Poziom deklarowanej empatii był istotnie statystycznie wyższy niż poziomy impulsywności oraz skłonności do ryzyka. Różnica pomiędzy impulsywnością a skłonnością do ryzyka okazała nieistotna statystycznie. Na podstawie wyników nie stwierdzono istotnych statystycznie różnic pomiędzy analizowanymi zmiennymi – lękiem jako cecha i lękiem jako stan.

W przypadku osób cierpiących na tę samą przypadłość poniżej 40 roku życia istotną różnicę zaobserwowano jedynie pomiędzy poziomami psychotyczności a pozostałymi zmiennymi, czyli neurotyzmem, ekstrawersją, kłamstwem. Poziom deklarowanej empatii był istotnie statystycznie wyższy niż poziomy impulsywności oraz skłonności do ryzyka. Różnica pomiędzy impulsywnością a skłonnością do ryzyka okazała nieistotna statystycznie. Na podstawie wyników nie stwierdzono istotnych

statystycznie różnic pomiędzy analizowanymi zmiennymi– lękiem jako cecha i lękiem jako stan.

U osób cierpiących na PFO powyżej 40 roku życia poziom kłamstwa okazał się istotnie statystycznie wyższy jedynie od poziomu psychotyczności. Poziom ekstrawersji okazał się istotnie statystycznie wyższy od poziomu psychotyczności. Pozostałe porównania były nieistotne statystycznie. Poziom deklarowanej empatii był istotnie statystycznie wyższy niż poziomy impulsywności oraz skłonności do ryzyka. Różnica pomiędzy impulsywnością a skłonnością do ryzyka okazała się nieistotna statystycznie. Na podstawie wyników nie stwierdzono istotnych statystycznie różnic pomiędzy analizowanymi zmiennymi– lękiem jako cecha i lękiem jako stan.

U osób z PFO poniżej 40 roku życia poziom ekstrawersji okazał się istotnie statystycznie wyższy od poziomu psychotyczności. Natomiast poziom kłamstwa okazał się również wyższy jedynie od poziomu psychotyczności. Biorąc pod uwagę poziom neurotyczności okazał się on również istotnie statystycznie wyższy pod poziomu psychotyczności. Poziom deklarowanej empatii był istotnie statystycznie wyższy niż poziomy impulsywności oraz skłonności do ryzyka. Różnica pomiędzy impulsywnością a skłonnością do ryzyka okazała się nieistotna statystycznie. Na podstawie wyników nie stwierdzono istotnych statystycznie różnic pomiędzy analizowanymi zmiennymi– lękiem jako cecha i lękiem jako stan.

Wśród osób badanych poziom ekstrawersji był istotnie statystycznie wyższy od poziomu wszystkich pozostałych zmiennych. Poziom kłamstwa istotnie różnił się od poziomu psychotyczności, który z kolei był istotnie statystycznie niższy od wszystkich pozostałych zmiennych. Poziom deklarowanej empatii był istotnie statystycznie wyższy niż poziomy impulsywności oraz skłonności do ryzyka. Z kolei różnica pomiędzy impulsywnością a skłonnością do ryzyka okazała się nieistotna statystycznie. Na podstawie wyników nie stwierdzono istotnej statystycznie różnicy pomiędzy analizowanymi zmiennymi – lękiem jako cechą i lękiem jako stanem.

U osób cierpiących na ASD jedyną nieistotną różnicą w analizowanym przypadku to ta pomiędzy poziomami neurotyczności a skalą kłamstwa. Poziom deklarowanej empatii był istotnie statystycznie wyższy niż poziomy impulsywności oraz skłonności do ryzyka. Różnica pomiędzy impulsywnością, a skłonnością do ryzyka okazała się być nieistotna statystycznie. Na podstawie wyników nie stwierdzono istotnej statystycznie różnicy pomiędzy analizowanymi zmiennymi – lękiem jako cechą i lękiem jako stanem.

U osób cierpiących na PFO istotną statystycznie różnicę zaobserwowano jedynie pomiędzy poziomem psychotyczności a pozostałymi zmiennymi. Poziom deklarowanej empatii był istotnie statystycznie wyższy niż poziomy impulsywności oraz skłonności do ryzyka. Różnica pomiędzy impulsywnością, a skłonnością do ryzyka okazała się być nieistotna statystycznie. Na podstawie wyników stwierdzono istotnej statystycznie różnicy pomiędzy analizowanymi zmiennymi – lękiem jako cechą i lękiem jako stanem.

Na podstawie wyników stwierdzono istotne statystycznie różnice w poziomach neurotyczności, ekstrawersji oraz kłamstwa. Kobiety z wrodzoną wadą serca są istotnie bardziej neurotyczne oraz osiągają istotnie wyższe wyniki w skali kłamstwa. Mężczyźni z kolei okazują się bardziej ekstrawertyczni. Na podstawie wyników stwierdzono istotne statystycznie różnice w nasileniu skłonności do ryzyka oraz empatyczności. To mężczyźni są bardziej skłonni do podejmowania ryzykownych decyzji, za to kobiety wykazują się o wiele większą empatią. Na podstawie wyników stwierdzono istotne statystycznie różnice w nasileniu lęku zarówno jako stanu, jak i cechy pomiędzy kobietami a mężczyznami. To kobiety charakteryzują się wyższym wynikiem na obu analizowanych skalach.

Rezultaty badań mogą być wykorzystane w lepszym zrozumieniu pacjenta, a także być podstawą do organizacji kompleksowej, interdyscyplinarnej terapii pacjentów z wrodzonymi wadami serca.

15. Abstract

Personality traits of people with congenital heart defects is a topic of little interest to researchers around the world. Hence, this work can be considered innovative. Lack of studies on the topic prompted the author to research this area.

The work presents a research project carried out in John Paul II Hospital, The Clinical Department of Cardiac and Vascular Diseases with the Intensive Cardiac Surgeon Division Institute of Cardiology, Collegium Medicum of the Jagiellonian University in Cracow, with participation of 100 patients with congenital heart defects (ASD – atrial septal defect i PFO – patent foramen ovale).

The results presented and their statistical analysis showed specific personality traits in patients with congenital heart defects.

We aimed to assess personality traits of clients suffering from congenital heart defects, in a group of women and men, younger, under 40 years old and older than 40 years old, with PFO and ASD before and after surgery.

The aim: identify specific personality traits of patients with congenital heart defects and to check the psychological functioning of patients by examining: the level of anxiety, impulsiveness, tendency to risk-taking, empathy, neuroticism, extraversion, psychoticism and lying.

Material and methods: We performed a psychological clinical assessment and conducted the psychological tests like EPQ-R(S) by Hans J. Eysenck and Sybil G. Eysenck, IVE by Hans J. Eysenck and Sybil G. Eystenck, STAI by C. D. Spielberger, R. L. Gorsuch, R. E. Lushene describing personality traits of patients.

The analysis gave grounds to identify significant differences. In the analyzed group, extraversion for men was significantly higher than psychoticism and the results of lying were statistically significantly higher than psychoticism. There were no significant differences between the values of the items for women in the IVE test. The tendency to take risks is characteristic of men with congenital heart disease. There were no significant differences between the values of items for men in the IVE test.

In men, no significant differences were found between the scores of anxiety as a state and anxiety as a trait of $p > 0.05$. The analysis of the results did not give rise to the conclusion that gender significantly differentiates the results of the EPQ-R (S), IVE and STAI tests $p > 0.05$. There were no statistically significant correlations between age and the results of the analyzed tests $p > 0.05$. As the level of education increases, the level of

trait anxiety decreases. Place of residence affected the level of the lie variable. The analysis of the results did not give rise to the conclusion that marital status significantly differentiated the results of the analyzed tests $p > 0.05$. The analysis of the results did not give rise to the conclusion that the work significantly differentiated the results of the analyzed tests $p > 0.05$.

In the case of a larger group (100 people, including 50 women, 50 men, including 70 people suffering from PFO and 30 with diagnosed ASD), the following results were obtained:

In the case of women statistically significant differences were found between the level of psychoticism and all other analysed variables. The results of extraversion, neuroticism and lies do not differ statistically from each other, and the level of declared empathy is statistically significantly higher than the levels of impulsiveness and tendency to risk-taking. On the other hand, the difference between impulsiveness and tendency to risk-taking turned out to be also statistically significant, no significant statistical differences were found in the scope of anxiety as a condition and feature.

For men, an insignificant difference was only observed between the level of neuroticism and the scale of lies; the difference between impulsiveness and tendency to risk taking also turned out to be statistically significant, just as in the case of women no significant statistical differences were found in the field of anxiety as a condition and trait.

There was no statistically significant difference between the analysed variables of anxiety as a trait and anxiety as a condition in people before the surgery suffering from ASD and after surgery in people suffering from PFO.

For people over 40 years of age suffering from ASD, an insignificant difference was observed only between the levels of extraversion and lies. The level of declared empathy was statistically significantly higher than the levels of impulsiveness and tendency to risk taking. The difference between impulsiveness and tendency to risk taking turned out to be statistically insignificant. Based on the results, no statistically significant differences were found between the analysed variables - anxiety as a trait and anxiety as a condition.

In the case of people suffering from the same condition below 40 years of age, a significant difference was observed only between levels of psychoticism and other

variables, i.e. neuroticism, extraversion, and lies. The level of declared empathy was statistically significantly higher than the levels of impulsiveness and tendency to risk taking. The difference between impulsiveness and tendency to risk taking turned out to be statistically insignificant. Based on the results, no statistically significant differences were found between the analysed variables - anxiety as a trait and anxiety as a condition.

For people suffering from PFO over 40, the level of lies turned out to be statistically significantly higher only than the level of psychoticism. The level of extraversion turned out to be statistically significantly higher than the level of psychoticism. Other comparisons were not statistically significant. The level of declared empathy was statistically significantly higher than the levels of impulsiveness and tendency to risk taking. The difference between impulsiveness and tendency to risk taking turned out to be statistically insignificant. Based on the results, no statistically significant differences were found between the analysed variables - anxiety as a trait and anxiety as a condition.

In people with PFO under 40, the level of extraversion turned out to be statistically significantly higher than the level of psychoticism. However, the level of lies turned out to be only higher than the level of psychoticism. Considering the level of neuroticism, it also turned out to be statistically significantly higher in terms of psychoticism. The level of declared empathy was statistically significantly higher than the levels of impulsiveness and tendency to risk taking. The difference between impulsiveness and tendency to risk taking turned out to be statistically insignificant. Based on the results, no statistically significant differences were found between the analysed variables - anxiety as a trait and anxiety as a condition.

Among the respondents, the level of extraversion was statistically significantly higher than the level of all other variables. The level of lies was significantly different from the level of psychoticism, which in turn was statistically significantly lower than all other variables. The level of declared empathy was statistically significantly higher than the levels of impulsiveness and tendency to tendency to risk taking. In turn, the difference between impulsiveness and tendency to tendency to risk taking turned out to be statistically insignificant. Based on the results, no statistically significant difference was found between the analysed variables - anxiety as a trait and anxiety as a condition.

In people suffering from ASD, the only insignificant difference in the analysed case is that between the levels of neuroticism and the scale of lies. The level of declared empathy was statistically significantly higher than the levels of impulsiveness and tendency to risk-taking. The difference between impulsiveness and tendency to risk-taking turned out to be statistically insignificant. Based on the results, no statistically significant difference was found between the analysed variables - anxiety as a trait and anxiety as a condition.

In people suffering from PFO, a statistically significant difference was observed only between the level of psychoticism and other variables. The level of declared empathy was statistically significantly higher than the levels of impulsiveness and tendency to risk-taking. The difference between impulsiveness and tendency to risk-taking turned out to be statistically insignificant. Based on the results, a statistically significant difference was found between the analysed variables - anxiety as a trait and anxiety as a condition.

Based on the results, statistically significant differences were found in levels of neuroticism, extraversion and lies. Women with a congenital heart disease are significantly more neurotic and achieve significantly higher scores on the lie scale. Men, in turn, turn out to be more extroverted. Based on the results, statistically significant differences were found in the severity of tendency to risk-taking and empathy. Men are more likely to take risky decisions, while women are much more empathic. Based on the results, statistically significant differences were found in the severity of anxiety both as a condition and as a feature between women and men. Women are characterized by a higher result on both analyzed scales.

The results of the research can be used to understand the patients better, as well as to form the basis for the organization of comprehensive, interdisciplinary therapy of patients with congenital heart defects.

16. Remaining scientific achievements

- Publication in international magazine Wiadomości Lekarskie *Personality traits of patients suffering from PFO and ASD and influence of COVID-19 pandemic time for patients suffering from congenital heart defects.* Wiad Lek. 2020;73(9 p. II):1926-1933 DOI: 10.36740/WLek202009206 Article indexed in: US National Library of Medicine National Institutes of Health – NCBI, Medline, PubMed, EBSCO, SCOPUS and Index Copernicus, (**MNiSW 20 pkt)** and Polska Bibliografia Lekarska.
- Publication in international magazine Journal of Thoracic Disease: *Psychological correlates of patients' identity suffering from atrial septal defect (ASD) and patent foramen ovale (PFO).* J Thorac Dis 2020;12(5):1999-2018. doi: 10.21037/jtd-20-220 **Impact Factor 2,046 (MNiSW 70 pkt)** PubMed Central, PubMed, SCOPUS, EBSCO, SCIRUS, CINAHL, Index Copernicus, Open J-gate, WorldCat, Google Scholar, Free Medical Journals, Wissenschaftszentrum Berlin (WZB database, Germany), German National Library ZDB database
- Publication in international magazine Wiadomości Lekarskie: *Personality traits of patients suffering from congenital heart defects.* 72 (11 cz 1):2135-2144, DOI: 10.36740/WLek201911114 Article indexed in: US National Library of Medicine National Institutes of Health – NCBI, Medline, PubMed, EBSCO, SCOPUS and Index Copernicus, (**MNiSW 20 pkt)** and Polska Bibliografia Lekarska.
- Publication in international magazine Wiadomości Lekarskie: *The effectiveness of cardiovascular education in the prevention of heart disease among the inhabitants if Lesser Poland* 73(4): 684-690; January 2020 DOI: 10.36740/WLek202004111 Article indexed in: US National Library of Medicine National Institutes of Health – NCBI, Medline, PubMed, EBSCO, SCOPUS and Index Copernicus, (**MNiSW 20 pkt)** and Polska Bibliografia Lekarska.
- Speech at the XXII International Congress of the Polish Neuropsychological Society Neuropsychology in medicine, medicine in neuropsychology on the topic: Neurocognitive functions in cardiovascular diseases Lublin, November 29-30, 2019. Funkcje neuropoznawcze w chorobach sercowo-naczyniowych Lublin 29.11-30.11.2019r.

- Publication in international magazine Wiadomości Lekarskie: *Cechy osobowości sprawców różnych typów przestępstw. Personality traits of perpetrators of various types of crimes*. Article indexed in: US National Library of Medicine National Institutes of Health – NCBI, Medline, PubMed, EBSCO, SCOPUS and Index Copernicus, (**MNiSW 11 pkt)** and Polska Bibliografia Lekarska.
- Speech at the VII National Conference of Forensic Psychiatry Departments Spała 09-10.03.2018. topic: Personality traits of prisoners on the basis of own research using the PAI test by Leslie C. Morey; Cechy osobowości więźniów na podstawie badań własnych z wykorzystaniem testu PAI autorstwa Leslie C. Morey'a
- Speech at the International Conference of Medical and Life Sciences in Lublin International Conference of Natural and Medical Sciences: Young Scientists, PhD Students, and Students – topic: Test PAI autorstwa Leslie C. Morey'a jako narzędzie do badania psychopatologii, cech i zaburzeń osobowości w medycynie i psychologii; The PAI test by Leslie C. Morey as a tool to study psychopathology, personality traits and disorders in medicine and psychology
- Speech at the 20th International Congress of the Polish Neuropsychological Society "Brain-Language-Behavior. Interdisciplinary approach" in Kielce topic: *The development of linguistic communication and its disorders: from childhood to old age* Rozwój komunikacji językowej i jej zaburzenia: od dzieciństwa do starości 21.10.2017r. – 22.10.2017r.
- Publication in international magazine Emergency Medical Service: *Wsparcie psychologiczne poszkodowanych w wypadku jako środek stosowany przez ratowników medycznych*, Article indexed in: **(MNiSW 20 pkt)** Index Copernicus, PBN, Polska Bibliografia Lekarska
- Publication in international magazine Emergency Medical Service: *Psychological support of the injured in the accident as a means used by paramedics* Article indexed in: **(MNiSW 20 pkt)** Index Copernicus, PBN, Polska Bibliografia Lekarska
- A presentation awarded by the Scientific Council during International Congress of the Forensic Psychiatry in Łódź 2017r. topic: Personality traits of perpetrators of various types of crimes. 21.04.-22.04.2017r.